CEPF SMALL GRANT FINAL PROJECT COMPLETION REPORT

Organization Legal Name:	Centre for Environment and Development (CED)
Project Title:	Identifying Potential Areas as "Conservation Reserves" in Agasthyamalai Biosphere Reserve
Date of Report:	
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CEPF Region: Western Ghats region (Periyar-Agasthyamalai Corridor)

Strategic Direction: 1 (Support partnerships to safeguard globally threatened species, ensure conservation of biodiversity in priority sites and enhance connectivity in the five corridors)

Grant Amount: 18500 US $.

Project Dates: 01.09.2009 – 31.12.2010.

Implementation Partners for this Project (please explain the level of involvement for each partner): The project was intended to develop methodologies for the identification and prioritization of Conservation Reserves in the forest areas of Agasthyamala Biosphere Reserve. During the implementation of the project Travancore Natural History Society, Thiruvananthapuram helped in data collection (birds, butterflies, amphibians, reptiles, etc). However the preliminary discussions with the department and local communities and their institutions showed that they endorse the outcome of the study and will be implementing it in due course.

Conservation Impacts

Please explain/describe how your project has contributed to the implementation of the CEPF ecosystem profile.

The project addresses the Strategic Direction (SD) 1 (Enable action by diverse communities and partnerships to ensure conservation of key biodiversity areas and enhance connectivity in the corridors) and in particular Investment Priority (IP) 1.1 (Test pilot models of community and private reserves to achieve conservation outcomes at priority sites and critical links in unprotected areas of the Anamalai and Malnad-Kodagu corridors as well as the Brahmagiri-Nagarhole critical link in the Mysore-Nilgiri corridor) of Western Ghats Ecosystem Profile. The project illustrated the above mentioned SD and IP where the emphasis has given more on the community involvement in conservation planning. The project contributed towards the identification of new protected area in the Periyar-Agastyamala Corridor, one of the priority landscapes according to CEPF ecosystem profile. It also worked towards the involvement of local communities and their institutions such as Vana Samrakshana Samithi (VSS) in conservation planning and management. The 20842.23 ha of forest areas identified as potential Conservation Reserves (new category of PAs) are biologically rich and ensures contiguity with existing PAs and conservation and protection of a wide range of globally significant species of plants and animals by involving local communities. The conservation reserves are the new category of PAs where the local community has more access to management.

Please summarize the overall results/impact of your project against the expected results detailed in the approved proposal.

The approved proposal state the following outputs, (i) criteria for identification of conservation reserves, (ii) details of biodiversity rich areas identified, delineated and mapped which can be declared as conservation reserves, (iii) details on the existing capacity and capability of the community institutions, (iv) necessary consultation with communities and (v) management strategies for the identified conservation reserves. The project has successfully developed the criteria using the biological and socio-economic strength of the forest area and the communities and their institutions (VSSs) involved in managing the forest patches. Two levels of criteria were developed, one for short-listing and the second stage criteria for prioritizing. The criteria are as exhaustive as possible and integrated into spatial format for analysis and interpretation. Many of the socio-economic criteria were developed with the help of consultation with the local people and verifying their records related to VSS meetings. The consultations with the communities also helped in developing the management strategies for the identified forest patches. The complete report has been annexed (Annexure 1).

Please provide the following information where relevant:

Hectares Protected: NIL

Species Conserved: NIL

Corridors Created: NIL

Describe the success or challenges of the project toward achieving its short-term and long-term impact objectives.

The implementation of the project was very successful with the cooperation of local communities, forest department officials, and others. The involvement of Vana Samrakshana Samithis (VSSs) and other institutions helped in many ways and the implementation of the project definitely scaled up to the real spirit of participatory research. This involvement helped in achieving the short term as well as long term objectives of the project.

Were there any unexpected impacts (positive or negative)?
No

Lessons Learned

Describe any lessons learned during the design and implementation of the project, as well as any related to organizational development and capacity building. Consider lessons that would inform projects designed or implemented by your organization or others, as well as lessons that might be considered by the global conservation community.

The major lesson learned include

(i) One of the researcher developed skill for the identification of birds and amphibians since he has extensively went to the field along with amateur field biologists.

(ii) The skill in communicating with the local people, to certain extent towards conduct of Participatory Rural Appraisal (PRA) exercise, was also developed through the execution of the project.

(iii) Technical capacity such as using Geological Information System (GIS) and remote sensing tool in data presentation, analysis and interpretation

(iv) One of the major lesson learned is the art of working with tribal people, and understanding their knowledge and skill in environment conservation and protection

Project Design Process: (aspects of the project design that contributed to its success/shortcomings)

The project was designed with achievable goals and objectives within the Strategic Direction and Investment Priority of the CEPF ecosystem profile. A careful reading of the past work and incorporation of available data also helped in successful completion of the project.

Project Implementation: (aspects of the project execution that contributed to its success/shortcomings)

The involvement of all stakeholders including Forest & Wildlife Department, Government of Kerala, the Participatory Forest Management Committees of different forest divisions in the Kerala-part of Agasthyamala Biosphere Reserve area, such as Vana Samrakshana Samithies (VSS), the amateur field biologists from Travancore Natural History Society (TNHS), and members from other NGOS helped in successful implementation of the project. The technical support provided by faculty members from CED also facilitated the project implementation.

Other lessons learned relevant to conservation community:

ADDITIONAL FUNDING

Provide details of any additional donors who supported this project and any funding secured for the project as a result of the CEPF grant or success of the project.

Donor	Type of Funding*	Amount	Notes
KFD	A	$ 300.00	Facilities, staff time
VSS	A	$ 500.00	Labour, meeting halls, man-hours equivalent
CED	A	$1680.00	Salary of the JRF and Research Associate during the extended period of the project

***Additional funding should be reported using the following categories:**

A *Project co-financing (Other donors contribute to the direct costs of this CEPF project)*

B *Grantee and Partner leveraging (Other donors contribute to your organization or a partner organization as a direct result of successes with this CEPF project.)*

C *Regional/Portfolio leveraging (Other donors make large investments in a region because of CEPF investment or successes related to this project.)*

Sustainability/Replicability

Summarize the success or challenge in achieving planned sustainability or replicability of project components or results.

Summarize any unplanned sustainability or replicability achieved.

The sustainability of the outcome depends on the implementation of the results which are yet to takes place. However the methodology developed for the identification of the conservation

reserve through this study is as exhaustive as possible and the same can be used in similar situations with context specific modifications. The outcome of the project once implemented would help in protecting and conserving a wide array of globally significant species of plants and animals. It also recommends a community owned PA management system which is the need of the hour. The criteria and other aspects in the methodology could be effectively replicated to similar situations with suitable modifications; hence the most conspicuous aspect of the success is determined by how many similar instances will be developed by taking cue from this study.

Safeguard Policy Assessment

Provide a summary of the implementation of any required action toward the environmental and social safeguard policies within the project.

Not applicable

Performance Tracking Report Addendum

CEPF Global Targets

(Enter Grant Term)

Provide a numerical amount and brief description of the results achieved by your grant.
Please respond to only those questions that are relevant to your project.

Project Results	Is this question relevant?	If yes, provide your numerical response for results achieved during the annual period.	Provide your numerical response for project from inception of CEPF support to date.	Describe the principal results achieved from (Attach annexes if necessary)
1. Did your project strengthen management of a protected area guided by a sustainable management plan? Please indicate number of hectares improved.	No			
2. How many hectares of new and/or expanded protected areas did your project help establish through a legal declaration or community agreement?	No			
3. Did your project strengthen biodiversity conservation and/or natural resources management inside a key biodiversity area identified in the CEPF ecosystem profile? If so, please indicate how many hectares.	No			
4. Did your project effectively introduce or strengthen biodiversity conservation in management practices outside protected areas? If so, please indicate how many hectares.	Yes	20842.3		The area identified are outside the existing PAs; Ponmudi (57.1753 sq.km), Kallar (24.0510 sq.km), Chankili (119.6457 sq.km) and Achancovil (7.5512 sq.km)
5. If your project promotes the sustainable use of natural resources, how many local communities accrued tangible socioeconomic benefits? Please complete Table 1below.	No			

If you answered yes to question 5, please complete the following table.

Table 1. Socioeconomic Benefits to Target Communities

Please complete this table if your project provided concrete socioeconomic benefits to local communities. List the name of each community in column one. In the subsequent columns under Community Characteristics and Nature of Socioeconomic Benefit, place an X in all relevant boxes. In the bottom row, provide the totals of the Xs for each column.

Name of Community	Community Characteristics								Nature of Socioeconomic Benefit												
									Increased Income due to:												
	Small landowners	Subsistence economy	Indigenous/ ethnic peoples	Pastoralists/nomadic peoples	Recent migrants	Urban communities	Communities falling below the poverty rate	Other	Adoption of sustainable natural resources management practices	Ecotourism revenues	Park management activities	Payment for environmental services	Increased food security due to the adoption of sustainable fishing, hunting, or agricultural practices	More secure access to water resources	Improved tenure in land or other natural resource due to titling, reduction of colonization, etc.	Reduced risk of natural disasters (fires, landslides, flooding, etc)	More secure sources of energy	Increased access to public services, such as education, health, or credit	Improved use of traditional knowledge for environmental management	More participatory decision-making due to strengthened civil society and governance.	Other

If you marked "Other", please provide detail on the nature of the Community Characteristic and Socioeconomic Benefit:

Additional Comments/Recommendations

Kerala Forest Department- The patches identified are some of the few biodiversity rich forest areas in the Agasthyamalai Biosphere Reserve of Kerala part where the local level participatory institutions make their strong presence. Hence on account of biological and social values these locations are suitable candidate for declaring Conservation Reserves.

Kerala State Biodiversity Board – The State Biodiversity Board may be taken keen initiative in collaboration with the forest department and other agencies to monitor and the biological diversity in the area.

ATREE – The facilitator of CEPF may make the process simple, especially in accounting and reporting. Moreover it would be appropriate if the full fledged report is being collected and web-published.

CEPF- The CEPF may continue to support such multi stakeholder involved conservation initiatives and would strengthen the implementation phase of selected projects

RIT – The regional implementation team may ensure more interactions and enhanced technical support to the organizations

Information Sharing and CEPF Policy

CEPF is committed to transparent operations and to helping civil society groups share experiences, lessons learned, and results. Final project completion reports are made available on our Web site, www.cepf.net, and publicized in our newsletter and other communications.

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FINAL REPORT

IDENTIFYING POTENTIAL AREAS AS CONSERVATION RESERVES IN AGASTHYAMALAI BIOSPHERE RESERVE

Submitted to

CRITICAL ECOSYSTEM PARTNERSHIP FUND – ASHOKA TRUST FOR RESEARCH IN ECOLOGY AND ENVIRONMENT (CEPF-ATREE)

By

CENTRE FOR ENVIRONMENT AND DEVELOPMENT

THIRUVANANTHAPURAM

August 2011

PROJECT TEAM

Investigators: **P.V. Karunakaran**

T.R. Vinod

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S. M. Nadeer

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At the Centre, Dr. Babu Ambat, Executive Director is acknowledged for the encouragement and other support provided to complete this study. We are also grateful to all the colleagues of the Institute for the various supports given to us during the field study and report preparation.

Project Team

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Chapter I

INTRODUCTION

Conservation of primary forest is highly significant to protect the biodiversity through minimizing the changes and losses of divers-genomes. For the proper survival of human beings, a holistic approach is required to be adopted as regards protection of the plant kingdom as well as the animal kingdom for the peaceful and mutually beneficial co-existence. Anthropogenic activities are producing numerous injurious effects to biota. Some organisms cannot thrive and some modify their genome to adapt this situation. Some artificial modifications are directly induced for human welfare. However, day-by-day actual genome of organisms are loosing in large scale. A well conceived procedure for conservation is highly essential in this extreme situation. The natural features that occur in protected areas and in the wider landscape – populations, species assemblages, environmental domains – obviously differ in spatial and temporal patterns. Their risk of loss points to the necessity for biodiversity conservation planning and management to address issues of vulnerability and persistence (Gaston *et al*., 2002). It has emerged as a key environmental concern of the day. Effective action in this context calls for an understanding of how biodiversity is distributed and maintained, in particular, within the species-rich tropical forest regions that are being rapidly depleted. We have limited information on these issues, much of it from investigations in a few localities on a few taxa (Daniels *et al*., 1992).

India is one of the mega-biodiversity countries in the world. The large area and the variety of bioclimatic conditions met within its different bio-geographical zones contribute to the great diversity of the Indian flora (Singh, 2001). Bio-geographical zones in India such as Trans Himalayan Region, Indian Desert, Semi-Arid, the Western Ghats, Deccan Peninsula, Gangetic Plains, North-East Region, Islands and Coasts are rich in genetic diversity of plant and animal life. Indian subcontinent forms the part of mega diversity hotspots of the world, occupying only 2.5% of the land area and accounting for 7.8% of the globally recorded species (Myers *et al*., 2000). Around 3000 B.C, nearly 80% of India was forested (Warner, 1982), but in 1999 it was reduced to 19.4% (FAO, 2001). From this data, we may infer that huge amount of genome was lost.

The Western Ghats, one of the 'biodiversity hotspots' in the world is a chain of mountains spread over an area of about 54,000km^2 is unique in terms of its endemic flora, fauna as well as the biological affinities it shares with forests in south-east Asia. This tropical region contains more than 30 percent of all plant, fish, herpetofauna, bird, and mammal species found in India with high rate of endemism. People in the Western Ghats have traditionally followed conservation systems like setting up sacred groves, near natural patches of forests protected in the name of local deities and hence they represent patches of primary forests which have very high conservation importance (Gokhale, 2004: Malhotra *et al.,* 2001). Except some protected areas, a major part of the primary forests in the Western Ghats have been lost or degraded due to various anthropogenic activities and many species have been driven to critical conservation status.

Among the other regions of the Western Ghats, the southern Western Ghats is one of the richest abodes of tropical moist forests in the country. A large portion of the southern Western Ghats falls within Kerala, with a few significant spur hills extending into the neighboring Tamil Nadu, viz. Nilgiris, Palani, High-Wavies and the Kalakkad (Praveen and Nameer, 2009). The Agasthyamalai hills, situated at the Southern most tip of the Western Ghats is notable for its very rich and diverse vegetation, with high concentration of endemics. It is considered as a divine grove, rich in myths, folk knowledge, area of biodiversity and associated cultural practices and lying as the meeting point of two southern Indian states, Kerala and Tamil Nadu. These hills form the major peaks, towards the tail end of the Western Ghats, before it abruptly falls into low hills at the Kanyakumari (Cape Camorin) district, the southern most tip of the Indian Peninsula. This is a compact range of hills with a main range descending equally steeply to both the western and eastern sides and this is the only part of the Western Ghats where some stretch of the western slopes are also in Tamil Nadu (Nair, 1991; Manju *et al*., 2009). Considering its immense

conservation potentials and human ecological significance, the area has been designated as 'Agasthyamalai Biosphere Reserve (ABR)' since 2001 (Manju *et al*., 2009). The ABR constitutes around 3500 km^2 area in which Kerala contributes nearly 1800 km^2 and the rest from Tamil Nadu.

In Agasthyamalai Biosphere Reserve (ABR) of Kerala part, Shenduruny, Peppara and Neyyar Wild Life Sanctuaries are the only Protected Areas (PAs) consisting of 160.87km^2, 82.68km^2 and 100.19km^2 areas respectively. Total percentage area under PA network in Kerala part of ABR is 20.69% which may not be sufficient enough to ensure the persistence of all endemic and globally threatened flora and fauna. Agasthyamalai region of southern Western Ghats is embedded in a human-dominated landscape and hence are subject to intense land-use conflicts. Only a smaller portion of the area is represented by PA system and many critical/ unique ecosystems (e.g. *Myristica* swamps), habitats and species are seldom represented under the PA network and could be protected through community participation. In this regard, the formation of Conservation Reserves will enhance the protection of rich biological wealth of the reserved forests through active participation of local communities.

Conservation Reserves are the fairly new category of PA affected with the amendment of Wildlife (Protection) Act, 1972, during 2002. It states that after due consultation with local communities, any area owned by the Government, particularly the areas adjacent to the National Parks and Sanctuaries and those areas which link one protected area with another, can be considered as a Conservation Reserve for protecting landscapes, seascapes, flora and fauna and their habitat. It means, by all probability the conservation reserves falls in the reserve forests (territorial divisions) where local community has considerable role to play in the management though custodial rights are vested

with forest department. Although the provision for creating conservation reserve has been given in the W (P) Act, 1972, declaration of the same has not been affected in the state even today. This may be due to the lack of proper suggestions or recommendations from the field by planners or other stakeholders. In order to assist the decision makers and conservation planners, it is decided to develop a methodology and criteria for identifying conservation reserves in the state with the following objectives. This attempt may be considered as an initial step towards an objective way of identification of conservation important areas and need to be discussed in detail before applying to the field.

1.1. Objectives

The main objective of the study is Identification of potential areas outside the present protected areas as Conservation Reserves in Agasthyamalai Biosphere Reserve of Kerala part.

The specific objectives are:

i) To develop criteria for identification of Conservation Reserves;

ii) To identify, delineate and map the biodiversity rich areas based on criteria which can be declared as Conservation Reserves;

iii) To assess the capacity and capability of existing community institutions (e.g. VSS) in managing the Conservation Reserves and suggest methods to improve the skills;

iv) To develop and suggest strategies to manage the Conservation Reserves.

Chapter II

REVIEW OF LITERATURE

Potential areas of forest for conservation in Kerala were initially proposed by Rodgers & Panwar (1988). In the revised report (Rodgers *et al.,* 2000) two National Parks (Agasthyamalai and Anamudi) and extension for Periyar National Park and 11 Wildlife Sanctuaries (Chirikala, Kurathimala, Palamala, Bharathapuzha, Agasthyamalai, Anamudi, Karimpuzha, Sabarigiri-Achenkoil, Malabar Wetalnd and Kumarakom) were suggested. Earlier, Nair (1991) suggested that while identifying areas for long-term conservation, representatives of the areas and measures for sustainable utilization of resources might be addressed. India has adopted only two categories of IUCN classification *i.e.,* II & IV correspond to National Parks and Wildlife Sanctuaries. These two categories of PAs certainly protect substantial part of country's natural ecosystems and wildlife. In an attempt to overcome the described problems and limitations to the Pas, the Wildlife (Protection) Act has been amended in 2002 and two more PAs have been legally envisaged *i.e.,* Conservation Reserves and Community Reserves. In a recent study Ramesh *et al.,* (2002) indicated that, of the 5009 km^2 (51%) of high conservation areas, only 22% are inside the PAs while 78% are outside and are potentially exposed to severe anthropogenic pressures.

Some of the recent studies at national and international levels used different criteria for conservation and prioritization. A thorough assessment of forest biodiversity is difficult to find out the potential area of forests for conservation. In this situation, presence of selected species or group is considered to assess the entire spectrum of biodiversity of a given area. The selected species or group may be a common, endemic, rare, threatened or endangered (Das *et al*., 2006, Eken *et al*., 2004) category. To evaluate the potential areas in marine ecosystem in Canada, only one species, *Katharina tunicate* was used (Salomon *et al*., 2006).

The criteria used to select the forest areas for conservation by Phua and Minowa (2005) is categorized under biodiversity conservation (ecosystem diversity and species diversity), soil and water conservation (flood prevention function, drought prevention function and landslide prevention function) and potential threats (proximity to roads, proximity to settlements and potential commercial timber) and given specific weightage to each category.

In priority area identification of tropical forests in Eastern Ghats of India, Balaguru *et al*., (2006) considered selected ecological characters such as vegetation type, species richness, endemic species and red-listed species and then applied score according to their extent. Study by Soosairaj *et al*., (2007) in selecting priority sites in tropical forest in India, considered most of the ecological parameters and deforestation risk as criteria, at the same time community participation for forest protection are not attempted.

As part of selection of high conservation value forest areas using participatory forest management (PFM), in Indonesia, Sulistioadi *et al*., (2004) illustrated the importance and relationship between water source and community; but ignored ecological factors and social aspects. Studies of prioritisation of conservation areas in the Western Ghats, Das *et al*., (2006) considered only the ecological factors and the scale of the study was not appropriate to delineate small areas for community conservation efforts. Ramesh *et al.* (2002) mentioned three basic ecological principles to adopt prioritization of potential areas for conservation such as, representativity, ecological integrity and contiguity. The said study used only limited biological or ecological criteria for identifying high conservation value areas.

All the above described studies used criteria either based on ecological principles or partially on social dimensions. No comprehensive study was carried out with both social and ecological parameters. Moreover, the scale of the study is very important since the implementation of the output will be in smaller scale for effective management by local communities. In this context, a comprehensive criteria developed through interactive process would be of much relevance in delineating the conservation reserves.

Chapter III

STUDY AREA

The Agasthyamalai Biosphere Reserve (ABR) of Kerala part, lying in the extreme southern region of Indian peninsula as well as southern Western Ghats was selected for this study (Fig. 3.1). ABR of this region consists of protected areas such as Neyyar, Peppara and Shendurney wildlife sanctuaries and territorial forest divisions such as Konni, Achancovil, Punalur, Thenmala and Thiruvananthapuram. Among these forest administrative units, only territorial divisions have been considered for the study because conservation reserves will be established in such forest divisions as per the Wildlife (Protection) Act.

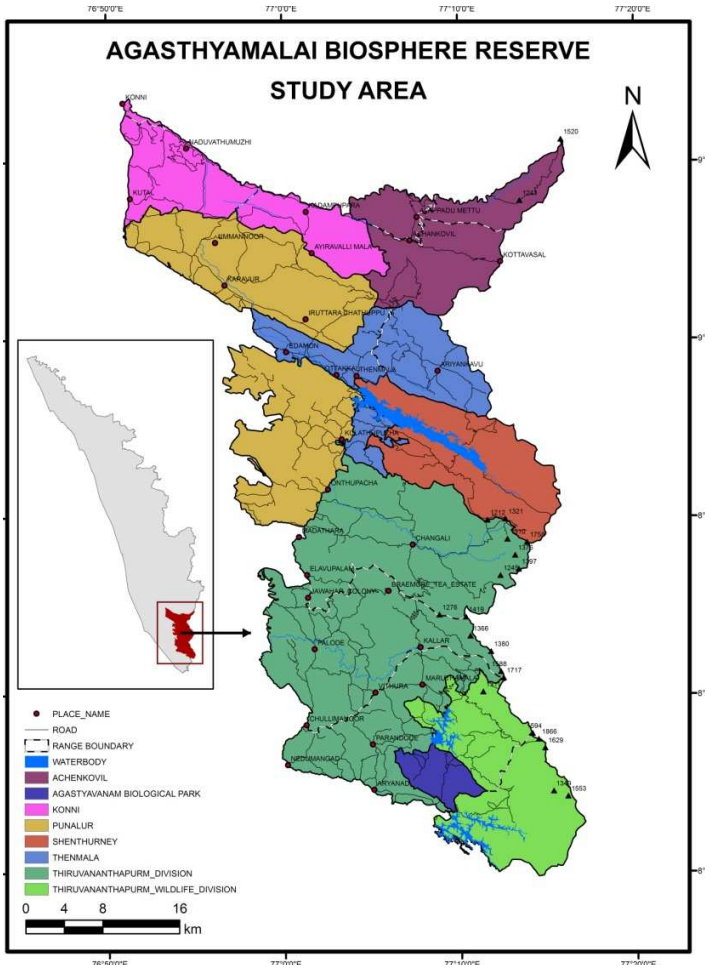


Fig. 3.1: Map of study area

3.1. Konni Forest Division

Konni Forest Division falls under Karunagapally and Pathanapuram Taluks of Kollam District and portion of Kozhenchery and Adoor Taluks of Pathanamthitta district. The division area lies between 9^0 3' and 9^0 15'N latitude and 77^0 4' and 77^0 6'E longitude. There are 320.55 km^2 of Reserve Forest coming under this Division. Konni Forest Division is land locked by Ranni on the north, Achancovil on the east, and Punalur Forest Division on the south. The administrative control of this Division extends up to Arabian Sea on the west. The forest tract from the part of the Western Ghats is situated mainly on its western slopes. The elevation varies from 60m (plains) to 997m at highest point namely Chelikkalkar. The forest tracts are undulating in nature, the main hillocks being Chelikkalkar (997m), Iruvullimala (817), Thunathumala (721m), Kodamala (598), Chembalakar (154m) etc. Generally, the aspect of the area dealt with is northern and southern through the presence of numerous ridges and valleys in various directions without a definite pattern gives rise to different aspects.

The soil is fine textured loam turning clayey in the valleys. Coarse soil mixed with quarts is observed in the ridges. The climate in the area is generally moderate with more daylight hours. The temperature varies from 17^0C in the rainy and winter seasons and up to 35^0C in the summer season. The hottest months are March and April. The average rainfall received during the last ten years is 346.4cm. The major forest types present in this division are west coast tropical evergreen forests, west coast semi- evergreen forests, southern moist mixed deciduous forests, wet reed brakes and grasslands.

3.2. Achancovil Forest Division

Achancovil Forest Division falls under Kollam and Pathanamthitta Revenue districts. Achancovil River that serves as the inter district boundary flows almost east to west, dividing the tract into two segments comprising Kallar and Kanayar Ranges and north section of Achancovil Range comes within the Aravappulam Village in Kozhenchery Taluk of Pathanamthitta district, while the southern segment, consisting of remaining portion on Achancovil Range (south section) falls within the Aryankavu Village in Pathanapuram Taluk of Kollam district. The Achancovil Forest Division lies between 09^0 $02^{'}$ $09^{''}$ N to 09^0 $12^{'}$ $30^{''}$ North latitudes and 77^0 $03^{'}$ $51^{''}$ to 77^0 $16^{'}$ $07^{''}$ East longitudes. The Forest Division is bounded on the north, west and south by Reserve forests of Konni, Punalur and Thenmala Forest Divisions respectively and on east by Tamil Nadu state. The tract dealt with is situated on the windward side of Western Ghats. Descending from the height of the Ghats, the land slopes towards west. Topographically, the

whole area is hilly, undulating and highly rugged. This continuous stretch of land, dotted with soaring cliffs and profound valleys support dense forests. The lofty main Ghats with elevation varying from 800m to 1920m, stretches along the eastern border forming an impassible barrier separating the two states because of its towering cliffs and higher slopes, which are notably and characteristically precipitous at many places. The altitude varies from 76m to 1923m. The temperature drops by 1^0C for every 300m rise up to 1000m and beyond that point, the temperature fall very rapidly.

The soil condition varies from locality and vegetation types. The major type of soils are red loamy, laterite, alluvial, sandy loam and clayey. Generally, climate in the area is moderately hot and humid. The hottest months are February to May and the coldest are December and January. The temperature varies from 20^0C to 34^0C in the lower reaches and from 17^0C to 30^0C at higher altitude. The reach, being on the windward side of the Western Ghats, enjoys rains from both south-west monsoon and north-west monsoon. The average rainfall received during the last ten years is 264.53cm. The major forest types present in this Division are west coast tropical evergreen forests, southern hilltop tropical evergreen forests, west coast semi evergreen forests, southern moist mixed deciduous forests, wet reed brakes, bamboo brakes, cane brakes and grass lands.

3.3. Punalur Forest Division

Punalur Forest Division comprises of Pathanapuram and Anchal Ranges coming under Pathanapuram and Kottarakkara Taluks of Kollam district. The area of reserve forest of the Division is 275.55km^2. The tract lies between 8^0 52' and 9^0 7' N latitude and 76^0 35' and 77^0 6' E longitude. The forest covers outer foothills of Western Ghats with a few peaks. Except the interior areas of Achancovil Reserves in Pathanapuram Range, the Reserves are well accessible in both ranges owing to various plantation projects. Yeroor and Airanalloor Reserve Forests have rolling terrain of low rounded hills alternately with swampy valleys. Achancovil and Shalikkara Reserves exhibit a more rugged topography with hill above 600m. The major forest types present in this division are the west coast tropical evergreen forest, west coast semi evergreen forest, southern moist mixed deciduous forest and grasslands.

Major type of soils found in most of the areas is red loamy, which is rich in minerals. Alluvial soil is found in the riverbanks and valleys. In Yeroor Reserve, sandy soil is met in some parts, which is pure in nutrients and humus. Sandy loam and clayey loam are found in areas around Kumarankudy and Kaikunnam portions of Achancovil and Shaliakara Reserves. Clayey loam is

more predominant at Mambazhathara in Achancovil Reserve. Generally, the soils are well drained. The climate in the area is moderately hot and humid. The hottest months are February to May and the coldest are December and January. The temperature varies from 18 to 39^0C. The tract receives both monsoons, but bulk of which is from south-west monsoon during June – August. The area receives an average rainfall of 240cm annually. The extent of natural vegetation in the division is very less owing to large scale plantation raised to support the industrial units in the area.

3.4. Thenmala Forest Division

Thenmala Forest Division is situated in the Pathanapuram and Kozhencherry Taluks of Kollam and Pathanamthitta Revenue districts respectively and lies within 76^0 59' 30"and 77^0 16' 30" north latitude and 8^0 44' and 9^0 44' and 9^0 14' south latitude. This division in north is surrounded by Achancovil Forest Division in the East by Tirunelveli (Tamilnadu State) in the South by Thiruvananthapuram division and Shendurney Wild Life Sanctuary and in the west by Punalur and Konni divisions. The total area of this division is 575.56 km^2. Kulathupuzha, Arienkavu, Achencoil, Konni Edamon Teak Plantation reserve forest make up the area of the division. In the east, there is a continuous stretch of dense forests with high and elevated cliffs and pinnacles which act as barriers seperating the states of Kerala and Tamil Nadu. The lofty Ghats casts numerous high spurs westwards which end abruptly after a few miles across forming deep valleys with preponderence of valuable tree growth. The valleys formed are (a) Achencoil (b) Arienkavu (c) Kallar and (d) Shenduruney. Altitude varies from 76 m (Achencoil) to 1922 m (Devarmalai) above the mean sea level. The important peaks present in this division are Devermali (1922 m), Pepparai (1916), Kottamala (1570), Tuval Mala (1436), Ramakal Theri (1180), Karimala Kadakkal (17631), Alwarkuruchi peak (1579), Pongumalai (16-9), Mudira malai (1041), Thirthakara malai (849) and Nilankoil Mottai (807).

The soil fertility varies according to the position of slope, soil depth; presence of stonyness, soil is deep, fine and fertile in the valleys while it is shallow and bouldary in the hill ridges. Laterite is also formed in varying degrees of disintegration of hard rock to fine gravel. The soil along the stream and river banks is of alluvial deposit being deep enough to support good tree growth. The climate is tropical with not much appreciable variation in both seasonal and diurnal temperature. Generally the climate is hot and humid. The hottest months are March, April and May and the coldest months are December, January and February. The maximum and minimum mean daily temperature during the hottest month of March and coldest month of January are 35.8°C and 20°C respectively. Both south-west and north-east monsoon bring in rain, but the tract receives bulk of the rainfall from the south-west monsoon with long duration and lasts from June to August.

The north-east monsoon lasts for about three months from October-December. The major forest types present in this division are the west coast tropical evergreen forests, southern hill top evergreen forests, the west coast semi-evergreen forests and southern moist mixed deciduous forests.

3.5. Thiruvananthapuram Forest Division

The Thiruvananthapuram Forest Division, the southernmost territorial division of the State is situated within 8º 17' 50" and 8º 53' 42" N and 76º 40' 24" and 77º 17' E . The area lies within Neyyattinkara, Thiruvananthapuram and Nedumangad Taluks of Thiruvananthapuram Revenue District and Chirayinkizhu, Kottarakkara and.Pathanapuram Taluks of Kollam Revenue District and encompass an area of about 300 km^2. It is bounded on north by Shendurney Wildlife Sanctuary and part of Punalur Division, east and south, the interstate boundary with Tamil Nadu and west the Arabian Sea. Forest tract of the division is mainly situated on the western side of the Western Ghats and the altitude varies from 50 m to 1869 m (Agasthyarkoodam). The other two peaks are Chottupura (490m) and 'Aathirumala' (720m). The climate is generally tropical and moderately cool in higher areas like Ponmudi. The dry season is from December to April and the hottest month is March. Most of the precipitation is received during south west monsoon which prevails from June to August. Pre-monsoon or summer showers are frequent in the months of March, April and May. North east monsoon too contribute considerably to the total precipitation of the area. The division is characterized by network of drainages which ultimately culminate to four major rivers namely Karamana Ar, Neyyar, Vamanpuram Ar and Kulathupuzha Ar. The natural vegetation of the division includes the following forest types, i.e., west coast tropical evergreen forests, semi evergreen forests, southern moist deciduous forest, grasslands, reed brakes, and myristica swamps. A small patch of montane grass lands and shola patches are also seen at Ponmudi and Varayattumudi.

Chapter IV

APPROCH AND METHODS

4.1 Development of Criteria

In order to maintain the objectivity in identification of biologically rich and community managed forests in the area, technically appropriate criteria were used. They were developed based on the similar studies conducted in the country and elsewhere for identifying the conservation important areas. Interaction with conservation planners, researchers and managers, also helped in formulating the criteria. Hence two level criteria were developed; the first level is being used at desktop stage with the help of satellite data for short listing the patches of forests and the second level on the data collected on certain biological and sociological parameters from each patch to prioritize the short-listed patches. The major principles of the criteria for the identification of conservation reserves were representativeness. It implies the representation as, climax type of forests, biological wealth indicated by species richness and presence of conservation important (endemic) and critical species of plants and animals (vertebrate species excluding mammals), natural resources like water bodies and human ecological dimensions indicated through dependency and resource collections. The information with respect to these parameters was collected through direct observation and from different documents of forest department and Vana Samarakshana Samithis (VSS). The criteria thus developed were finalized through consultative process with stakeholders.

4.2. First level criteria

In the first level, two criteria were used, type of forests and general involvement of community organization in the management of the forest areas (Figure 4.1)

4.2.1 Type of the forest

Type of the forest is commonly assessed by the nature, assemblage of different plant species and the behavior of geographic areas. It is directly related to forest potentiality, because diversity varies according to the forest types. Some studies reveal conspicuously reduced species richness in secondary (developed after clear-felling) or degraded (affected by logging) rainforests (Parthasarathy 1999; Keßler *et al*., 2002). Tree diversity is high in evergreen forest compared to other forest types (Callicott *et al.,* 2007). Schulze *et al.* (2004) revealed that tree species richness

is roughly parallel to the faunal assemblage. This relation is not surprising considering the crucial role of trees in structuring tropical forest habitats and in providing resources for many other organisms (Kessler *et al*., 2005). As a result, tree species richness explains 88% of the variation of fruit- and nectar-feeding birds and 83% of the variation among fruit-feeding butterflies (Schulze *et al.*, 2004). Here the importance has given to primary/evergreen forest types since biogeographically it represents the climax vegetation.

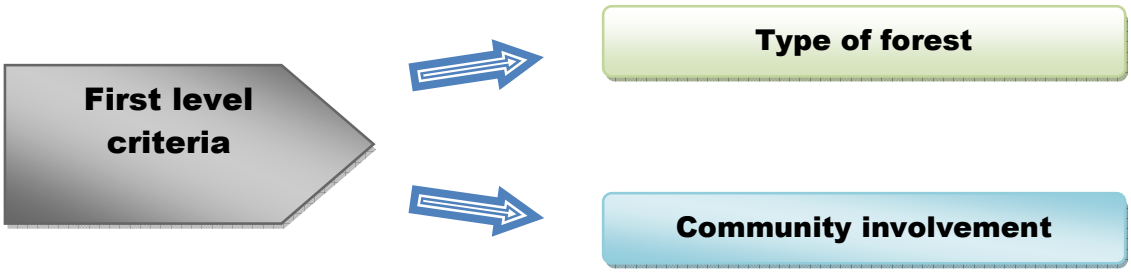


Fig 4.1: Schematic representation of first level criteria

4.2.2. Community involvement

Most of the criteria are limited to biodiversity aspects. Since the conservation reserves are invariably located in the territorial divisions and the community had rights vested with such forests and further, need to be managed by a committee represented by local people and forest managers, the current level of involvement of local people in conservation planning and management has been taken into account. Such planning for the stabilization of natural ecosystem is essential and this will reduce the conflicts on the natural forests once it has become community reserve that would prevent further loss of biodiversity in the longer run (Balaguru *et al*., 2006). As per the participatory forest management (PFM), the community has a major role to play in the conservation of forest (Kotwal *et al*., 2008). The presence of a suitable community institution in the jurisdiction of conservation reserve area would be a desirable condition for better management.

4.3. Second level criteria

4.3.1 Conservation Value

The conservation of an area is related to the ecosystem diversities and biodiversity. Biodiversity conservation is now widely acknowledged around the world as a fundamental part of ecologically

sustainable forest management (Hunter, 1999; Lindenmayer *et al*., 2006). The concept of biodiversity encompasses the entire biological hierarchy from molecules to ecosystems and it includes entities recognizable at each level (genes, taxa, communities, etc.) and the interactions between them (Margules *et al.*, 2002). Floral characteristics demonstrated through floristic composition and usually plant richness positively correlated with faunal species (Wright and Samways, 1996). The parameters selected for conservation value are species richness, endemism and, rare, endangered and threatened (RET) status of the species and unique ecosystem (Figure 4.2).

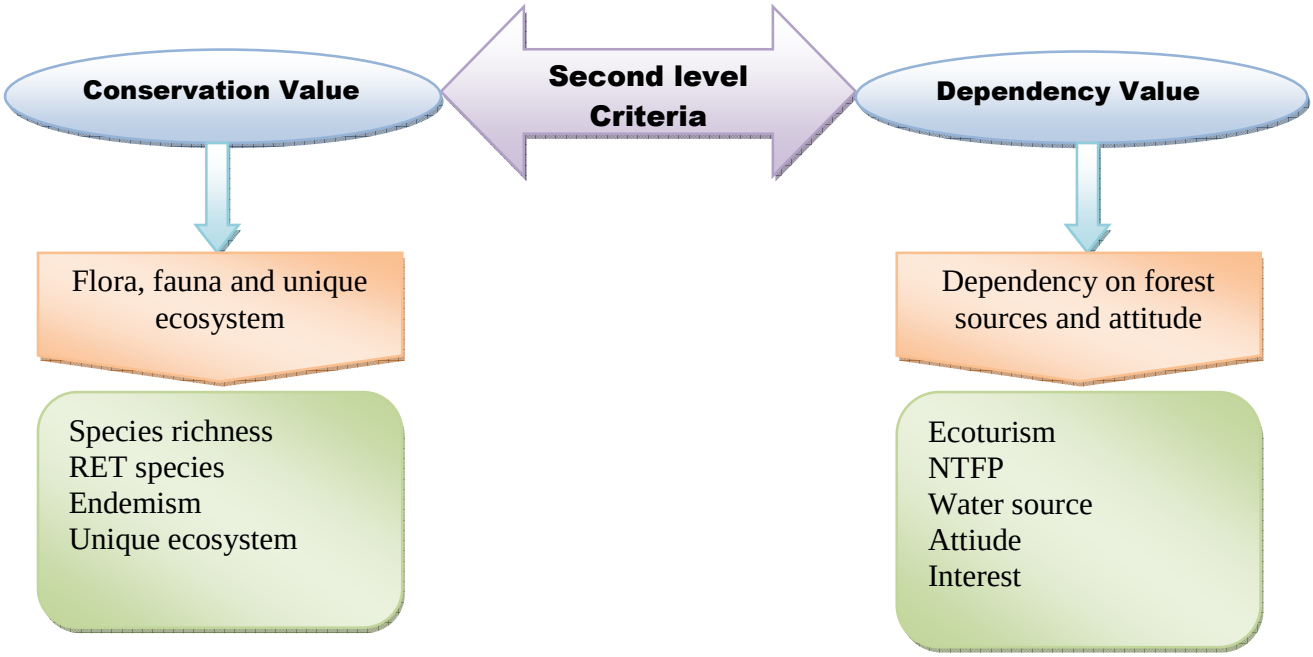


Fig 4.2: Schematic representation of secondlevel criteria

4.3.1 a. Species Richness

Greatest number of species in the selected sites is not the most efficient way to maximally represent biodiversity (Pimm and Lawton, 1998; Reid, 1998) because; it brings even the representatives of species also. Representation alone cannot ensure the maintenance of natural processes and survival of native species (Noss, 1995). However, it has become increasingly apparent that focusing on the representation of biodiversity does not guarantee the persistence of

viable populations or the protection of ecological processes that maintain biodiversity (Smith *et al.*, 1993; Cabeza and Moilanen, 2001; Kareiva and Marvier, 2003). As well as the presence of more population of particular species is not a character of good diversity in an area. Conservation efficiency is achieved by maximizing complementarities, the smallest set of sites with the greatest combined coverage of species presence (Pressey *et al*., 1993; Williams *et al*., 1996; Csuti *et al*., 1997; Kati *et al*., 2004) and their populations. The species richness is an indirect indication of the diversity of a particular group in an area.

b. RET species

Conservation of biodiversity will be more effective only if due importance is given to RET species. The analysis focused on rare, endangered and threatened species in addition to total species, as this group is the most vulnerable and most in need of conservation action (Eken *et al*., 2004). The most widely published prioritization of species for conservation action has been these categories defined by the IUCN and Red Data Book (Kumar *et al*., 2000; Nayar and Sastry, 1990; Ramesh *et al.*, 1997) and useful in providing guidelines for setting conservation priorities (Possingham *et al*., 2002). Prioritization could be carried out based on the number of RET species present in a given area.

c. Endemic species

Richness of endemic species is largely assisted by certain climatic conditions. Disturbance of the micro climate directly leads to loss of these species. Most of the endemic species with small geographic range end up as rare species and later threatened species unless their habitat is protected (Nayar, 1996). Endemic species requires prime importance in conservation measures (Ramesh *et al*., 1997). Endemism is one of the surrogates used to identify possible conservation areas also (Curnutt *et al*., 1994).

d. Unique ecosystem

Like peculiar conditions of endemic species, the interaction between different climatic and edaphic factors allows the development of specialised microhabitats in particular regions. These microhabitats provide environment for selected species called ‘habitat specialist’ because they have a significant positive correlation with their habitat or they cannot survive outside the specific habitat (Hubbell and Foster, 1985). Such micro habitats may not be present throughout the Ghats and restricted to certain regions only. Hence they are very significant from conservation point of view and to maintain these unique habitats, they have to be adequately brought under suitable conservation efforts such as conservation reserves.

4.3.2 Dependency Value

4.3.2 a. Ecotourism

Ecotourism is a growing sector in the modern world. Even though ecotourism may degrade habitats and landscapes if not properly planned, it can help to generate awareness for conservation and local culture and create economic opportunities for countries and local communities (Buyinza and Acobo, 2009). Eco-tourism, however, requires a proactive approach that mitigates the negative impact and enhances the positive impact on nature (Mader, 2002). It can transform rural communities and these ventures generate income and encourage conservation of natural resources (Buyinza and Acobo, 2009). Dependency of community in forest, in the case of income from ecotourism, has been considered as criteria because the growing importance given for ecotourism and the non extractive value of the natural resources are something which planners and conservationists need to tap for the sustainability. Such avenues will encourage the local communities in participating biodiversity management programmes.

b. Type of Non Timber Forest Product (NTFP) collected

Local communities are allowed to collect selected NTFPs from the forests for livelihood support. NTFP management is one of the fundamental activities for sustainable forest management and conservation strategies (Arnold, 2002). Harvesting of NTFPs can have either positive or negative impact on the conservation of biodiversity (Bhattarai and Croucher, 1996). In the absence of proper management and control in the collection and trade, NTFPs are becoming vulnerable, endangered and even extinct (Acharya, 2000). The NTFP collection and marketing is supporting the local economy of the people in a substantial way. Hence the contribution of NTFP towards the income of VSS members/VSS as an institution is considered as a criterion for prioritizing the conservation reserves.

c. Dependence on water source

The communities who are residing near the forest area depend on the natural water sources for their drinking and other purposes. In most of the occasions, draught is not being experienced in such area, which indicates the role of forests in providing water for sustenance. If a forest area comprises large proportion of catchment, it has critical role in maintaining water quality and quantity (Sulistioadi *et al.,* 2004). Presence of water bodies could enhance the habitat value of

the surrounding forest area (Ravan *et al*., 2005) and their dependence is considered an important criterion for deciding the importance of the patch.

4.3.3. Community attitude and awareness

The protected area authorities have failed to certain extent in attempting involvement of local people in conservation planning and management taking their concerns and trying to solve the issues through better management options derived through consultations and consensus building (Melkani, 2001). When identify a potential area of forest for conservation reserve, awareness and attitude of the community have to be considered (Harshaw et al., 2009). As part of the Participatory Forest Management (PFM) activities, the involvement of communities in conservation of forests in the country has yielded desirable results (Kotwal et al., 2008). As was expected, PFM programs have had positive results, because people have a stake in the outputs (Hill and Shields, 1998). Awareness and attitude in common forest resources management systems is growing and expanding as demonstrated by a number of studies (Nkembi, L.N. 2003). In this study, we considered the community awareness and attitude, as the criteria, to evaluate the extent of community's capability, to protect the identified potential areas of forest.

4.4. Identification and short-listing of patches

The preliminary identification and short-listing of the patches were carried out with the help of first level of criteria. To identify the patches, priority was given to the region having more evergreen forest patches with community involvement. This was done with the help of Survey of India toposheets (1: 50,000 Scale),IRS P6 LISS IV images and GIS softwares such as ArcGIS 9.3.1 and ERDAS IMAGINE 9.3, and the properties of toposheets, LISS IV images and community involvement in ABR were given in the Table 4.1, 4.2 and 4.3. The patches which qualify with certain threshold level of first level criteria were considered as short-listed patches.

Table 4.1: Details of toposheets used

S. No.	Toposheet No.	Covering region	
		Forest Range	**Forest Division**
1	58H-2	Paruthipally, Palode, Kulathupuzha	Thiruvanathapuram
2	58H-6	Paruthipally	Thiruvananthapuram
3	58D-13	Kulathupuzha	Thiruvananthapuram,
		Anchal	Punalur
4	58H-1	Palode, Kulathupuzha,	Thiruvananthapuram,
		Anchal	Punalur
		Arienkavu, Thenmala	Thenmala
5	58C-16	Arienkavu	Thenmala
		Anchal, Pathanapuram,	Punalur
		Konni, Neduvathumuzhi,	Konni,
6	58G-4	Arienkavu	Thenmala, ,
		Achancovil, Kallar, Kanayar	Achancovil
		Pathanapuram	Punalur
		Mannarpara, Naduvanthumuzhi,	Konni,

Table 4.2: Details of satellite images used

Orbit No.	Path/Row	Date	Place of Image
6551	102/136	20-Jan-05	Achancovil
6551	102/137	20-Jan-05	Thenmala
6551	102/138	20-Jan-05	East of Kulathupuzha/Peppara Dam
6551	102/138	20-Jan-05	Peppara Dam/East of Kulathupuzha
11794	201/126	24-Jan-06	Kulathupuzha Thenmala
17193	102/139	8-Feb-07	North of Neyyar
17193	102/140	8-Feb-07	Neyyar
7304	103/40	14-Mar-05	North Trivandrum District
7304	103/038	14-Mar-05	North of Thenmala

Table 4.3: List of VSS in Agasthyamalai Biosphere Reserve in Kerala

S.No.	Name of VSS	Reg. No.	No. of family	Range
Thiruvananthapuram Forest Division				
1	Pottamavu	461-2/2001	78	Kulathupuzha
2	Thannimoodu	561-1/98	46	Kulathupuzha
3	Adipparambu	561-5/01-02	53	Kulathupuzha
4	Mathrakarikkakam	561-5/02	126	Kulathupuzha
5	Peethalakarikkakam	562-4/01-2	68	Palode
6	Chekkonam	562-6/01-02	173	Palode
7	Vellyamdesam	562-3/01-02	133	Palode
8	Kochcdapupara	562-2/01-02	65	Palode
9	Pachamala	562-05/01-02	81	Palode
10	Mankayam	562-7/05-06	67	Palode
11	Ponmudi	562-8/05-06	108	Palode
12	Pattankulichapara	563-2/01-02	125	Paruthipally
13	Narakathinkala	563-1/01-02	102	Paruthipally
14	Kallar	563-3/03	137	Paruthipally
Thenmala Forest Division				
1	Villumala	531-1/99	398	Thenmala
2	Poothottam-pathekkar	531-3/02	70	Thenmala
3	Malavedar Colony	531-5/02	162	Thenmala
4	Ottakkal	531-4/2006	145	Thenmala
5	Kadamanpara	532-1/02	88	Arienkavu
6	Kottavasal	532-2/02	134	Arienkavu
7	Edappalayam	532-4/02	195	Arienkavu
8	Rajathottam	532-5/02	115	Arienkavu
9	Karayalarthottam	(532-5/02	126	Arienkavu
10	Palaruvi	532-6/03	132	Arienkavu
11	Karayalarmeth	532-7/07	186	Arienkavu
Punalur Forest Division				
1	Vanchiyodu	542-1/99	122	Anchal
2	Erayil	542-2/01	100	Anchal

3	Mukkoodu	542-3/01	77	Anchal
4	Kocharippa-Edappana	542-4/02	85	Anchal
5	Nattukal	542-5/02	63	Anchal
6	Cherukara	542-8/02	108	Anchal
7	Kallupacha	542-9/02	53	Anchal
8	Kudukkathupara	542-10/02	71	Anchal
9	Tholippacha	542-11/02	38	Anchal
10	Mampazhathara	541-7/02	55	Pathanapuram
11	Cherukadavu	541-12/02	115	Pathanapuram
12	Olappara	541-13/03	98	Pathanapuram
Konni Forest Division				
1	Mullumala	521-1/99	79	Mannarappara
2	Avanippara	521-1/02	24	Mannarappara
3	Vellamthatty	521-2/02	33	Mannarappara
4	Chembanaruvi	521-3/02	116	Mannarappara
5	Kadambupara	521-4/03	184	Mannarappara
6	Nellikkappara	522-1/02	131	Naduvathumoozhi
7	Appuppanthodu	522-2/02	93	Naduvathumoozhi
8	Padam	522-3/02	181	Naduvathumoozhi
9	Neeramakulam	522-4/02)	82	Naduvathumoozhi
10	Thalamanam	522-5/02	120	Naduvathumoozhi
11	Kottampara	522-6/02	10	Naduvathumoozhi
12	Kattathi	522-7/02	28	Naduvathumoozhi
13	Manneera	522-8/02	108	Naduvathumoozhi
14	Vilakkupadi	522-9/03	67	Naduvathumoozhi
15	Allumkal	522-10/03	82	Naduvathumoozhi
16	Kampakathumpacha	522-11/03	38	Naduvathumoozhi
17	Vadakke Manneera	522-12/03	122	Naduvathumoozh
18	Thavalappara	523-1/02	244	
19	Elimullaplackal	523-2/02	228	Konni
20	Avolikkuzhy	523-3/02	209	Konni
Achancovil Forest Division				
1	Achenkovil	551-1/00	81	Achenkovil
2	Manalar-Kumbhavurutty	551-2/02	17	Achenkovil

3	Achenkovil West	551-3/06	98	Achenkovil

4.5. Collection of primary data on biological and social parameters

The short-listed patches of forests were visited by a team of researchers and amatures who are specialized on plants, birds, amphibians, butterflies, etc... The locations surveyed were Ponmudi, Upper Sanatorium, Kallar, Meenmutti, Marutwa Malai, Chankili, Achancovil, Kottavasal and Kumbhaourutti. Particular attention was given to include altitudinal ranges of the region and this implies coverage of a wide range of altitudes from 100m MSL to 1200M MSL. The variety of habitats included are moist-deciduous forest, semi-evergreen forest, evergreen forests, high altitude shola grassland, riparian forest, secondary and degraded forests for the above mentioned types. Quadrate (20m x 20m) method for evergreen trees, and transect method, covering about 5 km, for both butterflies and birds were used in field survey. The checklists for reptiles, amphibians and fishes were prepared based on observations and corollary findings recorded during the earlier visits. GPS readings of transects were also recorded. The members of the local communities and local institutions (e.g. VSS) were consulted in collecting data with respect to resource species and the dependency.

The dependency criteria were limited to collecting NTFP and their income out of it, income from ecotourism, dependency on drinking water, etc. These data were collected through standard questionnaires and VSS documents. Name and corresponding short-listed patches are given in the table 4.4.

Table 4.4: Name of VSS and corresponding short-listed patches

Name of VSS	Corresponding selected patch	Name of Forest Range	Name of Forest Division
Ponmudi	Ponmudi	Palode	Thiruvananthapuram
Kallar	Kallar	Paruthipally	Thiruvananthapuram
Pottamavu	Chankili	Kulathupuzha	Thiruvananthapuram
Manalar Kumbavaratti	Achancovil	Achancovil	Achancovil

4.6. Analysis of data and prioritization of patches using spatial format

In order to prioritize the short listed patches of forests Weighted Sum Overlay Analysis (Arc GIS 9.3.1 v) were carried out. The input layers corresponding to conservation and social (dependency) values were analyzed. The thematic layers were species richness, endemism and

RET species of birds, butterflies, reptiles, amphibians, evergreen tree species and presence of unique ecosystems under the conservation values and ecotourism, income from NTFP, dependency to water sources, interest and awareness of nearby joint forest management institutions (Vana Samrakshana Samithi -VSS) under social (dependency) values. The maximum weightage for each thematic layer is 10 and the details of weightage assessment as per composition of parameters is given in the table 4.5, whereas for null values manually given zero. Each theme has been overlaid for analysis.

Table 4.5: Details of weigtage assessment as per composition of parameters

Class	Proportion of total interval (%)	Class	Weightage
1	0< - 25	Low	2.5
2	26 – 50	Low medium	5.0
3	51 – 75	High medium	7.5
4	76 - 100	High	10

The thematic layers were combined to get composite picture of conservation importance. Each layer composed of polygons that represent geographical areas assigned to one of the four classes of the corresponding type of information. By merging vector layers of these polygons, a new set of polygons were produced. The new layer contained polygons whose attribute information included the classes of each of the thematic layers. Then, for each polygon, a conservation and dependency score was derived from the classes to which they belong, and stored as new attribute information. The weightage for each patch (Wp) was calculated as follows:

$$Wp = \sum_{i=1}^{21} Ci$$

Where *i* is the information layer and *Ci* is a coefficient given according to the class to which the polygon belongs in layer *i*. The coefficients were from 2.5 to 10 with increments of 2.5 (class 1= 2.5, class 4= 10). The minimum and maximum possible values for ecological aspect would be 2.5 and 160 and for social aspect it is 2.5 and 50 respectively. Therefore, the total minimum possible weightage for a patch would be as low as 2.5 and maximum is as high as 210. These ecological and social aspect values were regrouped to obtain final map. Based on the weightage accorded for each patch, they would be prioritized. The patches which carry the

maximum weightage will be given first priority and subsequently weighted patches will be given appropriate significance.

Chapter V

RESULTS AND DISCUSSION

5.1 Identification of vegetation types

According to first level criteria, vegetation type is a criterion for short-listing the patches to identify potential areas as Conservation Reserves. The Kerala part of ABR composed of five territorial forest divisions such as Thiruvananthapuram, Thenmala, Punalur, Konni and Achancovil and the different vegetation types and their extent are described below.

5.1.1 Thiruvananthapuram forest division

The Thiruvananthapuram forest division, the southernmost territorial division of the State is situated within 8º 17' 50" and 8º 53' 42" N and 76º 40' 24" and 77º 17' E. The area lies within Neyyattinkara, Thiruvananthapuram and Nedumangad Taluks of Thiruvananthapuram Revenue district and Chirayinkizhu, Kottarakkara and Pathanapuram Taluks of Kollam Revenue district. This Division is covering the area of 59875.75ha and composed of three forest ranges such as Paruthipalli, Palod and Kulathupuzha. The moist deciduous type of forest occur in largest portion is 11645.51ha, then evergreen (11577.85ha), semi evergreen (7101.66ha), tree savanna/grassland (6629.19ha), plantation (2020.79ha) and the remaining area covered by settlements and water bodies. Map of different forest types in Thiruvananthapuram forest division shows in fig. 5.1.

5.1.2 Thenmala forest division

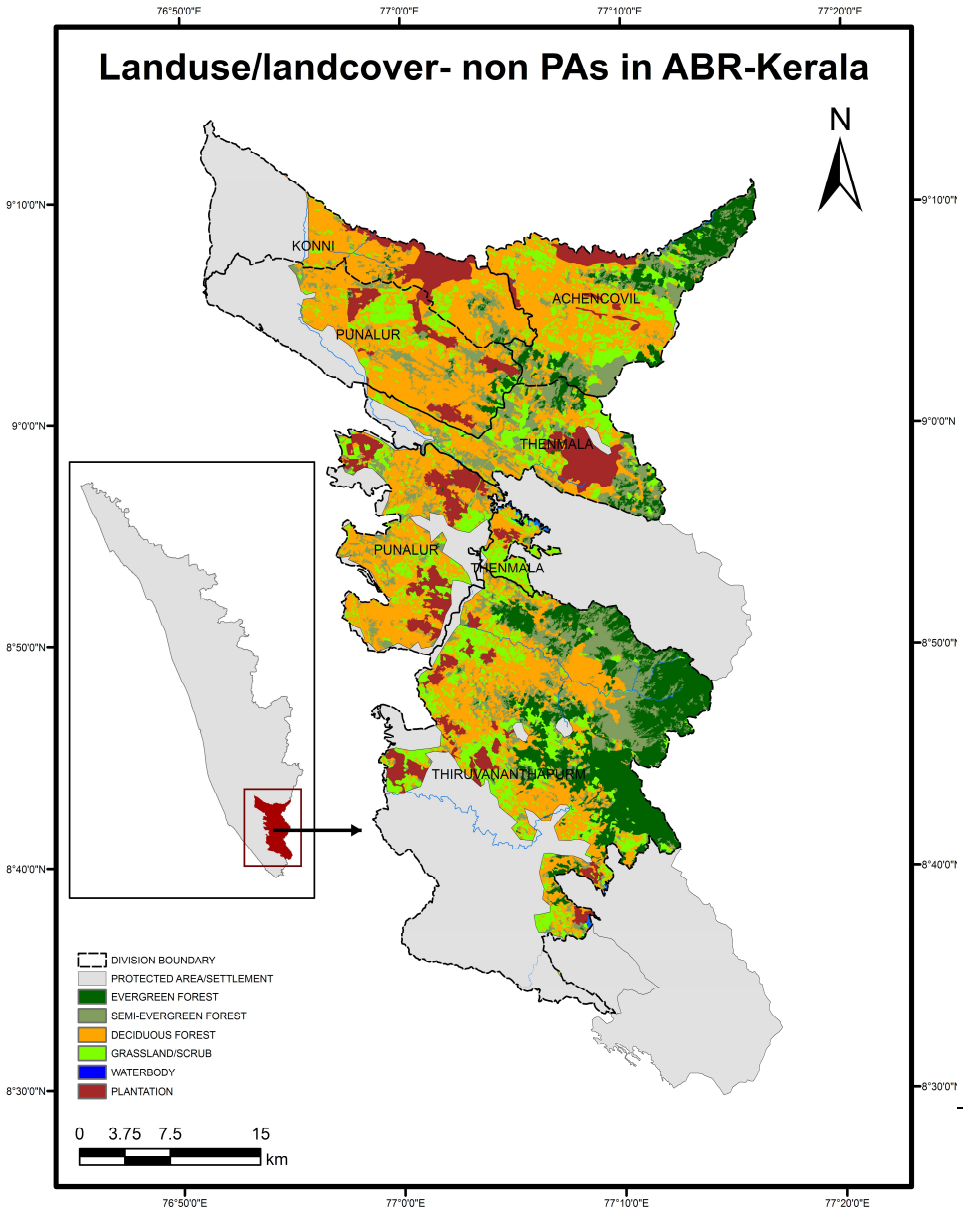
Thenmala forest division is situated in the Pathanapuram and Kozhencherry Taluks of Kollam and Pathanamthitta Revenue districts respectively and lies within 76^0 59’ 30”and 77^0 16’ 30” north latitude and 8^0 44’ and 9^0 44’ and 9^0 14’ south latitude. This division is covering an area of 15474.07 ha and composed of two forest ranges such as Thenmala and Ariyankavu. Moist deciduous forest predominates (4436.95ha) the landcover and subsequently tree savanna/grassland (3617.57ha), semi evergreen (3199.00ha) and evergreen (940.55ha) are the other natural forest types. Plantation is covered about 2047.93ha and and the remaining area

covered by settlements and water bodies. The fig. 5.1 shows the map of forest types in Thenmala forest division.

5.1.3 Punalur forest division

Punalur forest division coming under Pathanapuram and Kottarakkara Taluks of Kollam district lies between 8^0 52' and 9^0 7' N latitude and 76^0 35' and 77^0 6' E longitude. This division consists of two forest ranges such as Pathanapuram and Anchal, covering an area of 35613.23 ha. The largest area of forest type of this division is moist deciduous, covering the area of 14752.69ha, and then tree savanna/grassland (4252.37ha), semi evergreen (3137.64ha), evergreen (338.16ha), plantation (4014.58ha) and the remaining area is covered by settlements and water bodies (Figure 5.1).

Figure 5.1: Different vegetation types in Kerala part of ABR



5.1.4 Konni forest division

Konni forest division falls under Karunagapally and Pathanapuram Taluks of Kollam District and portion of Kozhenchery and Adoor Taluks of Pathanamthitta district. The division area lies between 9^0 3' and 9^0 15'N latitude and 77^0 4' and 77^0 6'E longitude. This division is composed of Konni and Naduvathumoozhi ranges covering the area of 16008.96ha. The largest portion of the forest type is moist deciduous, covering an area of 5557.16ha, and then semi evergreen (730.32ha), tree savanna/grassland (675. 01ha), evergreen (194.12ha), plantation (1642.55ha) and remainig portion covered by settlements and waterbodies (Fig 5.1).

5.1.5 Achancovil forest division

Achancovil forest division falls under Kollam and Pathanamthitta Revenue districts. The area of reseve forest lies between 9^0 2' 9" N to 9^0 12' 30" North latitudes and 77^0 3' 51" to 77^0 16' 7" East longitudes. This division composed of three ranges such as Kallar, Kanayar and Achancovil, covering an area of 17451.81ha. The major natural vegetation in this division is moist deciduous with an area of 6801.09ha and then tree savanna/grassland (3405.60ha), semi evergreen (3142.37ha), evergreen (3059.47ha), plantation (1042.97ha) and remaining area is covered by settlements and waterbodies. Map of different forest type of Achancovil forest division is given in the fig. 5.1.

5.2 Level of community involvement and shortlisitng of patches

The community involvement in the territorial divisions was assessed through the interactions with the VSS officials and other records. While reviewing the different VSSs and their respective geographical area of interventions, it was found that Kallar, Ponmudi, Chankili and Achancovil need special mention (Table 5.1). The type of interventions in these areas are fire protection, planting of degraded forests, collection of NTFP, general protection activities, management of ecotourism (except Pottamavu), etc.

Among these four patches, three are in Thiruvananthapuram forest division, lying between Peppara WLS and Shendurny WLS. The fourth one, the smallest patch is lying in Achancovil division, one of the northern forest divisions of ABR. The map of short-listed patches is given in the fig. 5.2.

Figure 5.2 Landuse/landcover map of short-listed patches

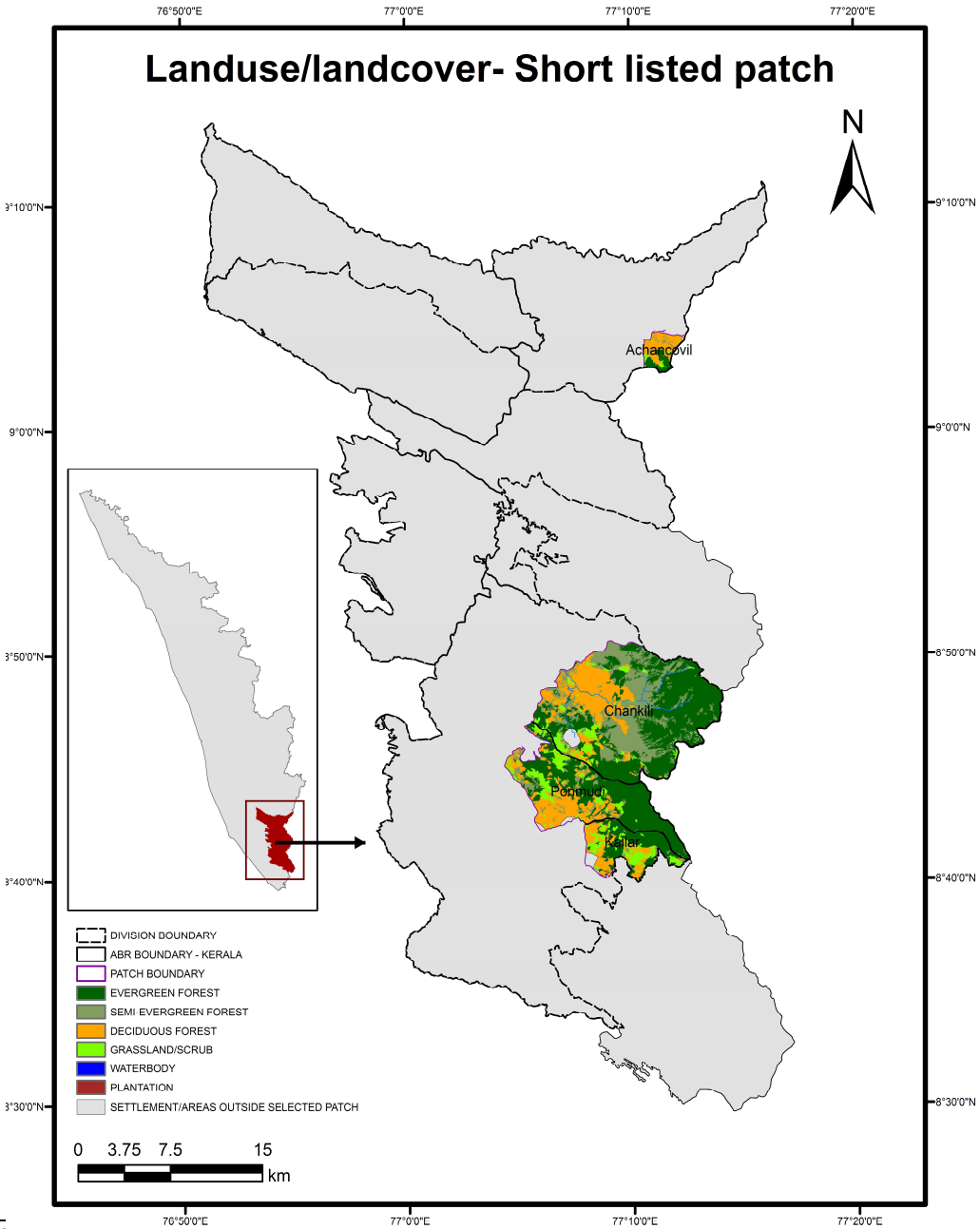


Table 5.1: Details of short-listed forest patches

VSS name	Corresponding short-listed patch	Patch area (km^2)	Location
Ponmudi	Ponmudi	57.175327	Palod Range of Thiruvananthapuram FD
Kallar	Kallar	24.051027	Paruthipally Range of Thiruvananthapuram FD
Pottamavu	Chankili	119.645728	Kulathupuzha Range of Thiruvananthapuram FD
Manalar Kumbavaratti	Achancovil	7.551238	Achancovil Range of Achancovil Forest Division

5.3 Characterisation of shortlisted patches

Characterisation of shortlisted patches was attemped with the help of second level criteria (fig 4.2). The short-listed patches at Kallar, Ponmudi, Chankili and Achancovil are considered for the collection of primary data for characterization. The primary data are grouped under two categories such as biological aspects and social aspects, the biological aspect related to selected groups of fauna, and flora and unique habitat, and the social aspect related to dependency of community. All the parameters on both the biological and social aspects are described below.

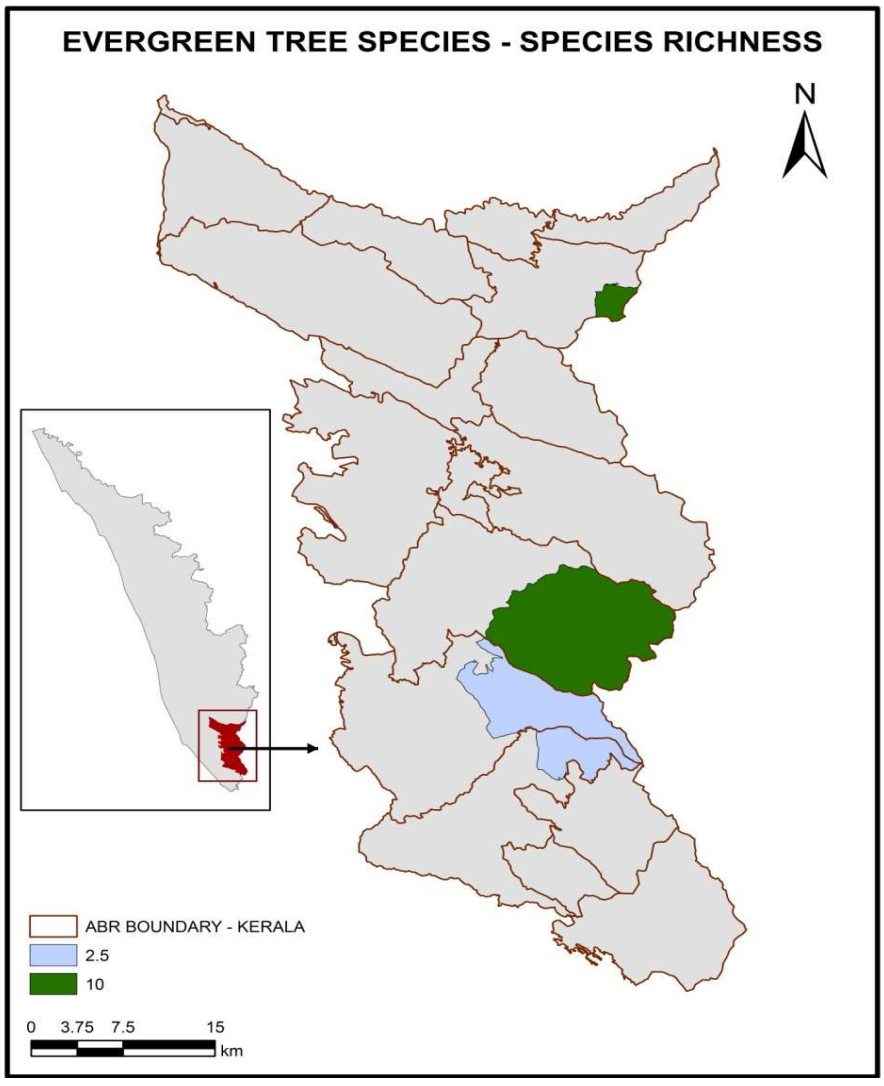
5.4 Biological value

5.4.1 Species richness

a. Evergreen trees

The species richness of evergreen trees is varying from 40 to 66. The highest species richness is from the Achancovil forest patch (66) and the lowest is 40 in two patches such as Kallar and Ponmudi, whereas 64 species is identified from Chankili patch. These values have been brought 4 classes with equal interval 6.5 to assign weightage in thematic map. So, the class 1 is 40 – 46.5, class 2 is 46.6 – 53, class 3 is 53.1 – 59.5 and class 4 is 59.6 - 66. Thematic map of evergreen tree species richness shows in figure 5.3.

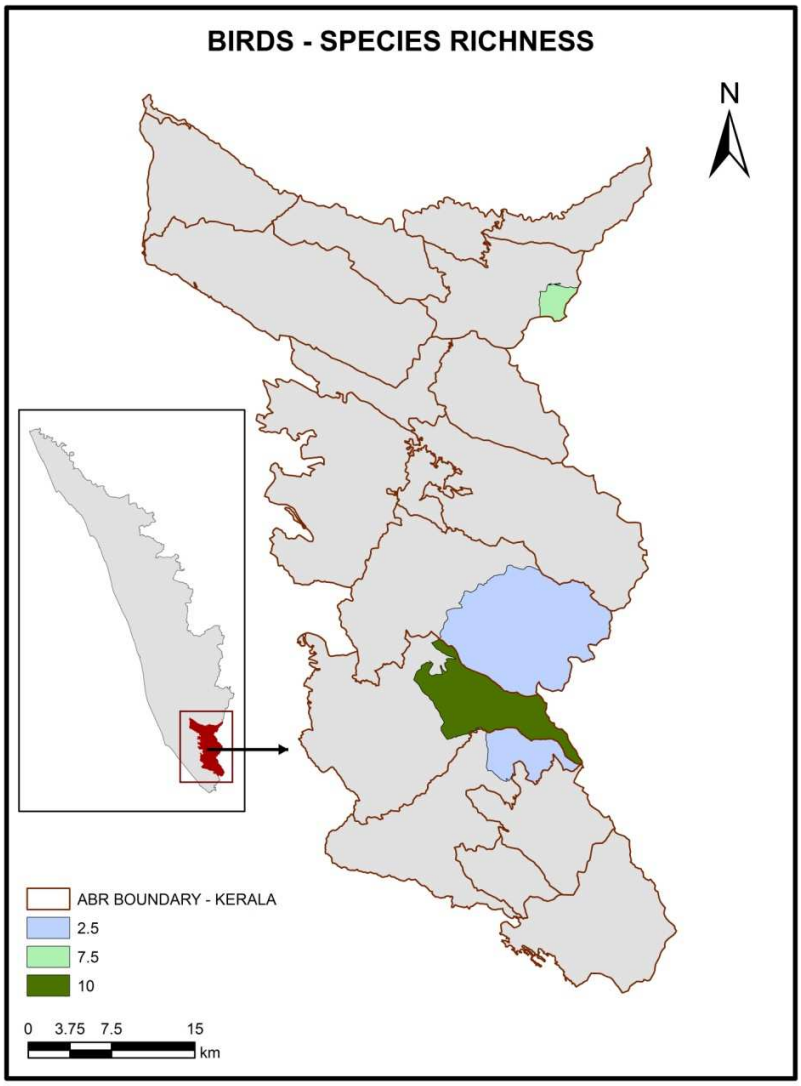
Fig 5.3: Thematic map of species richness of evergreen trees



b. **Birds**

The species richness of birds in four short-listed patches is varying from 72 to 115. The highest number of bird species was reported from Ponmudi (115) and lowest in Chankili (72) whereas the Achancovil and Kallar patches show 96 and 79 species respectively. These values are divided into four classes with class interval of 10.75 for giving weightage in thematic map. So, the class 1 is 72 – 82.75, class 2 is 82.76 – 93.5, class 3 is 93.6 – 104.25 and class 3 is 104.26 – 115. Thematic map of bird species richness is given in fig. 5.4.

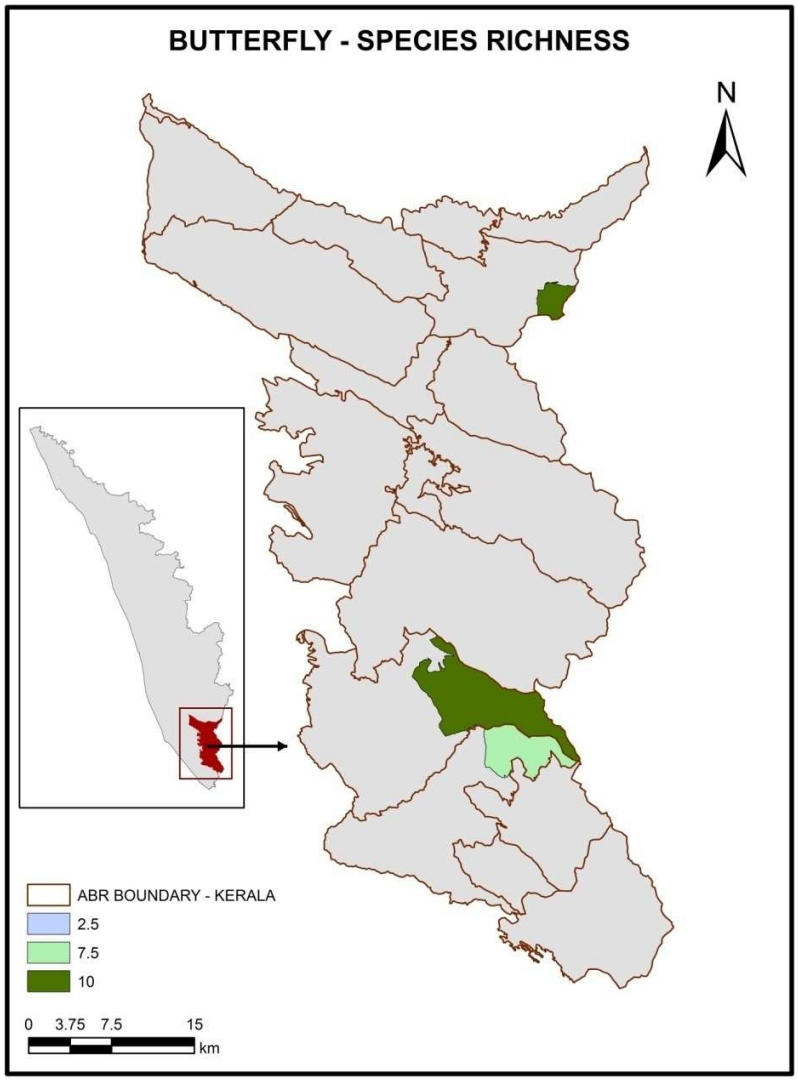
Fig 5.4: Thematic map of species richness of birds



c. Butterflies

In short-listed four patches, species richness of butterfles is varying from 88 to 131.This value is highest in Ponmudi patch (131) and lowest in Chankili patch is 88. In the meanwhile, Kallar shows 111 and Achancovil shows 96. The values of species richness are divided into four classes with equal interval is 10.75 for giving weightage in thematic map. So class 1 is 88 - 98.75, class 2 is 98.76 – 109.5, class 3 is 109.6 – 120.25 and class 3 is 120.26 – 131. The thematic map of species richness of butterflies is given in fig. 5.5.

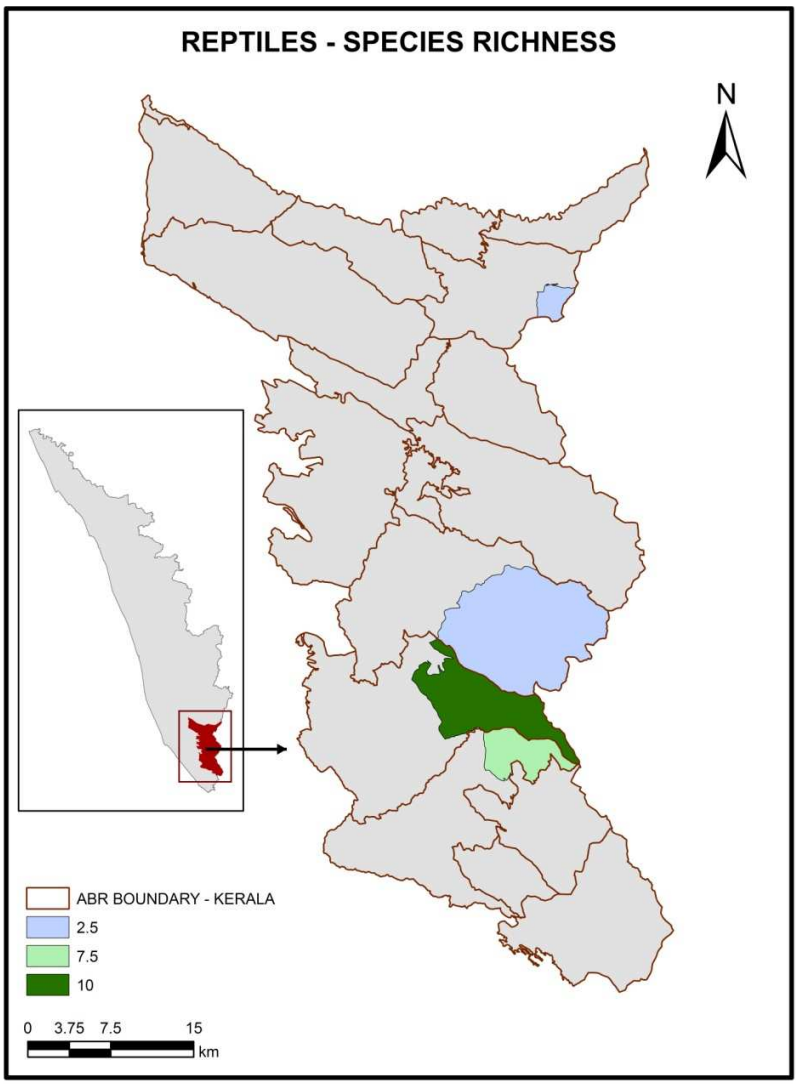
Fig 5.5: Thematic map of species richness of butterflies



d. Reptiles

The number of reptile species is varying from 10 to 19. The highest species richness of reptiles is recorded from Ponmudi (19) whereas the lowest species richness is 7, in Achancovil. The other two patches such as Kallar and Chankili show the values 16 and 10 respectively. These values are also divided into four classes with a class interval of 2.25 for giving weightage in thematic map. So, the class 1 is 10 - 12.25, class 2 is 12.26 – 14.50, class 3 is 14.51 – 16.75 and class 4 is 16.76 – 19. The low representation of reptiles in the survey may be due to the seasonal influence. Thematic map of reptile species richness is given in fig. 5.6.

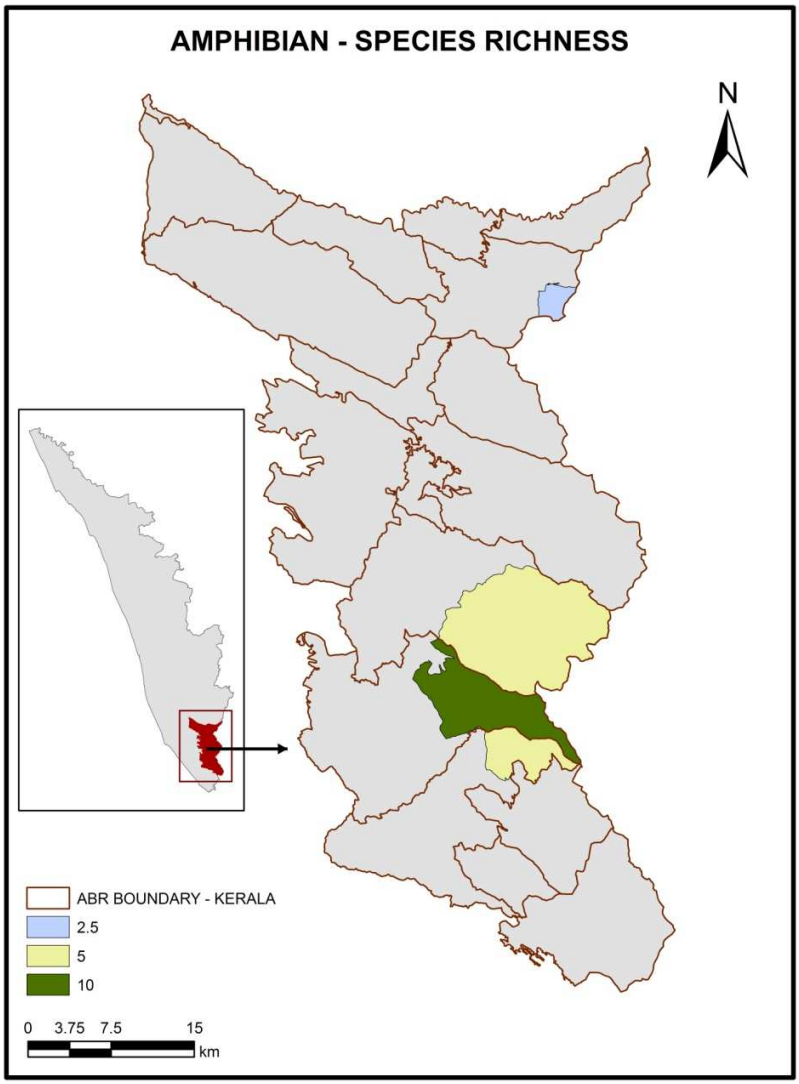
Fig 5.6: Thematic map of species richness of reptiles



e. Amphibians

The number of amphibian species in four patches is varying from 7 to 20, the low representation in the number may be due to the season sampled. The highest value is in Ponmudi patch which is 20 and lowest is 7,in Achancovil. Other patches such as Kallar and Chankili show the values 12 and 11 respectively. These values are splited into four classes with the interval of 3.25. So, the class 1 is 7 - 10.25, class 2 is 10.26 – 13.5, class 3 is 13.6 – 16.75 and class 4 is 16.76 – 20. The map of amphibian species richness in four patches is given in fig. 5.7.

Fig 5.7: Thematic map of species richness of amphibians



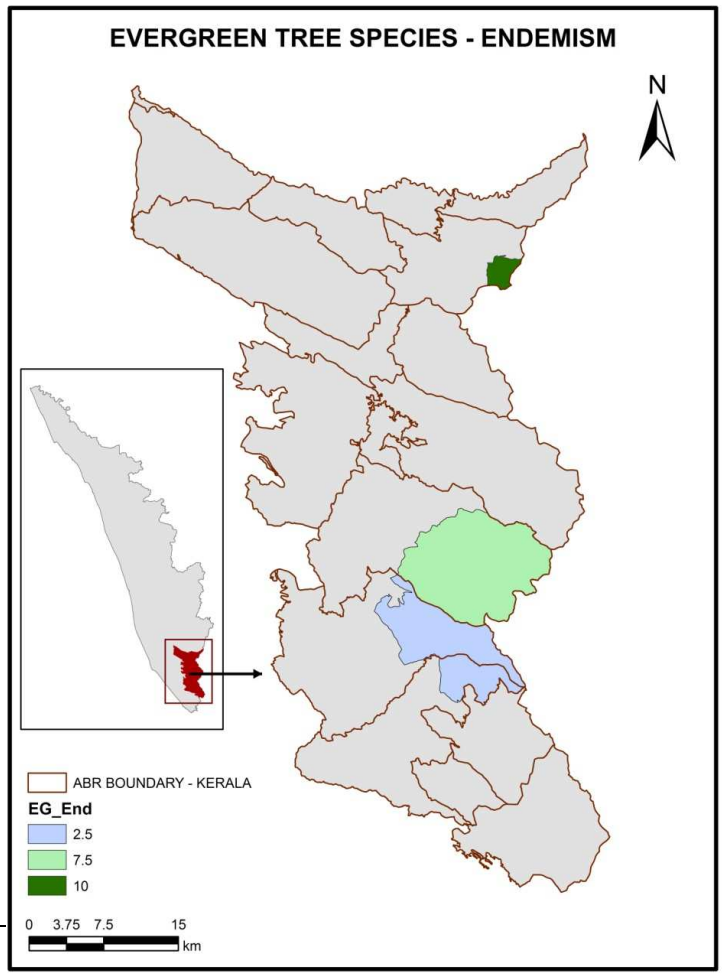
5.4.2 Endemism

All living organisms cannot tolerate entire environmental conditions in biosphere. Position and morphology of earth surface provide some small specialized climatic situations called microclimates. Some species, called endemic species, can adopt only this type of limited microclimates; hence they usually are small in populations. Disturbunces and degradation of the regions of microclimates or there occur living populations will lead to threatened situation of these endemic species immediately when compared with other species. The extent of endemic species should be considered for identifying the potential areas of forest.

a. Evergreen trees

Percentage endemism of evergreen tree species on short-listed patches is varying from 27.5 to 33.33. The highest percentage of endemic evergreen trees are recorded from Achancovil is 22 and the lowest in both Kallar and Ponmudi patches is 11. In Chankili patch, 20 percentage of endemic trees are also identified. Endemic percentage values on four patches are divided as four classes with the interval of 1.45. So, the class 1 is 77.5- 28.95, class 2 is 28.96 – 30.41, class 3 is 30.42 – 31.87 and class 4 is 31.88 – 3.33. The thematic map of evergreen trees' endemism of four patches is given in fig. 5.8.

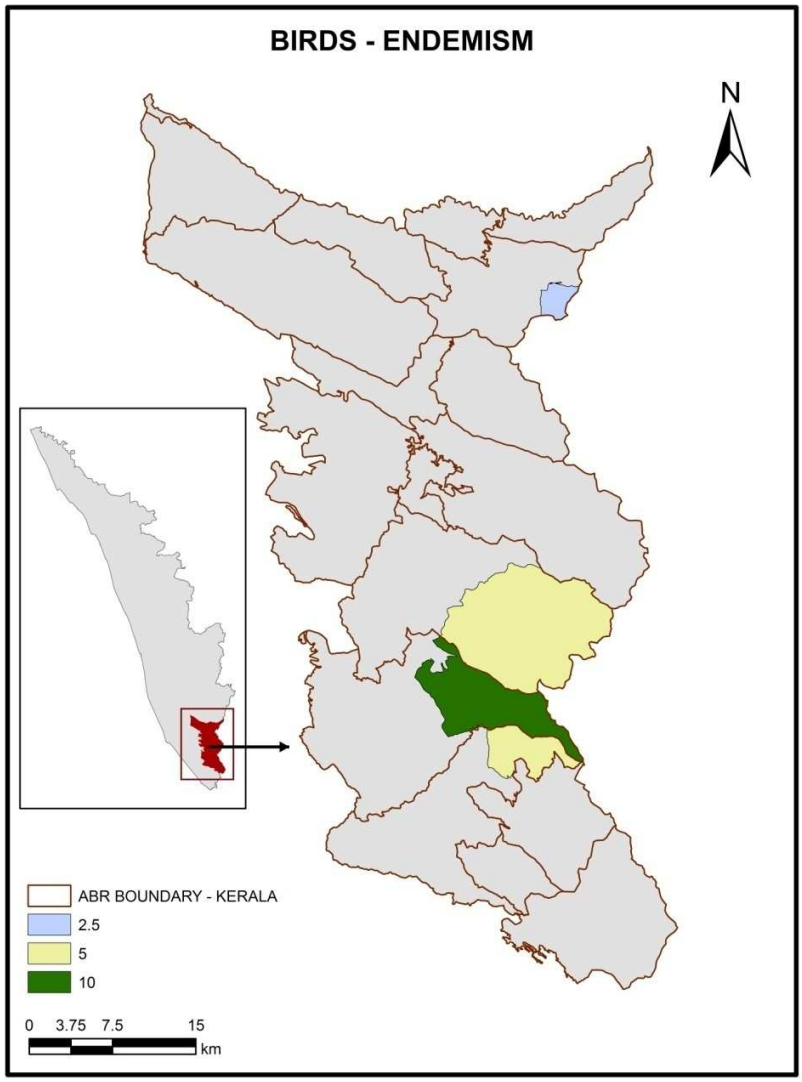
Fig 5.8: Thematic map of endemism of evergreen trees



b. Birds

In short-listed four patches, endemic percentage of bird species is varying from 3.125 to 5.217. The percentage of bird endemism is highest in Ponmudi patch which is 6, and lowest in Achancovil is 3.125 whereas other two patches such as Chankili and Kallar show 4.166 and 3.79 respectively. These values are divided into four classes with the interval of 0.523. So, the class 1 is 3.12 - 3.64, class 2 is 3.65 – 4.17, class 3 is 4.18 – 4.69 and the class four is 4.7 – 5.217. The endemism showing thematic map of birds is given in fig. 5.9.

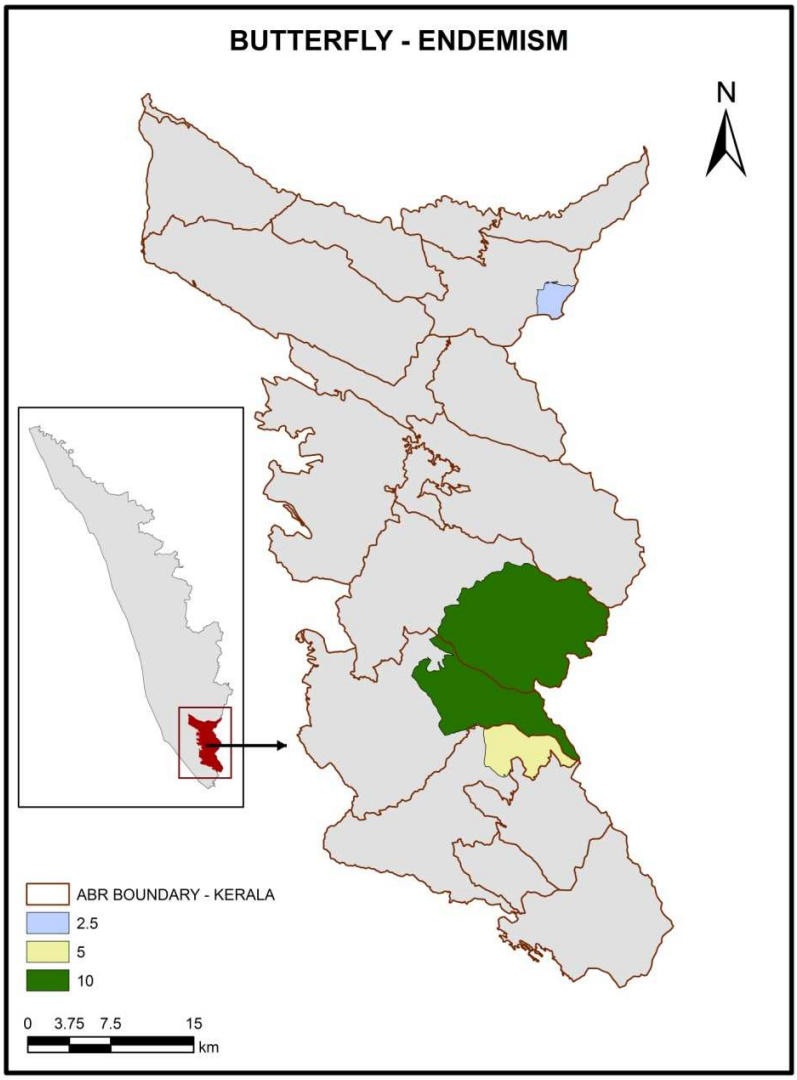
Fig 5.9: Thematic map of endemism of birds



c. Butterflies

The endemic percentage of butterflies in short-listed patches is varying from 5.83 to 16.03. It is highest in Ponmudi patch, 5.83 and the lowest in Achancovil, 5.83. The other two patches such as Chankili and Kallar show 13.63 and 10.81 respectively. These values are divided into four classes with the interval of 2.54. So, class 1 is 5.83 - 8.38, class 2 is 8.39 – 10.93, class 3 is 10.94 – 13.48 and class 4 is 13.49 – 16. 03. The thematic map of butterfly endemism in four short-listed patches is given in fig. 5.10.

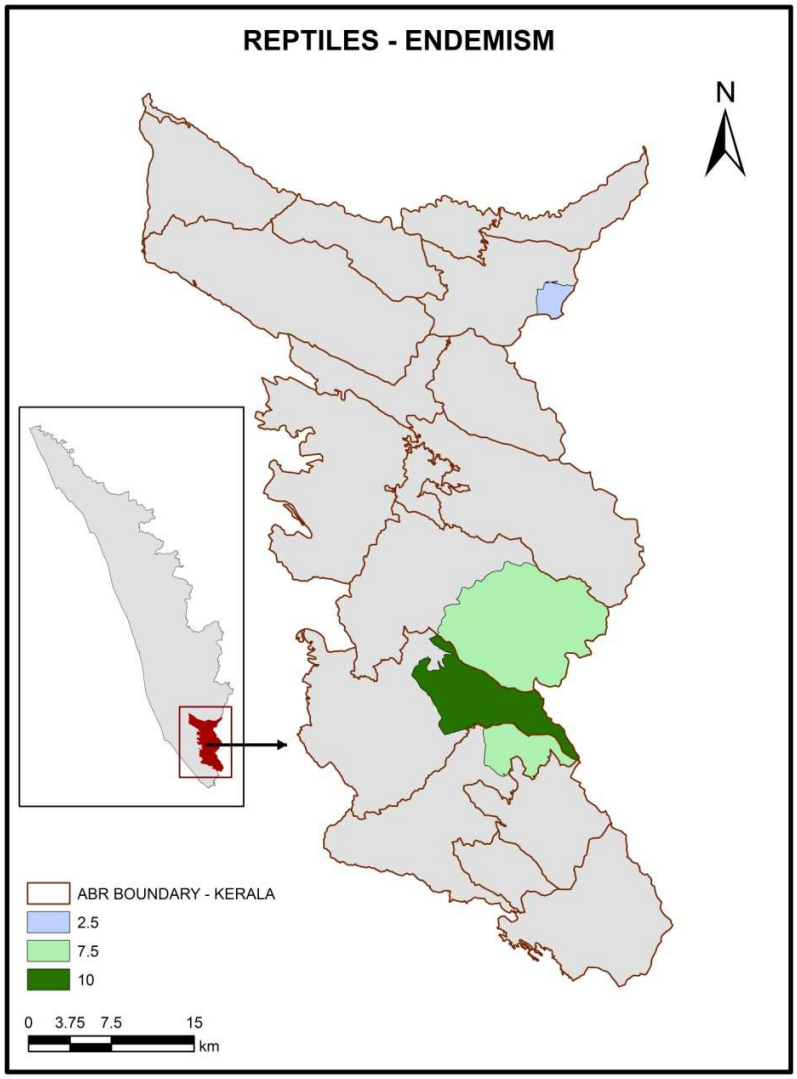
Fig 5.10: Thematic map of endemism of butterflies



d. Reptiles

The percentage of endemism of reptiles in the short-listed patches is varying from 8.33 to 31.57. The highest percentage endemism of reptiles is noted in Ponmudi patch which is 31.57 and the lowest in Achancovil, 8.33. The Kallar and Chankili patches show 25 and 20 respectively. These values are divided into four classes with equal interval of 5.81. So, class 1 is 8.33 - 14.14, class 2 is 14.15 – 19.95, class 3 is 19.96 – 25.76 and class 4 is 25.77 – 31.57. The thematic map of endemic species number of reptiles is given in fig. 5.11.

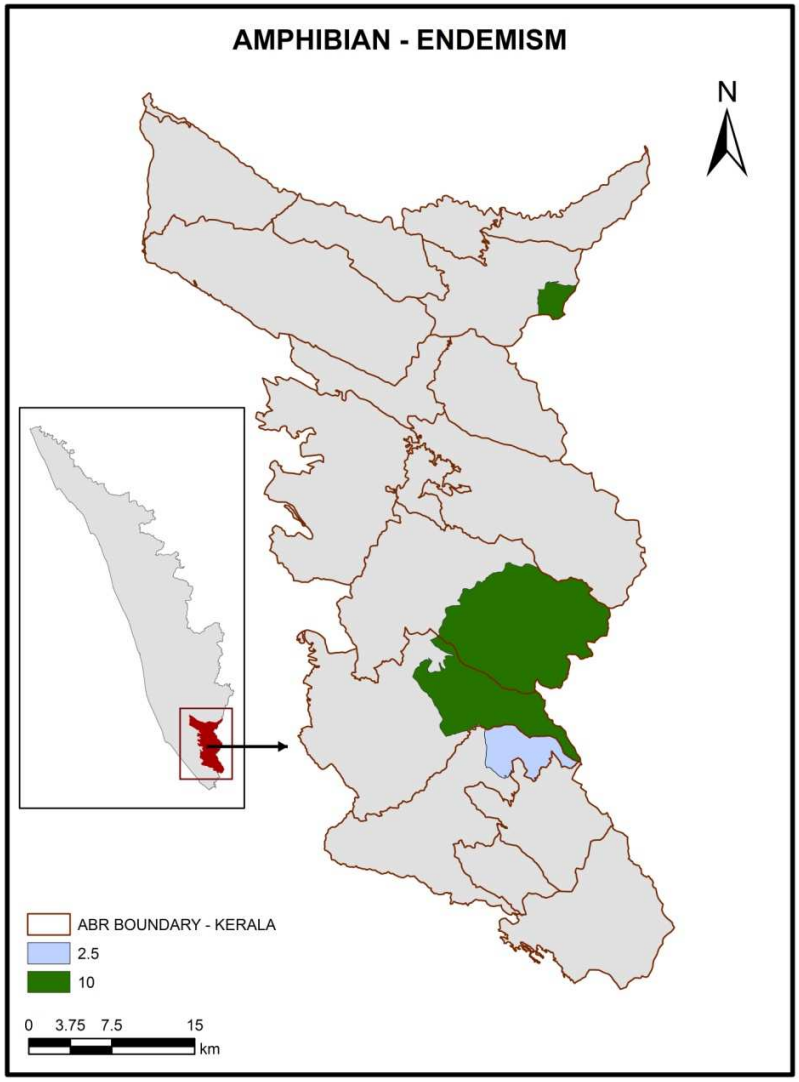
Fig 5.11: Thematic map of endemism of reptiles



e. Amphibians

Like other groups of species, percentage endemism of amphibians is showing varying trend, it is from 58.33 to 75, which is higher percentage than other groups. The highest percentage of endemic amphibian species is noted from the Ponmudi patch is 75 and lowest in Achancovil patch is 58.33. Other two patches such as Chankili and Kallar show 72.72 and 58.33 respectively. These values are divided into four classes with equal interval of 4.16. So, the class 1 is 58.33 - 62.49, class 2 is 62.5 – 66.66, class 3 is 66.67 – 70.83 and 70.84 – 75. The thematic map of endemic species of amphibians is given in fig. 5.12.

Fig 5.12: Thematic map of endemism of amphibians

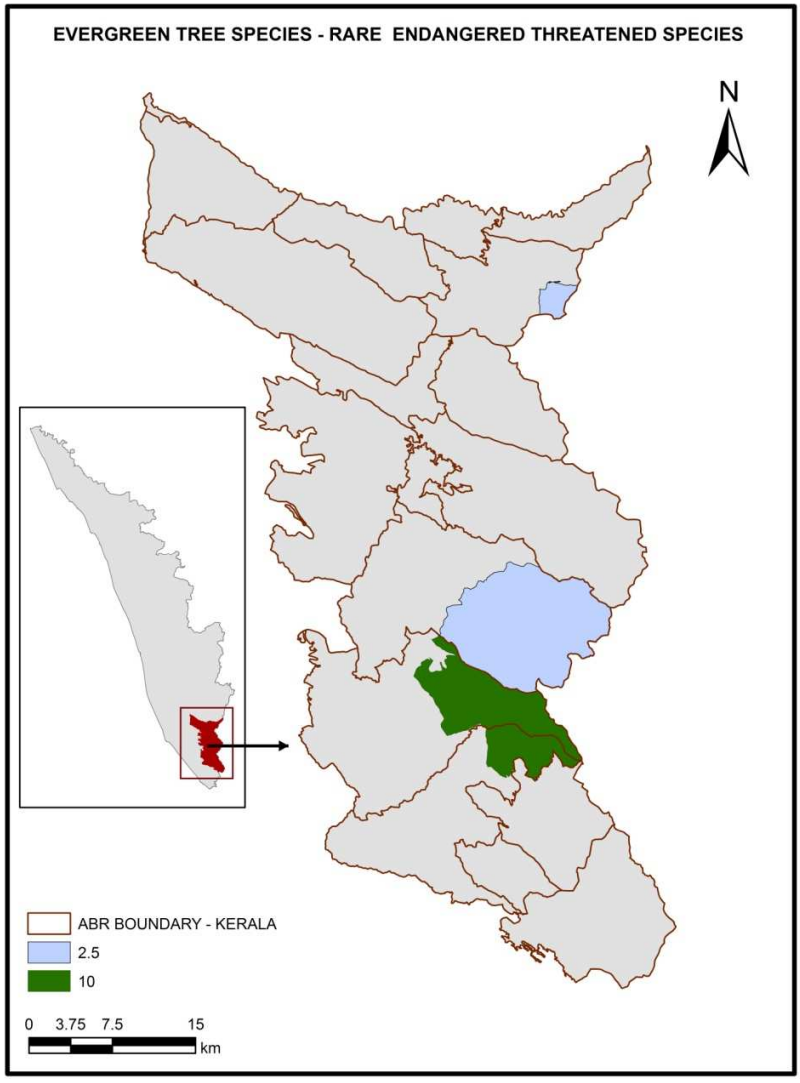


5.4.3 Critical species

a. Evergreen trees

The species coming under rare, endangered and threatened (RET) categories are considered as critical species. The percentage of critical species of evergreen trees is varying from 9.37 to 20. The highest value is recorded from both the Ponmudi and Kallar patches is 20 and lowest is from Chankili is 9.37 whereas the Achancovil patch shows the value of 10.60. These values are divided into four classes with the interval of 2.65. So, the class 1 is 9.37 - 12.02, class 2 is 12.03 – 14.68, class 3 is 14.69 – 17.34 and class 4 is 17. 35 – 20. The map of the evergreen critical species is given in fig. 5.13.

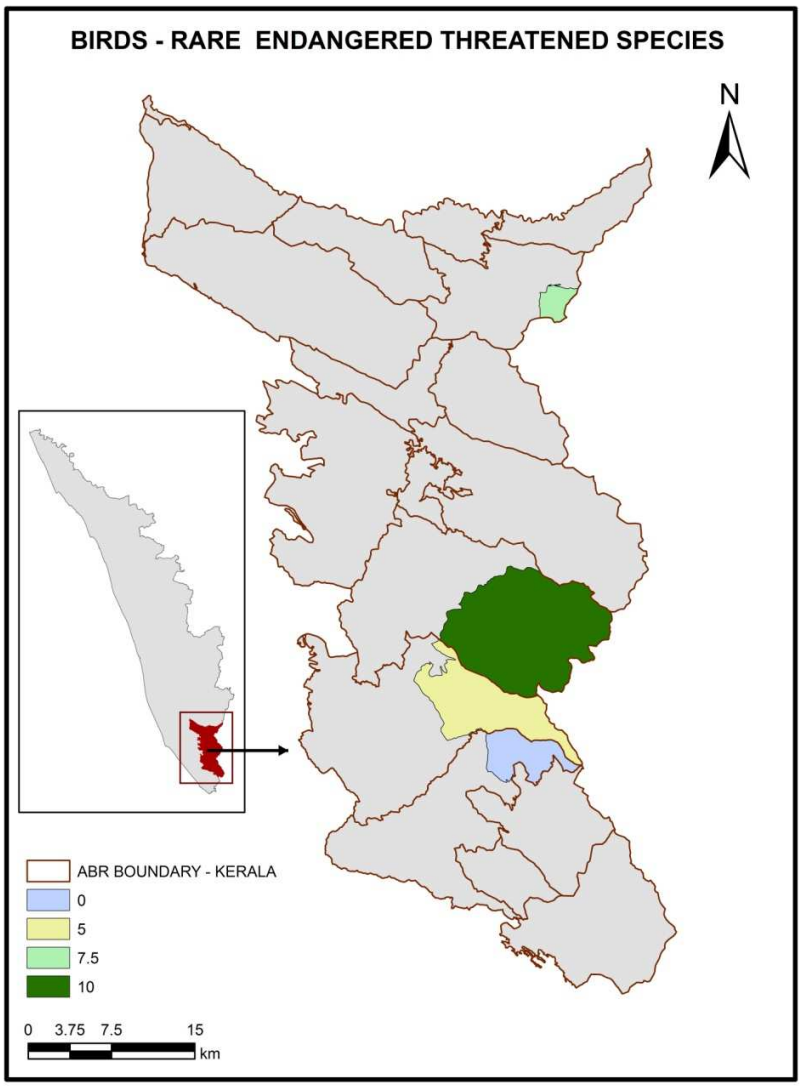
Fig 5.13: Thematic map of critical species of evergreen trees



b. Birds

In the shortlisted four patches, percentage of critical species of birds is varying from zero to 4.34. The percentage of birds' critical species is highest in Ponmudi patch which is 4.34, but in Kallar there is no species identified as critical species. At the same time, from the Chankili patch, 2.77 percentage of species and from Achancovil 1.04 percentage of species recorded are identified as critical species of birds. These values, except zero, are splited into four classes with the interval of 0.82. So, the class1 is 0< - 1.86, class 2 is 1.87 – 2.69, class 3 is 2.7 – 3.51 and the class 4 is 3.52 – 4.34. The thematic map of critical species is given in the fig. 5.14.

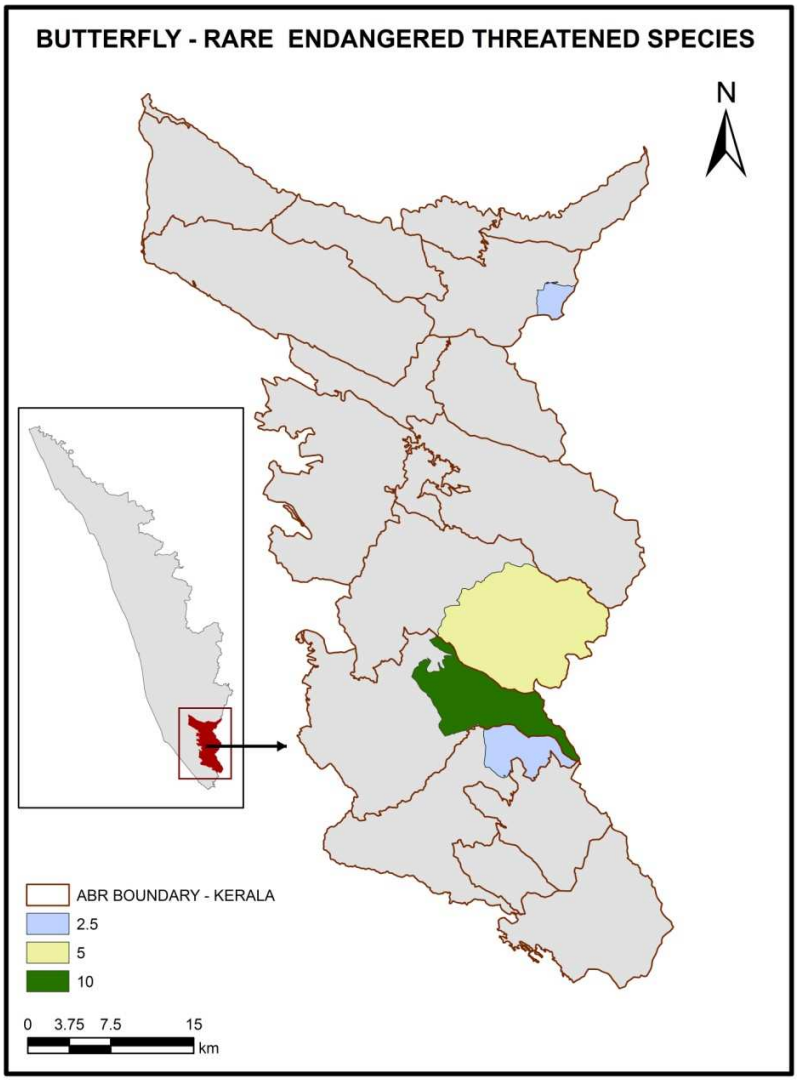
Fig 5.14: Thematic map of critical species of birds



c. **Butterflies**

When compared to other species, butterflies show lower percentage of critical species in the four patches surveyed. This percentage value is varying from 0.83 to 1.52. The highest percentage is 1.52 at Ponmudi and the lowest is 0.83 from Achancovil patch. In other patches such as Chankili and Kallar, show the percentages as 1.13 and 0.9 respectively. These values are divided into four classes with the interval of 0.17. So, the class 1 is 0.83 - 1, class 2 is 1.001 – 1.179, class 3 is 1.18 – 1.35 and 1.36 – 1.52. The map of the critical species of butterflies is given in fig. 5.15.

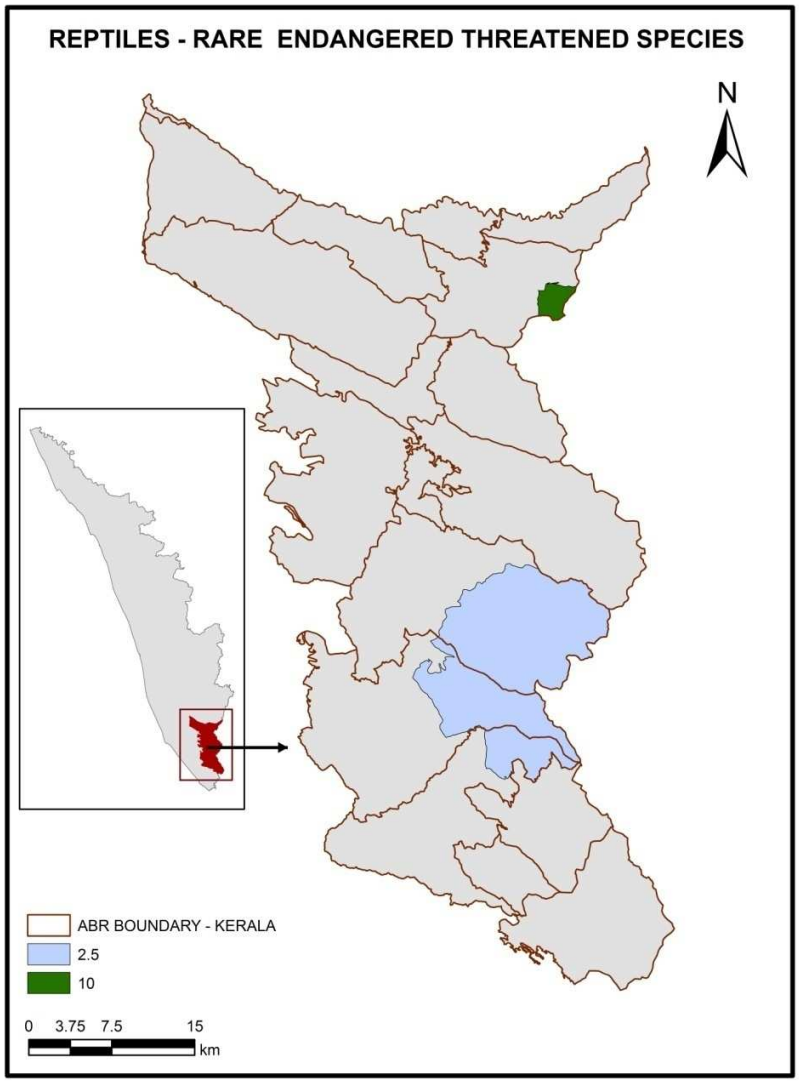
Fig 5.15: Thematic map of critical species of butterflies



d. Reptiles

When compared to percentage of endemism in other species, reptile shows higher values in four patches. It is varying from 37.5 to 58.33. The highest percentage is identified from Achancovil which is 58.33 and the lowest value is identified from Kallar patch. The other two patches such as Ponmudi and Chankili show 42.10 and 40 respectively. These values are divided into four classes with the interval of 5.20. So, the class 1 is 37.5 - 42.7, class 2 is 42.71 – 47.91, class 3 is 47.92 – 53.12 and class 4 is 53.13 – 58.33. The Thematic map of threatened species percentage of reptiles in four patches is given in the fig. 5.16.

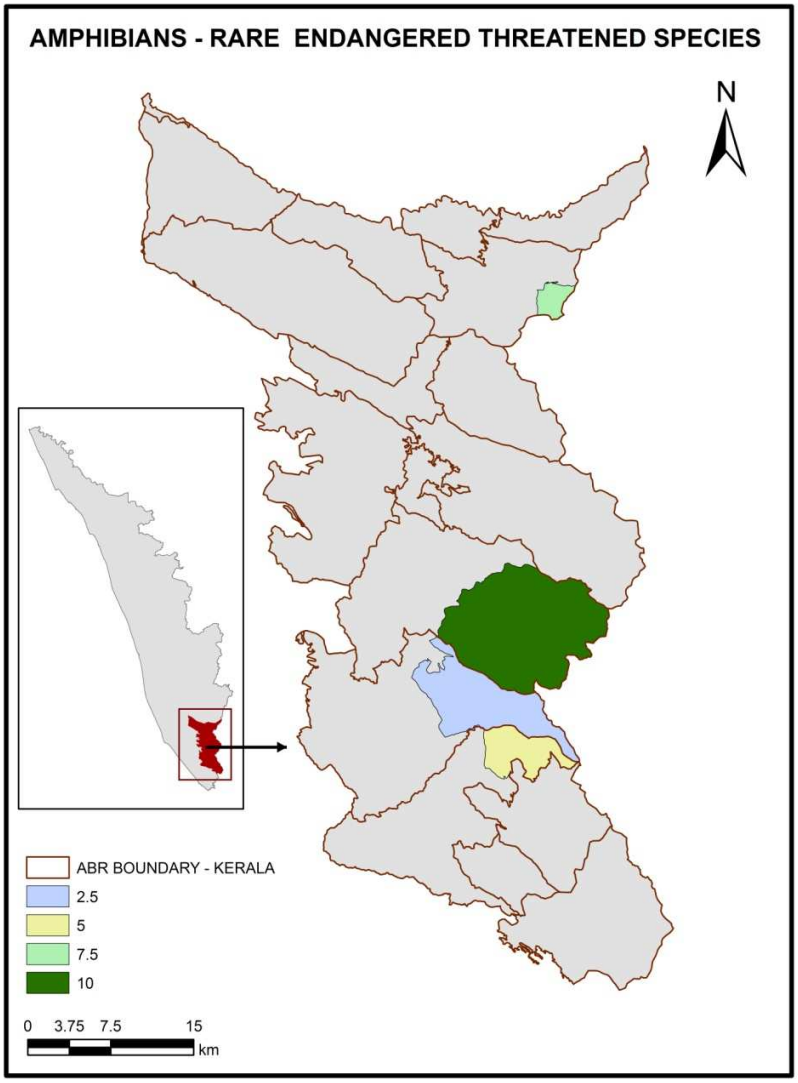
Fig 5.16: Thematic map of critical species of reptiles



e. Amphibians

The percentage of critical species of amphibians in four patches is varying from 20 to 63.This percentage is highest in Chankili which is 63.63 and lowest in Ponmudi, 20. The other patches such as Achancovil and Kallar show 42.85 and 33.33 respectively. These values are divided into four classes with the interval of 10.90. The class 1 is 20 - 30.90, class 2 is 30.91 – 41.80, class 3 is 41.81 – 52.72 and class 4 is 52.73 – 63.63. The thematic map of critical species of amphibian species is given in the fig. 5.17.

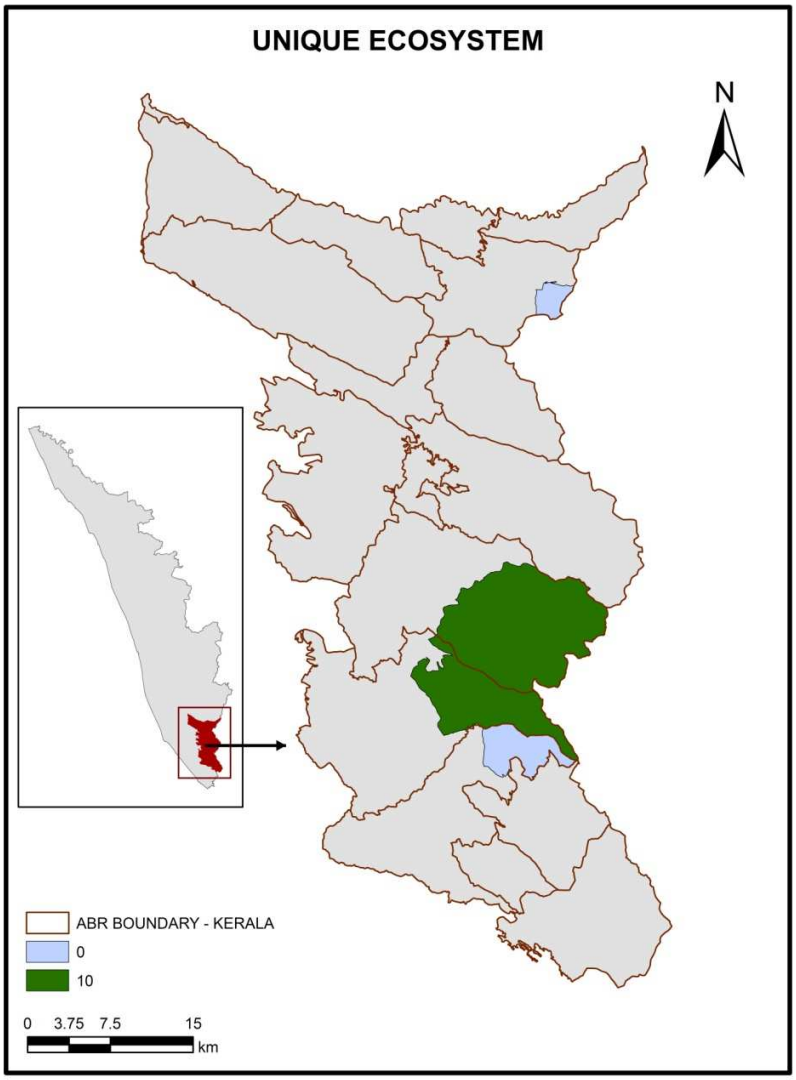
Fig 5.17: Thematic map of critical species of amphibians



5.4.4 Unique ecosystem

Like peculiar conditions of endemic species, the interaction between different climatic and edaphic factors allows the development of specific microhabitats in particular regions. Such micro habitats called unique ecosystem and may not be present throughout the Ghats and restricted to certain regions only. From four short-listed patches, Ponmudi has shola grassland and Chankili has *Myristica* swamps, whereas other two patches did not possess any distinct unique habitat and their thematic map is given in fig. 5.18.

Fig 5.18: Thematic map of unique ecosystems

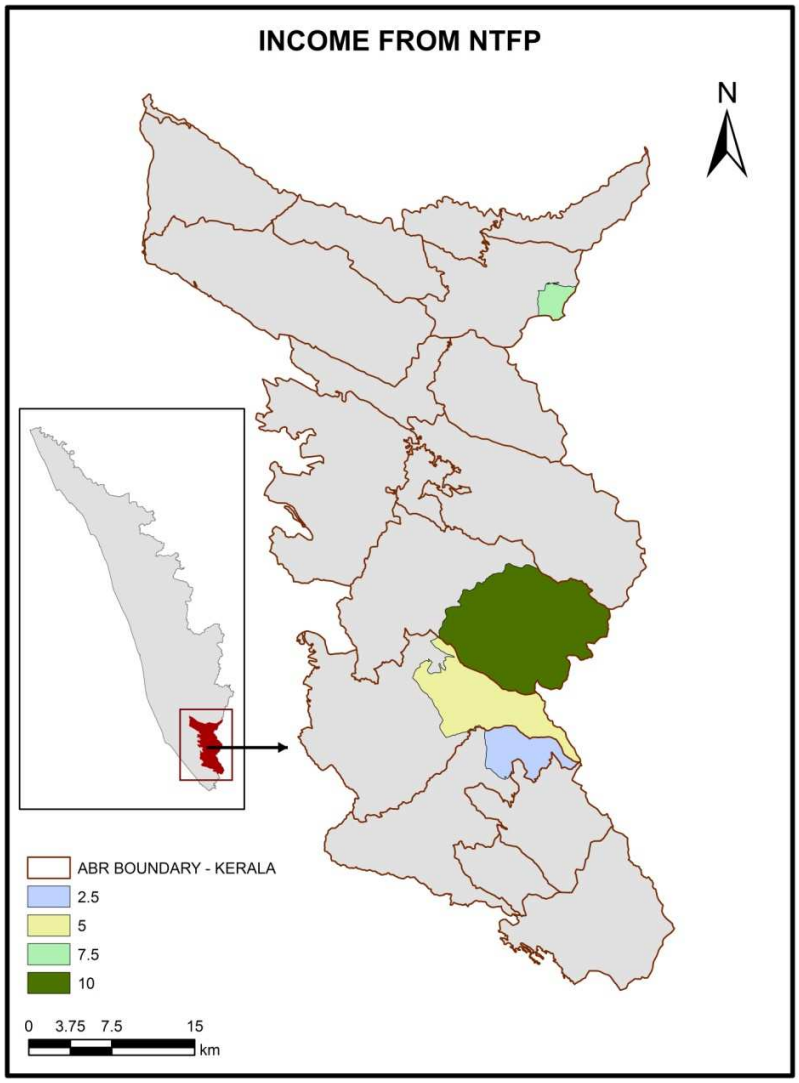


5.5 Social value

5.5.1 NTFP

The NTFP collection and marketing supports the local economy of the people in a substantial way. Hence the contribution of NTFP towards the income of VSS members may encourage conserving the forest. In order to assess their dependency on NTFP, the income has been considered. Thus the annual income of a community from NTFP is the highest at Pottamavu VSS ie, Rs/- 7200 and the lowest in Kallar VSS ie., Rs/- 864. In the meantime, members of Manalar-Kumbavaratti VSS and Ponmudi VSS have an annual income of Rs/- 5088 and Rs/- 3852 respectively. These values are divided into four classes with the interval of 1584. So, the class 1 is 864 - 2448, class 2 is 2448 – 4032, class 3 is 4033 – 5616 and class 4 is 5617 – 7200. The thematic map of dependency on NTFP in four patches is given in the fig. 5.19.

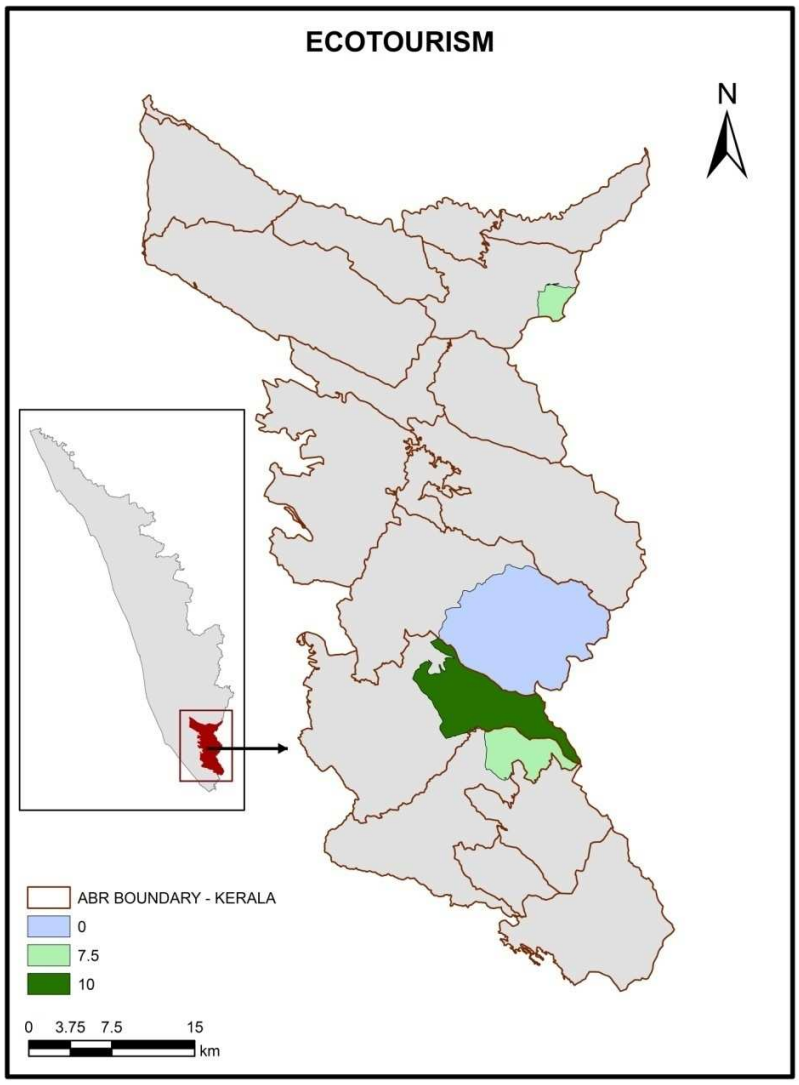
Fig 5.19: Thematic map of income from NTFP



5.5.2 Ecotourism

It is widely recognized that ecotourism can generate a variety of benefits to protected areas and local communities (Leung et al., 2003). The community benefits are actually referred to the economic benefit and the rate of this is related with the visitations. Records show that among the four sites only three are receiving visitors and Chankili did not represent in the ecotourism activities. Hence the annual income from ecotourism to the four selected communities is varying from zero to Rs/- 57840. It is highest in Ponmudi VSS which is Rs/- 57840 and lowest in Kallar, it is Rs/-38592.In the meantime Achancovil shows Rs/- 42600. These values are divided into four classes with the interval of 4812. So, the class 1 is 38592 - 43404, class 2 is 43405 – 48216, class 3 is 48217 – 53028, and class 4 is 53029 – 57840. The thematic map of dependency to ecotourism of four communities is given in the fig. 5.20.

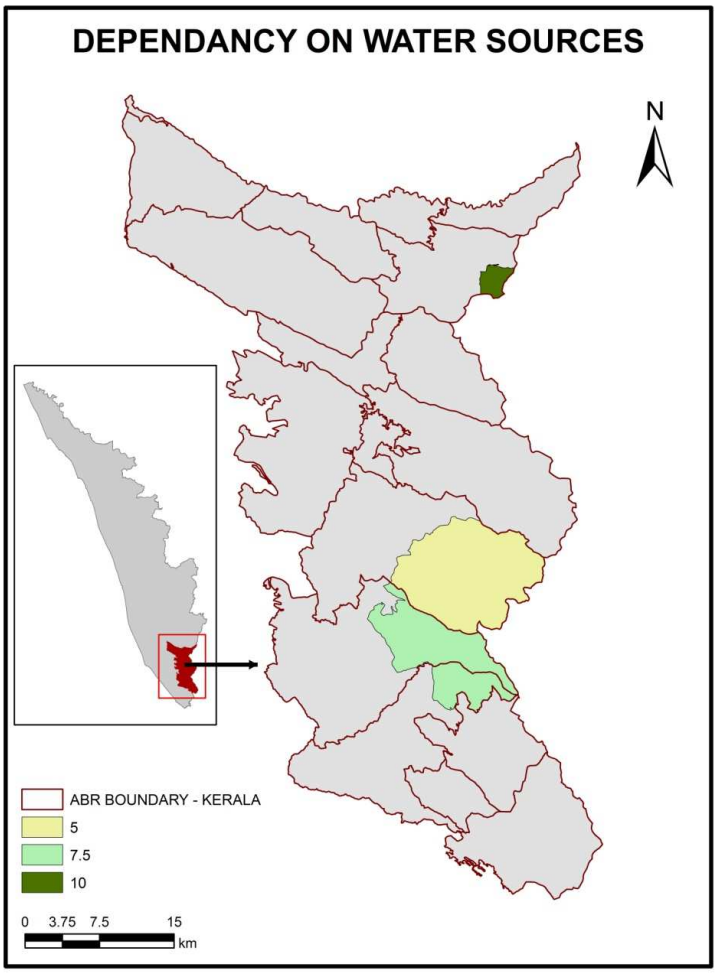
Fig 5.20: Thematic map of income from ecotourism



5.5.3 Water sources

The communities who are residing near the forest area depend on the natural water sources for their drinking and other purposes. In most of the occasions, the draught is not being experienced in such area, which indicates the role of forests in providing water to the sustenance. If a forest area comprises large proportion of catchment, it has critical role in maintaining water quality and quantity (Sulistioadi *et al.,* 2004). The communities those inhabit near or on such areas and using that water sources have a tendency to conserve such forest regions. It is evaluated by observation and discussions with communities and also divided the extent of water dependency as high, high medium, low medium and low. In four communities, Manalar Kumbavaratti VSS show high, Ponmudi and Kallar VSS is high medium and Pottamavu VSS is low medium based on the percentage of people who are depending on this. The thematic map of dependency to water sources of four communities is given in the fig. 5.21.

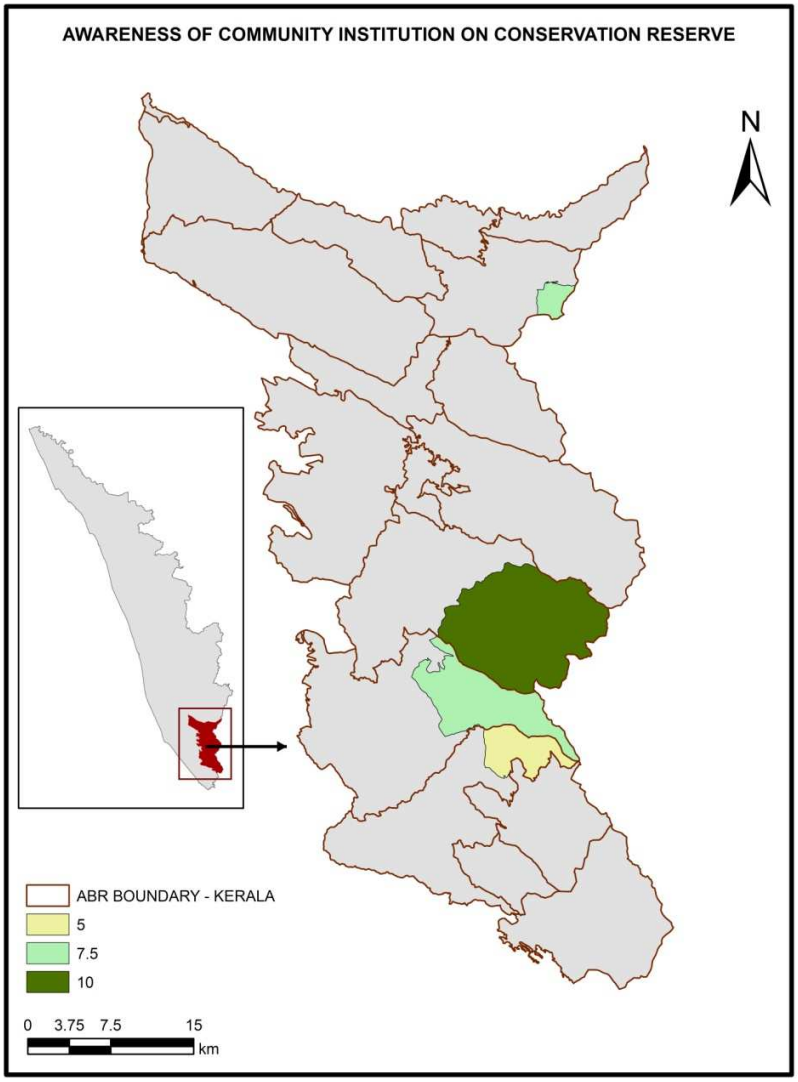
Fig 5.21: Thematic map of dependency to water sources



5.5.4 Awareness of communities

Awareness is an essential component for proper management of conservation important area and then only the sustainability of such forest become success. The evaluation of community awareness was done through personal discussions and arranged meetings. The evaluation result is divided into four groups such as high, high medium, low medium and low. Pottamavu VSS from Chankili patch has the high level of awareness whereas Manalar Kumbavaratti and Ponmudi show high medium, and Kallar are low medium. The thematic map of community awareness level of four patches is given in the fig. 5.22.

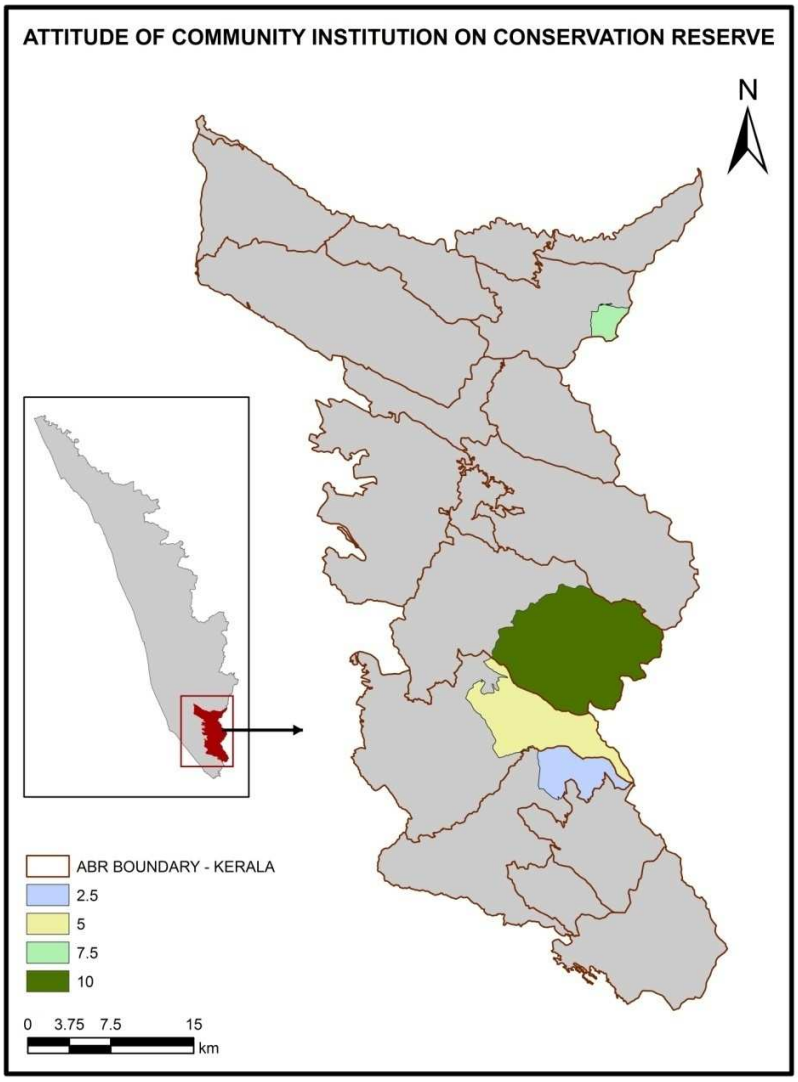
Fig 5.22: Thematic map of community awareness



5.5.5 Community attitude

The attitude of the community is one of the prerequisite for ensuring forest conservation. The weightage levels are divided into four classes such as high, high medium, low medium and low. The Pottamavu community shows high level of attitude and Manalar Kumbavaratti, Ponmudi and Kallar show high medium, low medium and low respectively. The thematic map of community attitude for conserve the forest is given in the fig. 5.23.

Fig 5.23: Thematic map of community attitude



5.6. Analysis and prioritization of areas as potential Conservation Reserves

Prioritization of short-listed patches was carried out as explained in the methods. The weighted sum analysis showed that Ponmudi patch shows high priority (125) and Kallar shows least priority (67.5) with biological values and, at the same time, in the social aspects, Achancovil shows high priority (40) and the Kallar shows least priority (25). Altogether Ponmudi patch comes under the first priority (160), Chankili comes under the second priority (137.5), Achancovil comes under the third priority (130) and Kallar comes under the fourth priority (92.5). The map of the prioritized patche sites for potential conservation reserves is illustrated in figure 5.24 and prioritization value of each patch is given in table 5.2.

Fig. 5.24: Map of prioritized Conservation Reserves

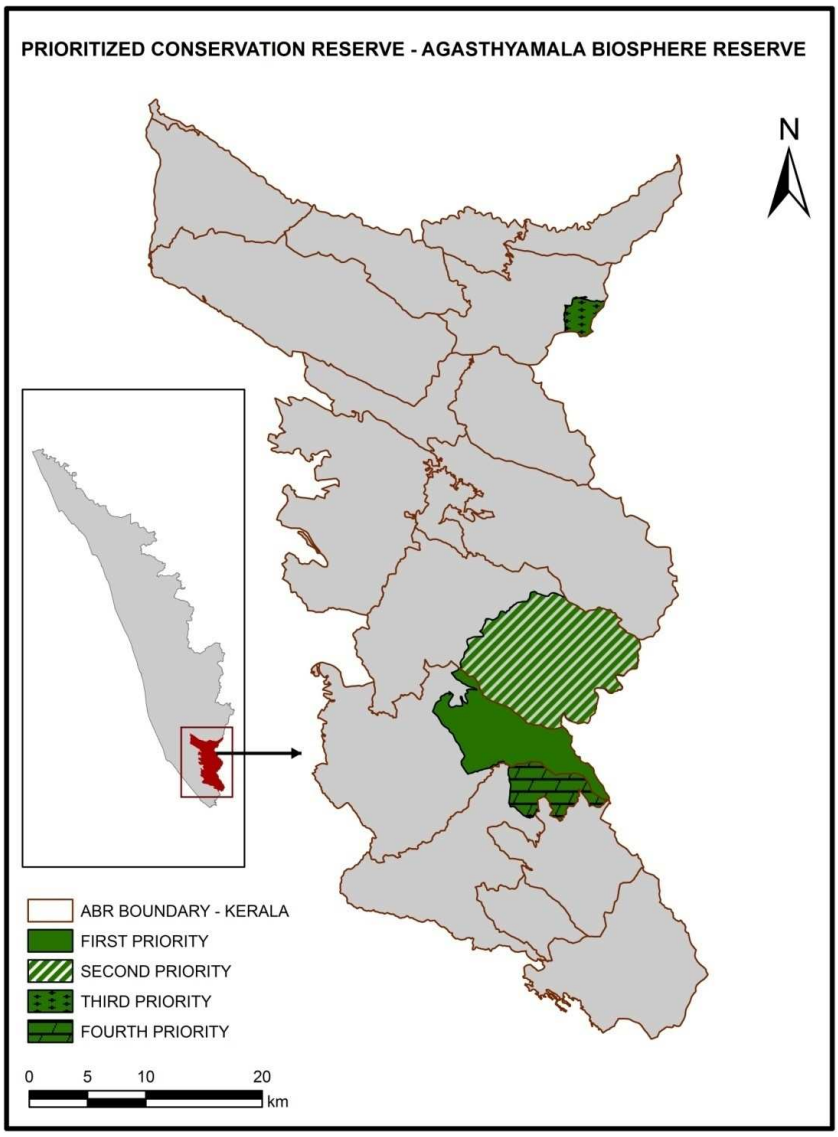


Table 5.2: **Priority list of potential Conservation Reserves patches**

Priority	Name of patch	Area of patch (km^2)	Priority value		
			Biological aspects	Social aspects	Total
1st priority	Ponmudi	57.175	125	35	160
2nd priority	Chankili	119.645	102.5	35	137.5
3rd priority	Achancovil	7.551	90	40	130
4th priority	Kallar	24.051	67.5	25	92.5

There are thousands of protected areas existing on earth, yet the deforestation rate continues unabated both inside and out side the protected areas especially in the tropical forests (Balaguru et al., 2006). Soosairaj *et al*., (2007) and Balaguru *et al*., (2006) identified priority sites in tropical forest in India (Eastern Ghats), where they considered most of the ecological parameters and deforestation risk as criteria, at the same time ignored the community dependence . Studies of prioritization of conservation areas in the Western Ghats (Das *et al*., 2006) and in Kerala forest (Ramesh *et al.* 2002) considered the ecological factors only and also the scale of the study was not appropriate to delineate small areas for community conservation efforts. For successful sustainability, only the prioritization or identification of biologically rich forest is not enough, but management options through consultation should also be attempted.

Most of the earlier studies are limited with criteria on ecological aspects whereas ignored social dimensions in identifying potential areas of forest for community conservation. The protected area authorities have failed to a great extent in seriously attempting involvement of local people in conservation planning and management taking their concerns into mind and trying to solve the issues through better management options derived through consultations and consensus building (Melkani, 2001).The efforts carried out in this exercise tried to incorporate both social and ecological parameters in identifying a suitable area for community conservation as Conservation Reserves. Since the community and their culture and life style are highly dynamic with many external factors, further consulation is required with them in the context of Forest Right Act before implementation.

5.7. Management strategies

The management of the Conservation Reserves would be through an independent committee called Conservation Reserve Management Committee which would be constituted by the government as part of the legal provision. The Committee shall consists of representative of the forest and/or wildlife department, who shall be the Member Secretary, one representative of each Village Panchayat in whose jurisdiction the reserve is located, three representatives of NGO/VSS or JFM committee working in the area and one representative each from the Department of Agriculture and Animal Husbandry. However the overall approach of the management would be participatory in nature and there should be specific strategies for each management issues. The major management issues identified from these prioritized patches are illegal or unsustainable collection of NTFP (biological resources), protection issues such as occasional poaching and fire, littering of wastes in tourism area, etc. The specific strategies that could be implemented through these institutions are described below.

5.7.1. Collection of biological resource for livelihood

The people who live within and on the periphery of the forests are engaged in NTFP collection for their livelihood. NTFP include all goods of biological origin as well as services derived from forests or any land under similar use and exclude wood in all its form. They consist of a variety of products, which are sources of food, fibre, manure, construction materials, cosmetics, and cultural products. The users of NTFP range from local individuals to multinational companies. This market driven utilization became instrumental for the unsustainable exploitation and resulted in degrading the natural vegetation. The conservation reserves identified through this study are very rich in NTFP including edible products, medicinal plants, toiletries, tans, dyes, gums, resins, rattan, bamboo, grasses etc. Illegal and unsustainable collection of NTFP is the root cause of depletion of forest based resources. Destructive and indiscriminate use of NTFP has long-term negative consequences for forests health. Therefore establishing sustainable yields along with community monitoring processes is crucial to conservation of NTFP diversity. The strategies include

- Identify the areas where NTFPs are available and understand the distribution and extent of availability of resource species and limit the collection from identified areas only;
- Establish sustainable harvesting methods and levels. Sustainable harvesting is broadly divided into six steps (Shiva, 1995) including (1). Species selection (2). Forest inventory (3).Yield studies (4). Regeneration surveys (5). Harvest assessments and (6) Harvest adjustments;

- Incorporate sustainable harvesting method and income from NTFP in microplans of VSS and management plans of conservation reserve;
- Encourage cultivation of commercially important NTFPs and medicinal plants through VSS;
- Provide training to NTFP dependents on cultivation techniques, harvesting, control of raw material, post harvest treatments (value addition), storage, etc, and link up with NGOs to help in capacity building and entrepreneurial activities;
- Develop and improve marketing mechanisms and local NTFP enterprises and provide market information to local NTFP collectors;
- Forest Development Corporation and the Forest Department need to create separate marketing and extension wings responsible for developing a VSS marketing strategy and publish regular price lists, open collection depots catering to dispersed locations and establish storage facilities.

5.7.2. Effect of mass ecotourism

Tourism activities in forest area in general are referred as ecotourism which refers to ecologically sound tourism that seeks to balance the goals of biodiversity conservation with culturally sensitive, community-based tourism. It is thus by and of the people and encourages a decentralized tourism that does not require much infrastructure development. The forest patches identified in the present study may be visited by many people both local and foreign who triggered the degradation of habitat. The major impact of tourism is on littering (pollution) and sharing of resources such as water, fuel wood, etc. So the net result is habitat degradation. Associated impacts are soil erosion, fire, disturbance to wild animals for feeding, ranging etc.

The strategy would be to reduce or minimize the impacts through the following actions.

- Develop detailed ecotourism plan for the area and the focal theme should be awareness programme;
- The involvement of VSS members should be made mandatory;
- Only after completing all preliminary steps including measures to plough back certain amount of the money to the area, the project should be implemented;
- Considering the vulnerability of the area it may be discussed whether the area can be closed for certain period and what other kind of measure can be taken to minimise the effect;

- Tourism interpretation centres should be set based on themes and provide qualified guides for proper interpretations;

5.7.3. Illicit activities

The main illicit activities in the identified patches are occasional poaching, sand mining, etc. Poaching is done largely for own consumption and river sand being one of the highly demanding construction materials and the scarcity of the same has made very lucrative for the people to fetch money in the recent years. Hence, the Conservation Reserve Management Committee should have proper strategies for addressing these issues. As a broad strategy each conservation reserve should develop a comprehensive protection plan. The specificities of this plan include the following

- Review each illicit activity for its extent, areas that are prone to different levels, impact, level of protection given, etc and identify the gap in protection. The monthly reports can be used for reviewing the status of illicit activities;
- Prepare a calendar for effective field combating. Constitute teams for combating on rotation basis with necessary gadgets. Implement and ensure an appropriate documentation system which should help in monitoring the illegal activities. Patrolling schedules need to be developed for difficult areas, which should indicate minimum coverage of certain routes/points over a period of time. Providing logistics such as free ration while patrolling may be thought off;
- Enhance the capacity of patrolling team through frequent refresher training;
- Coordinate the protection activities with different other enforcement agencies;
- Communication facilities need to be developed to the extent that each patrol team composed of VSS is able to communicate with the nearest enforcement agencies;
- Organize an intelligence network. The patrol team should develop intelligent network outside the forest area so that relevant information could be collected as early as possible;
- A mechanism of penalizing the members of the VSS and other staff responsible for wild animal poaching is needed once their negligence is confirmed through proper enquiry. The already developed mechanisms in case of commercially valuable trees may be extended to wild animals too if the negligence is confirmed;
- In order to combat the problems due to illicit distilling in the forest area, the VSS members and patrol team should identify the area prone to illicit brewing and more frequent field perambulation may be conducted;

- The people who are involved in illicit brewing may be brought to the mainstream activities of protection;
- Create awareness among local people regarding the multidimensional effects of brewing in the forests;
- In case of sand mining the VSS should identify the streams (rivers) where sand mining can be allowed since sustainable level of sand mining is allowed in the forests;
- Assess the yearly quantity that can be auctioned;
- Entrust the regulation of sand mining to people's committee through VSS and ensure mutual commitment from VSS on protection of stream banks for which a portion of the revenue generated may be used;
- Develop a proper plan for sand mining detailing season, timing, quantity to be allowed, access rules, etc
- Control the traffic (a common place for auctioning like timber yard) from going to the riverside.

5.7.4. Human-wildlife conflicts

Almost all the non-PAs of Agasthyamalai region contain human settlements/ habitations either inside or on the fringes of the forests, which are leading to degradation of surrounding habitats. Animals such as elephants, gaur, sambar, and wild boar cause extensive damage to the crops and other properties of the settlement. Presently, the Government of Kerala has made orders which permit killing of wild boar that damage the crops and other properties. The traditional tolerance among the people who live in the forest areas or its adjacent is fast disappearing and people have become increasingly antagonistic. As a result, the people tend to kill the animals either by poisoning or other means like keeping crackers in the fruits. At present, the Forest department provides compensation for the damage to crop and properties, cattle lifting, by schedule animals like elephants, tiger, leopard, guar, etc. The major strategy is that mitigate human-wildlife conflicts through participatory approach and the specific activities include.

- Arrest degradation of the patches due to forest fire and other causes and improve the habitats through appropriate measures;
- Identify innovative techniques like use of capsicum repellent and other means to chase the animals;
- Motivate the locals to change their land-use pattern, cropping pattern, etc. Make consensus on not raising agriculture in the traditional route of the animals and close vicinity of the forests;
- Try to avoid planting of tapioca, banana, rice, etc near to the forests;

- Encourage stall-feeding to check cattle lifting.

5.7.5. Fire

The effect of fire depends on the type of vegetation, frequency and intensity of fire and seasons of burning. Many weeds managed to establish a strong foothold even after fire with the help of fire resistant underground structures. Studies had shown that, a lot of species became either threatened or extinct due to fire. At present, fire is managed with the help of fire lines and appointment of firewatchers during the season. Participatory fire management system was introduced by the department in most of the forest divisions in Kerala. The main strategy towards fire protection in the conservation reserve is to minimize the fire incidence through participatory approach. The specific actions are

- Identify the fire prone areas in the reserve based on earlier records of fire incidence and proximity of settlements/roads/ etc;
- Highlight issues of fire control and protection through the meetings of VSS and SHG;
- Make sure that all the fire preventive measures such as fire line or early burning if it is practised have been completed before the fire season;
- Equip each conservation reserve management committee with necessary equipments;
- Conduct strong and intensive awareness creation among local people about the impacts of fire.

The above mentioned strategies and specific actions are related to some most prominent management issues in any forest patches. The Conservation Reserve being accorded a PA status need to be carefully managed beyond the mentioned activities. There could be other activities such as afforestation or soil and moisture conservation activities for the improvement of the wildlife habitat. Such aspect also needs to be implemented through participatory manner in order to attain the overall objective of conservation.

Chapter VI

CONCLUSION

Heterogeneity and specialization of the environmental factors in one region to other region are the preferring aspects of the biodiversity and endemism. The high diversity of the native, endemic, economically important and threatened species is the indication of high conservation and socio-economic values of the forest. Climate change and reduced tolerance limit of plants from polluted environment are highlighting the necessity of older extent of forest and their protection for sustainability. Among the three regions of the Western Ghats, the southern Western Ghats is one of the richest abodes of tropical moist forests in India and large portion of this region falls within Kerala. Considering immense conservation potential of this region, part of the area has been declared as 'Agasthyamalai Biosphere Reserve' since 2001. In Kerala part of ABR, the total area covered by PAs is only 20.69% which may not be sufficient enough to ensure the sustenance of the entire spectrum of flora and fauna. PAs in the ABR are embedded in a human-dominated landscape and hence are subject to intense land-use conflicts. The present study shows significant level of ecological features present outside PAs and higher percentage of endemism is noted in some groups when compared with the whole of the Western Ghats. The gap analysis study has also identified that more conservation important areas are lying outside the existing PA network as these existing PAs have more often been demarcated using *ad hoc* criteria.

In order to identify conservation important areas, most of the studies used criteria, either based on ecological principles or partially on social dimensions. No comprehensive study was carried out with both social and ecological parameters. Moreover, the scale of the study is also very important since the implementation of the output would be more effective by entrusting the management on the local communities. In this context, a comprehensive criteria developed through interactive process would be of much relevance in delineating the potential conservation reserves. The criteria were applied at two levels, i.e., first level, based on satellite data and literatures, and second level, based on primary data collected from the short-listed patches. As a result of the application of first level criteria, four patches of forests in the Kerala part of ABR were short-listed. Primary data was collected from these patches and the same has been used as 21 input parameters at second level in which, 16 coming under ecological values and 5 under social indication.The weighted overlay analysis shows that Ponmudi patch scored maximum weightage and considered to be a high priority area due to highest indication of biological parameters,

presence of unique ecosytem and social parameters when compared with other patches. Achancovil and Chankili patches got same weightage come under the second priority area and Kallar shows least priority, due to the lowest values of ecological and social parameters. All the criteria used for identification and prioritization of the potential areas as Conservation Reserves are feasible as well as covering the maximum possible ecological and social parameters. So, the identified areas are potential forest regions to manage as Conservation Reserves. Protection of these patches with community participation would ensure better management of forests for sustainability. The methodology and criteria used in this study is still largely indicative in nature, hence larger discussion is necessary for further improvement.

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Annexure 1 (a)

List of scientific name, common name, endemism and RET status of birds in Ponmudi patch.

S. No.	Scientific Name	Common Name	Endemism	RET
1.	*Accipiter badius badius* (Gmelin)	Shikra		Lc
2.	*Accipiter virgatus besra* Jerdon	BesraSparrowHawk		Lc
3.	*Acridotheres fuscus mahrattensis* (Sykes)	Jungle Myna		Lc
4.	*Acridotheres tristis tristis* (Linnaeus)	Common Myna		Lc
5.	*Aegithiatiphia multicolor* (Gmelin)	CommonIora		
6.	*Alcedo atthis taporbana* Kleinschmidt	SmallBlueKingfisher		
7.	*Anthus nilghiriensis* Sharpe	Nilgiri Pipit	E	NT
8.	*Anthus richardi* Vieillot	Richard's Pipit (M)		Lc
9.	*Anthus similis travancoriensis* Ripley	Brown Rock Pipit		
10.	*Ardeola grayii grayii* (Sykes)	Indian Pond Heron		Lc
11.	*Artamus fuscus*	AshyWoodswallow(Ashy Swallow-Shrike)		Lc
12.	*Athene brama brama* (Temminck)	SpottedOwlet		Lc
13.	*Bubo nipalenis nipalensis* Hodgson	ForestEagleOwl		Lc
14.	*Buceros bicornis homrai* Hodgson	GreatPiedHornbill		NT
15.	*Caprimulgus affinis monticolus* Franklin	Franklin'sNightjar		Lc
16.	*Caprimulgus asiaticus asiaticus*	Common Indian Nightjar		Lc
17.	*Caprimulgus atripennis* Jerdon	Jerdon'sNightjar		Lc
18.	*Caprimulgus indicusindicus* Latham	IndianJungleNightjar		Lc
19.	*Celius brachyurus jerdonii* (Malherbe)	RufousWoodpecker		Lc

20.	*Centropus sinensis parroti* Stresemann	GreaterCoucal		Lc
21.	*Centropus toulou bengalensis* (Gmelin)	LesserCoucal		Lc
22.	*Chalcophaps indica indica* (Linnaeus)	EmeraldDove		
23.	*Chloropsis aurifrons frontalis* (Pelzeln)	Gold-frontedChloropsis		Lc
24.	*Chloropsis cochinchinensis jerdoni* (Blyth)	Jerdon'sChloropsis		Lc
25.	*Chrysocolaptes lucidus*	Greater Golden-backed Woodpecker		Lc
26.	*Collocalia unicolor* (Jerdon)	IndianEdible-nestSwiftlet		Lc
27.	*Columba elphinstonii* (Sykes)	NilgiriWoodPigeon	E	V
28.	*Columba livia intermedia* Strickland	BlueRockPigeon		Lc
29.	*Coracias benghalensis indica*Linnaeus	IndianRoller		Lc
30.	*Coracin amelanoptera sykesi*	Black-headed Cuckooshrike		
31.	*Corvus macrorhynchos culminatus* Sykes	Jungle Crow		Lc
32.	*Corvus splendensprotegatus* Madaras	HouseCrow		Lc
33.	*Cuculus micropterus micropterus* Gould	IndianCuckoo		Lc
34.	*Cypsiurus balasiensis* (J.E.Gray)	AsianPalmSwift		Lc
35.	*Dendrocitta leucogastra*	White-belliedTreepie	E	Lc
36.	*Dendrocitta vagabundaparvula*	Indian Treepie		Lc
37.	*Dicaeum erythrorhynchos*	Tickell's Flowerpecker		Lc
38.	*Dicrurus paradiseusparadiseus*	Greater Racket-tailed Drongo		Lc
39.	*Dinopium benghalense*	Lesser Golden-backed Woodpecker		Lc
40.	*Dinopium javanense*	Common Golden-backed Woodpecker		Lc
41.	*Ducula aeneapusilla* (Blyth)	GreenImperialPigeon		Lc
42.	*Ducula badiacuprea* (Jerdon)	MountainImperialPigeon		Lc

43.	*Elanus caeruleusvociferus (Latham)*	Black-shoulderedKite		Lc
44.	*Eudynamys scolopacea scolopacea* (Linnaeus)	AsianKoel		Lc
45.	*Eurostopodus macrotis* (Hume)	Great-EaredNightjar		Lc
46.	*Eurystomus orientalis laetior* Sharpe	OrientalBroad-billedRoller		
47.	*Falco naumanni* Fleischer	Lesser Kestrel (M)		V
48.	*Falco peregrinus peregrinator* Sundevall	Shahin Falcon		Lc
49.	*Falco tinnunculus tinnunculus* Linnaeus	CommonKestrel		Lc
50.	*Gallus sonneratii* Temminck	GreyJunglefowl		Lc
51.	*Glaucidium radiatum malabaricum* (Blyth)	JungleOwlet		Lc
52.	*Gracula indica* (Cuvier)	Southern Hill Myna		
53.	*Halcyon pileata*(Boddaert)	Black-cappedKingfisher		Lc
54.	*Halcyon smyrnensis fusca*(Boddaert)	White-breastedKingfisher		Lc
55.	*Haliastur indusindus* (Boddaert)	BrahminyKite		Lc
56.	*Harpactes fasciatus malabaricus* (Gould)	MalabarTrogon		Lc
57.	*Hemicircus canente canente* (Lesson)	Heart-spottedWoodpecker		Lc
58.	*Hemiprocne coronata* (Tickell)	CrestedTreeSwift		Lc
59.	*Hieraaetus fasciatus fasciatus* (Vieillot)	Bonelli'sEagle		
60.	*Hieraaetus pennatus* (Gmelin)	Booted Eagle		Lc
61.	*Hieraaetus kieneriikienerii* (E.Geoffroy)	Rufous-belliedEagle		
62.	*Hierococcyx varius varius* Vahl	BrainfeverBird		
63.	*Hirundapus gigantean indica*	Brown-backed Needletail Swift.		Lc
64.	*Hirundo concolor concolor* Sykes	Dusky Crag-Martin		Lc
65.	*Hirundo daurica nipalensis*	Red-rumped Swallow (M)		Lc

	Hodgson			
66.	*Hirundo smithii filfera* Stephens	Wire-tailed Swallow		Lc
67.	*Hypsipetes indicus indicus* (Jerdon)	Yellow-browedBulbul		
68.	*Hypsipetes leucocephlus ganeesa* (Sykes)	BlackBulbul		Lc
69.	*Ictinaetus malayensis perniger* (Hodgson)	BlackEagle		Lc
70.	*Irena puellapuella* (Latham)	AsianFairyBlueBird		Lc
71.	*Ketupa zeylonensis leschenaul*t (Temminck)	BrownFishOwl		Lc
72.	*Lanius cristatus cristatus* Linnaeus	BrownShrike		Lc
73.	*Loriculus vernali svernalis* (Sparrman)	IndianHangingParrot		Lc
74.	*Megalaima haemacephala indica* (Latham)	CoppersmithBarbet		Lc
75.	*Megalaima rubricapilla* (Blyth)	Crimson-throated Barbet		Lc
76.	*Megalaima viridis* (Boddaert)	White-cheekedBarbet		Lc
77.	*Merops leschenaultil* Vieillot	Chestnut-headed Bee-eater		Lc
78.	*Merops orientalis orientalis* Latham	SmallBee-eater		Lc
79.	*Merops philippinus philippinus* Linnaeus	Blue-tailedBee-eater (M)		Lc
80.	*Milvus migransgovinda* Sykes	BlackKite		Lc
81.	*Myiophonus horsfieldii horsfieldii*	Malabar Whistling Thrush		
82.	*Nectarinia asiatica asiatica* (Latham)	PurpleSunbird		Lc
83.	*Nectarinia minima* (Sykes)	SmallSunbird	E	Lc
84.	*Nectarinia zeylonica flaviventris*	Purple-rumped Sunbird		Lc
85.	*Ninox scutulata hirsute* (Temminck)	BrownHawkOwl		Lc
86.	*Nycticorax nycticorax* (Linnaeus)	Black-crowned Night Heron		Lc
87.	*Nyctyornis athertoni*	Blue-bearded Bee-eater		Lc

	(Jardine&Selby)			
88.	*Ocyceros griseus* (Latham)	MalabarGreyHornbill	E	Lc
89.	*Otus bakkamoena bakkamoena* Pennant	CollaredScopsOwl		Lc
90.	*Otus sunia* (Hodgson)	Oriental Scops Owl		Lc
91.	*Pericrocotus flammeus flammeus* (Forster)	Scarlet Minivet		Lc
92.	*Pernis ptilo rhynchusruficollis* Lesson	Oriental Honey Buzzard		Lc
93.	*Pholidus badius ripleyi* Hussain & Khan	Oriental Bay Owl		
94.	*Picumnus innominatus malayorum* Hartert	SpeckledPiculet		Lc
95.	*Pitta brachyuran brachyuran* (Linnaeus)	IndianPitta (M)		Lc
96.	*Pomatorhinus horsfieldii* Harington	IndianScimitarBabbler		Lc
97.	*Prinia socialis socialis* Sykes	AshyPrinia		Lc
98.	*Psittacula krameri manilensis* (Bechstein)	Rose-ringedParakeet		Lc
99.	*Pycnonotus cafer cafer* (Linnaeus)	Red-ventedBulbul		Lc
100.	*Pycnonotus jocosus fuscicaudatus* (Gould)	Red-whiskeredBulbul		Lc
101.	*Pycnonotus melanicterus gularis* (Gould)	Ruby-throated Bulbul		Lc
102.	*Saxicolaca prata nilgiriensis* Whistler	PiedBushchat		
103.	*Schoenicola platyura*	Broad-tailedGrassbird	E	V
104.	*Spilornis cheelamelanotis* (Jerdon)	CrestedSerpent-Eagle		Lc
105.	*Spizaetu scirrhatus cirrhatus* (Gmelin)	ChangeableHawk-Eagle		
106.	*Sturnus malabaricus malabaricus* (Gmelin)	Grey-headedStarling		Lc
107.	*Surniculus lugubris* (Horsfield)	Drongo Cuckoo		Lc
108.	*Tachymarptis melbanubifuga*	AlpineSwift		Lc

	Koelz			
109.	*Treron bicincta bicincta* (Jerdon)	Orange-breastedGreenPigeon		Lc
110.	*Treron phoenicoptera* (Blyth)	Yellow-footed Green Pigeon		Lc
111.	*Treron pompadora affinis* (Jerdon)	PompadourGreenPigeon		Lc
112.	*Turdoides affinis affinis* (Jerdon)	White-headedBabbler		
113.	*Turdoides striatus malabaricus* (Jerdon)	Jungle Babbler		Lc
114.	*Tyto albastertens* Hartert	BarnOwl		Lc
115.	*Zoonavena sylvatica* (Tickell)	White-rumpedNeedletailSwift		Lc
Total	**115**		**6**	**99**

Annexure1 (b)

List of scientific name, common name, endemism and RET status of butterflies in Ponmudi patch.

S. No.	Scientific Name	Common Name	Endemism	RET
1.	*Abisara echerius*	Plum Judy		
2.	*Acraea violae*	Tawny Coster		
3.	*Actolepis puspa*	Common Hedge Blue		
4.	*Aeromachus dubius*	Dingy Scrub-Hopper	E	
5.	*Aeromachus pygmaeus*	Pygmy Grass-/Scrub-Hopper		
6.	*Appias indra*	Plain Puffin		
7.	*Appias lalage*	Spot Puffin		
8.	*Arnetta mercara*	Coorg Forest Hopper	E	
9.	*Athyma nefte*	Colour Sergeant		
10.	*Athyma perius*	Common Sergeant		
11.	*Athyma ranga*	Blackvein Sergeant		
12.	*Badamia*	Brown Awl		

	exclamationis			
13.	*Baracus vittatus*	Hedge/Hampson's Hedge-Hopper	E	
14.	*Bibasis sena*	Orangetail Awl		
15.	*Borbo bevani*	Bevan's Swift		
16.	*Caleta caleta*	Angled Pierrot		
17.	*Caltoris canaraica*	Kanara Swift	E	
18.	*Catopsilia pomona*	Common Emigrant		
19.	*Catopsilia pyranthe*	Mottled Emigrant		
20.	*Celaenorrhinus leucocera*	Common Spotted Flat		
21.	*Celaenorrhinus ruficornis*	Tamil Spotted Flat	E	
22.	*Cepora nadina*	Lesser Gull		
23.	*Cepora nerissa*	Common Gull		
24.	*Cethosia nietneri*	Tamil Lacewing		
25.	*Charaxes bernardus*	Tawny Rajah		
26.	*Cheritra freja*	Common Imperial		
27.	*Chilades laius*	Lime Blue		
28.	*Cirrochroa thais*	Tamil Yeoman	E	
29.	*Cupha erymanthis*	Rustic		
30.	*Cynthia cardui*	Painted Lady		
31.	*Cyrestis thyodamas*	Common Map		
32.	*Delias eucharis*	Common Jezebel		
33.	*Discophora lepida*	Southern Duffer	E	
34.	*Elymnias hypermenstra*	Common Palmfly		
35.	*Euchrysops cnejus*	Gram Blue		
36.	*Euploea core*	Common Indian Crow		

37.	*Euploea sylvester*	Double-Branded Crow		
38.	*Eurema blanda*	Three-Spot Grass Yellow		
39.	*Eurema hecabe*	Common Grass Yellow		
40.	*Euthalia aconthea*	Common Baron		
41.	*Everes lacturnus*	Indian Cupid		
42.	*Gangara thyrsis*	Giant Redeye		
43.	*Graphium agamemnon*	Tailed Jay		
44.	*Graphium doson*	Common Jay		
45.	*Graphium sarpedon*	Common Bluebottle		
46.	*Hasora taminatus*	White Banded Awl		
47.	*Hebomoia glaucippe*	Great Orange Tip		
48.	*Hypolimnas bolina*	Great Eggfly		
49.	*Hypolimnas misippus*	Danaid Eggfly		
50.	*Iambrix salsala*	Chestnut Bob		
51.	*Idea malabarica*	Malabar Tree Nymph	E	NE
52.	*Jamides alecto*	Metallic Cerulean		
53.	*Jamides bochus Jamides*	Dark Cerulean		
54.	*Jamides celeno*	Common Cerulean		
55.	*Junonia almana*	Peacock Pansy		
56.	*Junonia iphita*	Chocolate Pansy		
57.	*Junonia lemonias*	Lemon Pansy		
58.	*Kaniska canace*	Blue Admiral		
59.	*Lampides boeticus*	Pea Blue		
60.	*Leptosia nina*	Psyche		
61.	*Lethe drypetis*	Tamil Treebrown	E	

62.	*Limenitis procris*	Commander		
63.	*Loxura atymnus*	Yamfly		
64.	*Magisba malaya*	Malayan		
65.	*Matapa aria*	Common Redeye		
66.	*Melanitis leda*	Common Evening Brown		
67.	*Melanitis phedima*	Dark Evening Brown		
68.	*Melanitis zitenius*	Great Evening Brown		
69.	*Mycalesis anaxias*	Whitebar Bushbrown	E	
70.	*Mycalesis perseus*	Common Bushbrown		
71.	*Mycalesis subdita*	Tamil Bushbrown	E	
72.	*Mycalesis visala*	Longbrand Bushbrown		
73.	*Neptis hylas*	Common Sailer		
74.	*Neptis jumbah*	Chestnut-Streaked Sailer		
75.	*Notocrypta curvifascia*	Restricted Demon		
76.	*Notocrypta paralysos*	Common Banded Demon		
77.	*Oriens concinna*	Tamil Dartlet		
78.	*Oriens goloides*	Indian/Common Dartlet		
79.	*Pachliopta aristolochiae*	Common Rose		
80.	*Pachliopta pandiyana*	Malabar Or Ceylon Rose	E	
81.	*Pantoporia hordonia*	Common Lascar		
82.	*Papilio demoleus*	Lime		
83.	*Papilio dravidarum*	Malabar Raven	E	
84.	*Papilio helenus*	Red Helen		
85.	*Papilio leomedon*	Malabar Banded Swallowtail	E	
86.	*Papilio polymnestor*	Blue Mormon		

87.	*Papilio polytes*	Common Mormon		
88.	*Parantica aglea*	Glassy Tiger		
89.	*Parantica nilgiriensis*	Nilgiri Tiger	E	NT
90.	*Parantirrhoea marshalli*	Travancore Evening Brown	E	
91.	*Parthenos sylvia*	Clipper		
92.	*Pelopidas agna*	Dark Branded Swift		
93.	*Pelopidas mathias*	Dark Small-Branded Swift		
94.	*Pelopidas subochracea*	Large Branded Swift		
95.	*Phalanta phalantha*	Common Leopard		
96.	*Polytremis lubricans*	Contiguous Swift		
97.	*Polyura athamas*	Common Nawab		
98.	*Potanthus confucius*	Confucian/Chinese Dart		
99.	*Potanthus pava*	Pava Dart		
100.	*Potanthus psuedomaesa*	Psuedomaesa/Common Dart		
101.	*Prioneris sita*	Painted Sawtooth		
102.	*Prosotas nora*	Common Line Blue		
103.	*Psolos fuligo*	Coon		
104.	*Psuedozizeeria maha*	Pale Grass Blue		
105.	*Rapala manea*	Slate Flash		
106.	*Sovia hyrtacus*	Bicolour Ace	E	
107.	*Spalgis epius*	Apefly		
108.	*Spindasis elima*	Scarce Shot Silverline		
109.	*Spindasis schistacea*	Plumbeous Silverline		
110.	*Spindasis vulcanus Spindasis*	Common Silverline		

111.	*Suastus gremius*	Indian Palm Bob		
112.	*Suastus minuta*	Small Palm Bob		
113.	*Tagiades gana*	Immaculate/Large/Suffused Snow Flat		
114.	*Tagiades jepetus*	Common/Ceylon Snow Flat		
115.	*Tagiades litigiosa*	Water Snow Flat		
116.	*Taractrocera ceramas*	Tamil Grass Dart		
117.	*Telicota ancilla*	Dark Palm Dart		
118.	*Telicota colon*	Pale Palm Dart		
119.	*Thoressa astigmata*	Southern Spotted Or Unbranded Ace	E	
120.	*Thoressa sitala*	Sitala Ace	E	
121.	*Tirumala limniace*	Blue Tiger		
122.	*Tirumala septentrionis*	Dark Blue Tiger		
123.	*Troides minos*	Southern Birdwing		
124.	*Udaspes folus*	Grass Demon		
125.	*Vindula erota*	Cruiser		
126.	*Ypthima baldus*	Common Fivering		
127.	*Ypthima ceylonica*	White Or Ceylon Fourring		
128.	*Ypthima huebneri*	Common Fourring		
129.	*Ypthima ypthimoides*	Palni Fourring	E	
130.	*Zipoetis saitis*	Tamil Catseye	E	
131.	*Zizeeria karsandra*	Dark Grass Blue		
Total	**131**		**21**	**2**

Annexure 1(c)

List of scientific name, common name, endemism and RET status of amphibians in Ponmudi patch.

S. No.	Scientific Name	Common Name	Endemism	RET
1.	*Bufo melanostictus*			UV
2.	*Euphlyctis cyanophlyctis*			Nt
3.	*Fejervarya keralensis*	Kerala Warty Frog	E	Lc
4.	*Fejervarya limnocharis*	Common Pond Frog		Lc
5.	*Gegeneophis sps*		E	
6.	*Hoplobatrachus tigerinus*	Indian Bullfrog		VU
7.	*Ichthyophis sps*		E	
8.	*Indirana sps*		E	
9.	*Micrixalus fuscus*		E	NT
10.	*Nyctibatrachus aliciae*		E	T
11.	*Nyctibatrachus sps*		E	
12.	*Philautus akroparallagi*		E	
13.	*Philautus anili*		E	
14.	*Philautus beddomii*		E	
15.	*Philautus bobingeri*		E	
16.	*Philautus graminirupes*		E	
17.	*Philautus ponmudi*		E	
18.	*Polypedates maculates*	Himalayan Tree Frog		Lc
19.	*Sylvirana temporalis*		E	
20.	*Uraeotyphlus sps*		E	
Total	**20**		**15**	**8**

Annexure 1(d)

List of scientific name, common name, endemism and RET status of reptiles in Ponmudi patch.

S. No.	Scientific Name	Common Name	Endemism	RET
1.	*Bungarus ceruleus*	Common krait		
2.	*Calotes calotes* Green	Forest Lizard		Nt
3.	*Calotes versicolor*	Garden lizard		Nt
4.	*Cnemapsis sps*	Day Gecko		
5.	*Draco dussumieri*	Western Ghats Flying Lizard		
6.	*Hemidactylus frenatus*	Asian House Gecko		Lc
7.	*Hypnale hypnale*	Humpnosed pitviper	E	
8.	*Indotestudo travancorica*	Travancore tortoise	E	V
9.	*Lycodon aulicus*	Common Wolf snake		Lc
10.	*Lycodon travancorius*	Travancore Wolfsnake	E	Nt
11.	*Mabuya sps*	Travancore tortoise	E	
12.	*Naja naja*	Indian Cobra		
13.	*Otocryptis beddomeii*	Indian Kangaroo Lizard		VU
14.	*Psammophilus dorsalis*	South Indian Rock Agama		Nt
15.	*Ptyas mucosa*	Indian Rat Snake		Lc
16.	*Sphenomorphus dussumieri*	Dussumier's Litter Skink		
17.	*Trimeresurus malabaricus*	Malabar pitviper	E	Nt
18.	*Trimeresurus strigatus*	Horse shope pitviper	E	Nt
19.	*Varanus sps*			
Total	**19**		**6**	**11**

Annexure 1(e)

List of scientific name, common name, endemism and RET status of Evergreen trees in Ponmudi patch.

S. No.	Botanical name	Local name	Family	Threatened status	Endemism
1	*Aporosa cardiosperma*	Vetti	Euphorbaceae	VU	
2	*Artocarpus hirsutus*	Anjil	Moraceae		E
3	*Bischofia javanica*	Mlachethayan	Euphorbaceae		
4	*Buchanania lanceolata*	Kulamavu	Anacardiaceae		
5	*Calophyllum inophyllum*	Punna	Clusiacea	LC	
6	*Canarium strictum*	Thalli	Burseraceae		E
7	*Carallia brachiata*	Vallabham	Rhizophoraceae		
8	*Cinnamomum malabatrum*	Vayana	Lauraceae		E
9	*Cullenia exarillata*	Vediplavue	Bombacaceae		
10	*Diospyros paniculata*	Karumaram	Ebenaceae		E
11	*Dysoxylum malabaricum*	Akil	Meliaceae		E
12	*Elaeocarpus tuberculatus*	Karamaram	Elaeocarpaceae		
13	*Ficus religiosa*	Arayal	Moraceae		
14	*Garcinia gummi-gutta*	Kodampuli	Clusiacea		
15	*Gluta travancorica*	Chenkurungi	Anacardaceae	NT	E
16	*Hopea ponga*	Kambakam	Dipteriocarpacea	EN	E
17	*Hydnocarpus alpina*	Vetti	Flaucortiaceae		
18	*Knema attenuata*	Chorappayin	Myristaceae	LC	E
19	*Lagerstroemia speciosa*	Poomaruthu	Lythraceae		
20	*Lannea coromandelica*	Uthi	Anacardiaceae		
21	*Lophopetalum wightianum*	Venkkotta	Celastraceae	LC	
22	*Macaranga peltata*	Vatta	Euphorbaceae		
23	*Madhuca neriifolia*	Attu-ilippa	Sapotaceae		

24	*Mallotus tetracoccus*	Thavittuvatta	Euphorbiaceae		
25	*Mangifera indica*	Mavu	Anacardacea		
26	*Mastixia arborea ssp. arborea*	Kunthirikkam	Cornaceae	LC	E
27	*Melia dubia*	Malaveppu	Meliaceae		
28	*Mesua thwaitesii*	Nangu	Clusiaceae		
29	*Myristica malabarica*	Ponnambuvu	Myristicaceae		
30	*Naringi crenulata*	Kattunarakam	Rutaceae		
31	*Olea dioica*	Edana	Oleaceae		
32	*Persea macrantha*	Ooravu	Lauraceae		
33	*Poeciloneuron indicum*	Poothamkolli	Cluciaceae		E
34	*Psydrax dicoccos*	Irumbarappan	Rubiaceae		
35	*Schleichera oleosa*	Poovanam	Sapindaceae		
36	*Semecarpus auriculata*	Charei	Anacardaceae	NT	E
37	*Stereospermum colais var. colais*	Pathiri	Bignonaceae		
38	*Syzygium cumini*	Njaval	Myrtaceae		
39	*Terminalia bellirica*	Thanni	Combretaceae		
40	*Terminalia catappa*	Badam	Combretaceae		
Total	**40**			**8**	**11**

Annexure 2 (a)

List of scientific name, common name, endemism and RET status of birds in Kallar patch.

S. No.	Scientific Name	Common Name	Endemism	RET
1.	*Accipiter badius badius* (Gmelin)	Shikra		Lc
2.	*Accipiter virgatus besra*Jerdon	BesraSparrowHawk		Lc
3.	*Acridotheres fuscus mahrattensis* (Sykes)	Jungle Myna		Lc
4.	*Acridotheres tristis tristis* (Linnaeus)	Common Myna .		Lc
5.	*Aegithiatiphia multioclor* (Gmelin)	CommonIora		
6.	*Alcedo atthis taporbana* Kleinschmidt	SmallBlueKingfisher		
7.	*Ardeola grayii grayii* (Sykes)	Indian Pond Heron		Lc
8.	*Artamus fuscus*	AshyWoodswallow(Ashy Swallow-Shrike)		Lc
9.	*Athene brama brama* (Temminck)	SpottedOwlet		Lc
10.	*Caprimulgus asiaticus asiaticus*	Common Indian Nightjar		Lc
11.	*Celius brachyurus jerdonii* (Malherbe)	RufousWoodpecker		Lc
12.	*Centropus sinensis parroti*Stresemann	GreaterCoucal		Lc
13.	*Chalcophaps indica indica* (Linnaeus)	EmeraldDove		
14.	*Chloropsis cochinchinensis jerdoni* (Blyth)	Jerdon'sChloropsis		Lc
15.	*Chrysocolaptes lucidus*	Greater Golden-backed Woodpecker		Lc
16.	*Collocalia unicolor* (Jerdon)	IndianEdible-nestSwiftlet		Lc
17.	*Columba livia intermedia* Strickland	BlueRockPigeon		Lc
18.	*Coracias benghalensis indica* Linnaeus	IndianRoller		Lc
19.	*Coracin amelanoptera sykesi*	Black-headed Cuckooshrike		
20.	*Corvus macrorhynchos culminatus*	Jungle Crow		Lc

	Sykes			
21.	*Corvus splendensprotegatus* Madaras	HouseCrow		Lc
22.	*Cuculus micropterus micropterus* Gould	IndianCuckoo		Lc
23.	*Cypsiurus balasiensi* (J.E.Gray)	AsianPalmSwift		Lc
24.	*Dendrocitta leucogastra*	White-belliedTreepie ENDEMIC	E	Lc
25.	*Dendrocitta vagabundaparvula*	Indian Treepie		Lc
26.	*Dicaeum erythrorhynchos*	Tickell's Flowerpecker		Lc
27.	*Dicrurus paradiseusparadiseus*	Greater Racket-tailed Drongo		Lc
28.	*Dinopium benghalense*	Lesser Golden-backed Woodpecker		Lc
29.	*Eudynamys scolopacea scolopacea* (Linnaeus)	AsianKoel		Lc
30.	*Eurostopodus macrotis* (Hume)	Great-EaredNightjar		Lc
31.	*Falco tinnunculus tinnunculus* Linnaeus	CommonKestrel		Lc
32.	*Gallus sonneratii* Temminck	GreyJunglefowl		Lc
33.	*Glaucidium radiatum malabaricum* (Blyth)	JungleOwlet		Lc
34.	*Gracula indica* (Cuvier)	SouthernHillMyna		
35.	*Halcyon pileata* (Boddaert)	Black-cappedKingfisher		Lc
36.	*Halcyon smyrnensis fusca* (Boddaert)	White-breastedKingfisher		Lc
37.	*Haliastur indusindus* (Boddaert)	BrahminyKite		Lc
38.	*Harpactes fasciatus malabaricus* (Gould)	MalabarTrogon		Lc
39.	*Hemicircus canente canente* (Lesson)	Heart-spottedWoodpecker		Lc
40.	*Hemiprocne coronata* (Tickell)	CrestedTreeSwift		Lc
41.	*Hierococcyx varius varius* Vahl	BrainfeverBird		
42.	*Hirundapus gigantean indica*	Brown-backed Needletail Swift.		Lc
43.	*Hirundo daurica nipalensis*	Red-rumpedSwallow (M)		Lc

	Hodgson			
44.	*Hirundo smithii filfera* Stephens	Wire-tailedSwallow		Lc
45.	*Hypsipetes indicus indicus* (Jerdon)	Yellow-browedBulbul		
46.	*Ictinaetus malayensis perniger* (Hodgson)	BlackEagle		Lc
47.	*Irena puellapuella* (Latham)	AsianFairyBlueBird		Lc
48.	*Lanius cristatus cristatus* Linnaeus	BrownShrike		Lc
49.	*Loriculus vernali svernalis* (Sparrman)	IndianHangingParrot		Lc
50.	*Megalaima haemacephala indica* (Latham)	CoppersmithBarbet		Lc
51.	*Megalaima rubricapilla* (Blyth)	Crimson-throated Barbet		Lc
52.	*Megalaima viridis* (Boddaert)	White-cheekedBarbet		Lc
53.	*Merops leschenaultil* Vieillot	Chestnut-headed Bee-eater		Lc
54.	*Merops philippinu sphilippinus* Linnaeus	Blue-tailedBee-eater (M)		Lc
55.	*Milvus migransgovinda* Sykes	BlackKite		Lc
56.	*Myiophonus horsfieldii horsfieldii*	Malabar Whistling Thrush		
57.	*Nectarinia asiatica asiatica* (Latham)	PurpleSunbird		Lc
58.	*Nectarinia minima* (Sykes)	SmallSunbird ENDEMIC	E	Lc
59.	*Nectarinia zeylonica flaviventris*	Purple-rumped Sunbird		Lc
60.	*Ninox scutulata hirsuta* (Temminck)	BrownHawkOwl		Lc
61.	*Nycticorax nycticorax (*Linnaeus)	Night Heron		Lc
62.	*Ocyceros griseus* (Latham)	MalabarGreyHornbill ENDEMIC	E	Lc
63.	*Otus bakkamoena bakkamoena* Pennant	CollaredScopsOwl		Lc
64.	*Pericrocotus flammeus flammeus* (Forster)	ScarletMinivet		Lc
65.	*Pernisptilo rhynchusruficollis* Lesson	OrientalHoneyBuzzard		Lc

66.	*Picumnus innominatus malayorum* Hartert	SpeckledPiculet		Lc
67.	*Pitta brachyuran brachyura* (Linnaeus)	IndianPitta		Lc
68.	*Pomatorhinus horsfieldii* Harington	IndianScimitarBabbler		Lc
69.	*Psittacula krameri manilensis*(Bechstein)	Rose-ringedParakeet		Lc
70.	*Pycnonotus cafer cafer* (Linnaeus)	Red-ventedBulbul		Lc
71.	*Pycnonotus jocosus fuscicaudatus* (Gould)	Red-whiskeredBulbul		Lc
72.	*Pycnonotus melanicterus gularis* (Gould)	Ruby-throatedBulbul		Lc
73.	*Spilornis cheelamelanotis* (Jerdon)	CrestedSerpent-Eagle		Lc
74.	*Sturnus malabaricus malabaricus* (Gmelin)	Grey-headedStarling		Lc
75.	*Treron bicincta bicincta* (Jerdon)	Orange-breastedGreenPigeon		Lc
76.	*Turdoides affinis affinis* (Jerdon)	White-headedBabbler		
77.	*Turdoides striatus malabaricus* (Jerdon)	Jungle Babbler		Lc
78.	*Tyto albastertens* Hartert	BarnOwl		Lc
79.	*Zoonavena sylvatica* (Tickell)	White-rumpedNeedletailSwift		Lc
Total	**79**		**3**	**70**

Annexure 2 (b)

List of scientific name, common name, endemism and RET status of butterflies in Kallar patch.

S. No.	Scientific Name	Common Name	Endemism	RET
1.	*Abisara echerius*	Plum Judy		
2.	*Acraea violae*	Tawny Coster		
3.	*Actolepis puspa*	Common Hedge Blue		
4.	*Aeromachus pygmaeus*	Pygmy Grass-/Scrub-Hopper		
5.	*Appias indra*	Plain Puffin		
6.	*Athyma nefte*	Colour Sergeant		
7.	*Athyma perius*	Common Sergeant		
8.	*Athyma ranga*	Blackvein Sergeant		
9.	*Badamia exclamationis*	Brown Awl		
10.	*Bibasis sena*	Orangetail Awl		
11.	*Caleta caleta*	Angled Pierrot		
12.	*Catopsilia pomona*	Common Emigrant		
13.	*Catopsilia pyranthe*	Mottled Emigrant		
14.	*Celaenorrhinus leucocera*	Common Spotted Flat		
15.	*Cepora nadina*	Lesser Gull		
16.	*Cepora nerissa*	Common Gull		
17.	*Cethosia nietneri*	Tamil Lacewing		
18.	*Charaxes bernardus*	Tawny Rajah		
19.	*Cheritra freja*	Common Imperial		
20.	*Chilades laius*	Lime Blue		
21.	*Cirrochroa thais*	Tamil Yeoman	E	
22.	*Cupha erymanthis*	Rustic		

23.	*Cyrestis thyodamas*	Common Map		
24.	*Delias eucharis*	Common Jezebel		
25.	*Discophora lepida*	Southern Duffer	E	
26.	*Elymnias hypermenstra*	Common Palmfly		
27.	*Euchrysops cnejus*	Gram Blue		
28.	*Euploea core*	Common Indian Crow		
29.	*Euploea sylvester*	Double-Branded Crow		
30.	*Eurema blanda*	Three-Spot Grass Yellow		
31.	*Eurema hecabe*	Common Grass Yellow		
32.	*Euthalia aconthea*	Common Baron		
33.	*Everes lacturnus*	Indian Cupid		
34.	*Gangara thyrsis*	Giant Redeye		
35.	*Graphium agamemnon*	Tailed Jay		
36.	*Graphium doson*	Common Jay		
37.	*Graphium sarpedon*	Common Bluebottle		
38.	*Hasora taminatus*	White Banded Awl		
39.	*Hebomoia glaucippe*	Great Orange Tip		
40.	*Hypolimnas bolina*	Great Eggfly		
41.	*Hypolimnas misippus*	Danaid Eggfly		
42.	*Iambrix salsala*	Chestnut Bob		
43.	*Idea malabarica*	Malabar Tree Nymph	E	NE
44.	*Jamides alecto*	Metallic Cerulean		
45.	*Jamides bochus Jamides*	Dark Cerulean		
46.	*Jamides celeno*	Common Cerulean		
47.	*Junonia almana*	Peacock Pansy		
48.	*Junonia iphita*	Chocolate Pansy		

49.	*Junonia lemonias*	Lemon Pansy		
50.	*Kaniska canace*	Blue Admiral		
51.	*Lampides boeticus*	Pea Blue		
52.	*Leptosia nina*	Psyche		
53.	*Lethe drypetis*	Tamil Treebrown	E	
54.	*Limenitis procris*	Commander		
55.	*Loxura atymnus*	Yamfly		
56.	*Magisba malaya*	Malayan		
57.	*Matapa aria*	Common Redeye		
58.	*Melanitis leda*	Common Evening Brown		
59.	*Melanitis phedima*	Dark Evening Brown		
60.	*Melanitis zitenius*	Great Evening Brown		
61.	*Mycalesis perseus*	Common Bushbrown		
62.	*Mycalesis subdita*	Tamil Bushbrown	E	
63.	*Mycalesis visala*	Longbrand Bushbrown		
64.	*Neptis hylas*	Common Sailer		
65.	*Neptis jumbah*	Chestnut-Streaked Sailer		
66.	*Notocrypta curvifascia*	Restricted Demon		
67.	*Notocrypta paralysos*	Common Banded Demon		
68.	*Oriens goloides*	Indian/Common Dartlet		
69.	*Pachliopta aristolochiae*	Common Rose		
70.	*Pachliopta pandiyana*	Malabar Or Ceylon Rose	E	
71.	*Pantoporia hordonia*	Common Lascar		
72.	*Papilio demoleus*	Lime		
73.	*Papilio dravidarum*	Malabar Raven	E	
74.	*Papilio helenus*	Red Helen		

75.	*Papilio polymnestor*	Blue Mormon		
76.	*Papilio polytes*	Common Mormon		
77.	*Parantica aglea*	Glassy Tiger		
78.	*Parantirrhoea marshalli*	Travancore Evening Brown	E	
79.	*Parthenos sylvia*	Clipper		
80.	*Pelopidas mathias*	Dark Small-Branded Swift		
81.	*Pelopidas subochracea*	Large Branded Swift		
82.	*Phalanta phalantha*	Common Leopard		
83.	*Polytremis lubricans*	Contiguous Swift		
84.	*Polyura athamas*	Common Nawab		
85.	*Potanthus pava*	Pava Dart		
86.	*Potanthus psuedomaesa*	Psuedomaesa/Common Dart		
87.	*Prosotas nora*	Common Line Blue		
88.	*Psolos fuligo*	Coon		
89.	*Psuedozizeeria maha*	Pale Grass Blue		
90.	*Rapala manea*	Slate Flash		
91.	*Sovia hyrtacus*	Bicolour Ace	E	
92.	*Spalgis epius*	Apefly		
93.	*Spindasis vulcanus Spindasis*	Common Silverline		
94.	*Suastus gremius*	Indian Palm Bob		
95.	*Suastus minuta*	Small Palm Bob		
96.	*Tagiades gana*	Immaculate/Large/Suffused Snow Flat		
97.	*Tagiades litigiosa*	Water Snow Flat		
98.	*Taractrocera ceramas*	Tamil Grass Dart		
99.	*Telicota ancilla*	Dark Palm Dart		
100.	*Telicota colon*	Pale Palm Dart		

101.	*Thoressa astigmata*	Southern Spotted Or Unbranded Ace	E	
102.	*Tirumala limniace*	Blue Tiger		
103.	*Tirumala septentrionis*	Dark Blue Tiger		
104.	*Troides minos*	Southern Birdwing	E	
105.	*Udaspes folus*	Grass Demon		
106.	*Vindula erota*	Cruiser		
107.	*Ypthima baldus*	Common Fivering		
108.	*Ypthima ceylonica*	White Or Ceylon Fourring		
109.	*Ypthima huebneri*	Common Fourring		
110.	*Zipoetis saitis*	Tamil Catseye	E	
111.	*Zizeeria karsandra*	Dark Grass Blue		
Total	**111**		**12**	**1**

Annexure 2 (c)

List of scientific name, common name, endemism and RET status of amphibians in Kallar patch.

S. No.	Scientific Name	Common Name	Endemism	RET
1.	*Bufo melanostictus*			UV
2.	*Euphlyctis cyanophlyctis*			Nt
3.	*Fejervarya keralensis*		E	
4.	*Fejervarya limnocharis*			
5.	*Hoplobatrachus tigerinus*			VU
6.	*Ichthyophis sps*		E	
7.	*Indirana sps*		E	
8.	*Micrixalus fuscus*		E	Nt
9.	*Nyctibatrachus sps*		E	
10.	*Philautus anili*		E	
11.	*Polypedates maculates*			Lc
12.	*Sylvirana temporalis*		E	
Total	**12**		**7**	**5**

Annexure 2 (d)

List of scientific name, common name, endemism and RET status of reptiles in Kallar patch.

S. No.	Scientific Name	Common Name	Endemism	RET
1.	*Ahaetulla nasuta*	Vine snake		
2.	*Bungarus ceruleus*	Common Krait		
3.	*Calotes calotes*	Southern Green Calotes		Nt
4.	*Calotes ellioti*	Elliots forest lizard	E	Nt
5.	*Calotes versicolor*	Garden Lizard		Nt
6.	*Cnemapsis* sps			
7.	*Dendrelaphis tristis*	Bronzed tree snake		Lc
8.	*Draco dussumieri*	Western Ghats Flying Lizard		
9.	*Hypnale hypnale*	Humpnosed pit viper	E	
10.	*Lycodon aulicus*	Common wolf snake		Lc
11.	*Lycodon travancorius*	Travancore wolf snake	E	Nt
12.	*Naja naja*	Indian Cobra		
13.	*Otocryptis beddomeii*	Indian Kangaroo Lizard		VU
14.	*Ptyas mucosa*	Indian Rat Snake		Lc
15.	*Sphenomorphus dussumieri*	Dussumier's Litter Skink		
16.	*Trimeresurus malabaricus*	Malabar Pit viper	E	Nt
Total	**16**		**4**	**9**

Annexure 2 (e)

List of scientific name, common name, endemism and RET status of Evergreen trees in Kallar patch.

S. No.	Botanical name	Local name	Family	Threatened status	Endemism
1	*Aporosa cardiosperma*	Vetti	Euphorbaceae	VU	
2	*Artocarpus hirsutus*	Anjil	Moraceae		E
3	*Bischofia javanica*	Mlachethayan	Euphorbaceae		
4	*Buchanania lanceolata*	Kulamavu	Anacardiaceae		
5	*Calophyllum inophyllum*	Punna	Clusiacea	LC	
6	*Canarium strictum*	Thalli	Burseraceae		E
7	*Carallia brachiata*	Vallabham	Rhizophoraceae		
8	*Cinnamomum malabatrum*	Vayana	Lauraceae		E
9	*Cullenia exarillata*	Vediplavue	Bombacaceae		
10	*Diospyros paniculata*	Karumaram	Ebenaceae		E
11	*Dysoxylum malabaricum*	Akil	Meliaceae		E
12	*Elaeocarpus tuberculatus*	Karamaram	Elaeocarpaceae		
13	*Ficus religiosa*	Arayal	Moraceae		
14	*Garcinia gummi-gutta*	Kodampuli	Clusiacea		
15	*Gluta travancorica*	Chenkurungi	Anacardaceae	NT	E
16	*Hopea ponga*	Kambakam	Dipteriocarpacea	EN	E
17	*Hydnocarpus alpina*	Vetti	Flaucortiaceae		
18	*Knema attenuata*	Chorappayin	Myristaceae	LC	E
19	*Lagerstroemia speciosa*	Poomaruthu	Lythraceae		
20	*Lannea coromandelica*	Uthi	Anacardiaceae		
21	*Lophopetalum wightianum*	Venkkotta	Celastraceae	LC	
22	*Macaranga peltata*	Vatta	Euphorbaceae		
23	*Madhuca neriifolia*	Attu-ilippa	Sapotaceae		

24	*Mallotus tetracoccus*	Thavittuvatta	Euphorbiaceae		
25	*Mangifera indica*	Mavu	Anacardacea		
26	*Mastixia arborea ssp. arborea*	Kunthirikkam	Cornaceae	LC	E
27	*Melia dubia*	Malaveppu	Meliaceae		
28	*Mesua thwaitesii*	Nangu	Clusiaceae		
29	*Myristica malabarica*	Ponnambuvu	Myristicaceae		
30	*Naringi crenulata*	Kattunarakam	Rutaceae		
31	*Olea dioica*	Edana	Oleaceae		
32	*Persea macrantha*	Ooravu	Lauraceae		
33	*Poeciloneuron indicum*	Poothamkolli	Cluciaceae		E
34	*Psydrax dicoccos*	Irumbarappan	Rubiaceae		
35	*Schleichera oleosa*	Poovanam	Sapindaceae		
36	*Semecarpus auriculata*	Charei	Anacardaceae	NT	E
37	*Stereospermum colais var. colais*	Pathiri	Bignonaceae		
38	*Syzygium cumini*	Njaval	Myrtaceae		
39	*Terminalia bellirica*	Thanni	Combretaceae		
40	*Terminalia catappa*	Badam	Combretaceae		
Total	**40**			**8**	**11**

Annexure 3 (a)

List of scientific name, common name, endemism and RET status of birds in Chankili patch.

S. No.	Scientific Name	Common Name	Endemism	RET
1.	*Accipiter badius badius* Gmelin)	Shikra		Lc
2.	*Accipiter virgatus besra* Jerdon	BesraSparrowHawk		Lc
3.	*Acridotheres fuscus mahrattensis* (Sykes)	Jungle Myna		Lc
4.	*Acridotheres tristis tristis* (Linnaeus)	Common Myna .		Lc
5.	*Aegithiatiphia multicolor* (Gmelin)	CommonIora		
6.	*Alcedo atthis taporbana* Kleinschmidt	SmallBlueKingfisher		
7.	*Artamus fuscus*	AshyWoodswallow(Ashy Swallow-Shrike)		Lc
8.	*Athene brama brama* (Temminck)	Spotted Owlet .		Lc
9.	*Buceros bicornis homrai* Hodgson	GreatPiedHornbill		NT
10.	*Centropus sinensis parroti* Stresemann	GreaterCoucal		Lc
11.	*Chalcophaps indica indica* (Linnaeus)	EmeraldDove		
12.	*Chloropsis aurifrons frontalis* (Pelzeln)	Gold-frontedChloropsis		Lc
13.	*Chloropsis cochinchinensis jerdoni* (Blyth)	Jerdon'sChloropsis		Lc
14.	*Chrysocolaptes lucidus*	Greater Golden-backed Woodpecker		Lc
15.	*Collocalia unicolor* (Jerdon)	IndianEdible-nestSwiftlet		Lc
16.	*Columba elphinstonii* (Sykes)	NilgiriWoodPigeonENDEMIC	E	V
17.	*Columba livia intermedia* Strickland	BlueRockPigeon		Lc
18.	*Coracin amelanoptera*	Black-headed Cuckooshrike		

	sykesi			
19.	*Corvus macrorhynchos culminatus* Sykes	Jungle Crow		Lc
20.	*Corvus splendensprotegatus*	MadarasHouseCrow		Lc
21.	*Cuculus micropterus micropterus* Gould	IndianCuckoo (M)		Lc
22.	*Cypsiurus balasiensis* (J.E.Gray)	AsianPalmSwift		Lc
23.	*Dendrocitta vagabundaparvula*	Indian Treepie		Lc
24.	*Dicaeum erythrorhynchos*	Tickell's Flowerpecker		Lc
25.	*Dicrurus paradiseusparadiseus*	Greater Racket-tailed Drongo		Lc
26.	*Dinopium benghalense*	Lesser Golden-backed Woodpecker		Lc
27.	*Eudynamys scolopacea scolopacea* (Linnaeus)	AsianKoel		Lc
28.	*Falco tinnunculus tinnunculus* Linnaeus	CommonKestrel		Lc
29.	*Gallus sonneratii* Temminck	GreyJunglefowl		Lc
30.	*Glaucidium radiatum malabaricum* (Blyth)	JungleOwlet		Lc
31.	*Gracula indica* (Cuvier)	SouthernHillMyna		
32.	*Halcyon pileata* (Boddaert)	Black-cappedKingfisher		Lc
33.	*Halcyon smyrnensis fusca* (Boddaert)	White-breastedKingfisher		Lc
34.	*Haliastur indusindus* (Boddaert)	BrahminyKite		Lc
35.	*Harpactes fasciatus malabaricus* (Gould)	MalabarTrogon		Lc
36.	*Hemicircus canente canente* (Lesson)	Heart-spottedWoodpecker		Lc
37.	*Hemiprocne coronata* (Tickell)	CrestedTreeSwift		Lc
38.	*Hierococcyx varius varius*	BrainfeverBird		

	Vahl			
39.	*Hypsipetes indicus indicus* (Jerdon)	Yellow-browedBulbul		
40.	*Hypsipetes leucocephlus ganeesa* (Sykes)	BlackBulbul		Lc
41.	*Ictinaetus malayensis perniger* (Hodgson)	BlackEagle		Lc
42.	*Irena puellapuella* (Latham)	AsianFairyBlueBird		Lc
43.	*Ketupa zeylonensis leschenault* (Temminck)	BrownFishOwl		Lc
44.	*Lanius cristatus cristatus* Linnaeus	BrownShrike		Lc
45.	*Loriculus vernali svernalis* (Sparrman)	IndianHangingParrot		Lc
46.	*Megalaima haemacephala indica* (Latham)	CoppersmithBarbet		Lc
47.	*Megalaima rubricapilla* (Blyth)	Crimson-throated Barbet		Lc
48.	*Megalaima viridis* (Boddaert)	White-cheekedBarbet		Lc
49.	*Merops leschenaultil* Vieillot	Chestnut-headed Bee-eater		Lc
50.	*Merops philippinu sphilippinus* Linnaeus	Blue-tailedBee-eater (M)		Lc
51.	*Myiophonus horsfieldii horsfieldii*	Malabar Whistling Thrush		
52.	*Nectarinia asiatica asiatica* (Latham)	PurpleSunbird		Lc
53.	*Nectarinia minima* (Sykes)	SmallSunbird ENDEMIC	E	Lc
54.	*Nectarinia zeylonica flaviventris*	Purple-rumped Sunbird		Lc
55.	*Ninox scutulata hirsuta* (Temminck)	BrownHawkOwl		Lc
56.	*Nyctyornis athertoni* (Jardine&Selby)	Blue-bearded Bee-eater		Lc

57.	*Ocyceros griseus* (Latham)	MalabarGreyHornbill ENDEMIC	E	Lc
58.	*Pericrocotus flammeus flammeus* (Forster)	ScarletMinivet		Lc
59.	*Picumnus innominatus malayorum* Hartert	SpeckledPiculet		Lc
60.	*Pitta brachyuran brachyura* (Linnaeus)	IndianPitta		Lc
61.	*Pomatorhinus horsfieldii* Harington	IndianScimitarBabbler		Lc
62.	*Psittacula krameri manilensis* (Bechstein)	Rose-ringedParakeet		Lc
63.	*Pycnonotus cafer cafer* (Linnaeus)	Red-ventedBulbul		Lc
64.	*Pycnonotus jocosus fuscicaudatus* (Gould)	Red-whiskeredBulbul		Lc
65.	*Pycnonotus melanicterus gularis* (Gould)	Ruby-throatedBulbul		Lc
66.	*Spilornis cheelamelanotis* (Jerdon)	CrestedSerpent-Eagle		Lc
67.	*Tachymarptis melbanubifuga* Koelz	AlpineSwift		Lc
68.	*Terpsiphone paradisi*	Paradise flycatcher (M)		Lc
69.	*Treron bicincta bicincta* (Jerdon)	Orange-breastedGreenPigeon		Lc
70.	*Turdoides affinis affinis* (Jerdon)	White-headedBabbler		Lc
71.	*Turdoides striatus malabaricus* (Jerdon)	Jungle Babbler		Lc
72.	*Zoonavena sylvatica* (Tickell)	White-rumpedNeedletailSwift		Lc
Total	**72**		**3**	**64**

Annexure 3 (b)

List of scientific name, common name, endemism and RET status of butterflies in Chankili patch.

S. No.	Scientific Name	Common Name	Endemism	RET
1.	*Abisara echerius*	Plum Judy		
2.	*Actolepis puspa*	Common Hedge Blue		
3.	*Aeromachus pygmaeus*	Pygmy Grass-/Scrub-Hopper		
4.	*Arnetta mercara*	Coorg Forest Hopper	E	
5.	*Athyma nefte*	Colour Sergeant		
6.	*Athyma perius*	Common Sergeant		
7.	*Athyma ranga*	Blackvein Sergeant		
8.	*Badamia exclamationis*	Brown Awl		
9.	*Caleta caleta*	Angled Pierrot		
10.	*Catopsilia pomona*	Common Emigrant		
11.	*Catopsilia pyranthe*	Mottled Emigrant		
12.	*Celaenorrhinus leucocera*	Common Spotted Flat		
13.	*Celaenorrhinus ruficornis*	Tamil Spotted Flat	E	
14.	*Cepora nadina*	Lesser Gull		
15.	*Cepora nerissa*	Common Gull		
16.	*Cethosia nietneri*	Tamil Lacewing		
17.	*Cirrochroa thais*	Tamil Yeoman	E	
18.	*Cupha erymanthis*	Rustic		
19.	*Cyrestis thyodamas*	Common Map		
20.	*Delias eucharis*	Common Jezebel		
21.	*Elymnias hypermenstra*	Common Palmfly		

22.	*Euchrysops cnejus*	Gram Blue		
23.	*Euploea core*	Common Indian Crow		
24.	*Euploea sylvester*	Double-Branded Crow		
25.	*Eurema blanda*	Three-Spot Grass Yellow		
26.	*Eurema hecabe*	Common Grass Yellow		
27.	*Everes lacturnus*	Indian Cupid		
28.	*Graphium onfucius*	Tailed Jay		
29.	*Graphium doson*	Common Jay		
30.	*Graphium sarpedon*	Common Bluebottle		
31.	*Hypolimnas bolina*	Great Eggfly		
32.	*Hypolimnas misippus*	Danaid Eggfly		
33.	*Iambrix salsala*	Chestnut Bob		
34.	*Idea malabarica*	Malabar Tree Nymph	E	NT
35.	*Jamides alecto*	Metallic Cerulean		
36.	*Jamides celeno*	Common Cerulean		
37.	*Junonia iphita*	Chocolate Pansy		
38.	*Junonia lemonias*	Lemon Pansy		
39.	*Kaniska canace*	Blue Admiral		
40.	*Leptosia nina*	Psyche		
41.	*Lethe drypetis*	Tamil Treebrown	E	
42.	*Limenitis procris*	Commander		
43.	*Loxura atymnus*	Yamfly		
44.	*Matapa aria*	Common Redeye		
45.	*Melanitis leda*	Common Evening Brown		
46.	*Melanitis phedima*	Dark Evening Brown		
47.	*Melanitis zitenius*	Great Evening Brown		

48.	*Mycalesis anaxias*	Whitebar Bushbrown	E	
49.	*Mycalesis perseus*	Common Bushbrown		
50.	*Mycalesis subdita*	Tamil Bushbrown	E	
51.	*Neptis hylas*	Common Sailer		
52.	*Neptis jumbah*	Chestnut-Streaked Sailer		
53.	*Notocrypta curvifascia*	Restricted Demon		
54.	*Notocrypta paralysos*	Common Banded Demon		
55.	*Oriens goloides*	Indian/Common Dartlet		
56.	*Pachliopta aristolochiae*	Common Rose		
57.	*Pachliopta pandiyana*	Malabar Or Ceylon Rose	E	
58.	*Pantoporia hordonia*	Common Lascar		
59.	*Papilio demoleus*	Lime		
60.	*Papilio dravidarum*	Malabar Raven	E	
61.	*Papilio helenus*	Red Helen		
62.	*Papilio polymnestor*	Blue Mormon		
63.	*Papilio polytes*	Common Mormon		
64.	*Parantica aglea*	Glassy Tiger		
65.	*Parantirrhoea marshalli*	Travancore Evening Brown	E	
66.	*Parthenos sylvia*	Clipper		
67.	*Pelopidas subochracea*	Large Branded Swift		
68.	*Phalanta phalantha*	Common Leopard		
69.	*Polytremis lubricans*	Contiguous Swift		
70.	*Polyura athamas*	Common Nawab		
71.	*Potanthus confucius*	Confucian/Chinese Dart		
72.	*Potanthus psuedomaesa*	Psuedomaesa/Common Dart		
73.	*Prioneris sita*	Painted Sawtooth		

74.	*Prosotas nora*	Common Line Blue		
75.	*Psolos fuligo*	Coon		
76.	*Spindasis vulcanus Spindasis*	Common Silverline		
77.	*Suastus gremius*	Indian Palm Bob		
78.	*Tagiades gana*	Immaculate/Large/Suffused Snow Flat		
79.	*Tagiades litigiosa*	Water Snow Flat		
80.	*Taractrocera ceramas*	Tamil Grass Dart		
81.	*Tirumala limniace*	Blue Tiger		
82.	*Troides minos*	Southern Birdwing	E	
83.	*Udaspes folus*	Grass Demon		
84.	*Vindula erota*	Cruiser		
85.	*Ypthima ceylonica*	White Or Ceylon Fourring		
86.	*Ypthima huebneri*	Common Fourring		
87.	*Zipoetis saitis*	Tamil Catseye	E	
88.	*Zizeeria karsandra*	Dark Grass Blue		
Total			**12**	**1**

Annexure 3 (c)

List of scientific name, common name, endemism and RET status of amphibians in Chankili patch.

S. No.	Scientific Name	Endemism	RET
1.	*Bufo melanostictus*		VU
2.	*Fejervarya keralensis*	E	
3.	*Fejervarya limnocharis*		
4.	*Hoplobatrachus tigerinus*		VU
5.	*Indirana brachytarsus*	E	VU
6.	*Indirana sps*	E	
7.	*Limnonectes nilagirica*	E	EN
8.	*Micrixalus fuscus*	E	NT
9.	*Philautus anili*	E	
10.	*Rana aurantiaca*	E	Nt
11.	*Sylvirana temporalis*	E	
Total	**11**	**8**	**7**

Annexure 3 (d)

List of scientific name, common name, endemism and RET status of reptiles in Chankili patch.

S. No.	Scientific Name	Common Name	Endemism	RET
1.	*Calotes calotes*	Green calotes		Nt
2.	*Calotes versicolor*	Garden lizard		Nt
3.	*Cnemapsis* sps	Day gecko		
4.	*Dendrelaphis tristis*	Bronzed tree snake		Lc
5.	*Hypnale hypnale*	Humpnosed pit viper	E	
6.	*Otocryptis beddomeii*	Indian Kangaroo Lizard		VU
7.	*Ptyas mucosa*	Indian Rat Snake		Lc
8.	*Sphenomorphus dussumieri*	Dussumier's Litter Skink		
9.	*Trimeresurus malabaricus*	Malabar Pit viper	E	Nt
10.	*Varanus* sps	Monitor lizard		
Total	**10**		**2**	**6**

Annexure 3 (e)

List of scientific name, common name, endemism and RET status of evergreen trees in Chankili patch.

Sl. No.	Botanical name	Local name	Family	Threatened status	Endemism
1	*Aporosa cardiosperma*	Vetti	Euphorbaceae	VU	
2	*Artocarpus heterophylla*	Plavu	Moraceae		E
3	*Artocarpus hirsutus*	Anjil	Moraceae		E
4	*Averrhoa carambola*	Earnpuli	Oxalidaceae		
5	*Baccaurea courtallensis*	Mootikaya	Euphorbaceae		E
6	*Bischofia javanica*	Mlachethayan	Euphorbaceae		
7	*Buchanania lanceolata*	Kulamavu	Anacardiaceae		
8	*Calophyllum inophyllum*	Punna	Clusiacea	LC	
9	*Calophyllum polyanthum*	Malampunna	Clusiaceae		E
10	*Canarium strictum*	Thelli	Burseraseae		E
11	*Carallia brachiata*	Vallabham	Rhizophoraceae		
12	*Chukrasia tabularis*	Vellanangu	Meliaceae	LC	
13	*Cinnamomum malabatrum*	Vayana	Lauraceae		E
14	*Cullenia exarillata*	Vediplavu	Bombacaceae		E
15	*Dalbergia latifolia*	Veeti	Fabaceae		
16	*Diospyros buxifolia*	Elichuzhi	Ebenaceae		
17	*Diospyros paniculata*	Karumaram	Ebenaceae		E
18	*Diospyros pruriens*	Illakkatta	Ebenaceae		
19	*Dipterocarpus bourdillonii*	Karanjili	Dipteriocarpacea		E
20	*Dysoxylum malabaricum*	Akil	Meliaceae		E
21	*Elaeocarpus tuberculatus*	Ammakarum	Eleocarpaceae		
22	*Ficus religiosa*	Arayal	Moraceae		
23	*Ficus talbotii*	Vellayal	Moraceae		
24	*Garcinia gummi-gutta*	Kodampuli	Clusiaceae		E
25	*Gluta travancorica*	Chenkurungi	Anacardaceae	NT	E
26	*Hopea ponga*	Kambakam	Dipteriocarpacea	EN	E
27	*Hopea racophloea*	Naikambagam	Dipteriocarpaceae		
28	*Hydnocarpus alpina*	Vetti	Flaucortiaceae		
29	*Kingiodendron pinnatum*	Kulavu	Caesalpinaceae		E

30	*Knema attenuata*	Chorappayin	Myristaceae	LC	E
31	*Lagerstroemia speciosa*	Poomaruthu	Lythraceae		
32	*Lannea coromandelica*	Uthi	Anacardiaceae		
33	*Lophopetalum wightianum*	Venkkotta	Celastraceae	LC	
34	*Macaranga peltata*	Vatta	Euphobaceae		
35	*Madhuca neriifolia*	Attu-ilippa	Sapotaceae		
36	*Mallotus tetracoccus*	Thavittuvatta	Euphorbiaceae		
37	*Mangifera indica*	Mavu	Anacardacea		
38	*Mastixia arborea ssp. arborea*	Kunthirikkam	Cornaceae	LC	E
39	*Melia dubia*	Malaveppu	Meliaceae		
40	*Melicope lunu-ankenda*	Kanala	Rutaceae		
41	*Mesua ferrea var. ferrea*	Eliponku	Clusiaceae		
42	*Mesua thwaitesii*	Nangu	Clusiaceae		
43	*Myristica beddomei*	Kothappayin	Myristicaeae		
44	*Myristica malabarica*	Ponnampayin	Myristicaceae	VU	E
45	*Naringi crenulata*	Kattunarakam	Rutaceae		
46	*Olea dioica*	Edana	Oleaceae		
47	*Otonephelium stipulaceum*	Poripoovam	Sapindaceae		
48	*Palaquium ravii*	Pali	Sapotaceae		E
49	*Persea macrantha*	Ooravu	Lauraceae		
50	*Poeciloneuron indicum*	Poothamkolli	Cluciaceae		E
51	*Polyalthia fragrans*	Nedunar	Annonaceae		
52	*Psydrax dicoccos*	Irumbarappan	Rubiaceae		
53	*Sapindus emarginatus*	Soppinkaimaram	Sapindaceae		
54	*Schleichera oleosa*	Poovanam	Sapindaceae		
55	*Schleichera oleosa*	Poovanam	Sapindaceae		
56	*Semecarpus auriculata*	Charei	Anacardaceae	NT	E
57	*Stereospermum colais var. colais*	Pathiri	Bignonaceae		
58	*Strombosia ceylanica*	Kalmanikkam	Olacaceae		

59	*Syzygium cumini*	Njaval	Myrtaceae		
60	*Terminalia bellirica*	Thanni	Combretaceae	NT	
61	*Terminalia catappa*	Badam	Combretaceae		
62	*Terminalia travancorensis*	Peikkadukka	Combertaceae		
63	*Vatica chinensis*	Vellappayin	Dipteriocarpaceae		
64	*Xanthophyllum arnottianum*	Mottal	Polygalaceae		
Total	**64**			**11**	**20**

Annexure 4 (a)

List of scientific name, common name, endemism and RET status of birds in Achancovil patch.

S. No.	Scientific Name	Common Name	Endemism	RET
1.	*Accipiter badius badius*(Gmelin)	Shikra		Lc
2.	*Accipiter virgatus besra* Jerdon	Besra Sparrow Hawk		Lc
3.	*Acridotheres fuscus mahrattensis* (Sykes)	Jungle Myna		Lc
4.	*Acridotheres tristis tristis* (Linnaeus)	Common Myna		Lc
5.	*Acrocephalus dumetorum* Blyth.	Blyth's Reed-Warbler		Lc
6.	*Aegithiatiphia multioclor* (Gmelin)	CommonIora		
7.	*Alcedo atthis taporbana*	Kleinschmidt Small Blue Kingfisher		
8.	*Alcippe poioicephala poioicephala* (Jerdon)	Quaker Babbler		
9.	*Anthus similis travancoriensis*	Rock Pipit		
10.	*Apsus affinis affinis* (J.E.Gray)	House Swift		
11.	*Arachnothera longirostris longirostris* (Latham)	Little Spiderhunter		
12.	*Ardeola grayii grayii* (Sykes)	Indian Pond Heron		Lc
13.	*Artamus fuscus* Vieillot	Ashy Swallow-Shrike		Lc
14.	*Athene brama brama* (Temminck)	Spotted Owlet		Lc
15.	*Cacomantis sonneratii sonneratii* (Latham)	Banded Bay Cuckoo		Lc
16.	*Carpodacus erythrinus roseatus* (Blyth)	Common Rosefinch		Lc
17.	*Celius brachyurus jerdoni* (Malherbe)	Rufous Woodpecker		Lc
18.	*Centropus sinensis*	Greater Coucal		Lc
19.	*Chalcophaps indica indica* (Linnaeus)	Emerald Dove		
20.	*Chloropsis aurifrons frontalis*	Gold-fronted Chloropsis		Lc

	(Pelzeln)			
21.	*Chloropsis cochinchinensis jerdoni* (Blyth)	Jerdon's Chloropsis		Lc
22.	*Collocalia unicolor* (Jerdon)	Indian Edible-nest Swiftlet		Lc
23.	*Columba livia intermedia*	Strickland Blue Rock Pigeon		Lc
24.	*Copsychus saularis ceylonensis* Sclater	Oriental Magpie Robin		Lc
25.	*Coracina melanoptera* (Strickland)	Black-headed Cuckooshrike		
26.	*Corvus macrorhynchos culminatus* Sykes	Jungle Crow		Lc
27.	*Corvus splendens protegatus*	Madaras HouseCrow		Lc
28.	*Dendrocitta leucogastra* Gould	White-bellied Treepie	E	Lc
29.	*Dendrocitta vagabunda parvula* Whistler&Kinnear	Indian Treepie		Lc
30.	*Dicaeum concolor concolor* Jerdon	Plain Flowerpecker		Lc
31.	*Dicaeum erythrorhynchos* (Latham)	Tickell's Flowerpecker		Lc
32.	*Dicrurus aeneus aeneus* Viellot	Bronzed Drongo		Lc
33.	*Dicrurus macrocercus* Viellot	Black Drongo		Lc
34.	*Dicrurus paradiseus paradiseus* (Linnaeus)	Racket-tailed Drongo		Lc
35.	*Dinopium benghalense* Lesser	Golden-backed Woodpecker		Lc
36.	*Dinopium javanense*	Golden-backed Woodpecker		Lc
37.	*Egretta garzetta garzetta* (Linnaeus)	Little Egret		Lc
38.	*Eudynamys scolopacea scolopacea* (Linnaeus)	Asian Koel		Lc
39.	*Falco tinnunculus tinnunculus* Linnaeus	Common Kestrel		Lc
40.	*Gallus sonneratii* Temminck	Grey Junglefowl		Lc
41.	*Glaucidium radiatum malabaricum* (Blyth)	Jungle Owlet		Lc

42.	*Gracula indica* (Cuvier)	Southern Hill Myna		
43.	*Halcyon capensis capensis* (Linnaeus)	Stork-billed Kingfisher		
44.	*Halcyon smyrnensis fusca* (Boddaert)	White-breasted Kingfisher		Lc
45.	*Harpactes fasciatus malabaricus* (Gould)	Malabar Trogon		Lc
46.	*Hemicircus canente canente* (Lesson)	Heart-spotted Woodpecker		Lc
47.	*Hemiprocne coronata* (Tickell)	Crested Tree-Swift		Lc
48.	*Hieraaetus pennatus* (Gmelin)	Booted Eagle		Lc
49.	*Hierococcyx variusvarius* Val	Brainfever Bird		
50.	*Hippolaisca ligatarama* (Sykes)	Booted Warbler		
51.	*Hirundo concolor concolor* Sykes	DuskyCrag-Martin		Lc
52.	*Hirundo rustica gutturalis* Scopoli	Common Swallow **(M)**		Lc
53.	*Hypsipetes indicus indicus* (Jerdon)	Yellow-browed Bulbul		
54.	*Hypsipetes leucocephlus ganeesa* (Sykes)	Black Bulbul		Lc
55.	*Ictinaetus malayensi sperniger* (Hodgson)	Black Eagle		Lc
56.	*Irena puellapuella* (Latham)	Asian Fairy BlueBird		Lc
57.	*Lanius cristatus cristatus* Linnaeus	Brown Shrike		Lc
58.	*Loriculus vernalis vernalis* (Sparrman)	Indian Hanging Parrot		Lc
59.	*Megalaima haemacephala indica* (Latham)	Coppersmith Barbet		Lc
60.	*Megalaima rubricapilla* (Blyth)	Crimson-throated Barbet		Lc
61.	*Megalaima viridis*(Boddaert)	White-cheeked Barbet		Lc
62.	*Merops leschenaulti*	Vieillot Chestnut-headed Bee-eater		Lc
63.	*Merops philippinus philippinus* Linnaeus	Blue-tailed Bee-eater **(M)**		Lc

64.	*Milvus migrans govinda* Sykes	Black Kite		Lc
65.	*Motacilla cinerea cinerea* (Tunstall)	GreyWagtail		Lc
66.	*Motacilla indica* Gmelin	ForestWagtail **(M)**		
67.	*Muscicapa muttui muttui* (Layard)	Brown-breasted Flycatcher **(M)**		Lc
68.	*Muscicapala tirostris* Raffles	Asian Brown Flycatcher		
69.	*Myiophonus horsfieldii* (Vigors)	Malabar Whistling Thrush		
70.	*Nectarinia asiatica asiatica* (Latham)	Purple Sunbird		Lc
71.	*Nectarinia lotenia hindustanica* (Whistler)	Loten'sSunbird		Lc
72.	*Nectarinia minima* (Sykes)	Small Sunbird	E	Lc
73.	*Nectarinia zeylonica flaviventris* (Hermann)	Purple-rumped Sunbird		Lc
74.	*Ninox scutulata hirsute* (Temminck)	Brown Hawk Owl		Lc
75.	*Ocyceros griseus griseus* (Latham)	Malabar GreyHornbill	E	Lc
76.	*Oriol usoriolus kundoo* Sykes	Eurasian Golden Oriole		
77.	*Parus majo rmahrattarum*	Hartert GreatTit		
78.	*Pavo cristatus* Linnaeus	Common Peafowl		Lc
79.	*Pellorneum ruficeps ruficeps*	Swainson Spotted Babbler		Lc
80.	*Pericrocotus cinnamomeus malabaricus* (Gmelin)	Small Minivet		Lc
81.	*Pericrocotus flammeus flammeus* (Forster)	Scarlet Minivet		Lc
82.	*Pernis ptilorhynchus ruficollis* Lesson	Oriental Honey Buzzard		
83.	*Pomatorhinus horsfieldii*	Harington Indian Scimitar Babbler		Lc
84.	*Psittacula krameri manilensis* (Bechstein)	Rose-ringed Parakeet		Lc
85.	*Pycnonotus jocosus fuscicaudatus* (Gould)	Red-whiskered Bulbul		Lc

86.	*Pycnonotus melanicterus gularis* (G ould)	Ruby-throated Bulbul		Lc
87.	*Rhopocichla atriceps atriceps* (Jerdon)	Black-headed Babbler		Lc
88.	*Spilornis chela melanotis* (Jerdon)	Crested Serpent-Eagle		Lc
89.	*Streptopelia chinensis suratensis* (Gmelin)	Spotted Dove		Lc
90.	*Sturnus malabaricus blythii* (Jerdon)	Blyth's Starling		Lc
91.	*Sturnus malabaricus malabaricus* (Gmelin)	Grey-headed Starling		Lc
92.	*Sturnus pagodarum* (Gmelin)	Brahminy Starling		Lc
93.	*Terpsiphone paradisi leucogaster* (Swainson)	Paradise fly catcher **(M)**		Lc
94.	*Threskiornis melanocephalus* (Latham)	Oriental White Ibis		NT
95.	*Turdoides striatus malabaricus* (Jerdon)	Jungle Babbler		Lc
96.	*Zoonavena sylvatica* (Tickell)	White-rumped Needletail Swift		Lc
Total	**96**		**3**	**75**

Annexure 4 (b)

List of scientific name, common name, endemism and RET status of butterflies in Achancovil patch.

S. No.	Scientific Name	Common Name	Endemism	RET
1.	*Acraea violae* Fabricius	Tawny Coster		
2.	*Actolepis puspa* Horsfield	Common Hedge Blue		
3.	*Amblypodia anita* Hewitson	Leaf Blue		
4.	*Anaphaeis aurota* Fabricius	Pioneer or Caper white		
5.	*Appias albina*	Common Albatross		
6.	*Appias indra* Moore	Plain Puffin		
7.	*Arhopala pseudocentaurus* Doubleday	Western Centaur Oakblue		
8.	*Ariadne merione* Cramer	Common Castor		
9.	*Athyma nefte* Cramer	Color Sergeant		
10.	*Athyma ranga* Moore	Black vein Sergeant		
11.	*Baoris farri* Moore	Paintbrush Swift		
12.	*Borbo cinnara* Wallace	Rice Swift		
13.	*Caleta caleta* Hewitson	Angled Pierrot		
14.	*Caprona agama* Moore	Spotted Angle		
15.	*Castalius rosimon* Fabricius	Common Pierrot		
16.	*Catopsilia pomona* Fabricius	Common Emigrant		
17.	*Cephrenes acalle*	Hopffer Plain Palmdart		
18.	*Cethosia nietneri* C. & R. Felder	Tamil Lacewing		
19.	*Charaxes bernardus* Fabricius	Tawny Rajah		
20.	*Cheritra freja* Fabricius	Common Imperial		

21.	*Chilades laius* Stoll	Lime Blue		
22.	*Chilades pandava* Horsfield	Plains Cupid		
23.	*Choaspes benjaminii* Guerin-Meneville	Indian Awlking		
24.	*Cirrochroa thais* Fabricius	Tamil Yeoman		
25.	*Coladenia indrani* Moore	Tricolor Flat		
26.	*Cupha erymanthis* Drury	Rustic		
27.	*Cyrestis thyodamas* Boisduval	Common Map		
28.	*Danaus chrysippus* Linnaeus	Plain Tiger		
29.	*Danaus genutia* Cramer	Striped or Common tiger		
30.	*Delias eucharis* Drury	Common Jezebel		
31.	*Deudorix epijarbas* Moore	Cornelian		
32.	*Euchrysops cnejus* Fabricius	Gram Blue		
33.	*Euploea core* Stoll	Common Indian Crow		
34.	*Euploea sylvester* Fabricius	Double-Branded Crow		
35.	*Eurema blanda* Boisduval	Three-Spot Grass Yellow		
36.	*Eurema hecabe* Linnaeus	Common Grass Yellow		
37.	*Euthalia nais* Forster	Baronet		
38.	*Everes lacturnus* Godart	Indian cupid		
39.	*Freyeria trochilus* Kollar	Grass Jewel		
40.	*Gangara thyrsis* Fabricius	Giant Redeye		
41.	*Graphium antiphates* Cramer	Five-Bar Swordtail		
42.	*Graphium doson* C. & R. Felder	Common Jay		
43.	*Graphium nomius* Esper	Spot Swordtail		
44.	*Graphium sarpedon*	Common Bluebottle		

	Linnaeus			
45.	*Halpe homolea* Hewitson	Indian/Ceylon ace		
46.	*Hasora chromus* Cramer	Common Banded Awl		
47.	*Hebomoia glaucippe* Linnaeus	Great Orange Tip		
48.	*Hypolimnas misippus* Linnaeus	Danaid Eggfly		
49.	*Hypolycaena othona* Hewitson	Orchid Tit		
50.	*Iambrix salsala* Moore	Chestnut Bob		
51.	*Jamides alecto* C.Felder	Metallic Cerulean		
52.	*Jamides bochus* Stoll	Dark Cerulean		
53.	*Jamides celeno* Cramer	Common Cerulean		
54.	*Junonia atlites* Linnaeus	Grey Pansy		
55.	*Junonia hierta* Fabricius	Yellow Pansy		
56.	*Junonia iphita* Cramer	Chocolate Pansy		
57.	*Junonia lemonias* Linnaeus	Lemon Pansy		
58.	*Kaniska canace* Linnaeus	Blue Admiral		
59.	*Lampides boeticus* Linnaeus	Pea Blue		
60.	*Leptosia nina*	Fabricius Psyche		
61.	*Leptotes plinius* Fabricius	Zebra Blue		
62.	*Lethe europa* Fabricius,	Bamboo Treebrown		
63.	*Lethe rohria* Fabricius	Common Treebrown		
64.	*Matapa aria* Moore	Common Redeye		
65.	*Melanitis leda* Linnaeus	Common Evening Brown		
66.	*Melanitis phedima* Stoll	Dark Evening Brown		
67.	*Mycalesis patnia* Moore	Gladeye Bushbrown		
68.	*Mycalesis perseus* Fabricius	Common Bushbrown		

69.	*Mycalesis subdita* Moore	Tamil Bushbrown	E	
70.	*Nacaduba berenice* Herrich-Schaffer	Rounded 6-Line Blue		
71.	*Neptis hylas* Linnaeus	Common Sailor		
72.	*Neptis jumbah* Moore	Chestnut-Streaked Sailor		
73.	*Notocrypta paralysos* W-M& deN Common	Banded Demon		
74.	*Odontoptilum angulata* C.Felder,	Chestnut/Banded Angle		
75.	*Orsotrianea medus* Fabricius	Medus Bushbrown		
76.	*Pachliopta aristolochiae* Fabricius	Common Rose		
77.	*Pachliopta hector* Linnaeus	Crimson Rose		
78.	*Pachliopta pandiyana* Moore	Malabar or Ceylon rose	E	
79.	*Pantoporia hordonia* Butler	Common Lascar		
80.	*Papilio clytia* Linnaeus	Common Mime		
81.	*Papilio demoleus* Linnaeus	Lime		
82.	*Papilio helenus* Linnaeus	Red Helen		
83.	*Papilio polymnestor* Cramer	Blue Mormon		
84.	*Papilio polytes* Linnaeus	Common Mormon		
85.	*Parantica aglea* Stoll	Glassy Tiger		
86.	*Parantica nilgiriensis* Moore	Nilgiri Tiger	E	NT
87.	*Parantirrhoea marshalli* WM	Travancore Evening Brown	E	
88.	*Parthenos sylvia* Cramer	Clipper		
89.	*Petrelaea dana* de Niceville	Dingy Line-blue		

90.	*Phalanta phalantha* Drury	Common Leopard		
91.	*Polyura athamas* Drury	Common Nawab		
92.	*Prosotas nora* C.Felder	Common Line Blue		
93.	*Psolos fuligo* Mabille	Coon		
94.	*Psuedocoladenia dan* Fabricius	Fulvous Pied Flat		
95.	*Quedara basiflava* de Niceville	Yellow-base/Golden Tree-flitter		
96.	*Rapala manea* Hewitson	Slate Flash		
97.	*Rapala varuna* Horsfield	Indigo Flash		
98.	*Salanoemia sala* Hewitson	Maculate Lancer		
99.	*Sovia hyrtacus* de Niceville	Bicolor Ace	E	
100.	*Spialia galba* Fabricius	Indian grizzled/Indian skipper		
101.	*Suastus gremius* Fabricius	Indian Palm Bob		
102.	*Suastus minuta* Moore	Small Palm Bob		
103.	*Tagiades litigiosa* Moschler	Water Snow Flat		
104.	*Talicada nyseus* Guerin-Meneville	Red Pierrot		
105.	*Tanaecia lepidea* Butler	Grey Count		
106.	*Taractrocera maevius* Fabricius	Common Grass dart		
107.	*Telicota ancilla* Herrich-	Schaffer Dark Palmdart		
108.	*Thaduka multicaudata* Moore	Many-tailed Oakblue		
109.	*Tirumala limniace* Cramer	Blue Tiger		
110.	*Tirumala septentrionis* Butler	Dark Blue Tiger		
111.	*Troides minos* Cramer	Southern Birdwing	E	
112.	*Vindula erota* Fabricius	Cruiser		

113.	*Ypthima asterope* Klug	Common Threering		
114.	*Ypthima baldus* Fabricius Common Fivering			
115.	*Ypthima ceylonica* Hewitson	White Fourring		
116.	*Ypthima chenui* Guerin-Meneville	Nilgiri Fourring	E	
117.	*Ypthima huebneri* Kirby	Common Fourring		
118.	*Zeltus amasa* Hewitson	Fluffy Tit		
119.	*Zizina otis* Fabricius,	Lesser Grass Blue		
120.	*Zizula hylax* Fabricius	Tiny Grass Blue		
Total			**7**	**1**

Annexure 4 (c)

List of scientific name, common name, endemism and RET status of abphibians in Achancovil patch.

S. No.	Scientific Name	Common Name	Endemism	RET
1.	*Indirana brachytarsus*		E	VU
2.	*Limnonectes keralensis*	Verrucose Frog		
3.	*Limnonectes nilagirica*		E	EN
4.	*Nyctibatrachus sps*	Wrinkled Frog	E	
5.	*Philautus sps*	Bush Frog	E	
6.	*Rana aurantiaca*		E	Nt
7.	*Rana temporalis*	Bronzed Frog		
Total	**7**		**5**	**3**

Annexure 4 (d)

List of scientific name, common name, endemism and RET status of reptiles in Achancovil patch.

S. No.	Scientific Name	Common Name	Endemism	RET
1.	*Calotes calotes*	Green Forest Lizard		Nt
2.	*Cnemapsis sps*	Day Gecko		
3.	*Dendrelaphis grandoculis*	Large-Eyed Bronzed Tree Snake	E	VU
4.	*Draco dussumieri*	Western Ghats Flying Lizard		
5.	*Hemidactylus frenatus*	Asian House Gecko		Lc
6.	*Mabuya sps*	Unidentified Skink		
7.	*Melanochelys trijuga*	Indian Black Turtle		Nt
8.	*Naja naja*	Indian Cobra		
9.	*Otocryptis beddomeii*	Indian Kangaroo Lizard		VU
10.	*Psammophilus dorsalis*	South Indian Rock Agama		Nt
11.	*Ptyas mucosa*	Indian Rat Snake		Lc
12.	*Sphenomorphus dussumieri*	Dussumier's Litter Skink		
Total	**12**		**1**	**7**

Annexure 4 (e)

List of scientific name, common name, endemism and RET status of Evergreen trees in Achancovil patchs

Sl. No.	Botanical name	Local name	Family	Threatened status	Endemism
1	*Aporosa cardiosperma*	Vetti	Euphorbaceae		
2	*Artocarpus heterophylla*	Plavu	Moraceae		E
3	*Artocarpus hirsutus*	Anjil	Moraceae		E
4	*Atuna travancorica*	Kallankaimaram	Chrysobalanaceae		E
5	*Averrhoa carambola*	Earnpuli	Oxalidaceae		
6	*Baccaurea courtallensis*	Mootikaya	Euphorbaceae		E
7	*Bischofia javanica*	Mlachethayan	Euphorbaceae		
8	*Buchanania lanceolata*	Kulamavu	Anacardiaceae		
9	*Calophyllum polyanthum*	Malampunna	Clusiaceae		E
10	*Canarium strictum*	Thelli	Burseraseae		E
11	*Carallia brachiata*	Vallabham	Rhizohporaceae		
12	*Chukrasia tabularis*	Vellanangu	Meliaceae	Lc	
13	*Cinnamomum malabatrum*	Vayana	Lauraceae		E
14	*Cullenia exarillata*	Vediplavu	Bombacaceae		E
15	*Dalbergia latifolia*	Veeti	Fabaceae		
16	*Diospyros buxifolia*	Elichuzhi	Ebenaceae		
17	*Diospyros oocarpa*	Karunkali	Ebenaceae		
18	*Diospyros paniculata*	Karumaram	Ebenaceae		E
19	*Diospyros pruriens*	Illakkatta	Ebenaceae		
20	*Dipterocarpus bourdillonii*	Karanjili	Dipteriocarpacea	CR	E
21	*Dysoxylum ficiforme*	Akil	Meliaceae		E
22	*Elaeocarpus tuberculatus*	Ammakarum	Eleocarpaceae		
23	*Ficus religiosa*	Arayal	Moraceae		
24	*Ficus talbotii*	Vellayal	Moraceae		
25	*Garcinia gummi-gutta*	Kodampuli	Clusiaceae		E
26	*Gluta travancorica*	Chenkurinji	Anacardiaceae	Nt	E
27	*Holigarna beddomei*	Aanacheru	Anacardiaceae		
28	*Hopea ponga*	Kambakam	Dipteriocarpacea	EN	E

29	*Hopea racophloea*	Naikambagam	Dipteriocarpaceae		
30	*Kingiodendron pinnatum*	Kulavu	Caesalpinaceae		E
31	*Knema attenuata*	Chorappayin	Myristicacea	LC	E
32	*Knema attenuata*	Chorappayin	Myristicacea	Lc	E
33	*Lagerstroemia speciosa*	Poomaruthu	Lythraceae		
34	*Lannea coromandelica*	Uthi	Anacardiaceae		
36	*Lophopetalum wightianum*	Venkkotta	Celastraceae	Lc	
37	*Macaranga peltata*	Vatta	Euphobaceae		
38	*Madhuca neriifolia*	Attu-ilippa	Sapotaceae		
39	*Mallotus tetracoccus*	Thavittuvatta	Euphorbiaceae		
40	*Mangifera indica*	Mavu	Anacardacea		
41	*Mastixia arborea ssp. arborea*	Kunthirikkam	Cornaceae	Lc	E
42	*Melia dubia*	Malaveppu	Meliaceae		
43	*Melicope lunu-ankenda*	Kanala	Rutaceae		
44	*Mesua ferrea var. ferrea*	Eliponku	Clusiaceae		
45	*Mesua thwaitesii*	Kilinanku	Clusiaceae		
46	*Myristica beddomei*	Kothappayin	Myristicaeae		
47	*Myristica malabarica*	Ponnampayin	Myristicaceae	VU	E
48	*Naringi crenulata*	Kattunarakam	Rutaceae		
49	*Olea dioica*	Edana	Oleaceae		
50	*Otonephelium stipulaceum*	Poripoovam	Sapindaceae		
51	*Palaquium ravii*	Pali	Sapotaceae		E
52	*Persea macrantha*	Ooravu	Lauraceae		
53	*Poeciloneuron indicum*	Poothamkolli	Cluciaceae		E
54	*Polyalthia fragrans*	Nedunar	Annonaceae		
55	*Psydrax dicoccos*	Irumbarappan	Rubiaceae		
56	*Sapindus emarginatus*	Soppinkaimaram	Sapindaceae		
57	*Schleichera oleosa*	Poovanam	Sapindaceae		
58	*Semecarpus auriculata*	Charei	Anacardaceae	NT	E
59	*Stereospermum colais var. colais*	Pathiri	Bignonaceae		
60	*Stereospermum colais var. colais*	Pathiri	Bignonaceae		

61	Strombosia ceylanica	Kalmanikkam	Olacaceae		
62	Syzygium cumini	Njaval	Myrtaceae		
63	*Terminalia bellirica*	Thanni	Combretaceae	NT	
64	*Terminalia travancorensis*	Peikkadukka	Combertaceae		
65	*Vatica chinensis*	Vellappayin	Dipteriocarpaceae	CR	
66	Vitex altissima	Myila	Verbanaceae		
67	*Xanthophyllum arnottianum*	Mottal	Polygalaceae		
Total	**66**			**12**	**22**