UNION TERRITORY OF PONDICHERRY BIODIVERSITY STRATEGY AND ACTION PLAN



PREPARED UNDER THE NATIONAL BIODIVERSITY STRATEGY AND ACTION PLAN – INDIA



SCHOOL OF LIFE SCIENCES
PONDICHERRY UNIVERSITY
PONDICHERRY

2003

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CREDITS

NBSAP EXECUTING AGENCY: Ministry of Environment and Forests, Government of India

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NBSAP TECHNICAL IMPLEMENTING AGENCY: Technical and Policy Core Group (TPCG) coordinated by Kalpavriksh, Pune

NBSAP ADMINISTRATIVE AGENCY: Biotech Consortium India Ltd., New Delhi

PONDICHERRY BSAP NODAL AGENCY: School of Life Sciences, Pondicherry University, Pondicherry

NODAL AGENCY PERSONNEL: Prof. P.P. MATHUR and Dr. A.R. REDDY

STEERING COMMITTEE MEMBERS:

The Secretary, Department of Science, Technology & Environment, Government of Pondicherry - Chairman

The Director, Department of Agriculture, Government of Pondicherry

The Deputy Conservator of Forests & Wildlife, Government of Pondicherry

Dr. S. Kasinathan, Reader in Biology (Retd.), Pondicherry University

Dr. N. Parthasarathy, Reader, Salim Ali School of Ecology, Pondicherry University

Mr. V. Ramalingam, Secretary, Pondicherry Iyarkai Kazhagam, Pondicherry

Dr. M.P. Ramanujam, Lecturer in Botany, Kanchimamunivar Centre for Postgraduate Studies, Pondicherry

Tmt. M.K. Sayekumari, President, Pondicherry Women's Conference, Pondicherry

The Director, Science, Technology & Environment, Government of Pondicherry - Member Secretary

PEER REVIEWERS:

Mr. Paul Aderian, Additional Director, Department of Agriculture, Government of Pondicherry

Professor Priya Davidar, Salim Ali School of Ecology, Pondicherry University

Professor A. Gnanam, Eminent Scientist and Former Vice Chancellor, Pondicherry University

Dr. Alfred Gnanou, Director, Department of Animal Husbandry, Government of Pondicherry

Dr. S. Kasinathan, Reader in Biology (Retd.), Pondicherry University

Mr. Ashish Kothari, Coordinator, Technical and Policy Core Group, NBSAP, Kalpavriksh, Pune

Dr. Clement Lourdes, Senior Lecturer, Department of English, Pondicherry University

Dr. G. Narendra Kumar, I.A.S., Former Secretary, Department of Science, Technology & Environment, Government of Pondicherry

Mr. G. Malarkannan, Director, Department of Tourism, Government of Pondicherry

Mr. A. Rajasekaran, Principal, District Institute of Education and Training, Government of Pondicherry

Mrs. G. Ramalakshmi, Joint Director, Department of Fisheries & Fishermen Welfare, Government of Pondicherry

Dr. M.P. Ramanujam, Lecturer in Botany, Kanchi Mamunivar Centre for Postgraduate Studies, Pondicherry

Mr. Uddipta Ray, Director, Department of Science, Technology & Environment, Government of Pondicherry

Smt. M.K. Sayekumari, President, Pondicherry Women's Conference, Pondicherry

Dr. P. Selvaraj, Dean, Pandit Jawaharlal Nehru College of Agriculture and Research Institute, Karaikal

Mr. Prabhat Tyagi, I.F.S. Deputy Conservator of Forests & Wildlife, Department of Forests & Wildlife, Government of Pondicherry

Mr. S. Venkatesan, Superintendent Engineer, Public Works Department, Government of Pondicherry

Dr. M.V.M. Wafar, Scientist, National Institute of Oceanography, Goa

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ABBREVIATIONS

AIDS	Acquired Immune Deficiency Syndrome
BCIL	Biotech Consortium India Limited
BSAP	Biodiversity Strategy and Action Plan
EIA	Environment Impact Assessment
FFDA	Fish Farmers Development Agency
Ha	Hectare
IPM	Integrated Pest Management
JIPMER	Jawaharlal Institute of Postgraduate Medical Education and Research
MCM	Million Cubic Metres
MoEF	Ministry of Environment and Forests, Government of India
③g/m^3	Micro gram per meter cube
MSSRF	M.S. Swaminathan Research Foundation
MT	Metric Tonnes
NBSAP	National Biodiversity Strategy and Action Plan
NGO	Non Governmental Organization
PAJANCOA & RI	Pandit Jawaharlal Nehru College of Agriculture and Research Institute
PAPSCO	Pondicherry Agro-Products Food and Civil Supplies Corporation Limited
PASIC	Pondicherry Agro Service and Industries Corporation Limited
PET	Polyethylene terephthalate
PIPDIC	Pondicherry Industrial Promotion, Development and Investment Corporation Limited
PPCC	Pondicherry Pollution Control Committee
SAP	Strategy and Action Plan
SSC	State Steering Committee
SPM	Suspended Particulate Matter
TPCG	Technical and Policy Core Group
VCRC	Vector Control Research Centre

EXECUTIVE SUMMARY

The Union Territory of Pondicherry, spread over an area of 492 sq. km, comprises four erstwhile French establishments of Pondicherry, Karaikal, Mahe and Yanam, geographically separated from each other. This report provides a preliminary exhaustive check list of the flora of Pondicherry region for the first time. Pondicherry does not have reserve forest or scrub jungle to support wild animals. The document has attempted to list plant and animal biodiversity of Pondicherry along with a list of rare, endangered and threatened plant species. Relative insensitivity to environmental and biodiversity issues have caused significant damage to plant and animal biodiversity.

The major causes of loss of biodiversity in Pondicherry have been excessive population growth, habitat destruction and commercial exploitation of natural resources. As a result of increased human activities the area under irrigation has sharply fallen, the ground water has alarmingly depleted and pollution has increased significantly. Excessive use of fertilizers and pesticides has extensively damaged the micro-environment of the agriculture fields. Moreover, cultivation of only selected crop varieties has resulted in the loss of traditional varieties. Beach erosion, pollution and threats to nesting habits of turtles along the coastal areas have severely damaged the marine biodiversity.

Recently several government departments have taken some steps which, in the long run, would help protecting biodiversity. The Department of Agriculture has been promoting the use of bio-fertilizer, organic manure and integrated pest management. The government has also started Farmers' Markets which would eventually help farmers to sell the traditional varieties of vegetables and crops. In a quest for higher yields the traditional knowledge of farmers about seed selection, preservation and storage has been neglected. There is an urgent need to formulate a policy of agro-biodiversity to stop monoculture and loss of traditional varieties.

The government has started projects for rehabilitation of tanks and afforestation of mangrove plantations. The government has enforced fishing holiday and the fisher folk have been provided with increased compensation. The government is taking steps to conserve the existing heritage buildings and to declare Pondicherry city as a heritage town. This would help protection of biodiversity in these buildings. The government is trying to promote 'eco-tourism' which is yet to be clearly defined through a policy document. The government has not initiated any systematic activity to prepare an inventory of biological

resources in the Union Territory of Pondicherry. The following strategies and action plans have been suggested for the Union Territory of Pondicherry.

1. Integration of biodiversity in governance: Decision makers, officials, social workers, politicians and legal experts have to be sensitised to bio diversity and environment related issues. In order to integrate biodiversity in governance, all the departments have to be provided with a biodiversity fund. Experts in biodiversity conservation should be involved in all the planning activities and every project should highlight biodiversity component in it.

2. Empowerment of local communities and decentralisation of planning process: Documentation and protection of traditional knowledge is possible only through empowerment of local communities. The government should hold elections to local bodies immediately and provide legal backing to decentralised planning at local level. At least 25% of the planned budget of the Union Territory should be earmarked for the local planning process.

3. Establishment of a Biodiversity Board: A State Biodiversity Board has to be established in the Union Territory of Pondicherry. The Board should be a non-governmental independent set up under the chairmanship of an eminent person having adequate knowledge and experience in conservation and sustainable use of biological diversity and in matters relating to equitable sharing of benefits. The Board may consist of ex-officio members from various departments, French Institute, Pondicherry University, NGOs, women groups and environmental experts. The functions of the Biodiversity Board would be to advise the government on matters relating to the conservation of biodiversity, sustainable use of its components and equitable sharing of benefits arising out of the utilisation of biological resources and to coordinate the biodiversity conservation related projects submitted by the various government departments and organisations.

4. Biodiversity education: Inclusion of biodiversity related issues in the school/ college curricula is urgently required. Teachers should also be familiarised with the concept of biodiversity. Students should be involved in arranging exhibitions, festivals and competitions highlighting various aspects of biodiversity.

5. Public awareness and training: Biodiversity festival and seed exchange fairs should be conducted to create awareness, to highlight the importance of conservation and to share the views on traditional ways of farming. These efforts will help the public to become aware of food security, nutritional security, sustainable agriculture development, farmers' rights and intellectual property rights.

6. Conservation of agriculture land: The Union Territory of Pondicherry has faced serious problem of dwindling land availability and use of agriculture land for non-agricultural purposes. In order to prevent further loss of the agricultural land, appropriate rules need to be framed and law enforcement mechanisms to be geared up. The government should also release a document spelling out its agriculture policy.

7. Promotion of native varieties and agro-biodiversity: The government should encourage cultivation of traditional varieties of crops, vegetable and pulses by providing incentives. In order to promote traditional varieties of crops the government could initiate food festivals using traditional varieties of crops and also include them in the breakfast and noon meal schemes. The farmers should be encouraged to bring native varieties of foods and vegetables and sell them in the Farmers' Markets.

8. Checking the use of chemical fertilizers and integrated pest management: Farmers should be educated about the impact and the risk involved in using chemical fertilizers and pesticides. Use of bio-fertilizers, organic manure, enriched compost and bio-pesticides should be encouraged. The government should undertake surveys to evaluate microbial population in various areas. A knowledge information centre should be established in all the key villages to provide updated information regarding day to day agriculture development, weather forecast and biodiversity related information.

9. Restoration of botanical garden and cultivation of medicinal plants: Due to increased human activity, release of saline water from the aquarium, dying of trees have resulted a great damage to the biodiversity in the botanical garden. There is a strong need of rejuvenating the existing botanical garden. Since most of the trees are getting aged an alternate botanical garden can be established in a silent zone of Pondicherry. A collaborative programme between the Department of Agriculture and Pondicherry University should be established to encourage the cultivation of medicinal plants.

10. Eco-restoration of mangroves: Due to population growth and overexploitation, the mangrove vegetation in Pondicherry has rapidly degraded and depleted in the last two decades. A mangrove vegetation map should be prepared which will provide the mangrove vegetation scenario of Pondicherry. On-site research and demonstration should be undertaken to grow the other economically important mangrove species. Participation of rural communities in mangrove-based plantation activities should be given priority. It is

also intended to educate local public to get them involved in protecting their own resources. Strict law should be enforced to protect the existing mangroves.

11. Protection and conservation of sacred groves: The sacred groves are facing threats of encroachment and destruction. Immediate steps need to be taken in order to protect and conserve the sacred groves. Some of the sacred groves in the Union Territory which are facing destruction and need immediate attention are situated in Pooanankuppam, Keezhkumaramangalam, Manapet, Sedarapet, Karasur, Mangalam, Moorthikuppam.

12. Conservation of Swadeshi Mills Campus vegetation: The only existing forest patch in Pondicherry is the vegetation available in Swadeshi Mills Campus. During the process of preparation of this action plan, a sizeable patch of Swadeshi Mills forest was cleared off its vegetation and was given for the construction of district court building. In this process a huge loss of biodiversity has occurred. An evaluation should be done to enumerate the lost species and steps to restore them should be initiated. The area should be declared as a protected area and all human activities should be stopped.

13. Conservation of fish and marine biodiversity: The government should attempt to enlist rare, threatened, endangered and extinct marine animals. In order to make fishing holidays more successful and effective the government should try to address the issue at the grassroot level and the fisher folk should be made to feel partners in the whole effort. The government should increase the compensation to the fisher folk and also provide them training for value added fish products like pickles and handicrafts.

14. Water conservation and rain water harvesting: Conservation of ground water resources for agriculture could be done by conducting field schools in the villages. It would help crop water management and inculcate awareness among farmers towards usage of water judiciously. The government should popularise the use of sprinkler and drip irrigation system for orchard crops to conserve water. The village ponds should be desilted and tube wells can be constructed in all these ponds as rain water harvesting structures.

The existing regulations of rain water harvesting for houses and buildings are being hardly followed, which is causing serious threat to this precious natural resource. Percolation pits should be provided in all the small houses. All the house owners must be given a deadline to comply with the regulations. All the government buildings, educational institutions should become model examples for rain water harvesting. Rain water harvesting systems should also be installed at public places so as to popularize the concept.

Incentives in the form of tax deductions for house tax, water tax etc., could be provided. Banking loans could be arranged for fixing rain water harvesting system.

15. Urban biodiversity: The government should immediately declare all the buildings constructed during French rule as heritage buildings and stringent measures have to be adopted for their preservation and maintenance. Use of such buildings for biodiversity conservation must be ensured. Any additions, alterations and renovations in these buildings must follow strict guidelines so that the architectural and biodiversity heritage of Pondicherry could be protected.

16. Eco-tourism: The government should encourage eco-friendly practices that focus on harmony with nature and spirituality and to develop the conscious process at all levels. The government should aim to encourage low volume but high value tourism in Pondicherry. The mangrove vegetation in Yanam should not be disturbed and the damaged patches should be restored. Usage of 'environmental friendly' constructions would not help conserving biodiversity. Any activity damaging the natural ecosystem in islands near Yanam should not be allowed. Ousteri lake could be developed as an 'eco-friendly' tourist spot in Pondicherry and local communities should be involved in the whole process. It is necessary that the water inlets to the lake be opened so that the lake could get enough water. Fruit bearing and shade trees could be planted near the lake so that migratory birds could start visiting again.

17. Pollution control: The commune municipalities should identify places for disposal of organic waste and for vermicomposting. Public transport vehicles using kerosene and sub-standard fuel with high emission of toxic substances should immediately be seized. The government should encourage plying of battery driven public transport vehicles. There is an urgent need to strengthen the existing public transport system so that people are not forced to use their own vehicles. Due to increase in number of vehicles many roads have been widened after removing age-old as well as young trees. Traffic congestion could be reduced by staggering school and office timings which would greatly reduce the density of polluting agents during peak hours. Awareness should be created in all the sections of the society for proper disposal of household and industrial waste. Penalty should be fixed for littering public places with plastic bottles, bags etc. The existing system of door to door collection of solid wastes in some of the areas should be introduced to all the residential and business areas of Pondicherry. The government should try to introduce bags of different colours in order to handle biodegradable and non-biodegradable wastes. The non-

biodegradable waste should not be allowed to be used for land fills. Efforts must be made to get the non-biodegradable waste recycled. No fresh licenses should be granted to start units manufacturing non-biodegradable products. The use of plastic should be eliminated in a phased manner and the government should provide avenues for alternate employment opportunity to the employees working in plastic industries.

1. INTRODUCTION

1.1 General

Biodiversity is the variability among living organisms from all sources, including terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are a part; this includes diversity within species, between species and of ecosystems. The term 'biodiversity' was coined only in the 1980s, and there is still much misunderstanding about what it means. Biodiversity can be conserved, used, or destroyed. Biodiversity and conservation are two separate, but commonly-linked concepts. It is important to separate them when considering biodiversity in a development context. The role of the natural resources within ecosystems is of critical importance for maintaining the health of the environment. Although less visible, the role of biodiversity components in maintaining soil fertility, forest habitats and productive wetlands and other ecosystem services is crucial to sustainable development. Moreover, many components of biodiversity, little-used today, may be important to meet changing needs in the future. Biodiversity is the very basis of human survival and economic well-being and encompasses all life forms, ecosystems and ecological processes, acknowledging the hierarchy at genetic, taxon and ecosystem levels.

The world is losing its biodiversity at an increasingly rapid rate. In their effort to understand the term, people have considered it from various perspectives. For example, it can be described in terms of its composition, structure and function; the information it holds; its energy and mass; as various combinations of human and natural capital; the goods and services it provides; its spiritual and religious importance; and the options it represent for the future. Humans have long been a component of ecosystems, and the interplay between biological processes and human impacts have shaped each other, giving rise to productive landscapes that combine biological and cultural diversity. To understand the importance of biodiversity for human development, we need to evaluate the products that can be used, and the ecosystem services for human development. An accurate evaluation of biodiversity needs to consider the direct use values (products), and indirect use values (services), and combine consumptive and non-consumptive use.

In India, the recorded diversity is about 130,000 species, though scientists agree that the actual (unrecorded) diversity would be much greater. The cost of environmental

damage and the depletion of natural resources have never been taken into account, to our own detriment. It is not easy to assign value to biodiversity especially in terms of monetary value, as the roles played by the various species are many, complex, often hidden and insufficiently understood by humans. It is possible to conserve biodiversity that is threatened by development and farming practices. Governments and the others outside the government have taken many initiatives to protect biodiversity, such as the widespread effort of declaring of protected areas, communities, regeneration and conservation of natural resources. With an aim to encourage these trends, the urgent need for developing a National Biodiversity Strategy and Action Plan (NBSAP) has been strongly felt.

It was the World Conservation Strategy which first stressed upon the need for conservation-based development. Subsequently the United Nations Conference on Environment and Development at Rio de Janeiro in June 1992 highlighted the concept of biodiversity and resulted in the Convention of Biological Diversity (which entered into force in 1993). Under the Convention, it is mandatory for all contracting parties to prepare Biodiversity Strategy and Action Plan (BSAP). As a follow up action, Government of India in 2000, initiated the process of developing BSAP, which envisages preparation and merger of eco-regional, state level and sub state level plans and thematic documents.

1.2 NBSAP

The National Biodiversity Strategy and Action Plan (NBSAP), a project of the Union Ministry of Environment & Forests (MoEF) aims to produce a series of planning documents dealing with the conservation of India's biodiversity, sustainable use of its biological resources, and equity including in decisions regarding access to such resources and the benefits accruing from them. The project is funded by the Global Environment Facility through United Nations Development Programme (UNDP). A unique aspect of the project is that its technical execution is by a Technical and Policy Core Group (TPCG) being coordinated by a Non Governmental Organisation (NGO) Kalpavriksh, and its administrative coordination is by the Biotech Consortium India Ltd (BCIL).

The NBSAP process has included extremely widespread consultation across the country and across all sectors of society, involving tens of thousands of people. It aims to produce not one national action plan, but 18 local (sub state) plans, 33 state and union

territory plans, 10 ecoregional (inter-state) plans, and 13 thematic plans. All these will coalesce in to a national plan, but will also remain independent for implementation purposes. In addition, over 30 thematic papers have been commissioned on a variety of topics related to biodiversity. Within this overall process, one of the state action plan is on Union Territory of Pondicherry, which has been drafted by a nodal agency consisting of persons experienced in the field.

The present document defines the BSAP of the Union Territory of Pondicherry. It establishes a general frame work for the State policy on conservation and sustainable use of biological resources, explains its current status and identify the processes which are leading to its deterioration. This proposal will form a strong link between the National Strategy and Action Plan and the role of the Union Territory of Pondicherry for application of measures and actions at the grass root level.

1.3 Objectives

The objectives of the BSAP for the Union Territory of Pondicherry are as follows:

- To assess the existing status of biodiversity.
- To identify the root causes of biodiversity deterioration.
- To promote conservation and sustainable use of the biological resources of the Union Territory.
- To promote awareness and dissemination of information amongst government departments and the public for realizing peoples' participation in biodiversity conservation activities.
- To create mechanism required to plan natural resource management and long term conservation process.
- To promote cooperation between all stake holders including government, public institutions, social and economic groups and the masses.
- To incorporate principles of conservation, restoration, and sustainable use of biodiversity in planning and execution of sectoral and cross sectoral policies.
- To empower local groups and women for their security through biodiversity conservation.
- To stimulate education, training and research in the area of biodiversity.
- To identify legal and financial instruments to achieve these objectives.

- To promote regional, inter-state, national and international co-operation through multilateral programmes and joint initiatives.

1.4 Scope

This document also covers the following levels of biodiversity in the context of issues of conservation, sustainable and equitable use of natural resources and their scientific, economic and cultural dimensions :

- Natural ecosystems: Include small patches of forest, sacred groves, mangroves, wetlands, ponds etc.
- Agriculture eco-systems: Include historic changes in land use pattern, farm lands, fodder.
- Wild species and varieties : An attempt has been made to collect and collate all available data on species of plants and animals.
- Domesticated species and varieties: Varieties/ species of crops, livestock, fishes, including genetic variation, wherever possible.
- Root causes of the loss of biodiversity.
- Socio-economic and cultural aspects related to nature.
- Educational aspects related to biodiversity.
- Urban biodiversity, Eco-tourism and biodiversity issues.
- Action plans, which integrate biodiversity issues in all the developmental activities of the Union Territory of Pondicherry.

1.5 Contents of the BSAP

The Biodiversity Strategy and Action Plan consists of the following:

- A detailed profile of the Pondicherry ecoregion including origin, history, physiography, biodiversity and human ecology.
- A discussion of the various factors responsible for loss of biodiversity and continued pressure on biodiversity.
- An outline of the various recommendations made for the conservation and sustainable use of biodiversity/ biological resources both published and unpublished.
- Specific strategies and action plan for the Union Territory of Pondicherry.

- Annexure which include check list of documented biodiversity, threatened species and details of public hearings and the process followed during the preparation of the action plan.

1.6 Methodology

The BSAP process for the Union Territory of Pondicherry was started with the designation of School of Life Sciences, Pondicherry University, Pondicherry, signing of MoU between Pondicherry University and MoEF and formation of State Steering Committee in 2001.

The Government of Pondicherry issued a notification under G.O. Ms. No.9/ 2001/ Envt. dated March 19, 2001 designating Department of Life Sciences, Pondicherry University as the nodal agency to prepare the biodiversity strategy and action plan for the Union Territory of Pondicherry.

The BSAP process was started in 2000 at national level. The first national workshop of the NBSAP was conducted during June 2000, which was attended by a few representatives from Pondicherry Government and Pondicherry University. As per the requirements of the MoEF, the Government of Pondicherry notified the constitution of the State Steering Committee only in March 2001.The mid-term National Workshop of NBSAP was conducted between June 13-15, 2001 at New Delhi which was attended by the coordinator. The coordinator made linkages with other coordinators and persons to get inputs for the process and designing of the methodology. The first meeting of the State Steering Committee (SSC) of the Union Territory of Pondicherry was held on June 28, 2001 to consider and approve the methodology for the preparation of the strategy and action plan. The work was started in August/ September 2001 with the appointment of two personnel to help the coordinator. It was decided to adopt 'top to bottom' approach for bringing out biodiversity related issues since the time available for finalisation of the report was very short. In this approach biodiversity problems were identified by the working group and the SSC in consultation with various experts, government officials and activists. The problems in addition to other issues were analysed. This approach was also discussed during a meeting with Dr. Ashish Kothari, National Coordinator, NBSAP during his visit to Pondicherry on August 30, 2001.

A working group was formed which functioned on day-to-day basis from October 2001 to April 2002. The Committee started the preparation of frame-work for the action

plan and decided to select the villages to conduct public hearings and to gather on-hand information about the existing biodiversity in the wake of preparation of the action plan. The coordinator visited Centre for Advanced Study in Marine Biology, Annamalai University, Parangipettai and had interaction with Prof. L. Kannan, coordinator for east coast ecoregion, to gather information on coastal biodiversity. The working group started collecting data and information from various government departments and agencies, gazetteer, books, news papers, articles, individuals, NGOs, academicians, websites etc.

The coordinators and the staff made visits to the existing biodiversity sensitive areas such as mangroves, sacred groves, Botanical Garden, privately owned gardens, Swadeshi Mills deemed forest, Pondicherry University and other places to assess the current status of biodiversity of Pondicherry.

The NBSAP booklet "Call for Participation" was distributed among public in English, Tamil, Malayalam and Telugu to let the people know about the process and asking them to come forward to participate in the process. In order to propagate the message of biodiversity conservation and seek participation of teachers and school children, an elocution contest on biodiversity related issues was conducted in St. Patrick School, Pondicherry and prizes were given to the best participants.

A workshop on "Understanding Biodiversity and the Role of Teachers" was conducted in collaboration with the Department of Education, Government of Pondicherry, for the school teachers on October 12, 2001. Resource persons were invited and talks on various topics on conservation and biodiversity were delivered. The teachers were given a questionnaire and the feed-back was collected. A public hearing was conducted among teachers and the views of teachers on various biodiversity issues were taken and discussed. This session included the involvement of teachers and students in protecting biodiversity in Pondicherry. More than 50 teachers from various schools of Pondicherry attended the workshop. Newspaper articles about conservation of biodiversity and need for peoples' participation were published in national and local news papers to obtain the views from the public. (Section 12.1) However, the participation of the public and NGOs was not very enthusiastic.

Public hearings were conducted according to the guidelines of NBSAP in the agriculture and fisher folk villages of all the four regions of the Union Territory of Pondicherry to collect first hand information about the existing biodiversity related issues and its conservation and also to seek their partnership in this venture. Public hearings were

conducted in the villages across Pondicherry, Karaikal, Yanam and Mahe among agriculturists, fisher folk, teachers, students, village elders etc. The target groups were informed about the public hearings well in advance through elders and youth groups in the villages and wide publicity was given through the distribution of the booklet 'Call For Participation' in respective languages. The meetings were arranged at convenient times agreeable to both women and men. The theme and purpose of the hearings were explained to the participants and the participants were explained as to how the interaction would be very useful for the preparation of the strategies and action plan. The attendance of the participants was recorded by obtaining their signatures in a register. The women participation in Karaikal was very encouraging as compared to other regions of Pondicherry. In Yanam and Mahe regions, the public hearings were conducted with the help of translators in respective regional languages. The meetings were photographed and the minutes were properly recorded. The details of public hearings are outlined in Section 12. 2.

The working committee, in liaison with the State Steering Committee members, prepared the first draft of the BSAP for Pondicherry and the copies were circulated among the SSC members and the Heads of the concerned Departments for their perusal and comments. A few copies were circulated among some of the scientists interested in biodiversity for peer review and their comments. The coordinator interacted with other working groups of neighbouring states of Andhra Pradesh, Kerala and Tamil Nadu and with Kalpavriksh. The coordinator, attended the Southern Regional Workshop/ Review meeting held at Zaheerabad, Hyderabad between January 5-7, 2002. Comments about the first draft were received from Dr. Ashish Kothari, Coordinator, NBSAP and Dr. M.V.M. Wafar, Scientist, National Institute of Oceanography, Goa, which were considered and are being incorporated in this document.

The second meeting of the SSC was convened under the Chairmanship of the Secretary, Department of Science, Technology & Environment, Government of Pondicherry on January 23, 2002. Apart from the members, officers representing various government departments and institutions were invited to attend the meeting. The coordinator briefed the tasks undertaken and the progress made. Feed-back was received from the concerned departments and SSC members. The inputs for the preparation of final draft were received from the Department of Agriculture and Pandit Jawaharlal Nehru College of Agriculture & Research Institute, Karaikal, Department of Fisheries &

Fishermen Welfare, Department of Education, Department of Town & Country Planning, The Department of Science, Technology & Environment, Public Works Department and from some of the SSC members, which are being incorporated in this document.

The third meeting of the SSC was held on April 30, 2002 to review the final draft action plan. The coordinator presented the final draft to the members and other invitees. The strategy and action plans presented in this document were discussed and got approval of all the members. The draft report was released to the press for highlighting key issues of the action plan in the news papers and it was also hosted on a website through the National Informatics Centre, Pondicherry.

2. PROFILE OF PONDICHERRY

2.1 Historical background

Pondicherry, an erstwhile French colony, was freed in October 1954 with the de fac-to transfer of power by the French to the Indian Government after signing of the pact of transfer of Pondicherry between the then Prime Minister Jawaharlal Nehru and S. Ostrorog, the Ambassador Extraordinary and plenipotentiary of France in India. The French actually left only on August 16, 1962. The people who were born in Pondicherry were given an option whether to take French citizenship. As on date there are about 8,000 French-Pondicherrians in the city alone and in France there are about 60,000 people from Pondicherry. A French Consulate General in Pondicherry is also functioning to continue the Union Territory's links with France.

2.2 Geographical profile

The Union Territory of Pondicherry is spread over an area of 492 Sq. Km which constitutes of the four erstwhile French establishments of Pondicherry, Karaikal, Mahe and Yanam .The regions are being shown in Fig.1.

2.2.1 Location

The Union Territory of Pondicherry, consisting of four regions, are situated at different geographical locations and are isolated from one another. Pondicherry region, which is the largest of all the four, lies on the east-coast, consisting of twelve scattered areas lying in between 11 42' & 12 30'N, and between 76 36' & 79 53'E. Karaikal region is about 150 Km south of Pondicherry and is surrounded by Nagaipattinam District of Tamil Nadu. It is located between 10 49' & 11 01'N, and 79 43' & 79 52'E. Yanam region is located between 16 42' & 16 46'N and 82 11' & 82 19'E at about 840 Km northeast of Pondicherry near Kakinada in Andhra Pradesh. Mahe region lies almost parallel to Pondicherry between 11 42' & 11 43'N and 75 31' & 75 33'E at 653 Km away on the west coast near Tellicherry in Kerala. (Antony et al., 1982). Maps representing various regions are shown in Fig. 2 to 5.

2.2.2 Climate

Semi-arid type of climate, with a mean annual temperature of around 30 C and with 70 to 85% relative humidity, is prevalent in the Union Territory. While Pondicherry and Karaikal regions receive rain mostly through northeast monsoon, Mahe and Yanam regions benefit from the southwest monsoon.

2.2.3 Language Composition

The scattered locations of the regions have produced diversity in language composition in the Union Territory. However, Tamil speaking people are predominantly residing in the principal regions of Pondicherry and Karaikal. Malayalam and Telugu are the main languages in Mahe and Yanam regions, respectively. The other important languages spoken in the Union Territory are French, English, Hindi, Bengali, Gujarati, Kannada, and Marathi.

2.2.4 Topography

2.2.4.1 Pondicherry Region

The region is flat countryside of an average elevation of about 15 meters above sea level, intersected by the deltaic channels of rivers Gingee and Ponnaiyar and other streams forming the two main drainage basins, interspersed with lakes and tanks. To the northwest of Pondicherry town, a girdle of low hills (or an elevated ground of about 30 meters high) extends in a east north east and west south west direction. This high ground suddenly emerges from the low alluvial plain country known as "Les Montagnes Rouges" or the "Red Hills of Pondicherry", or Gorimedu. The river Gingee crosses the region diagonally from north-west to south-east and the river Ponnaiyar forms the southern border. The alluvial delta of the river Ponnaiyar is only a few meters above the sea. To the north-west of the hills is a section of fossiliferous limestone formations of the Cretacian age.

Black clays and simulating marine clays have been observed in well cuttings to the west and south west of Pondicherry with local intercalation of peaty materials and sands. The persistence of the horizon over a considerable area is said to be suggestive that the area at one time must have been a lagoon. There are evidences to show a gentle submergence along the east coast perhaps during the Pleistocene times. During the period, several changes seem to have taken place including the changes in course of certain rivers. According to geomorphologists,

Fig. 1. Map showing various regions of the Union Territory of Pondicherry

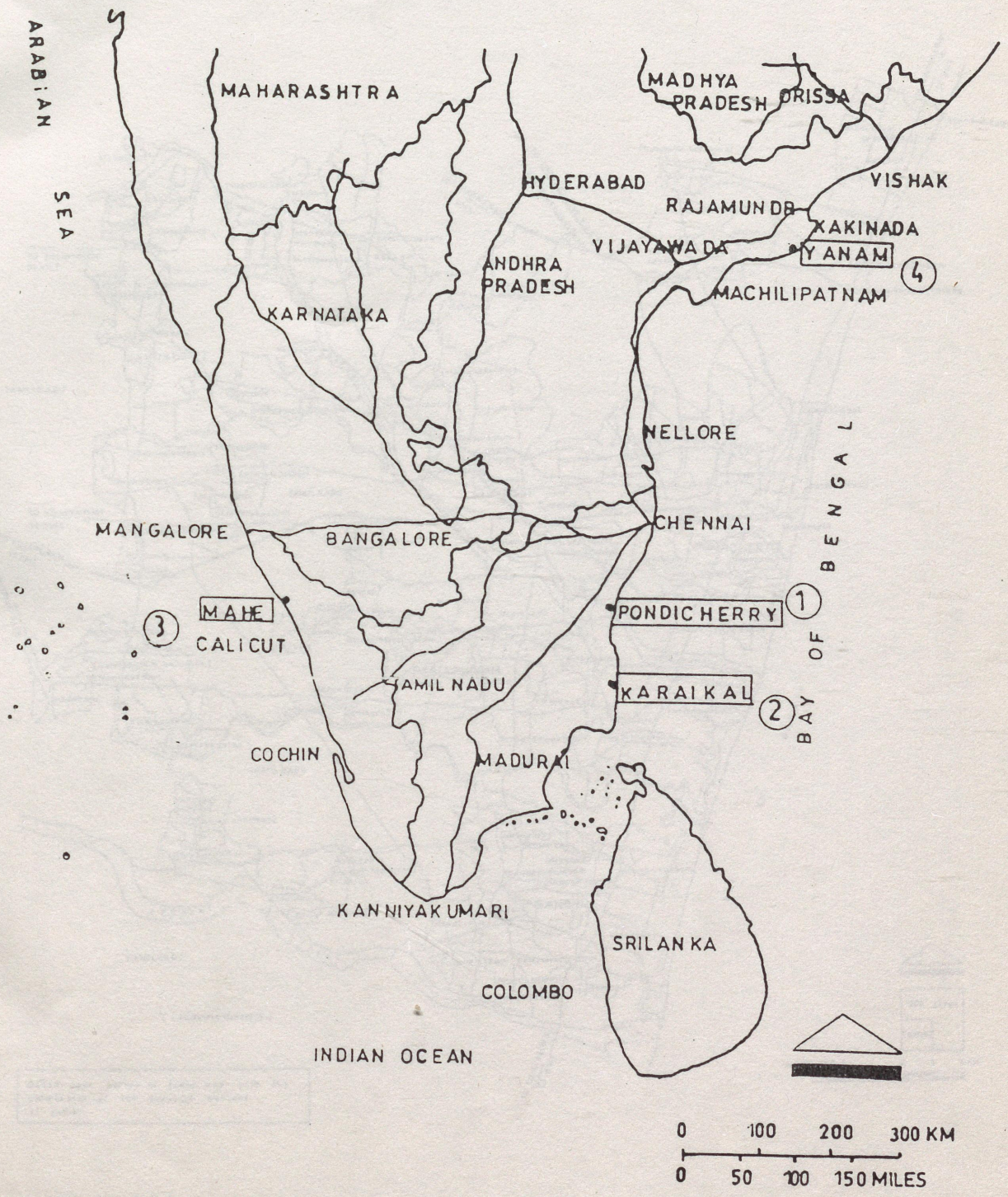


Fig.2: Map showing various hamlets of Pondicherry interspersed within Tamil Nadu

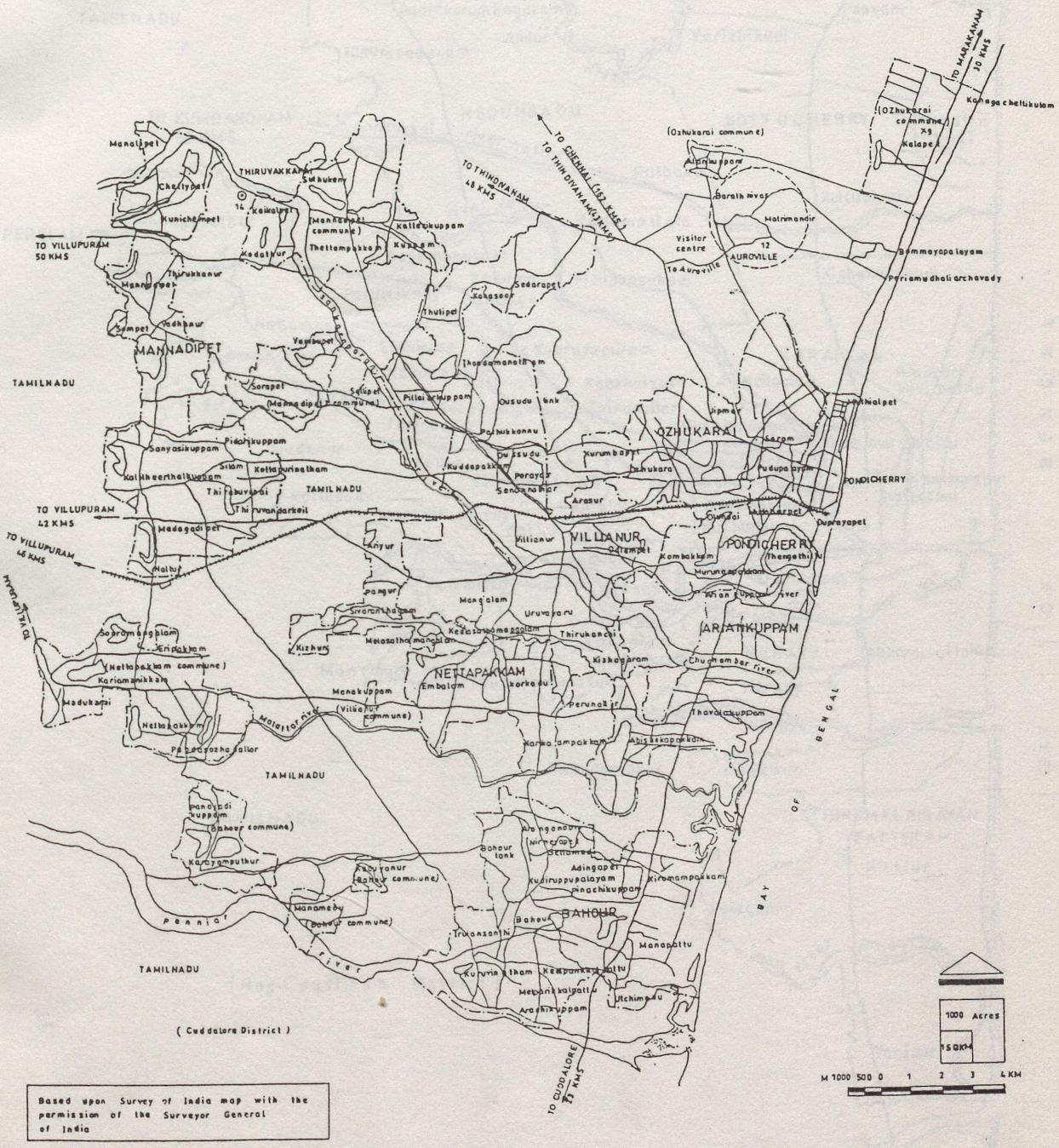


Fig. 3. Map showing Karaikal region of the Union Territory of Pondicherry

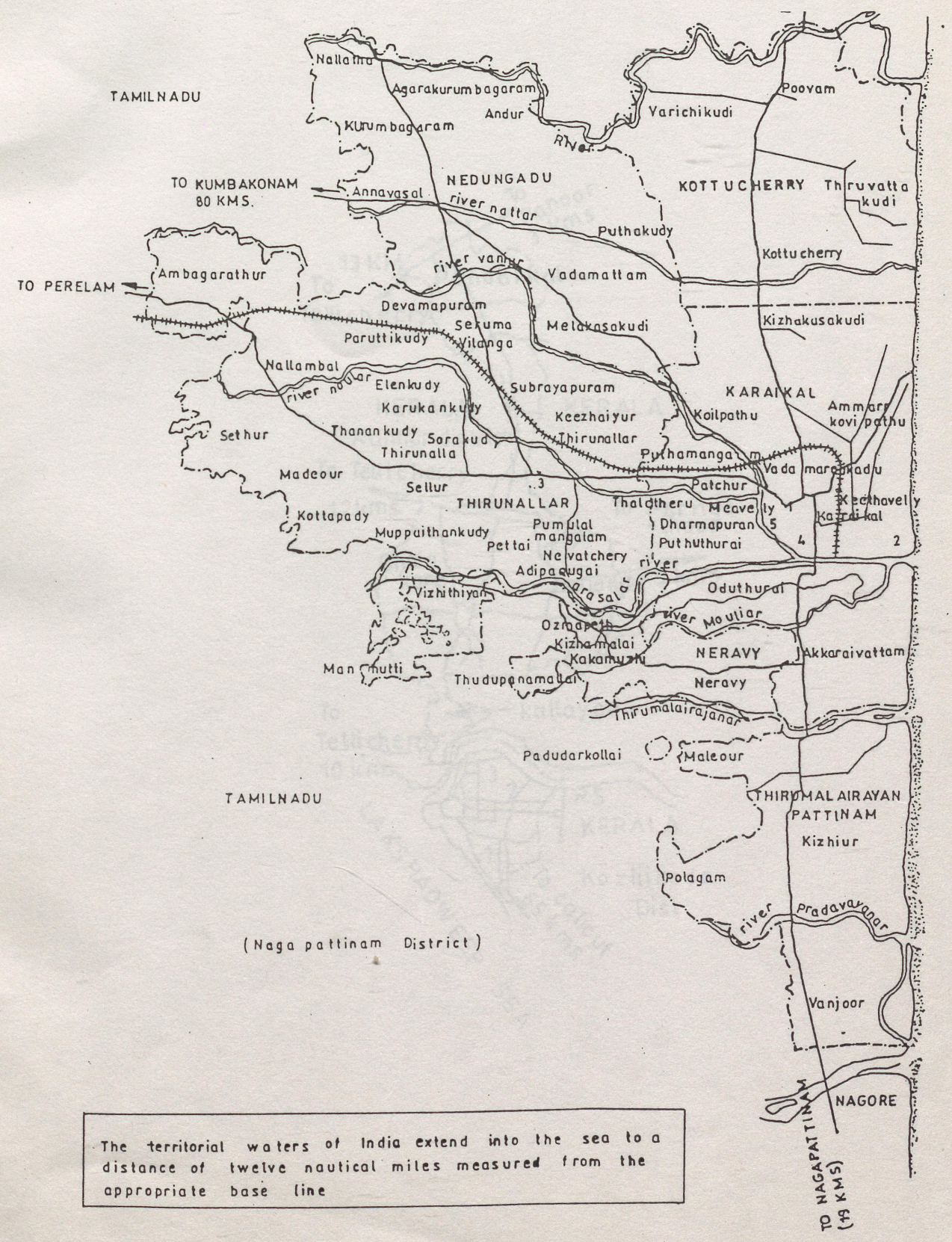


Fig. 4. Map showing Mahe region of the Union Territory of Pondicherry

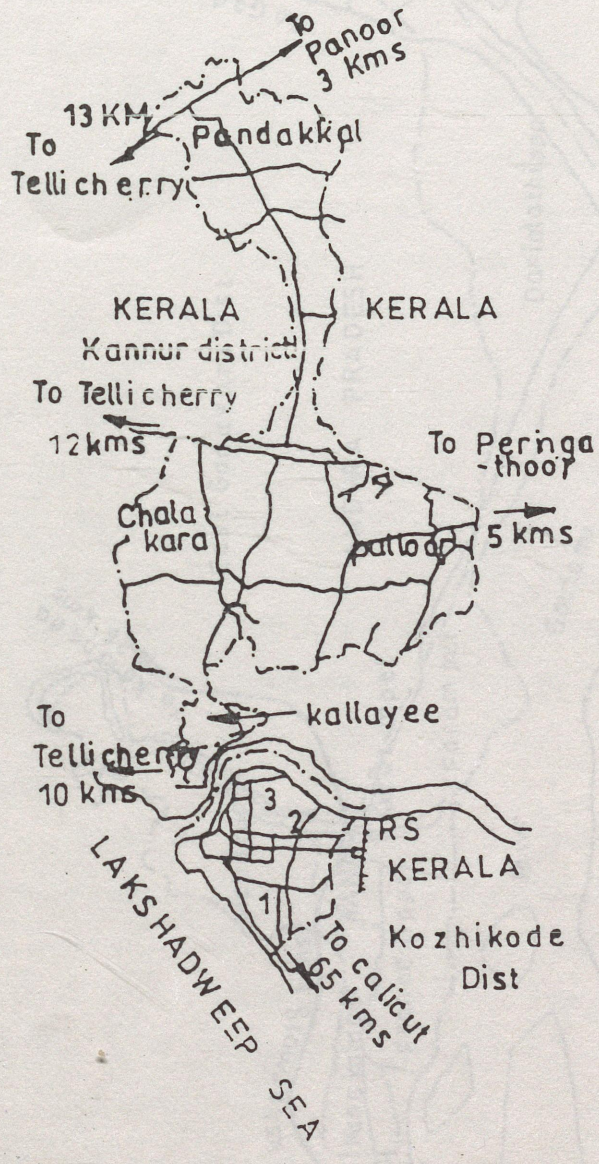
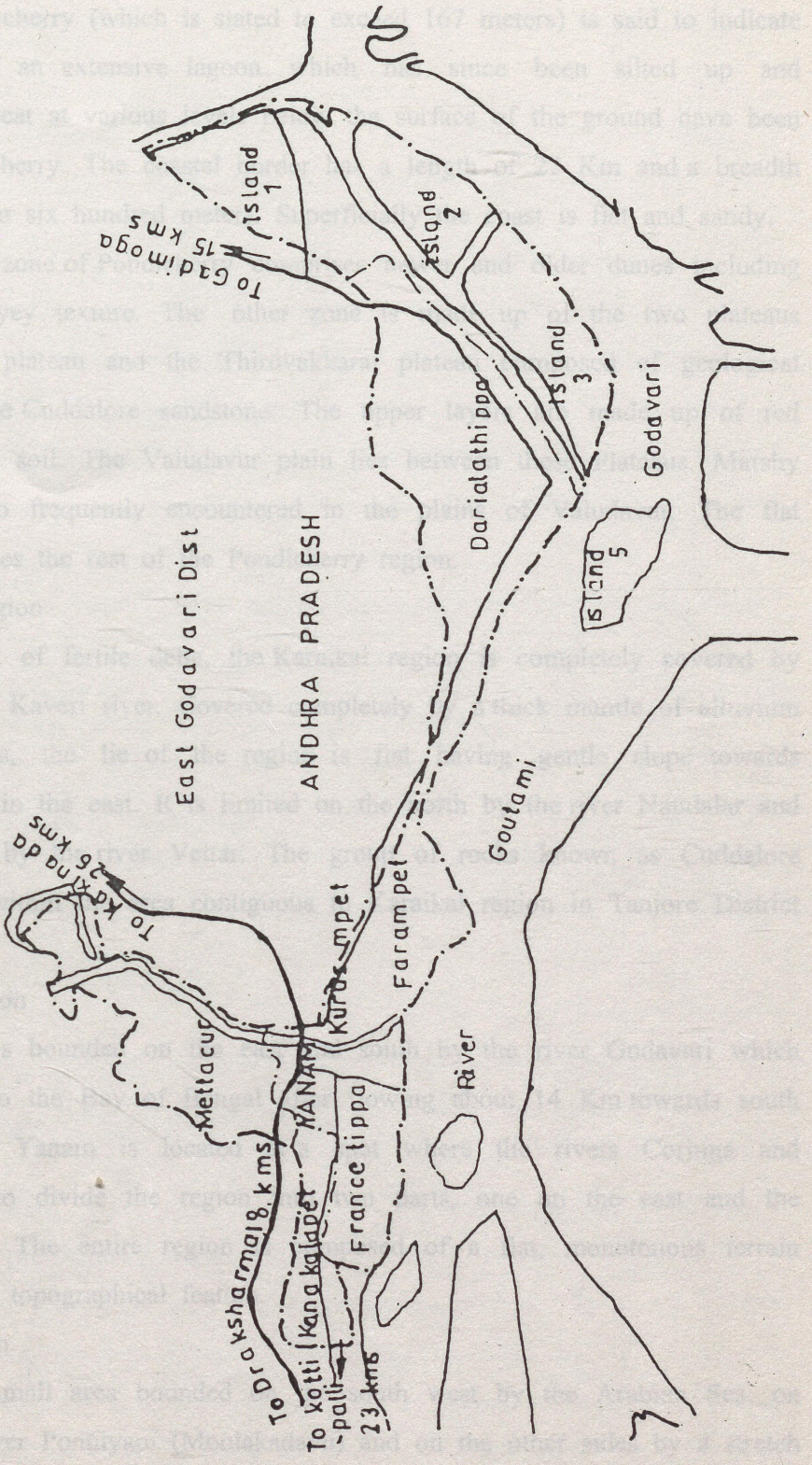


Fig. 5. Map showing Yanam region of the Union Territory of Pondicherry



the straight shore line is also suggestive of some structural dislocation. Shallow bays were formed during the submergence, the limits of which may be traced from the presence of black sticky clays recorded in the area. The unusual thickness of alluvium near Pondicherry (which is stated to exceed 167 meters) is said to indicate that it was part of an extensive lagoon which has since been silted up and uplifted. Beds of peat at various levels below the surface of the ground have been recorded near Pondicherry. The coastal border has a length of 22 Km and a breadth ranging from four to six hundred meters. Superficially the coast is flat and sandy.

The coastal zone of Pondicherry comprises newer and older dunes including saline areas of clayey texture. The other zone is made up of the two plateaus called Pondicherry plateau and the Thiruvakkarai plateau composed of geological formation called the Cuddalore sandstone. The upper layers are made up of red transported ferralitic soil. The Valudavur plain lies between these Plateaus. Marshy depressions are also frequently encountered in the plains of Valudavur. The flat alluvial zone occupies the rest of the Pondicherry region.

2.2.4.2 Karaikal Region

Forming part of fertile delta, the Karaikal region is completely covered by the distributaries of Kaveri river. Covered completely by a thick mantle of alluvium of variable thickness, the lie of the region is flat having gentle slope towards the Bay of Bengal in the east. It is limited on the north by the river Nandalar and on the south east by the river Vettar. The group of rocks known as Cuddalore formations is met within the area contiguous to Karaikal region in Tanjore District of Tamil Nadu.

2.2.4.3 Yanam Region

The region is bounded on the east and south by the river Godavari which discharges itself into the Bay of Bengal after flowing about 14 Km towards south east. The town of Yanam is located at a spot where the rivers Coringa and Godavari separate to divide the region into two parts, one on the east and the other on the west. The entire region is composed of a flat, monotonous terrain without any distinct topographical feature.

2.2.4.4 Mahe Region

Mahe is a small area bounded on the south west by the Arabian Sea, on the north by the river Ponniyam (Moolakadavu) and on the other sides by a stretch

of calcareous hills of medium height which are linked to the ghats by a series of wooded hillocks. The river Mahe, which flows towards the west, divides the region into two parts.

2.3 Socio-economic profile

The socio-economic profile is being discussed in the following sections.

2.3.1 Demographic and social parameters

Pondicherry ranks twenty-eighth among all the states and Union Territories in the size of population and second among Union Territories. As per the census of India, 2001, the total population of the Union Territory of Pondicherry is 9,73,829 consisting of 4,86,705 males and 4,87,124 females, registering a sex ratio of 1001females for every 1000 males. The region-wise break up of the population is given in Table 1.

Table 1: Region wise break up of population (2001 census)

Region	Area(Sq.Km)	Population	Male	Female
Pondicherry	293	7,35,004	3,69,318	3,65,686
Karaikal	160	1,70,640	84,365	86,275
Mahe	9	36,823	17,146	19,677
Yanam	30	31,362	15,876	15,486

(Source: Directorate of Economics and Statistics, Government of Pondicherry)

2.3.2 Literacy

The literacy rate in the Union Territory of Pondicherry is estimated as 81.49%. The literacy level among males is 88.89% and among females is 74.13%.

2.3.3 Major ethnic groups

Among the diverse ethnic groups, scheduled caste people occupy an important position. The total scheduled caste population in the Union Territory, (according to 1991 census) is 1,31,278 which constitutes16.25% of the total population. According to the recent report on identification of the scheduled tribes in Pondicherry (An ethnographic study) it is presumed that there are about 4000 people belonging to different class of

scheduled tribes distributed in the Union Territory of Pondicherry, who have migrated from neighbouring states. (Naidu, 2001)

2.3.4 Major occupations

Agriculture is the most important occupation in the Union Territory of Pondicherry. It provides livelihood for about 35.2% of the rural population and 5.66% of the Union Territory's income is derived from this sector. Major crops in the Union Territory are paddy, sugarcane, coconut, ground nut, pulses and cotton. The Union Territory of Pondicherry is characterized with large portion of small holdings of less than 1 Ha The land holding pattern and land use pattern are shown in Table 2 & 3.

Table 2: Land holding pattern of Pondicherry

Land Area	No. of Holdings	Area in Ha.
Less than 1 Ha.	26096	9299
In between 1 and 2	5011	7105
Above 2 Ha.	3468	16874
TOTAL	**34575**	**33278**

(Source: Department of Agriculture, Government of Pondicherry)

Table 3: Land use pattern in Pondicherry

Land Use	Area in Ha.
1. Total area according to village papers	48,842
2. Forests	--------
3. Land not available for cultivation	15,369
4 Other uncultivated land (Excluding fallow land)	4,284
5. Fallow land	4,757
6. Net Area sown	24,432
7. Area sown more than once	19,965
8. Total cropped area	42,397

(Source: Directorate of Economics and Statistics, Government of Pondicherry)

Paddy, sugarcane, groundnut, pulses and cotton are the major crops in the Union Territory of Pondicherry. The area under crops irrigated Table 4 & 5, agriculture production Table 6. The main dry crops of Union Territory of Pondicherry are Bajra- *Pennisetum typhoides*. (Tamil- Cambu), Groundnut- *Arachis hypogaea* (Tamil- Verkkadalai), Gingili- *Sesamum indicum* (Tamil- Ellu), Cashewnut- *Anacardium occidentale* (Tamil-Mundri). The main wet crops of Union Territory of Pondicherry are Rice- *Oryza sativa* (Tamil-Nellu), Sugar cane- *Saccharum officinarum* (Tamil-Karumbu), Betel vine-*Piper betel* (Tamil-Vetrilai). The fertilizer consumption in the Union Territory of Pondicherry is very high and has been estimated at 400/ Ha according to the Department of Agriculture.

Table 4: Area under crops irrigated (Ha)

Crops	1997-98	1998-99	1999-2000
Paddy	26,349	24,622	25,444
Ragi	140	112	123
Cumbu	154	102	149
Other millets*	1	--	3
Total Cereals	**26,644**	**24,836**	**25,719**
Black gram	282	270	97
Green gram	61	22	71
Other pulses**	8	4	6
Total Pulses	**349**	**296**	**174**
Total Food Grains	**26,993**	**25,132**	**25,893**
Sugar cane	**2,397**	**2,710**	**2,798**
Plantain	265	304	282
Tapioca	543	649	365
Chillies	5	8	11
Other food crops	217	263	256
Total Food Crops	**30,420**	**29,066**	**29,605**
Cotton	459	453	357
Ground nut	1,311	952	860
Gingili	90	57	52
Other Non-food crops	1,928	2,643	2,769
Total Non-food crops	**3,788**	**4,105**	**4,038**
Grand Total	**34, 208**	**33,171**	**33,643**

*Includes Chollam, Varagu and Thenai ** Includes Red gram, Karamani and Perumpairu
(Source: Directorate of Economics and Statistics, Government of Pondicherry)

Table 5: Area under all crops (Ha)

Crops	1997-98	1998-99	1999-2000
Paddy	26,349	24,622	25,444
Ragi	140	112	124
Cumbu	216	149	170
Other millets	6	4	4
Total Cereals	**26,711**	**24,887**	**25,742**
Black gram	3,245	3,413	3,159
Green gram	2,543	2,548	2,453
Other pulses	37	58	65
Total Pulses	**5,825**	**6,019**	**5,677**
Total Food Grains	**32,536**	**30,906**	**31,419**
Sugar cane	2,397	2,710	2,798
Plantain	265	304	282
Mango	214	219	217
Cashew nut	198	206	210
Tapioca	543	649	365
Chillies	5	8	11
Other food crops	491	531	524
Total Food Crops	**36,649**	**35,533**	**35,827**
Cotton	459	453	357
Ground nut	1,463	1,046	898
Gingili	124	147	133
Coconut	2,132	2,176	2,214
Other Non-food crops	2,977	3,236	2,969
Total Non-food crops	**7,155**	**7,058**	**6,571**
Grand Total	**43,804**	**42,591**	**42,398**

(Source: Directorate of Economics and Statistics, Government of Pondicherry)

Table 6: Agriculture Production (MT)

Crops	1997-98	1998-99	1999-2000
Paddy	51,463	56,601	59,434
Ragi	367	366	452
Cumbu	417	324	470
Other millets*	2	3	4
Total Cereals	**52,249**	**57,294**	**60,360**
Black gram	1,211	1,899	2,467
Green gram	781	1.228	1,321
Other pulses**	19	30	123
Total Pulses	**2,011**	**3,157**	**3,911**
Total Food Grains	**54,260**	**60,451**	**64,271**
Sugar cane	191,253	232,369	237,610
Tapioca	15,541	19,110	10,571
Chillies	14	23	35
Other food crops	11,686	14,518	14,090
Total Food Crops	**272,754**	**326,471**	**326,577**
Cotton (Kapas)	344	372	312
Ground nut (Kernels)	2,158	2,062	2,511
Gingili	71	70	94
Other Non-food crops	70	20	4
Total Non-food crops	**2,643**	**2,524**	**2,921**
Total Food & Non-food crops	**275,397**	**328,995**	**329,498**

(Source: Directorate of Economics and Statistics, Government of Pondicherry)

In the Union Territory, 82% of the net area sown is irrigated by canals and tube wells . Net area irrigated is 21628 Ha As such, there are no major irrigation projects in the Union Territory of Pondicherry. The irrigation pattern by various methods and area under irrigation is given in Table 7.

Table 7: Area under irrigation by sources (1999 – 2000)

Mode	Area (Ha)
By tubewells	13,398
By canals	8,155
Others	75
Total	**21, 628**

(Source: Directorate of Economics and Statistics, Government of Pondicherry.)

Fisheries provide yet very important source of livelihood. The Union Territory of Pondicherry comprises a coastline of 45 Km with 675 Sq. Km of in-shore waters, 1347 Ha of inland water and 800 Ha of brackish water fisheries. The production of fish was 900 MT in 1954 as against 4,350 MT of Inland fishing and 38,950 MT of marine fishing. (Table 8). There are 27 marine fishing villages with a population of about 43,395 out of which 10,000 marine fishermen are actively engaged in fishing. At present about 7300 traditional crafts are engaged in marine fishing.

Table 8: General statistics of fisheries

Particulars	1997-98	1998-99	1999-2000
Fishermen Population	43, 495	43, 495	43, 495
Active Fishermen	9, 871	9, 871	9, 871
Fishing villages			
(a) Marine	27	27	27
(b) Inland	25	25	25
Fish Farms	3	3	3
Fish Seed Farm	2	2	2

(Source: Department of Fisheries & Fishermen Welfare, Government of Pondicherry)

The Union Territory is promoting development of sustainable and responsible fisheries. The main varieties caught are mackerel, sardines, perches, ribbon fish, flying fish and shrimps. The volume of fish production in Pondicherry are given in Table 9. Annual marine production in 1998-99 in Pondicherry is listed in Section 12 .3.

Table 9: Fish Production (MT) in the Union Territory of Pondicherry

Particulars	1997-98	1998-99	1999-2000
(a) Marine	38, 420. 000	38,595. 000	38, 620. 000
(b) Inland	4, 104. 000	4, 108. 000	4, 210. 000

(Source: Department of Fisheries & Fishermen Welfare, Government of Pondicherry)

The animal husbandry sector has considerable relevance to Pondicherry, due to the efforts in cross breeding programmes for the last two decades, there is a substantial increase in the cross bred population of cattle. These cross bred animals are maintained mainly for milk production. The dairy development has undergone tremendous changes in the Union Territory of Pondicherry. The milk production during 2000-2001 was 36,459 MT. The Pondicherry Cooperative Milk Producers Union Ltd., dairy development in the Union Territory has shown a remarkable growth and increase in milk production. Milk production has gone up to 84150 litres per day in 1998 from 15814 litres per day in 1980. Collection of 50000 litres of milk from 110 Primary milk Cooperatives, with in the radius of 30 Km is done under the jurisdiction of the Pondicherry Cooperative Milk Producers Union Ltd.

Poultry has not developed significantly in the Union Territory of Pondicherry. Egg production is estimated at 95.08 lakhs per annum, which accounts for only 20% of the requirement. The remaining 80% demand is met by neighbouring states. Broiler industry is fairly widespread with a capacity ranging from 200 to 1000 birds per unit. Due to the efforts taken by the Department of Animal Husbandry & Animal Welfare, Government of Pondicherry.

2.4 Water resources

Underground water resources in the Union Territory of Pondicherry comprise a very important source for irrigation and drinking purposes. Region-wise analysis of underground water resources is discussed in the following sections.

2.4.1 Pondicherry region

The ground water resources of Muthirapalayam of Pondicherry first came to be utilized as early as in 1863 for providing good drinking water for the people of Pondicherry. The existence of three artesian wells were in continuous operation within a radius of 600 yard close to the sea is recorded in the records of the Government of India. The ground water has been under continuous exploitation for all these years in Pondicherry region. With the improvement in the supply of electricity, tube-wells have been on the increase. Pondicherry town is fed by the water works at Mutirapalayam, Ellapillaichavadi and Muthialpet. The general water table in this region is said to be shallow of about 3 to 4.5 m. It drops down by a

few meters during the lean months. Artesian and sub artesian aquifers are commonly encountered, particularly in the coastal areas between Pondicherry and Cuddalore. Around Pondicherry, Thengaithittu and Ariyankuppam artesian aquifers are encountered at the depths between 20 to 45 m. with many artesian wells around Thengaithittu. The water from these artesian aquifers is generally alkaline with a slight sulphurous smell and is stated to damage the casting pipes leading to collapse of the sides of the tube well and stoppage of flow. Many tube wells, sunk in the past, are so irregularly distributed that some of them do not yield water while adjoining ones are pumped. If this is continued for long, it would lead to localised subsidence and this could be avoided by putting gravel packed wells that are now in vogue.

2.4.2 Karaikal region

Karaikal region gets most of its water for irrigation from Karaikal and as such ground water resources in the region have not been fully developed. The quality of shallow ground water is rather poor. Several attempts were made to tap ground water by means of deep tube wells for drinking and agricultural purposes. Ground water in Karaikal is developed chiefly by means of dug wells or filter point wells piercing blown sands and alluvium. Karaikal town gets its water by means of a battery of shallow interconnected open wells and an infiltration gallery in the bed of the river, Arasalar. A few villages between Akalangannu and Karaikal also get their water supply from this source.

2.4.3 Mahe Region

Depth of the water in the thick alluvium overlying the Laterite, along the river bank varies from 1 to 1.5 m. below ground level and in the Laterite areas it varies from 4.5 to 8.0 m. below the ground level, during the dry months. The salt water intrusion in the near surface aquifer or the dug well zone during the summer months is noticed.

2.4 .4 Yanam region

Yanam region is occupied by the alluvium consisting of sands, clay and gravel. Ground water occurs both as water table and confined conditions in the

granular beds in the alluvial deposits, and is developed by means of shallow filter point wells within a depth of 9 m.

2.5 Political profile

The Union Territory of Pondicherry has an elected democratic government. The Union Territory is legally governed by the Lieutenant Governor who represents the Central Government. There is a council of ministers headed by the Chief Minister who aids and consults the administrator in the exercise of his/ her functions in relation to matters with respect to which Legislative Assembly has powers to make laws. There are thirty members of legislative assembly. Two members of parliament, one each in Lok Sabha and Rajya Sabha, represent the Union Territory of Pondicherry.

The Chief Secretariat deals with all policy matters and corresponds with the Central Government and other State Governments. The Chief Secretary is the head of the Secretariat and is assisted by the Development Commissioner and other secretaries. The officers of the Government are drawn from Indian Administrative Service as well as Pondicherry Civil Service. The outlying regions such as Karaikal, Mahe and Yanam are administered by separate Administrators now re-designated as Regional Executive Officers. These officers exercise a wide range of powers. Though a provision of local government system exists, the elections to commune panchayats were not conducted since 1968.

2.5.1 Administration

The Union Territory of Pondicherry constitutes a single district consisting of 264 census villages, 129 revenue villages in two taluks and four sub-taluks. For the purpose of development administration, the Union Territory is divided into six Blocks consisting of 47 circles of village level units.

The local administration is through panchayats. Pondicherry Panchyats Act of 1973 and Municipalities Act of 1973 came into force in 1974. There are five Municipalities, namely, Pondicherry, Oulguaret, Karaikal, Mahe and Yanam. There are ten Commune Panchayats: five in Pondicherry region: Villianur, Mannadipet, Ariyankuppam, Bahoor and Nettapakkam and five in Karaikal region: Thirunallar, Neravy, Nedungadu, Kottucherry and T.R.Pattinam. Pondicherry region consists of three blocks namely, Ariyankuppam, Ozhugukarai and Villianur. Karaikal, Yanam and Mahe regions have one block each. Elections to local bodies were not conducted since 1968.

3. CURRENT (KNOWN) RANGE AND STATUS OF BIODIVERSITY

3.1 Floral diversity in the Union Territory of Pondicherry

The flora of Pondicherry has a remarkable diversity which may be attributed to the diverse soil types comprising the hydromorph soil (rich in clay), the halomorphic soils (terrains more or less saltish), the sand dunes and the very dry soils developed on the red sand stones of Kalapet, Dhanvantri nagar (Gorimedu) and Ousteri in Pondicherry. The red sand stones are unknown in Karaikal and Yanam. Added to this, a large number of exotic varieties were introduced by the Europeans in the course of last three centuries. This ecological diversity is reflected in the land use. There are no significant studies enlisting various algae, fungi, bryophytes, pteridophytes, micro-organisms and wildlife. The flora is listed under six categories, viz., hydrophytes, halophytes, plants of sandstones, avenue trees, hedge plants and ornamental plants. Complete current information on flora of Pondicherry is lacking. However, a preliminary exhaustive check list of the flora of Pondicherry region prepared by Balachandran, N. and Kichenamourthy, S. is being presented for the first time in this document. (Section 12. 4.) A list of rare, endangered and threatened plants in Pondicherry region prepared by Balachandran are also given in Section 12. 5.

3.1.1 Hydrophytes

Two species of the family Nymphaeceae with large floating leaves, *Nymphaea stellata* and *Nymphaea nouchali* are very common in ponds or pools with still water surface. *Nelumbium speciosum* is the biggest Nymphaceae with floating leaves. Sacred lotus is cultivated in some gardens. More striking vegetation is *Eichornia crassipes*. (Tamil-Akasathamarai) and *Lemna polyrrhiza*, with very tiny floating green plants covering the entire surface of small pools. The tall *Vetiveria zizanioides* (Tamil-Vettiver) with big tuffs of leaves could also be spotted in these regions. One of the most characteristic species is a small bamboo called *Arundo donax.*

3.1.2 Halophytes

The halomorphic soils are alluvial which may be periodically inundated by a film of brackish water. These salty terrains are sandy and clayish. Their flora is particularly well represented in the neighbourhood of lagoons in the south Pondicherry town. The vegetation consists of three species of Cyperaceae and three of Poaceae. viz., *Fimbristylis spathacea, Kyllinga monocephala*-(Tamil-Muttaikkorai) *Cyperus arenarius, Eragrostis riparia, Tragus biflorus* are more common. In Ariyankuppam area one would come across a good number of herbaceous or semi woody species tolerating the slightly saltish soils: *Portulaca pilosa, Pedalium murex, Ludwegia perennis, Corchorus actuangulus* and *Pupalia lappacea* are present. With the decrease in the clay content of the soil, the floristic composition changes. Plants like *Boerhaavia diffusa* (Tamil-Sattaranai), *Physalis minima* (Tamil-Thakkali), *Acalypha indica, Leucas aspera* (Tamil-Thumbai), *Commelina benghalensis* (Tamil-Kanavalai), *Chloris barbata*, (Tamil-Mayil Kondai Pul) *Brachiaria distachya*, *Tridax procumbens, Emelia sonchifolia, Eclipta alba*, (Tamil-Karisalankanni), *Vernonia cinerea*, *Sida cordata* (Tamil-Tutti), and *Crotalaria verrucosa* (Tamil-Gilugilupai) are seen.

3.1.3 Plants of the sand-dunes

The woody plant group noticed near the sea is *Casuarina spp.* and *Eucalyptus spp.* They are grown along the sea coast and are mostly cultivated for fire wood. Among the herbs growing on the sand are *Spinifex littoreus, Ipomea pes-caprae, Bulbostylis barbata*, and *Gisekia pharnaceoides.*

3.1.4 Plants of sandstones

The vegetative landscape of Pondicherry is essentially composed of tall palms. *Borassus flabellifer* (Panai maram-Tamil), *Phoenix sylvestris* (Ichai maram- Tamil), *Phoenix humilis var pedunculata* (Kattu-Ichai maram-Tamil) and cashew tree *Anacardium occidentale* (Mundri-Tamil).

3.1.5 Avenue trees

The trees growing along the road-sides are considerably rich in woody species. They consist of a number of very beautiful trees, some of them are with straight and regular trunks reaching upto 20 mts. and others are with shorter trunks

but of great economic and ecological value. Commonly existing road side trees are *Azadirachta indica* (Tamil-Veppa maram), *Ficus benghalensis* (Tamil-Ala maram), *Ficus religiosa* (Tamil-Arasa maram), *Samanea saman* (Tamil–Thoongumungi maram), *Tamarindus indica* (Tamil – Pulia maram), *Thespesia populnea* (Tamil–Poovarasu maram), *Delonix regia* (Tamil-Sigappu konnai maram), *Peltophorum pterocarpum* (Tamil–Manjakondrai), *Madhuca longifolia* (Tamil-Eluppai maram), *Syzygium cumini* (Tamil–Naval maram), *Ficus glomerata* (Tamil–Athi maram) *Albizia lebbeck* (Tamil–Vagai) etc.

3.1.6 Hedge plants

The common hedge plants grown in Pondicherry region are, *Justicia adhathoda* (Tamil–Adatodai), *Ipomea carnea* (Tamil-Neyveli Kattamanakku), *Jatropha curcas* (Tamil-Kattu amanaku) *Opuntia dillenii* (Tamil–Nakatali), *Euphorbia antiquorum* (Tamil–Sadurakkalli), *Agave sisalana* (Tamil-Kathalai), *Lantana camara* (Tamil-Unnichedi), *Vitex negundo* (Tamil–Nochi), *Ricinus communis* (Tamil–Amanaku), *Pedilanthus tithymaloides* (Tamil- Kannadi kalli) etc.

3.1.7 Ornamental plants

The ornamental plants grown in the gardens, parks and backyards for ornamental and economical purposes are: *Caryota urens* (Tamil–Koondhal panai maram), *Corypha umbraculifera* (Tamil–Kudaippanai), *Areca catechu* (Tamil-Pakku maram), *Borassus flabellifer* (Tamil-Panai maram), *Cocos nucifera* (Tamil–Thennai maram), *Pandanus tectorius* (Tamil-Thazai maram), *Moringa oleifera* (Tamil–Murangai) *Allamanda cathartica* (Tamil-Manjal patti) *Antigonon leptopus, Bougainvillaea spectabilis* (Tamil– Kahithapoo), *Hibiscus rosa-sinensis* (Tamil–Sembaruthi), *Caesalpinia pulcherrima* (Tamil–Mayilkondrai), *Lawsonia inermis* (Tamil-Maruthondri), *Plumeria alba* (Tamil–Alari), *Quisqualis indica* (Tamil–Rangoon malligai), *Jasminum grandiflorum* (Tamil–Malligai), *Polyalthia longifolia* (Tamil–Asoka maram), *Nyctanthes arbor- tristis* (Tamil–Pavazhamalli) *Rosa damascana* (Tamil–Roja), *Michelia champaca* (Tamil–Shenbaga maram) etc.

3.2 Mangrove vegetation

Species diversity of mangroves is very much limited in Pondicherry region. It is present in the estuaries and the riverine sides of Ariyankuppam river and Malattar. A well developed *Avicennia* patch is present in Thengaithittu and Murthikuppam.

Avicennia and *Clerodendrum* are present in all the deltaic regions of Pondicherry region. However, only *Excoecaria* in Murthiuppam river and *Bruguiera* at Ariyankuppam are only seen in this area. *Rhizophora* is found on the sides of Ariyankuppam bridge and in Veerampattinam region in Pondicherry. It is observed that a few birds like common myna, pied kingfisher, little egret, median egret, common sand piper and red wattled lapwing are commonly noticed in the *Avicennia* patch near Thengaithittu. The wildlife in mangroves include insects, molluscs, edible fishes, prawns, amphibians, reptiles and even microscopic plankton.

The existing mangrove species and associated species in Pondicherry region are *Avicennia marina, Avicennia officinalis, Bruguiera cylindrica, Rhizophora apiculata, Rhizophora mucronata, Excoecaria agallocha, Acanthus ilicifolius, Clerodendrum inerme, Hibiscus tiliaceaous, Pandanus tectorius, Suaeda martima, Suaeda monoica* and *Sesuvium portulacastrum.*

Karaikal region is situated in the Kaveri delta. The natural vegetation consists of numerous plants of littoral regions which could tolerate the briny sand or the brackish water. The mangroves are seen naturally in the estuary of the river, Arasalar. Mangroves like *Avicennia officinalis, Bruguiera cylindrica, Rhizophora apiculata, Excoecaria agallocha, Acanthus ilicifolius, Clerodendrum inerme, Pandanus tectorius* and *Sesuvium portulacastrum* are seen.

Yanam region, situated in the delta of the river Godavari, dense mangrove vegetations are seen abundantly in the Griyampetta islands. Species like *Avicennia marina, Avicennia officinalis, Avicennia alba, Excoecaria agallocha, Bruguiera cylindrica, Bruguiera gymnorhiza, Rhizophora apiculata, Kandelia candel, Lumnitzera racemosa, Acanthus ilicifolius, Suaeda martima, Suaeda monoica, Sarcostemma sp., Cassia sp., Derris trifoliata etc.,* are seen.

The mangrove vegetation in the Union Territory of Pondicherry is under threat due to continued encroachment and deforestation. Satellite imaginaries have confirmed the loss of mangrove vegetation of Pondicherry.

3.3 Sacred groves

Pondicherry bio-region with a land mass of 293 Sq. Km, devoid of natural forest, has been bestowed with patches of sacred groves which may be termed as

natural islands of climax vegetation, maintained and preserved for centuries in the name of the God and usually looked after by the local communities.

The sacred groves are known as "Koilkaddu" in Tamil Nadu and Pondicherry. The presiding deity of sacred groves is Aiyanar in the centre, flanked by his two consorts Poorani and Porkalai in a stone slab. Terracotta images of horses and elephants are also seen which are generally offered by the people who conduct annual festivals. The temple structures had been started without any images, then a stone slab with images were housed and later they were built in a big way after clearing existing vegetation. From the environmental point of view small patches of forest were often left untouched, because people repose immense faith in the God and believe that the God will be infuriated if the vegetation or the wild animals are harmed. These groves have been facing destruction due to modern developmental activities and anthropoic pressures in the form of timber extraction, fuel wood collection, collection of medicinal plants and encroachment of land for agricultural thrashing. Recent enumeration of sacred groves in Pondicherry region has revealed that it possess nearly 250 species of higher plants. The distribution of species vary from one grove to the other. Despite signs of degradation, they harbour some rare, endangered and threatened plants like *Derris ovalifolia* of Fabaceae which has been rediscovered after a century. *Santalum album* of Santalaceae, which is a threatened taxon, is seen in Pooranankuppam and Sedarapet groves of Pondicherry. *Mallotus philippensis* of Euphorbiaceae and *Agalaia elaeagnoidea* of Meliaceae, which are mountainous ever-green species are seen in Pondicherry.

Tropical dry evergreen species *like Atlantia monophylla, Pamburus missionsis, Glycosmis pentaphyla,, Lepisanthus tetraphylla, Diosypyros ebnum* are also generally seen in some of the sacred groves. *Amorphophalus sylvaticus,* an endangered species, has found asylum in Karasur grove. The regionally threatened taxa namely, *Gloriosa superba* and *Gymnema sylvestre* of high medicinal value are seen as a part of ground vegetation in a couple of sacred groves. Valuable medicinal tree, *Crateva religiosa* and *Salvadora persica* are found in good population in sacred grove in Kizhur. The lianas such as *Combretum ovalifolium, Derris scandens* and *Derris ovalifolia* are present in the sacred groves. *Dioscorea oppositifolia* and *Dioscorea pentaphylla* which have been over exploited for the medicinal purposes resulting in endangered category, are also seen in some of the sacred groves. The

sacred groves in Mahe region are known as Ayyappan Kavu, which are maintained by the local trusties. The sacred groves in Pandakkal and Chembara of Mahe is of dense vegetation.

3.4. Medicinal plants

Availability of raw materials obtained from the medicinal plants is most essential to provide quality medicine. Therefore, increasing the availability of medicinal plants is very important. A reference centre of medicinal plants is functioning in Madagadipet village near Pondicherry. The following medicinal plants are threatened in the wild.

1. *Alpinia galanga,* 2. *Acorus calamus,* 3. *Gloriosa superba*, 4. *Ormocarpum sennoides,* 5. *Saraca asoca,* 6. *Amorphallus sylvaticus.*

3.5 Forestry

Union Territory of Pondicherry does not have forest resources in abundance and in fact there is no recorded forest area in Pondicherry except the Swadeshi Mills Campus where rich biodiversity was protected accidentally. A list of species diversity is given in Section 12. 6. During the BSAP process, a part of the compound was cleared and was given for construction of court complex. This action has caused much damage to the biodiversity of the only known forest area of the Union Territory of Pondicherry. The foregoing description does not in any way provide a comprehensive account of the current status of biodiversity of the Union Territory of Pondicherry. There are no published exhaustive check lists of plants, animals and microbes. No data is available elucidating the damage done to the plant and animal biodiversity in the past years. It is noteworthy that though there is no forest in the Union Territory of Pondicherry, sixty saw mills, four mills for sandal wood oil extraction and four camphor units have been operating in the Union Territory of Pondicherry. Obviously these activities have been detrimental to the biodiversity of Pondicherry and the neighbouring states.

3.6 Social forestry

Social forestry can aptly be defined as forestry of the people, by the people and for the people. Since September 1986 social forestry programmes have been implemented by the Department of Agriculture, Local Administration Department, Animal Husbandry Department and the Public Works Department in

Pondicherry. The Local Administration Department planted trees in their own land, while the Animal Husbandry Department planted trees in Ossudu and Bahour regions and Public Works Department planted trees along the road sides and on the banks of the tanks. Though many departments were involved in this programme, complete data of the status was not made available.

In the national level there is no projection of green cover status of the Union Territory of Pondicherry because of the non-availability of forest area in Union Territory of Pondicherry as well as any data on other plantations in complete shape. In the year 1997 a separate Department of Forests & Wildlife was created. Now the department feels that there should be complete data on plantations, done by different departments/ institutions/ quasi-government/ organizations/ individuals to focus it at the national level. The Forest Department is very enthusiastic about taking up various projects in order to produce documentation on forests and forestry activities.

3.7 Wild animals diversity

Wild animal population in Pondicherry comprises small mammals, birds, reptiles and amphibians as well as insects, but vivid data is not available. Some birds may be spotted in Pondicherry near wet lands, such as tanks, well wooded areas such as Botanical Garden. Two of the tanks, viz. Oussudu and Bahour tanks, have been declared to be areas closed for hunting under Wildlife Protection Act (1972) Bird population at Oussudu has been surveyed in the past during winter season but no other study is available to indicate details of native and migratory bird diversity. However, instances of poaching of animals by nomadics and tribes from neighbouring Tamil Nadu state are reported.

3.7.1 Status of wildlife in the Union Territory of Pondicherry

Though Pondicherry is neither having reserve forest nor scrub jungle to support wild animals, it has wetlands such as Ousteri and Bahour Tank (fresh water), the marshy area near light house (brackish water) and extended backwaters found in Karaikal, which attract huge number of migratory water birds, both migrants and residents. They mainly include ducks, teals, pochards waders which are mainly coming from very far off places mostly from north and central Siberia. These water fowls arrive here in late August and early September and depart in

mid April after spending their winter in India. (Section 12.7-list of birds) The following wild animals, other than birds have been in this state: jackal, black napped hare, bonnet macaque, jungle cat, civet cat, mongoose, monitor lizard, olive ridley turtle and leather backed turtle. (Section 12. 8-list of animal biodiversity)

The endangered marine reptiles like olive ridley turtle and leather backed turtle have been breeding along the shores of Pondicherry and Karaikal. Among the birds, the rare birds like pelican, white necked stork and glossy ibis have been recorded in Ousteri tank. The crested pochard, which is considered to be rare species in South India, is found in thousands in Kaliveli tank of nearby Tamil Nadu state and in hundreds in Ousteri tank in Pondicherry. However, the birds population has been going steeply down during the past several years.

3.8. Marine biodiversity

Pondicherry territories are situated on the coast and quite a sizeable population depends on the exploitation of marine resources. Over exploitation of fisheries has major impact on marine biodiversity leading to impoverishment of stocks on target species. This can have a knock- on effects to other aspects of the marine ecosystem, including its productive capacities. However fisheries being an open access and mobile resource makes the definition and enforcement of limits problematic. The major varieties of fishes landed during different months are listed below. A check list of fishes is also given in Section 12.9.

Type of fish		**Month of catching**
Sardines	:	October to April.
Anchovies	:	May to November.
Seer fish	:	October to March.
Flying fish	:	May to July.
Silver bellies	:	August to April.
Shrimps	:	January to August.

Studies on the diversity of other marine animals restricted to Pondicherry coast are not systematically done. However, documentation of biodiversity of crustaceans on Pondicherry and Karaikal coasts have been done (Kumaran, 2001).The study revealed the presence of 61 species. However, their distribution varied from one study station to the other. In general, the species belonging to the sub class Cirripedia and Malacostraea were reported in the coastal regions of Pondicherry and Karaikal .The number of species displayed seasonal variation. The crustacean population was found to be severely reduced at Vaithikuppam area of Pondicherry coast, which is under severe pollution stress due to discharge of polluted water into the sea.

4. STATEMENT OF PROBLEMS RELATING TO BIODIVERSITY

4.1 Root causes for the loss of biodiversity

Biodiversity is not evenly distributed around the world. The single most obvious pattern in the global distribution of species is the overall increase in species richness as latitude decreases toward the equator. Biodiversity of any area is particularly relevant to food production, which can be considered in terms of the quality of wild foods gathered and trapped, hunted or fished, as well as the range of crop and stock varieties bred and maintained to support livelihoods. Genetic biodiversity is also crucial in conferring resilience on crops and stock for farmers who cannot afford to buy pesticides, fertilizers and other inputs. The intrinsic worth of biodiversity is enough for some people to leave it untouched and to recognize its existence value. But this is not happening, and serious threats have come in to the biodiversity. The root causes for the losses of biodiversity may be direct or indirect. Some of them in the context of Pondicherry are discussed below.

4.2 Loss of genetic diversity

In Pondicherry, the direct cause of genetic erosion is due to spread of modern, commercial agriculture, which includes conversion to monocultures. The introduction of new crop varieties has led to replacement and loss of traditional crop varieties developed by the subsistence farmers for their high variability. In Pondicherry at least a few rice varieties have become extinct in the past two decades or, not cultivated because of its low yield potentials. Similarly several breeds of livestock should also have become extinct or threatened. This indicates that the genetic base on which production systems rely is being eroded through loss of local varieties of crops and breeds of livestock.

Records of other causes of genetic erosion include destruction of even little forest and bush lands. Linked with these losses, loss of vital knowledge about how different varieties and breeds were produced and when they would best flourish. Even more genetic material is lost when species go extinct. The major loss is due to human-induced mass extinctions. Habitat loss is held to be the main direct cause of species loss.

Degradation of habitats through unsustainable harvesting of plants and animals have been noted. For example, because of high trade demand is commercial exploitation of several trees, many tree species are declining due to unsustainable felling. Alien species are

cited as the most common cause of mammal extinctions, accounting to 40% of disappearance where the cause of extinction has been determined. (Groombridge, 1992)

Ecosystems and habitats can be lost entirely, degraded or fragmented if proper care is not taken immediately. The most common cause of terrestrial wild land ecosystem loss is its conversion to farming, urban development and infrastructure, and over-exploitation of ecosystem resources, Natural disasters such as floods and fires, also do great damage to biodiversity. Other than the direct root causes for the loss of biodiversity as mentioned above, certain general underlying factors can also be applied to Pondicherry region. These factors are interrelated, and have indirect variable impacts. (Wood et al., 2000).

Population growth, distribution and migration patterns are significant factors in the degradation of environment and loss of biodiversity. Right now there are two billion people in the world and the number grows by 1.4 per cent per year. Mass movement and migration can damage biodiversity. Poverty and inequality are other root causes for loss of biodiversity. Poor and weak mostly migrate to marginal lands where conversion to agriculture results in loss of biodiversity. Non-participatory management of natural resources have been very damaging to biodiversity.

National policies including macro-economic policies and trade practices have resulted in constant loss of biodiversity for various reasons. For example, subsidies have resulted in unsustainable development. Environment laws are weak or not enforced.

Environmental impact studies have not been carried out and Government agencies with responsibility for environment and natural resources management are under- staffed and under-resourced. Ultimately biodiversity management is hindered by lack of knowledge and ignorance of how human use and management systems affect different ecosystems. Lack of awareness and pre-sights and callous attitude towards nature as well as lack of criteria for economic evolution of bio-resources constitute the core from which many negative impacts on biodiversity conservation emerge. It is, therefore, important to identify the factors affecting the biodiversity and then to suggest the solutions.

4.3 Agriculture

Eversince 1958–59 the area put under plough in Pondicherry has been gradually decreasing, while the area sown more than once has been steadily on the increase over a period of preceding two decades and then started declining or

stabilizing in comparison with the net area cultivated. With the increase in the intensity of cropping, there has been continuous depletion of soil resources, particularly, the major plant nutrients as well as micro-nutrients. To replenish these nutrient resources, huge quantities of chemical fertilizers are applied to the soil continuously for years together, thereby changing the soil reaction constantly in terms of soil pH, which is one of the reasons for inhibiting the survival of the micro-flora and micro-fauna of the soil.

It is observed that there has been a drastic reduction in the area irrigated by surface water resources and there has been a corresponding increase in the area irrigated by ground water sources through the net work of bore wells. Consequently, large quantities of soluble salts including toxic substances like sulphides and iron compounds are increasingly brought about and deposited on the soil surface which are also responsible for inhibiting the growth of micro organisms to a larger extent. Normally, fallowing of cultivable lands for a specific length of period is a desirable agronomic practice to enable the soil to replenish its wear and tear and to recoup the plant nutrient resources for supporting the crop growth in the succeeding years. The statistics reveal that even though that the current fallow other fallows and culturable waste are gradually increasing year after year, there is no restoration of cultivable land. It reveals the fact that these fallowing lands are nothing but unauthorized conversion of land use from agriculture to non agriculture uses like housing etc., which have become irreversible.

4.3.1 Over-exploitation of ground water resources

Due to poor maintenance of irrigation tanks in Pondicherry region the entire burden of irrigation of all crops fell on ground water resources. Apart from this, the requirement of drinking water and industries are also met from the ground water resources. The net result is depletion of ground water resources and decline of water table in the coastal aquifers and salinisation of aquifers due to salt water intrusion. The water table has declined by 5 to 23 m. from the east to the north west of Pondicherry region between 1981 and 2001.

There is a telling effect on agriculture biodiversity due to over-exploitation of water resources and the damage caused to the coastal aquifers has become irreversible. If the trend continues, the agriculture activities within Pondicherry

region will be seriously affected with salt water intrusion and probably no irrigated crops could be grown with ground water in future.

Around 84 irrigation tanks are expected to be rehabilitated by the end of December 2004, under Tank Rehabilitation Project (The European Union aided Project), which would be able to irrigate 6000 Ha at least for one crop. Apart from this, there would be enhanced recharge of the ground water aquifers by not using the tube wells and from the return flows of the irrigated fields under the tank command areas. In order to conserve the ground water resources, field schools are conducted in the villages in participatory mode in crop water management and thereby awareness is created among the farmers to use water for irrigation of crops judiciously.

4.3.2 Excessive use of pesticides

After the introduction of high yielding varieties from 1960s, the need for applying external inputs like chemical fertilisers and usages of pesticides for control of pest and diseases to get better productive in rice crop was inevitable. Extensive cultivation of paddy crop was undertaken in the Union Territory of Pondicherry for the past 25 years. Single crop had become as double crop and triple crop in this region and a stage has come now with plateuing yields in rice crop. Extensive damage done to the micro environment of the agriculture fields by destroying predators, while controlling pest and diseases, caused total imbalance of various organisms in the field of agriculture biodiversity.

To tackle the above said issues, the Department of Agriculture has conducted a detailed soil survey in the Union Territory of Pondicherry and the same has been documented. A detailed study of the status of micronutrients available in the soils of Pondicherry region was conducted and documented. Inputs like green manure seeds, biofertilizer and enriched compost, neem cake and micronutrients are made available to the farmers at 75% and 50% subsidized cost. Integrated Pest Management practices are strongly advised to the farmers. Non-availability of adequate quantity of the raw material like garbage for the preparation of enriched compost and the inputs like green manure seeds for timely distribution to the farmers are some of the major gaps which are inhibiting the desired level of achievements.

4.4 Marine animals diversity

Pondicherry has a significant long coastline of 45 Km. Issues pertaining to conservation of marine life (marine animals and plants) need to be identified and a conservation strategy developed. In fact little data are available in this regard as far as Pondicherry is concerned.

Beach erosion is also one of the threats to nesting habitats of the turtles along the Pondicherry coast. Because of the shore erosion the slope of the beach has become a hindrance for the upward movement of the turtle from the high tide water mark. Beach erosion is intensive along the beaches of Moorthikuppam and between Kanagachettykulam and Kalapet villages.

Fearing the possible loss of buildings due to erosion, the use of many methods to stabilize beaches have started. Along the Pondicherry coast, government has put up erosion preventive embankments by piling large stones all along the coast from the new harbour area to Vaithikuppam which makes the nesting habitat unavailable to the turtles. One of the major threats to the turtle nesting habitat is the violation of the Environmental Conservation Act which prohibits the construction/ establishment of any sort of buildings on the shore within 500 m. from the high tide water mark. But contrastingly in earlier times, most of the buildings were constructed on the shore. In certain places, most of the houses and beach resorts are located with in 100 - 300 m. from the seashore. The other threats identified are disturbances and predators. Now a days, the sea shore is always bustling with the activities by fishermen throughout night due to different methods of fishing which they adopt, such as "crab fishing" by burning torches with burning cycle tyres. The internal conflicts and disturbances between the neighbouring groups of the nearby fishing villages is a common feature. The beaching of the catamarans all along the beaches near their settlements is a common sight which completely occupies the nestling areas available to the turtles. Artificial lights and the menace of the feral dogs have been an perennial threat to the nesting turtles.

4.5 Animal husbandry

Union Territory of Pondicherry does not have its own native breed of livestock. Most of them are from the neighbouring state of Tamil Nadu. The loss of domesticated animals which are better adopted to local stress conditions is mainly due the policy of

introduction of white revolution and produce more milk and eggs/ meat and other animal products resulting in wide scale hybridization.

4.6 Pollution

Unplanned development of Pondicherry has created serious environmental problems, leading to lowering of living standards. Scarcities of basic requirements like drinking water, proper drainage facilities for waste water, inadequate sewage treatment and disposal facility has put Union Territory of Pondicherry environmentally in tight spot. The rate of increase in population in Pondicherry has been very high as compared to other parts of the country. Literacy rate and per capita income are of course also high. Initially agriculture and fishing formed the major source of income but the trend has shifted to industrialisation due to tax concessions and availability of various civic and public amenities in this small territory.

Rampant industrialisation and urbanisation have been very important causes for putting pressure on natural resources and also causing environmental degradation. Eventhough the contribution of industries to the environmental problems of Pondicherry is high, there are other factors also contributing substantially to environmental problems. These factors are the result of population growth and the deficiency of infrastructure needed to cater to the ever growing population of the Union Territory of Pondicherry. Some of the other factors which contribute to environmental degradation in Pondicherry are the absence of proper facilities for the treatment and disposal of domestic waste-water, municipal solid waste, bio-medical waste and industrial effluent discharges.

Industries are periodically monitored by the pollution control committee to check the status of air pollution control devices and effluent treatment plants from the stage of establishment of an industry. Besides residential houses, waste generation sources in Pondicherry region are big market, bus stand, hotels and restaurants, marriage halls, government offices, gardens, cattle waste, building construction sites and hospitals.

4.6.1 Consequences of open drainage

Escherichia coli and related organisms designated as coliforms, fecal streptococci and *Clostridium perfringens* are normal inhabitants of the large intestine of the man and other animals. Thus the presence of any of these bacterial species in water is evidence of excreta or fecal pollution of human or animal origin. Sewage containing human

excreta, however is the most dangerous material that pollutes the water, people with communicable disease of many eliminate the causative organisms in their excreta. The most important microbial, communicable diseases transmitted through polluted water are typhoid, paratyphoid, amoebic dysentery, bacillary dysentery, cholera and infective hepatitis.

4.6.2 Effect of drain clogging and overflow

During monsoon season, the clogging and overflow of drains is observed in Pondicherry, not only during monsoon, but also, now and then drains get clogged and cause overflow. This is because of the dumping of garbage, plastics etc. into the gutter. The clogging of drain leads to foul smell and also provides conditions inevitable for breeding of vectors. Because of this condition, many diseases like malaria, filaria, dengue fever, viral fever, brain fever are reported.

4.6.3 Solid waste management

The present system of primary collection of garbage is through bins. About 500 numbers of dust bins are kept in residential areas for collection of wastes. The streets are swept and handcarts collect the garbage which is removed from these areas daily in handcarts or motorized vehicles. On special occasions and as and when necessity arises, shift system is followed to clear the accumulated garbage. Finally the garbage is transported and dumped near the new lighthouse. Many land-fills have also been receiving household garbage. Private contractors are also involved in the removal of garbage in five selected wards in Nellithope constituency. The work done by these private contractors is more effective and satisfactory than that of Municipality involved in the removal of garbage. Domestic households are the main source of waste generation in Oulgaret Municipality. These households contribute to major portion of the total waste generated in the town. In addition to this, commercial establishments and waste from drain cleaners and street sweepings contribute to the remaining waste.

The Municipality had some time back introduced a scheme of door to door collection of garbage which is found to be very much satisfactory and is welcomed by the public. Under this scheme in selected areas, the residents keep the garbage in their containers. The collection carts go round the areas covering each street ringing bell and on hearing the bells the residents come and empty their garbage into the collection carts.

These collection carts empty the garbage in motorized vehicles through which the garbage is transported and dumped in Mettupalayam behind the industrial estate or used for land-fills. There are two common solid waste dumping sites for the Pondicherry and Oulgaret Municipalities, respectively. As such, at present there is no treatment of solid waste done at these common dumping sites. Improper handling of solid waste is a health hazard and causes damage to the environment. The main risks to human health arise from the breeding of disease vectors, like flies and rats.

4.6.4 Air pollution

The rapid increase of the city with industrial, commercial and day to day activities has caused an explosive growth in the vehicular population. As in other parts of the country, the trend in increasing vehicle population is the same in Pondicherry also year after year. Pollutants emerging from automobile exhausts draw the attention of scientists, technologists and communities primarily because these pollutants contribute to photochemical smog and significantly to air pollution. Motor vehicles traffic is the major and most important source of pollution in Pondicherry. Many of the heavy polluting public transport vehicles (tempos) are still allowed to operate in the city limits.

4.6.5 Biomedical waste management

Rampant proliferation of health care system in the form of hospitals, dispensaries, nursing homes etc., and improper disposal of waste from slaughter houses have been causing increased production of biomedical wastes. Exposure to improperly handled bio-medical waste causes communicable diseases in humans and animals. Skin contact, injection and inhalation are possible routes of exposure, which could cause chronic effects and acute health problems. Hepatitis B and AIDS are two such blood borne infectious diseases which could spread if bio-medical waste is not properly treated. As such there is an urgent need to plan and implement updated procedures at different levels for the management of medical wastes like storage, segregation, transfer, treatment and disposal.

There is no uniform method for the disposal of biomedical waste. Since there is no special mode to transport health care waste, workers who are employed by the municipality for handling municipal wastes are also engaged for the collection, transport and disposal of hospital waste. At present, due to non-segregation of the garbage, hospital garbage gets mixed with general garbage in the city and since the organic content of domestic garbage is

high there may be chances for contamination of all the waste. In majority of the health care establishments the garbage is collected in plastic bags but colour coding and labelling of containers is not followed in most of the places except in Jawaharlal Institute of Postgraduate Medical Education and Research (JIPMER) and Vector Control Research Centre (VCRC).

4.6.6 Slaughter house waste

Pondicherry town has only one slaughter house at Dr. Ambedkar Nagar under the control of Pondicherry Municipality. Oulgaret Municipality has a proposal to establish another slaughter house. However, in every locality make-shift slaughter places are increasing and slaughtering of the animals is being done in vacant plots, road sides or near drainage canals.

A veterinary doctor controls the official slaughter house and slaughtering is done under supervision in the slaughter house. As per IS 4393 – 1979, the slaughter halls and ancillary accommodation rules are being followed. It is noteworthy that the make shift slaughter places are uncontrolled and pose a great health hazard. The number of such slaughter places have been increasing over the past years. In the slaughter house, little wastewater is generated. Spillage of body fluids is being washed and cleaned using bleaching powder and discharged into the upper canal. This drainage also carries the domestic sewage A part of the Pondicherry waste water is let out into this canal and it reaches the sea. At present, the slaughter house waste is being let out into municipal sewer, without any treatment. Before being let out into the sewer, the slaughter house waste should under go primary treatment such as screening, oil and grease separation etc. Solid waste generated by goat, sheep, and large animals from the slaughter house is nearly 200 to 250 kg per day. These solid wastes are purely organic. Hence, they are collected separately and dumped in the manure pit. After accumulation of a certain load it is auctioned to the public and used as manure.

4.6.7 Non-biodegradable waste

The biodiversity of Pondicherry has been severely threatened with rampant usage and uncared disposal of the plastic bags. The disposal of plastics along with garbage in land fills make the land unfit for supporting any plantations. The death of many animals due to consumption of plastics and environmental degradation due to burning of plastics is

a very serious problem. Many areas like Rainbow Nagar, Hundred Feet Road etc., give a coloured look due to presence of plastic bags all around. Clogging of sewage system due to plastic bags is a serious threat to health, environment and biodiversity. It is high time that the government addresses this problem.

4.6.8 Vehicular pollution

Normal air pollution caused due to vehicular movement on the road leads to generation of dust including suspended particulate matter (SPM) from the roads and emission of gaseous pollutants such as SO_2, NOx, CO and Pb from the exhaust of the vehicles. Apart from this, pollution also results due to spillage of diesel, petrol, lubricants, etc. on the roads. Ambient air quality was monitored in eight locations in the city for suspended particulate matter (SPM), SO_2, NOx, and lead. During day time (10 hours to 18 hours) 8 hourly monitoring was conducted near Old Bus Stand, near Patel Petrol Bunk, near Vasanthi Petrol Bunk, near Swadeshi cotton Mill, East coast road Kalapet, Indira Gandhi Statue, Ashram Petrol Bunk, Indira Nagar, Gorimedu.

4.6.9 Respirable particulate matter

Ambient air, quality monitoring was conducted to find out the respirable particulate matter in the ambient air, in the following four locations: Near Indira Gandhi Statue, Bus Stand, traffic signals near Muruga and Raja Theatres. The SO_2 and NOx were also monitored in the four locations. The respirable particulate matter and total suspended particulate matter were found to be above the standard limit, which is mainly due to the more number of automobiles plying in these areas. However, the SO_2 and NOx values are found to be within the standard limits in these areas. The SO_2 concentration in ambient air was found to be satisfactory in all the 8 monitored locations well within the stipulated standards limits. The oxides of nitrogen concentration were found to be slightly higher in the two locations. East Coast Road, Kalapet the NOx concentration is 86.33 ③g/m^3 and near Ashram Petrol Bunk the value was 82.53③g/m^3.

4.7 Other activities

Due to low tax structure in Pondicherry, there has been indiscriminate construction and tourist activities which have caused severe damage to biodiversity.

4.7.1 Town and country planning

Pondicherry has witnessed extraordinary growth in urban population. Growth of human population, heavy impact of economic activity, rapid urbanization, enormous increase in pollution have been causing habitat destruction. With the increase in population, many agricultural lands have been converted into housing and industrial sites. Trees around houses, schools and public places have been removed to construct buildings and highways. With the growth of the Pondicherry town, the vegetation has decreased and pollution has increased. The automobile exhausts greatly damage the road side vegetation. The vegetation has also undergone a drastic change in composition and character. Urbanization has thus changed the dynamics of natural vegetation in Pondicherry during the last few decades.

4.7.2 Tourism

Pondicherry having remained capital of the erstwhile French India, the city's cultural legacy has a unique hue to it, not to be found anywhere else in the country. Like most ancient cities, the origin of Pondicherry lies buried in legends. Excavations in the Arikamedu area, near Pondicherry, have brought to light, the remains of the trading port, which had connections with the Greco-Roman world, more than a century before the dawn of the Christian era. The glorious remains of Arikamedu are on display in the archaeology section of the Pondicherry museum.

Pondicherry has always been able to attract various types of tourists. Sri Aurobindo Ashram and Auroville (Tamil Nadu) attracts tourists who are looking for spiritual solace. The unique French culture, still preserved in Pondicherry town, also brings tourists from various parts of the country and abroad who are interested in seeing the cross-cultural differences. The other kind of 'tourists' who have been coming to Pondicherry are for cheap liquor and cheaper commodities due to differential in tax structure. This floating population has been a cause of loss of biodiversity and heritage damage in Pondicherry. However, with the introduction of uniform sales tax on various items since the year 2000, the number of such type of 'tourists' has come down and the various sectors associated with hospitality industry are feeling the pinch. The Government is trying to redefine its tourism policy and showcasing Pondicherry for tourists. A small but beautiful coastline and backwaters are being targeted as tourist attractions. The Government is also preparing itself for getting the town declared as an "International Heritage" spot. In addition the

Government is projecting eco-tourism as the focus not only for Pondicherry town but also for Karaikal and Yanam. In this process Pondicherry hosted a shopping festival during December 2001- January 2002. It did attract people from neighbouring places to visit Pondicherry and Karaikal. At Karaikal and Pondicherry, the government has been planning facilities for water sports and water rides. Such projects will be of benefit to Pondicherry, only when tourist activities are regulated and are eco friendly.

5. MAJOR ACTORS AND THEIR CURRENT ROLES RELEVANT TO BIODIVERSITY

For the successful conservation of biodiversity, a holistic approach is needed with the cooperation of several related Government Departments, Educational Institutions with like-minded academicians, scholars, scientists and NGOs and above all, the public. In this connection certain departments have to play a major and proactive role for the successful implementation of biodiversity action plan.

5.1 Department of Agriculture

Agriculture has the closest relationship with the biodiversity conservation. The Union Territory of Pondicherry has made rapid growth in agriculture production and productivity by the application of science and technology, exploitation of irrigation potential and creation of necessary infrastructure for facilitating the development, dissemination and adoption of improved agricultural technologies. However, promotion of high yielding crop varieties have led to the loss of traditional varieties. Hence, it is necessary to reframe the current agriculture policies and practices to restore biodiversity in agriculture. The department should also see empowerment of agriculture folk by involving them in decision making.

5.2 Department of Education

Education and awareness play an important role in biodiversity conservation, in promoting knowledge-moulding attitudes and developing necessary skills. Hence the educational institutions can play a crucial role in promotion and preservation of biodiversity.

5.3 Department of Fisheries & Fishermen Welfare

Diversity of coastal system, like Pondicherry coast, is affected directly or indirectly by human activities, which include: over-exploitation of fishes, coastal aquaculture, physical alteration of the habitat by trawling, dredging, drilling, dumping etc. The department should also see empowerment of fisher folk and provide them alternate support mechanism during fishing holiday period.

5.4 Department of Forests & Wildlife

The Union Territory of Pondicherry does not have forest resource in abundance and in fact there is no recorded forest area in Pondicherry except Swadeshi Mill campus, which can be classified as a deemed forest. However, under social forestry scheme, plantations have been raised at several places which include road sides, tank bunds, school campuses, waste land (poramboke land) etc., to increase the green cover of Pondicherry. The Department of Forests & Wildlife has to play significant role in protecting the existing green cover and also to conserve the existing mangroves and sacred groves in the Union Territory of Pondicherry.

5.5 Public Works Department

Public Works Department has also been contributing towards the conservation of biodiversity by maintaining gardens at road junction points, meridians, planting and maintaining avenue trees along the road sides.

5.6 Pondicherry University

Pondicherry University plays a very important role in conserving biodiversity and offering several courses to its students related to conservation of natural resources. The University periodically conducts training programmes/ seminars on biodiversity related issues. Some of the faculty members offer consultation on environmental issues. The present work of preparing BSAP document was undertaken by Pondicherry University. The University campus is situated on a 780 acres, spread on either side of the East Coast Road. The land is harbouring rich plant and animal biodiversity and could be developed as a biodiversity park.

Pondicherry University is planning to establish a medicinal plants garden with certain rare and endangered medicinal plants. This ex-situ conservation will be useful to understand the medicinal properties of several endangered species. Pondicherry University also tries to establish a botanical garden in the University campus to conserve rare and endangered plant species which are indigenous and exotic in nature. Pondicherry University also proposes to work on restoring the degraded mangrove vegetation in and around Pondicherry. Furthermore Pondicherry University could take lead in playing a proactive role in all the biodiversity related issues in the Union Territory of Pondicherry.

5.7 Department of Science, Technology & Environment

The Department of Science, Technology & Environment has been playing significant role in assessing the proposals submitted by various industries and evaluating their effect on environment. It has also been involved in dealing with environmental impact assessment of the existing industries. However, the department should involve itself more deeply in protection and conservation of biodiversity in the Union Territory of Pondicherry.

The Pondicherry Pollution Control Committee (PPCC), which is being coordinated by the Department of Science, Technology & Environment, functions as the environmental protection agency for Pondicherry since 1992. The committee regulates the polluting activities of various organisations that cause an adverse effect on the environment. It is also entrusted with the task of monitoring the status of environment in various parts of the Union Territory and increasing environmental awareness among public, youth, school and college students.

5.8 Department of Town & Country Planning

The Department of Town & Country Planning plays a very crucial role in conservation of biodiversity as the department is responsible for designing land use plan in the Union Territory of Pondicherry. It is very important that all the personnel involved in the planning and execution are trained in evaluating biodiversity related issues in order to be more sensitive in checking the loss of biodiversity. The Department of Town & Country Planning could play very crucial role in stopping conversion of agriculture land into housing sites and also enforcing rain water harvesting system.

5.9 Non-governmental organisations

The major NGO which is actively involved in biodiversity related work and towards empowerment of rural-folk through information centres in Pondicherry is M.S.Swaminathan Research Foundation (MSSRF). A few NGOs are also working on environment related activities. However, during this process no NGO came forward to offer significant help in the process nor did any of the NGOs address various environmental issues of Pondicherry through press and other media. A list of NGOs supposed to be working on environmental issues are given in section 12.9

5.10 Industrial and corporate sector

The corporate sector has perhaps never contributed towards wild or agro-biodiversity conservation. Industries set up on prime agricultural land have rather led to biodiversity loss. In 1999-2000 there were 6,199 small scale industries, 155 large and medium industries in the Union Territory of Pondicherry. However, factories like Chemfab India Ltd., Whirlpool of India Ltd., Hindustan Lever Ltd., are maintaining small horticulture gardens inside their campuses and as well as at certain traffic junctions. This sector should be contributing much more in protecting biodiversity.

5.11 Mass media

The local press has been alive of the problems pertaining to the environment and pollution in Pondicherry. During the process of this document preparation, it was observed that the press has been covering various issues related to biodiversity. Apart from a folio on biodiversity published by the Hindu, the local papers have been bringing several biodiversity related issues. The BSAP process also got coverage in the local press. The mass media can be an effective partner in addressing the biodiversity related issues in the Union Territory of Pondicherry where the literacy rate is significantly high.

6. ONGOING BIODIVERSITY INITIATIVES BY THE GOVERNMENT

Relative insensitivity to environmental and biodiversity issues have caused significant damage to the plant and animal biodiversity in the Union Territory of Pondicherry. However, recently there has been an awakening and several steps are being contemplated which would eventually help conserving biodiversity in Pondicherry. The government has implemented uniform sales tax policy on many commodities. Some of the steps being taken by various departments are being highlighted below.

6.1 Departments of Agriculture and Forests & Wildlife

The Department of Agriculture has taken some steps which, in the long run would help protecting biodiversity in the Union Territory of Pondicherry.

6.1.3 Promotion of the use of bio-fertilizer and organic manure

Intensive campaigns have been conducted for the past five years to check indiscriminate use of pesticides in the crops through field schools by adopting IPM. As a result; the use of pesticides have come down from 106 MT to 66 MT over a period of six years. IPM is proposed to be followed in the years to come to cover other crops like groundnut, cotton, vegetables etc., and to intensify post-harvest technology to minimize loss on account of pest and disease attack.

6.1.2 Farmers' Markets

The Department of Agriculture has started Farmers' Markets (Uzhavar sandhai) so that the farmers can bring produce directly to the market and sell it to the customers without involving middle men. This scheme has helped the farmers to get market price for their produce and in these markets one can get the traditional varieties and produce. Many varieties of fruits and vegetables which do not attract good prices in the regular market are being sold. Encouragement should be given to the farmers to bring more and more traditional varieties for sale.

6.1.3 Tank rehabilitation programmee

Tank rehabilitation project has been undertaken with the financial assistance from the European Union to rehabilitate all the 84 irrigation tanks available in Pondicherry region. The project is envisaged to be completed before December 2004, when all the tanks will be able to supply 75 mcm (45% of the present drawal of ground water in

Pondicherry region.) of water for irrigation purposes covering an area of 6500 Ha (present total area irrigated is 13,721 Ha). Almost 50% of the present net area irrigated could be supplied with surface water for one crop from November-April. This would bring in saving of pumping ground water to almost 40% of the present annual drawal and also additional recharge would be available to aquifers from the deep percolation losses occuring from the irrigated fields.

6.1.4 Mangrove vegetation

The Departments of Agriculture and Forests have mooted proposals for the afforestation of mangrove plantations at Thengaithittu and along the Ariyankuppam river in Pondicherry. The plantation of mangroves has been taken up at Karaikal in Keezhaveli backwaters. However, saving of mangrove destruction in Yanam region needs to be addressed urgently.

6.1.5 Swadeshi Mills Campus

The Department of Forests & Wildlife have been taking steps to protect the biodiversity in the Swadeshi Mills Campus. It has initiated several programmes of social forestry in Pondicherry.

6.2 Department of Fisheries & Fishermen Welfare

The Department of Fisheries, through the Fish Farmers' Development Agency (FFDA), provides assistance for construction of new ponds and tanks with proper screened inlet, outlet and shallow tubewell in the land of the persons who want to do inland fisheries They also assist in reclamation and renovation of ponds and tanks. Expertise is also provided in the area of integrated fish farming, fresh water fish seed hatchery, setting up of fish food units and training for fish farmers.

The department has established large fresh water prawn seed hatcheries at state level and small hatcheries for beneficiaries. Laboratories for checking of water quality and fish health have been set up at state level. Soil and water testing kits to each FFDA are being provided and setting up of integrated units including hatcheries for ornamental fishes have been planned.

In addition, transport facilities have been provided to the fisher folk to bring their catch to the central market from different places. Fishing holidays on the east coast have being enforced starting from the year 2001 for 45 days from April 15 to May 29 and from June 15 to July 29 on the west coast. In 2001, only 25 Kg of rice was distributed which was

not sufficient to sustain the families during the period. However, in 2002, ninety Kg of rice and Rs. 300/- are being distributed to each family.

6.3 Department of Town & Country Planning

The Government of Pondicherry has started taking steps to conserve the existing heritage buildings and to declare the city as 'heritage town' as it has the unique heritage with a long historical association with French culture which was one of the greatest cultures of Europe. This is very important as much biodiversity is being protected in the heritage buildings. Demolition and or renovation of such buildings damage biodiversity in addition to losing the French ethos of Pondicherry.

6.4 Department of Science, Technology & Environment

The Department of Science, Technology & Environment has been trying to fund suitable projects on environment and biodiversity issues. However, it was found that only a very limited number of projects have been funded in this area in the past years.

The Pondicherry Pollution Control Committee (PPCC) which functions as the environmental protection agency under the Department of Science, Technology & Environment has imposed a ban on the issue of fresh licenses for establishment of new steel and iron factories. The government is also contemplating on banning plastic cups. To make the city clean, the various municipalities in Pondicherry have introduced a new system of collecting domestic waste on day-to-day basis, and also from door-to-door which has made significant impact on cleanliness and drainage system in the town.

6.5 Department of Tourism

The government is trying to promote 'ecotourism' which is yet to be clearly defined through a policy document. It is not clear how the government wants to promote ecotourism in the absence of forests and protected areas. The government seems to be planning eco-friendly tourism.

7. GAP ANALYSIS

During the BSAP process it was noticed that most of the sections of people are unaware of biodiversity issues and the long term benefits of protecting biodiversity. Many teachers, government officials, politicians, students and media persons seemed to be unaware of the importance of biodiversity and its conservation. There has been lack of awareness in the farming community about the crop diversity, nutritional value of traditional crops and the use of biofertilizers and integrated pest management.

A lack of understanding and appreciation of biodiversity related issues by various officials has been one of the root causes of biodiversity damage in the Union Territory of Pondicherry. The planning and developmental schemes of the government do not address the biodiversity and environment related issues. The governmental planning does not start from the grass-root levels and the elections to the local bodies have not been conducted since 1968. Large scale urbanization and industrialization have caused severe depletion of agriculture land.

The vision of agriculture policy makers have been to offer short-term benefits instead of long-term security of farm lands. The traditional knowledge of farmers about seed collection, preservation and storage has been largely ignored and the role of women in maintenance of crop biodiversity has been neglected. The failure of understanding the vision of farmers by the policy makers resulted in anti-diversity. The government has not brought out its agriculture policy.

There is no policy of checking coastal pollution. As a result marine biodiversity has got adversely affected. There has been no effective policy regarding protection of mangroves and their restoration. During fishing holidays neither the fisher folk were provided with suitable compensation nor were they trained for alternate means of earning their livelihoods.

No significant efforts towards documenting plant, animal and microbial biodiversity have been made by any of the government departments, educational institutions or NGOs. Thus the assessment of impact of various human activities on biodiversity over a period of time has been quite difficult.

In spite of receding water table the government does not have any policy for sustainable use of water resources. Rain water harvesting has not been enforced and conservation of ground water has not been given priority.

The government has not defined its policy on eco-tourism and the handling of garbage from different sources is not aimed at proper recycling. The issue of non-biodegradable waste has not been properly addressed.

Though legal system exists, there is lack of implementation of existing provisions of law. There is no policy on protection of biodiversity-rich areas.

8. MAJOR STRATEGIES TO FILL THESE GAPS AND TO ENHANCE/ STRENGHTEN ONGOING MEASURES

The Union Territory of Pondicherry has a small area and relatively large infra-structure to deal with most of the problems of environmental degradation and loss of biodiversity. It can thus become a model state in terms of protection of biodiversity. The gaps in information, vision, policy and enforcement structure have been identified. The following strategies have been suggested to fill those gaps.

- Biodiversity and environmental issues should be integrated with all the plans of every department of the government.
- There is an immediate need for empowering local groups and communities and planning processes of the government should start from grass root levels.
- A Biodiversity Board should be established.
- Biodiversity related issues should form an integral component of education.
- Awareness regarding biodiversity and its benefits has to be created among the masses.
- The loss of agriculture land should be immediately checked.
- Native and traditional varieties of crops must be documented and promoted.
- High use of fertilizers and pesticides should be stopped and bio-fertilizers and bio-pesticides should be promoted.
- The existing botanical garden has to be restored and many threatened species have to be conserved effectively.
- The degradation of mangrove vegetation has to be stopped and restoration mangrove vegetation has to be done.
- The sacred groves have to be protected and conserved.
- Biodiversity in Swadeshi Mills campus has to be protected.
- Marine biodiversity has to be listed and conserved.
- Conservation plan of ground water has to be prepared and implemented.
- Rain water harvesting has to be effectively implemented.
- Urban biodiversity of Pondicherry has to be protected.

- An eco-friendly tourism policy has to be prepared and local communities to be involved in the process.
- Increasing pollution levels have to be checked.
- Non-biodegradable waste management plan has to be prepared and implemented.

9. REQUIRED ACTIONS TO FILL GAPS, AND ENHANCE/ STRENGTHEN ONGOING MEASURES

9.1 Integration of biodiversity in governance

Decision makers and other officials should be made aware of the various biodiversity related issues and the urgency with which the actions are required to be taken. Decision makers and other officials should also be sensitised to biodiversity conservation. Sensitisation of social workers, politicians and legal experts should also be undertaken. The Department of Science, Technology & Environment should establish a biodiversity conservation training centre. Leading experts in the field could be invited to address the participants of training programmes.

In order to integrate biodiversity in governance, all the departments should be provided with a biodiversity fund to implement various biodiversity related activities. Department of Planning and Research and the Department of Finance could create budget heads for biodiversity conservation with an initial allocation of Rs. 10 lakhs to each department. For financial and other planning activities, experts in biodiversity conservation should be invited and all the projects should highlight biodiversity component thus paving way for biodiversity governance.

This action plan should be implemented by the Department of Science, Technology & Environment, Department of Planning and Research and Department of Finance.

9.2 Empowerment of local communities and decentralisation of planning process

Indigenous traditional knowledge regarding agriculture, medicinal plants, fisheries and wildlife vests with local communities. Documentation and protection of such knowledge is possible only through empowerment of local communities. With the 73rd and 74th amendments of the Indian constitution, decentralisation of democratic process leading to the Gram Panchayats and Gram Sabhas become prime movers of the decentralized planning process. The government should hold elections to local bodies immediately and provide legal backing to decentralised planning at local level. The resources for local planning should be specified well in advance by the Department of Finance. At least 25% of the planned budget of the Union Territory should be earmarked for the local planning

process during the next financial year. The local planning committee could be provided with some key roles as enumerated below:

- Identification of local needs and objectives within the framework of national and Union Territory level objectives.
- Each Gram Panchayat/ Gram Sabha should be treated as an unit of planning.
- Collection, compilation and updation of information relating to local natural and human resources in order to produce a sound data base for decentralized planning process.
- Determination of programmes and schemes for development of local communities in order to maximize the utilization of a viable natural and human resource base.
- Formulation of draft five year and also annual development plans of all the local commune panchayat areas in their socio-economic temporal and spatial dimensions. Consolidation of the plans prepared by panchayats and the municipalities should be submitted to the government.
- The draft local plans should address the concern on environmental issues.
- Monitoring, evaluation and review of the programmes under the decentralized planning frame work should be done by the local bodies.
- The voluntary sector like NGOs should be involved in the overall process.

Each local planning committee to be constituted to discharge the above functions will have inter-sectoral representation to ensure ownership of the entire planning process. The committee will function through thematic groups like agriculture, fisheries, education etc.,

This action plan should be implemented by the Local Administration Department, Department of Planning and Research and the Department of Finance.

9.3 Establishment of a Biodiversity Board

To conserve Biodiversity and to control its related activities, a Biodiversity Board has to be established in the Union Territory of Pondicherry as per the provisions of the Biodiversity Bill

The Board will consist of representatives of various government departments, academicians, scientists, NGOs and various interest groups. The Board should be an independent set up under the Chairmanship of an eminent person having adequate

knowledge and experience in the conservation and sustainable use of biological diversity and in matters relating to equitable sharing of benefits.

The government may nominate ex-officio members from the Department of Agriculture, Department of Fisheries, Department of Science, Technology and Environment, Department of Finance, Department of Tourism, Department of Education, Department of Forests and Wildlife and from Pondicherry University. In addition, the government should nominate members from French Institute, NGOs, women representatives and environmental experts from outside the Union Territory.

The functions of the Biodiversity Board would be to advise the government on matters relating to the conservation of biodiversity, sustainable use of its components and equitable sharing of the benefits arising out of the utilisation of biological resources and to coordinate the biodiversity conservation related projects submitted by various government departments and organizations. Annual status report on biodiversity should be prepared by the Biodiversity Board.

The government, after due appropriation made by the legislature by law, may pay to the State Biodiversity Board by way of grants or loans such sums of money as the government may think fit for being utilised for the purposes of the Biodiversity Act. A Biodiversity Fund should be created and all the provisions of the Biodiversity Bill should be funded .

9.4 Biodiversity education

There is no mention of biodiversity related issues in school/ college curricula. Inclusion of biodiversity related education in primary/ high school and higher secondary school curricula in a graded and non-formal manner is urgently required. Introduction of biodiversity related issues should be started from the first standard in a easy to understand manner. The issues should be brought with the help of stories, films, field visits etc,. The students as per their age groups should be expected to do some activities in their neighbourhoods. The problems should be analyzed in an environment conducive to the students.

Teachers at schools are not familiar with the concept of biodiversity. The priority is to develop appropriate short courses for the teachers particularly in primary and secondary schools. Awareness and acknowledgement of biodiversity conservation by teachers is the first important step for biodiversity. It is important to integrate biodiversity related themes

into teacher training courses. In-service teachers could be trained in the practical methods of teaching biodiversity.

In the Colleges and Universities, environment protection and biodiversity related issues should form an integral component of all the syllabi as per the recommendation of the University Grants Commission. However, the involvement of the students in community development and conservation of biodiversity should be ensured through NSS and NCC programmes also. Street plays, Tree Plantation Programmes, Clean and Green Pondicherry Programmes could be important component of these programmes The Department of Education should give more emphasis for biodiversity component while conducting exhibitions and festivals in schools and colleges annually. All the schools should be instructed to conduct biodiversity related activities and various awards should be instituted at primary/ secondary/ college levels by conducting elocution, essays, quiz competitions. Some important days like "National Science Day", "World Environment Day", "World Earth Day", "Human Right's Day" etc., should be used to address various environment and biodiversity related issues. The Nature clubs in schools should be encouraged to grow rare medicinal plants, indigenous species in their school premises garden as a part of biodiversity conservation where the whole focus should be towards "greening" of the education. During preparation of programmes of art and cultural performance, experts on biodiversity conservation can be invited to provide technical guidance and consultation to improve the quality of the programmes. Special posters and placards on biodiversity conservation should be installed on specific sites including main road crossings, parks, botanical gardens, museums, and beach . These posters and placards can be used to introduce the basic knowledge on protected species, habitats, main laws and regulations of biodiversity conservation and others. These special sites can be used as in-situ classrooms for students in primary and secondary schools to present knowledge of biodiversity conservation to them.

This action plan should be implemented by the Department of Education, Department of Science, Technology & Environment, National Service Scheme and NGOs.

9.5 Public awareness and training

Biodiversity festival and seed exchange fairs should be conducted to create awareness, to highlight the importance of conservation and to share the views on traditional ways of agriculture farming system. The fairs could coincide with traditional harvest

festival like Pongal and Tamil New Year. In order to promote traditional non-grain crops, more Farmers' Markets (Uzhavar sandai) could be established in the Union Territory so that the farmers could get good price of their produce. PAPSCO/ PASIC should coordinate such ventures.

Efforts should be made to create awareness of the biodiversity issues in agriculture by organizing workshops, symposia and biodiversity festivals. This will help the public to become aware of food security, nutritional security, sustainable agriculture development, farmers' rights, bio-prospecting/ benefit sharing, geographical indicators, intellectual property rights, importance of convention on biological diversity (CBD), bio-piracy, importance of documentation of bio-resources etc., in the era of patent disputes. Taxonomy of field crops should be promoted by organizing short-term practical courses for students, research scholars, scientists with exposure to both classical and as well as molecular taxonomy using DNA marker-based techniques. National level Traditional Science Congress with the focus on conservation of biodiversity could be conducted.

This action plan should be implemented by the Department of Agriculture in coordination with Pondicherry University, and PAJANCOA & RI, Karaikal.

9.6 Conservation of agriculture land

The Union Territory of Pondicherry has faced the serious problem of dwindling land availability not only due to fragmentation of holdings, but also due to population pressure, large scale industrialization and consequent urbanization. Further, agriculturally productive lands have been put to non-agricultural purposes like providing space for housing, industries and degrading activities like brick making etc. These activities have rendered agriculture land permanently non-productive. There has been a constant decline in the net cultivated area due to competing demands on the inelastic land resource by industries and for other socio-economic activities. In order to prevent further loss to the agriculture land, identification of prime agriculture land and framing of appropriate rules to prevent its diversion to other uses should be enforced by imposing strict laws. The Department of Town & Country Planning should not allow further diversion of agricultural land for non-agricultural purposes. The government should also release a document spelling out its agriculture policy.

This action plan should be implemented by the Department of Agriculture, Department of Town & Country Planning & Law Department.

9.7 Promotion of native varieties and agro-biodiversity

Agricultural modernization, which introduced new and uniform crops into farmers' fields, have seriously eroded the diversity of local varieties. This displacement has not only led to the loss of biodiversity, but also caused undesirable ecological disturbances. Several paddy varieties such as *Seeraga samba* (Tamil), *Kuthiraival samba* (Tamil) *and Vaigunda* (Tamil) are now facing extinction. These varieties, need conservation and protection from becoming extinct. A concerted effort to preserve them is vital to agro-biodiversity.

The government should encourage cultivation of traditional varieties of paddy, vegetables, pulses and millets among the interested farmers by providing seeds, incentives and buy-back facilities.

In order to promote traditional varieties of crops the Pondicherry Institute of Hospitality and Hotel Management could organize food festivals using traditional varieties and popularise the value of such varieties. This would help increasing the demand of local produce of traditional crops. The Department of Education should promote the use of some of the traditional varieties of rice by including them in their breakfast and noon-meal schemes. Hospitals could be motivated to use the traditional varieties of paddy and vegetables for their in-patients. Restaurants and hotels run by the government such as Le Café and Hotel Ashok could be asked to prepare delicious food items using traditional varieties of paddy, vegetables and pulses. Biodiversity festival and food festivals could be periodically organised, which will help to popularise the native varieties. The farmers should be encouraged to bring traditional varieties of fruits and vegetables to the Farmers' Markets.

A community seed bank for seed exchange should be set up which should be managed by the farming community itself. Survey and documentation of conservation of traditional paddy varieties, groundnut, and indigenous vegetables should be undertaken. Characterization and multiplication of the traditional varieties can be done. The community seed bank will help the farmers to conserve the traditional varieties. Indigenous knowledge system should be catalogued with reference to conservation of bio-resources.

In order to develop a Biodiversity Register of various crop species and varieties, a technical advisory board consisting of agriculture experts should be formed. This will help to identify geographical indicators if any. The Board could comprise Secretary/ Director, Agriculture, Dean, Pandit Jawaharlal Nehru College of Agriculture & Research Institute,

Principal, Krishi Vignan Kendra, Pondicherry, and coordinators of BSAP from Pondicherry University.

This action plan should be implemented by the Department of Agriculture in collaboration with the Department of Tourism, Department of Education, Department of Health and Family Welfare and PAPSCO.

9.8 Checking the use of chemical fertilizers and integrated pest management

Farmers should be educated through field schools about the importance of biodiversity conservation. The impact and the risks involved in using chemical fertilizers and the status of the nutrient content of the soil should be made known to the farmers. A soil health card can be made available to the farmers and periodical soil examinations can be carried out and accordingly the fertilizers can be judicially used. To minimize the use of chemical fertilizers, the subsidy can be totally removed. Use of bio-fertilizers, organic manure, enriched compost, green manure seeds and bio-pesticides should be encouraged by giving more subsidy.

To assess the status of microbial population in different kind of soils, surveys have to be conducted. In order to channalise the limited available materials like enriched compost, green manure seeds etc., should be made available to the areas where the intensity of microbial population is comparatively less, so as to step up the same on par with other areas. Studies have to be conducted to assess the status of humus content in soils in terms of the available organic carbon to give preferential allotment of the enriched compost etc., to the deficient areas.

The above surveys are required to be conducted and completed within a period of two years so as to make use of the findings for implementing the corrective measures within the shortest possible time span. The surveys could be done by PAJANCOA & RI with the help of soil microbiologists. Awareness campaigns in the localities deficient in the microbial population as well as humus content have to be conducted to motivate the farmers and to treat these areas on priority basis with the whole village adoption approach. To promote organic farming farmers should be trained on vermicomposting and coir-pith composting. The farmers should be encouraged to do organic farming by providing compensation for losses. Necessary steps should be established to market linkages and to certify the organic produce in order to encourage the public and the farmers. A separate

market should be established to popularise organic products which in turn will create awareness among public.

Pondicherry Government should encourage the use of bio-fertilisers in place of chemical fertilisers. The use of bio-fertilisers has been very successful in neighbouring Auroville. (Tamil Nadu). Auroville model may be implemented in Pondicherry. The farmers then would be able to get more money on such produce as agriculture produce without the use of fertilizer and pesticides is in great demand in the Indian and foreign market.

Apart from conducting field schools and providing information about the Integrated Pest Management and agriculture practices, more emphasis should be given for identification and documentation of plants with pesticidal properties. A practical feasible plan for use of non-chemical pesticides for farmers should be developed. Periodical training programmes should be conducted to familiarize the use of bio-pesticides.

A knowledge information centre should be established in all the key villages in the Union Territory of Pondicherry to provide updated information regarding day to day agriculture development, weather forecast and biodiversity related news etc. In this regard, M. S. Swaminathan Research Foundation, a pioneer in such a programme, could be consulted.

This action plan should be implemented by the Department of Agriculture (Extension wing) and PAJANCOA & RI, Karaikal, M. S. Swaminathan Research Foundation and NGOs.

9.9 Restoration of botanical garden and cultivation of medicinal plants

The existing botanical garden in Pondicherry houses many government departments, aquarium and a toy train within it. Due to increased human activity, release of saline water from the aquarium and dying of trees have resulted a great damage to the biodiversity. There is a strong need for rejuvenating the existing botanical garden. Since most of the trees are getting aged, an alternate botanical garden can be established in a silent zone of Pondicherry. It is suggested that Pondicherry University can undertake this project and necessary funds could be provided by the government for such venture and a new botanical garden should be established in Karaikal region with the help of PAJANCOA & RI with many indigenous, rare, endangered, threatened plants as well as many horticultural plants and some exotic plants.

A collaborative programme between the Department of Agriculture and Pondicherry University should be established to encourage the cultivation of medicinal plants. Coordination between Pondicherry University and Department of Forests & Wildlife should be encouraged for taking up programmes of growing medicinal plants which are in short supply and need propagation. Short term training programmes on collection and harvesting of medicinal plants should be introduced. A standing committee should be formed with representatives drawn from the Departments of Agriculture, Forests & Wildlife and coordinators of BSAP, Pondicherry University are recommended.

This action plan should be implemented by the Department of Agriculture, in collaboration with the Pondicherrry University and PAJANCOA & RI, Karaikal.

9.10 Eco-restoration of mangroves

Due to population growth and overexploitation, the mangrove vegetation in Pondicherry has rapidly degraded and depleted in the last two decades. There are four regions of Pondicherry coast with mangrove vegetation which are over-exploited, degraded and depleted. These areas are Thengaithittu, Veerampattinam, Ariankuppam, Murthikuppam, Yanam and Karaikal.

To restore the mangroves sustainably in Pondicherry regions, the following actions are required:

- Vegetation profile Establishment:

The mangrove vegetation profile of Pondicherry region is poorly understood. The taxonomy of mangrove species of different locations should be established. A mangrove vegetation map should be prepared which will provide the mangrove vegetation scenario of Pondicherry. On-site research and demonstration should be undertaken to grow the other economically important mangrove species including, *Bruguiera, Excoecaria, Rhizophora* and *Acanthus*. In addition, growth patterns of other mangroves should also be studied in different locations. Plantation should be undertaken to accelerate the reclamation of the soils near the Veerampattinam village.

- Interaction with Village groups:

Interaction with village groups has to be undertaken to enthuse them with all information related to the importance of conservation of mangrove species.

- Seminars, workshops and public hearings:

Seminars, workshops and public hearings should be conducted for various users of the mangrove environment including farmers, fishermen and shrimp farmers as the target groups with a strong message that they will be involved in protecting their own resources. As this programme is primarily aimed at natural resources utilization and management strategies of Pondicherry, the target groups will be mostly rural farmers, fishermen, shrimp farmers. They should be enthused in conservation of mangroves. Participation of rural communities in mangrove-based plantation activities should be given priority. It is also intended to educate local public to encourage them to a degree of self management amongst the various users of the mangrove environment, so that they are involved in protecting their own resources. Mangrove management plans, no matter how well articulated, cannot succeed without considering the requirements and aspirations of indigenous and local communities. We should thus plan to educate the local populations through extension and secure their support and commitment in establishing the depleted mangrove vegetation.

Over-exploitation of mangrove forests occurs mainly due to primary lack of awareness of several problems rather than to a lack of economic alternatives . In addition to establish the site-specific mangrove species, the main objective of this program should also include to win public acceptance and support for this type of research programs. The final output should be to restore the degraded mangrove vegetation and re-establish the glory of the mangrove forest and finally to conserve the biodiversity of mangroves in the Union Territory of Pondicherry.

- Restoration of mangroves in Pondicherry, Yanam and Karaikal regions:

To develop the mangrove vegetation in Pondicherry, Karaikal and Yanam regions, a project could be undertaken for plantation of mangroves extensively along the coast., in collaboration with Pondicherry University. Strict law should be enforced to protect the existing mangroves as there is human interference. The Department of Fisheries & Fishermen Welfare in consultation with the Department of Forests & Wildlife could develop mangrove plantation along the estuaries which will serve as a natural breeding ground for fishes and prawns. In addition the plantation will serve as a wind breaker to the coastal villages during cyclone.

This action plan should be carried out by the Department of Forests & Wildlife, Department of Agriculture, Department of Fisheries & Fishermen Welfare and School of Life Sciences, Pondicherry University.

9.11 Protection and conservation of sacred groves

The sacred groves in the Union Territory of Pondicherry are facing threats of encroachment and destruction. Immediate steps need to be taken in order to protect and conserve the sacred groves. Some of the sacred groves in the Union Territory which are facing destruction and need immediate attention are situated in Pooanankuppam, Keezhkumaramangalam, Manapet, Sedarapet, Karasur, Mangalam, Moorthikuppam. The following actions are required in this direction:

- Scientific explanations of cultural faiths and beliefs should be propagated which would include creating awareness of ecology and environment related issues. This could be done at the local level and the local communities should be involved in the process.
- An interpretation centre regarding cultural links with nature and biodiversity should be established.
- There should be a buffer zone created near the groves in order to prevent collection of fuel, food and fodder from the groves thus causing their destruction.
- Cultivation of medicinal plants should be encouraged by establishing various herbal gardens. Collection of medicinal plants from the groves should be stopped.
- Enumeration of plant species in the Ayyappan Kavu in Pandakkal and Chembra hills (Mahe) sacred groves should be undertaken at the earliest by the Department of Forests and Wildlife. Such patches should be declared as protected areas in consultation with the committees of Ayyappan Kavu to ensure conservation of these groves.

This action should be undertaken by the Department of Forests & Wildlife, Pondicherry University and the local village committees.

9.12 Conservation of Swadeshi Mills Campus vegetation

The only existing forest patch in Pondicherry is the vegetation available in Swadeshi Mills Campus. During the process of preparation of this action plan, a sizeable patch of Swadeshi Mills forest was cleared off its vegetation and was given for the construction of district court building. Such degradative actions must not be undertaken in the Swadeshi Mills Campus and a list of the flora, prior to the clearing operation is being given in section 12.6. In this process a huge loss of biodiversity has occurred. It is suggested that an evaluation should be made to enumerate the lost species and steps to

restore them should be made. The area should be declared as a protected area and all human activities should be stopped.

This action plan should be undertaken by the Department of Law and the Department of Forests & Wildlife.

9. 13 Conservation of fish and marine biodiversity

There has been no attempt to enlist endangered and extinct marine animals. The Department of Fisheries should undertake a project to prepare a list of endangered marine animals. This work could be done in collaboration with Pondicherry University and local degree and Postgraduate colleges.

The traditional fisher folk have indigenous knowledge regarding seasonal availability, breeding season, quality of fish, various factors in fishing, medicinal properties of fishes etc., Documentation and protection of their knowledge is required. Fishermen and women with traditional knowledge should be identified and their help could be sought in documentation of their information.

In order to make fishing holidays more successful and effective the government should try to address the issue at the grass-root level and the fisher folk should be made to feel partner in the whole effort. The government should increase the compensation to the fisher folk and also provide them training so that they can prepare value added fish products like pickles and also handicrafts. The government should try to sell these products through the cooperative societies.

This action plan should be implemented by the Department of Fisheries and Fishermen Welfare, Department of Agriculture, Department of Forests and Wildlife, Department of Education and Pondicherry University, Pondicherry.

9. 14 Water conservation

Depletion of ground water resources has been adversely affecting crops in Pondicherry and Karaikal regions. Conservation of ground water resources for agriculture could be done by conducting field schools in the villages in participatory mode. It would help crop water management and inculcate awareness among farmers towards usage of water judiciously. The Government should popularise the use of sprinkler and drip irrigation system for orchard crops to conserve water.

The village ponds in the Pondicherry region should be desilted for better recharge. Additionally tube wells can be constructed in all these ponds as rain water harvesting structures to increase artificial recharge to aquifers. Proposals of the construction of Check dams on Pambai and other rivers could be evaluated.

Increased allocation of funds should be made for transportation of water from tube-wells to the fields through underground pipes in order to prevent loss due to seepage in earthen canals.

The power supply to agriculture pump sets could be regulated to 10 to 12 hours per day instead of 24 hours. The present tariff for electricity for agriculture may be increased for agriculture pump sets to imbibe economy in usage of ground water and also to achieve irrigation efficiency in the application of water to the irrigated crops.

Extensive education programmes on crop-water management methodologies should be undertaken covering the entire Union Territory of Pondicherry for paddy, sugar cane and ground nut to impart the latest available technologies to the farmers.

This action plan should be implemented by the Department of Agriculture, Krishi Vignan Kendra, PAJANCOA & RI, Karaikal, and Electricity Department.

9.15 Rain water harvesting

Due to neglect of maintenance of irrigation tanks in Pondicherry region the entire burden of irrigation of all crops has been thrust on ground water resources. Moreover, the requirement of water for drinking and industrial use is also met from the ground water resources. The net result is over-exploitation of ground water resources and decline of water table in the coastal aquifers and salinisation of aquifers because of salt water intrusion. During the past years, due to increased urbanization, industrialization and over-exploitation, the ground water table has been decreasing at an alarming rate. This has been causing great damage to biodiversity.

The Union Territory of Pondicherry experiences moderate to heavy rain fall and most of the precious rain water goes to the sea. It is imperative that the rain water harvesting policy is redefined and strictly enforced.

The existing regulations of rain water harvesting for houses and buildings are being hardly followed which is causing serious threat to this precious natural resource. Non-availability of ground water in several parts of Karaikal and Pondicherry has been a cause of depletion of biodiversity in addition to other problems faced by the residents.

Rain water that falls on terrace of the houses and buildings could be diverted to the existing open wells or borewells. Percolation pits should be provided in all the small houses. All the house owners must be given a deadline to comply with it. Heavy fines should be levied for the persons who do not provide for rain water harvesting within two years from the date of notification. In the big houses and apartment buildings recharge trenches have to be provided for. In the large buildings and industries recharge wells must be dug so as to harvest rain water. To begin with, all the Government buildings and educational institutions should become model examples for rain water harvesting. Rain water harvesting systems should also be installed at public places so as to popularise the concept.

Incentives in the form of tax deductions for house tax, water tax etc., could be provided to induce and reward the persons. Banking loans could be arranged for fixing rain water harvesting system.

This action plan should be implemented by the Department of Agriculture, in collaboration with the Department of Town and Country Planning and Law Department.

9.16 Urban biodiversity

Land ceiling Act has been a key factor for the conversion of agriculture lands, wet lands in housing and industrial sites. Now after repealing of the Act, Town and Country Planning Department must strictly enforce laws to prevent conversion of agriculture land into urban areas. The existing wet lands and tanks should not be filled in the name of urban development as this has been a key cause of biodiversity destruction. Accordingly the government should formulate a strict law to protect the above said lands. Law enforcement and legal system need to be sensitised to check such acts.

Pondicherry as a heritage city, has a strong French culture. There are many buildings which were constructed at the time of French rule. Pondicherry has a rare mix of French and Tamil history that makes the town unique. The "white" and "Tamil" part of the town are still in splendid shape in many areas. The old French buildings in the white town such as Marie, Raj Bhavan, Sacred Heart Church, Cathedral, Sri Aurobindo Ashram and Museum have unique architectural significance. In addition they provide place for protection of biodiversity in the form of gardens and kitchen gardens. It has been noticed that once such buildings are demolished the new structures which come up at these places are only concrete structures covering the whole ground areas. The high land prices in the

white town areas have seen the demolition of several protectable buildings. This has caused extensive damage to biodiversity in Pondicherry.

The government should immediately declare all the buildings constructed during French rule as heritage buildings and stringent measures have to be adopted for their preservation and maintenance. Use of such buildings for biodiversity conservation must be ensured. Any additions, alterations and renovations in these buildings must follow strict guidelines, so that the architectural and biodiversity heritage of Pondicherry could be protected.

This action Plan should be carried out by the Department of Town and Country Planning, Law Department and Department of Police (Traffic).

9.17 Eco-tourism

The Government should focus 'eco-tourism' policy to encourage eco-friendly practices that focus on harmony with nature and to develop the conscious process at all levels.

Pondicherry has already made its name in spirituality and Yoga. For the several years Pondicherry has been hosting International Yoga Festival in the first week of January. The Government should plan opening of Yoga centres and spirituality centres so that sustainable tourism could be addressed and involvement of local persons could be there without degrading biodiversity.

However, the government should aim to encourage low volume but high value tourism in Pondicherry, which could be directed to eco-friendly tourism. As Pondicherry is not having substantial vegetation, no natural vegetation should be disturbed. The mangrove vegetation in Yanam is very beautiful and should not be disturbed and the damaged patches should be restored by the Department of Forests and Wildlife. Usage of 'environmental friendly' constructions would help conserving biodiversity. Any activity damaging the natural eco-system in islands near Yanam should not be allowed.

Ousteri lake could be developed as an 'eco-friendly' tourist spot in Pondicherry and local communities should be involved in the whole process. It is necessary that the water inlets to the lake be opened, so that the lake could get enough water. Fruit bearing and shade trees could be planted near the lake, so that migratory birds could start visiting again during winter.

In places like Botanical Garden, a fee should be collected to restrict the human activity which damages biodiversity. In such cases, only the interested public will visit and the fee could be used to maintain the garden. No food should be allowed inside the garden area. The revenue generated at tourist places could be used for biodiversity conservation in those places and assure sustainability.

This action plan should initiated and carried out by the Department of Tourism, Department of Agriculture and the Department of Forests and Wildlife.

9.18 Pollution control

Pollution has been increasing in Pondicherry at an alarming rate. The government should take following actions to check it.

- The commune municipalities should identify places for disposal of organic waste and should be used for vermicomposting. NGOs should be involved for training the persons in vermicomposting.
- A proper drainage system for the disposal of domestic liquid waste should be developed and plants should be installed for treatment of liquid waste before releasing into sea or used for irrigation.
- Biomedical wastes from hospitals, nursing homes, laboratories and slaughterhouses should be handled separately and incinerator facilities have to be upgraded for disposal of such wastes.
- Unauthorised slaughtering of animals should be prohibited in all the rural and urban areas.
- Public transport vehicles using kerosene and sub-standard fuel with high emission of toxic substances should immediately be seized.
- The government should encourage plying of battery driven public transport vehicles and there is an urgent need to strengthen the existing public transport system so that people are not forced to use their own vehicles.
- Due to increase in number of vehicles many roads have been widened after removing age-old as well as young trees. Traffic congestion could be reduced by staggering school and office timings which would greatly reduce the density of polluting agents during peak hours.

The action plan should be implemented by Pondicherry Pollution Control Committee, Department of Science, Technology & Environment, Local Administration

Department, Commune Municipalities, Department of Health & Family Welfare, Department of Animal Husbandry & Animal Welfare, Public Works Department, Department of Police (Traffic) and NGOs.

9.19 Non-biodegradable waste

The use of plastic and other man made non-biodegradable materials has sharply increased in Pondicherry. An urgent action is required to regulate their use. The following are urgently required in this direction.

- Awareness should be created in all the sections of the society for proper disposal of household and industrial waste. This could be done by aggressive publicity, through mass media, public hoardings and street shows.
- Industries should be closely monitored for their compliance to the procedures of disposal of waste products and installation of effluent treatment plants.
- The existing system of door to door collection of solid wastes in some of the areas should be introduced to all the residential and business areas of Pondicherry.
- The government should try to introduce bags of different colours in order to handle biodegradable and non-biodegradable wastes. The non-biodegradable waste should not be allowed to be used for land fills.
- Awareness campaigns should be launched aggressively to educate people with the various hazards of plastic pollution. Warnings may also be made mandatory on all plastic materials including toys.
- The use of plastics should be minimized in the Government organizations like Amudhasurabhi, Vanavil, Le Café etc. Gauge measuring machine should be installed and anybody found using plastics of less than 20 microns should be punished.
- Plastic and other non-biodegradable waste should be collected and handled separately and efforts must be made to get them recycled with the help of private contractor or putting a recycling plant in Pondicherry.
- Establishments not using plastic bags should be given a special status. Consumers should be encouraged to bring cloth bags for carrying their groceries and other purchases.

- No fresh licenses should be granted to start units manufacturing plastic bags, packing materials, PET bottles, toys etc. Instead, encouragement must be provided to the industries set up for recycling waste without polluting the environment. Heavy penalty should be fixed if the garbage of hotels, wedding halls (kalyan mandapams) contain plastic wastes. Penalty should be fixed for littering public places with plastic bottles, bags etc., The use of plastic should be eliminated in a phased manner and the government should provide avenues for alternate employment opportunity to the employees working in plastic industries.

This action plan should be implemented by Pondicherry Pollution Control Committee, Department of Science, Technology & Environment, Local Administration Department, Law Department and NGOs.

10. FOLLOW UP

The NBSAP process has brought out many key issues relevant to conservation and protection of biodiversity in the Union Territory of Pondicherry. The strategies and action plans developed during the process must be implemented and followed up on a regular basis. There is a need of continued efforts in this direction. It is proposed that the implementing agencies are asked to submit their detailed action plans with the names of the responsible persons along with time frames.

The State Steering Committee could be reconstituted and may be asked to function till Biodiversity Board is enacted. Periodical reviews and monitoring of the efforts and plants of each of the implementing agencies have to be discussed and suggestions given by the members should be incorporated. Every year a status report on biodiversity should be prepared and the planning department should allocate funds to various departments for implementation of the projects. The State Steering Committee should also facilitate coordination and collaboration amongst various implementing agencies. Steering committee meetings and seminars should also be organised from time to time.

The process of the public hearings, training programmes and capacity building should continue and sufficient human and financial resources should be allocated. Various departments should also try to write projects and raise funds from various sources for implementation of their action plans.

The State Steering Committee/ Biodiversity Board should also communicate with various stake holders and public. The various issues and the action plans have to be given wide publicity. The government should allocate funds for publication and translation of this document into Tamil, Telugu and Malayalam so that the publication could reach the masses and the stake holders can understand the importance of biodiversity.

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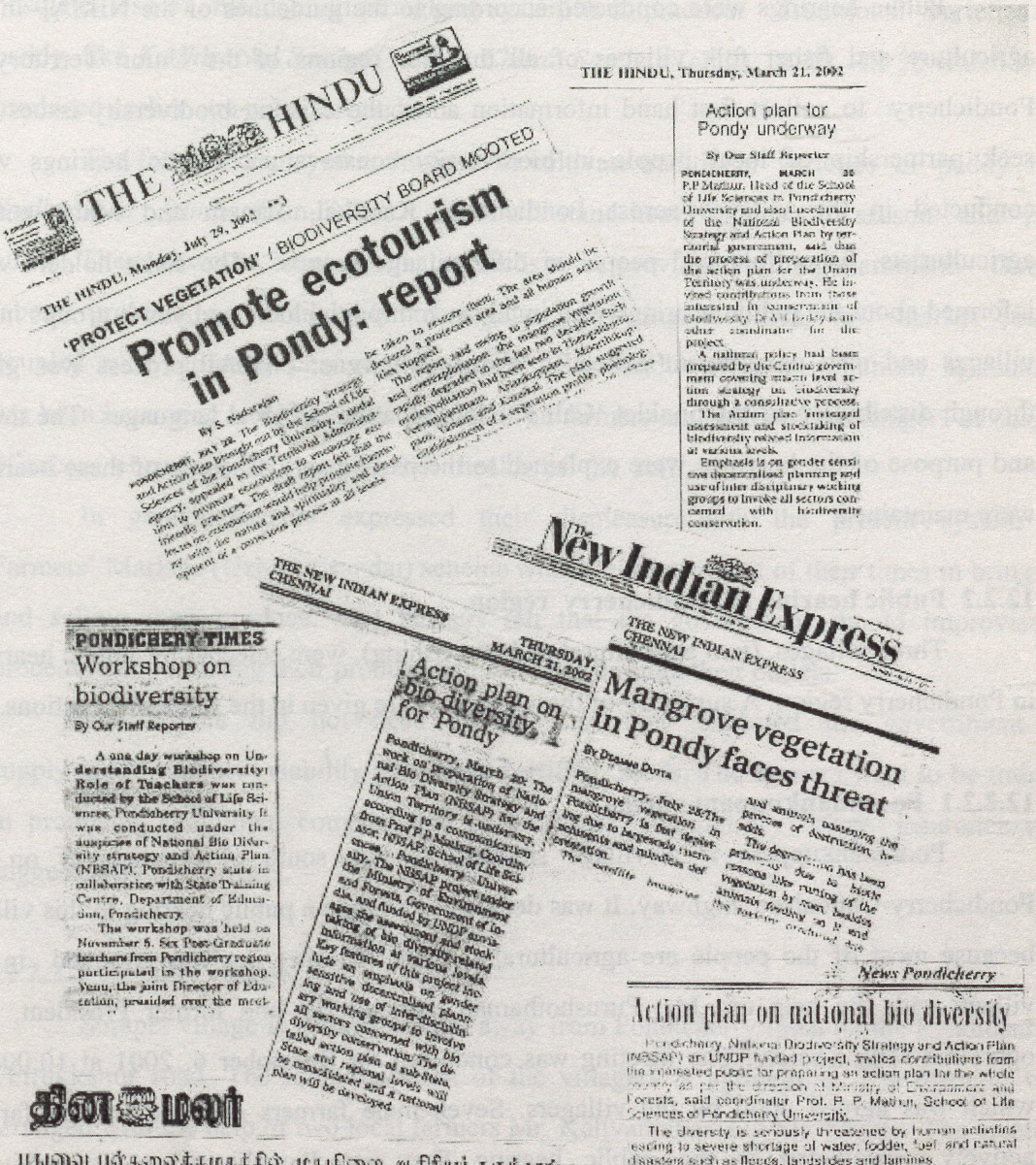
12. ANNEXURES

12.1 Publicity of BSAP through press



THE HINDU

THE HINDU, Monday, July 29, 2002

'PROTECT VEGETATION' / BIODIVERSITY BOARD MOOTED

Promote ecotourism in Pondy: report

By S. Sadasivan

PONDICHERRY, JULY 28. The Biodiversity Strategy and Action Plan brought out by the School of Life Sciences of the Pondicherry University, a premier agency, stressed on the Territorial Administration to promote ecotourism to encourage economic activities. The study report felt that the focus on consumerism could help promote harmony with the natural and spiritual environment of a conducive process at all levels.

be taken to restore them. The area should be declared a protected area and all human activities stopped.

The report said owing to population growth and overexploitation in the last two decades, the mangrove vegetation had been seen to disappear considerably degraded in the last two decades. Study overexploitation had been seen to disappear. Unemployment, urbanisation, industrialisation, pollution, tourism and tourism had also contributed. Identification, conservation of a vegetation profile, phenology

THE HINDU, Thursday, March 21, 2002

Action plan for Pondy underway

By Our Staff Reporter

PONDICHERRY, MARCH 20. P.P. Mathur, Head of the School of Life Sciences in Pondicherry University and also Coordinator of the National Biodiversity Strategy and Action Plan by territorial government, said that the process of preparation of the action plan for the Union Territory was underway. He invited contributions from those interested in conservation of biodiversity for A.P. Reddy as another coordinator for the project.

A national policy had been prepared by the Central government covering macro level action strategy on biodiversity through a consultative process.

The Action plan envisaged assessment and stocktaking of biodiversity related information at various levels.

Emphasis is on gender sensitive decentralised planning and use of inter disciplinary working groups to involve all sectors concerned with biodiversity conservation.

THE NEW INDIAN EXPRESS CHENNAI

THURSDAY, MARCH 21, 2002

Action plan on bio-diversity for Pondy

Pondicherry, March 20: The work on preparation of National Bio Diversity Strategy and Action Plan (NBSAP) for the Union Territory is underway, according to a communication from Prof P.P. Mathur, Coordinator, NBSAP, School of Life Sciences, Pondicherry University. The NBSAP project under the Ministry of Environment and Forests, Government of India, and funded by UNDP envisages the assessment and stocktaking of bio diversity related information at various levels. Key features of this project include an emphasis on gender sensitive decentralised planning and use of inter-disciplinary working groups to involve all sectors concerned with bio diversity conservation. The detailed action plans at sub-state, State and regional levels will be consolidated and a national plan will be developed.

The New Indian Express

THE NEW INDIAN EXPRESS CHENNAI

Mangrove vegetation in Pondy faces threat

By Dhanno Dutta

Pondicherry, July 28: The mangrove vegetation in Pondicherry is fast depleting due to largescale encroachments and mindless deforestation. The satellite imageries and records assessing the process of destruction, he adds.

The degenerating has been primarily due to such reasons like ruining of the vegetation by man besides animals feeding on it and the forests catching fire.

PONDICHERRY TIMES

Workshop on biodiversity

By Our Staff Reporter

A one day workshop on **Understanding Biodiversity: Role of Teachers** was conducted by the School of Life Sciences, Pondicherry University. It was conducted under the auspices of National Bio Diversity strategy and Action Plan (NBSAP), Pondicherry state in collaboration with State Training Centre, Department of Education, Pondicherry.

The workshop was held on November 5. Sex Post-Graduate teachers from Pondicherry region participated in the workshop. Venu, the Joint Director of Education, presided over the meet.

News Pondicherry

Action plan on national bio diversity

Pondicherry, National Biodiversity Strategy and Action Plan (NBSAP) an UNDP funded project, invites contributions from the interested public for preparing an action plan for the whole country as per the direction of Ministry of Environment and Forests, said coordinator Prof. P. P. Mathur, School of Life Sciences of Pondicherry University.

The diversity is seriously threatened by human activities owing to severe shortage of water, fodder, fuel and natural disasters such as floods, landslides and famines.

The detailed action plans for sub-state, state and regional levels will be consolidated and a national plan will be developed.

As the process of preparing action plan for Union Territory of Pondicherry is underway, those who are interested to contribute to the conservation of biodiversity, may send their valuable contribution to Prof. P.P. Mathur, and Dr. A.P. Reddy, Coordinators, NBSAP, School of Life Sciences, Pondicherry University at the earliest.

தினமலர்

புதுவை பல்கலைக்கழகத்தில் முதுநிலை ஆசிரியர் கருத்தரங்கு

12.2 Public hearings in the Union Territory of Pondicherry

12.2.1 The process

Public hearings were conducted according to the guidelines of the NBSAP in the agriculture and fisher folk villages of all the four regions of the Union Territory of Pondicherry to collect first hand information about the existing biodiversity issues and seek partnership of local people in biodiversity conservation. Public hearings were conducted in the villages across Pondicherry, Karaikal, Yanam and Mahe among agriculturists, fisher folk and people of different age groups. The stake holders were informed about the public hearings well in advance through elders and youth groups in the villages and also government officials. Wide publicity of NBSAP process was given through distribution of the booklet 'Call For Participation' in local languages. The theme and purpose of the hearings were explained to the participants. Records of these hearings were maintained.

12.2.2 Public hearing in Pondicherry region.

Three villages, (two agricultural and one fishing), were selected for public hearings in Pondicherry region. A summary of these hearings are given in the following sections.

12.2.2.1 Pooranankuppam village

Pooranankuppam is a village situated 12 Km south of Pondicherry on the Pondicherry-Cuddalore highway. It was decided to arrange a public hearing in this village because most of the people are agricultural farmers. The hearing was arranged in the village with the help of Mr. Purushothaman, agriculturist and former President, Co-operative Milk Society. The meeting was conducted on December 6, 2001 at 10:00 am which was agreed upon by the villagers. Seven male farmers and one woman farmer actively participated in the public hearing. They were Purushothaman, Kulandaivelu, Balaraman, Murugaian, Udayakumar, Kamalapatham, Sivaraman and Selvi.

The farmers informed that the varieties currently under cultivation are the improved varieties of paddy like ADT 36, ADT 37, Trichy 1 and White Ponni as the first crop, followed by growing vegetables like brinjal, okra, bitter gourd, snake gourd, chillies of traditional varieties, tomato, green vegetables, millets like hybrid kambu, ragi, ground nut, plantain and tapioca.

The traditional pattern of agriculture is not practiced at present due to availability of obsolete modern techniques and urbanisation pattern. Modern irrigation facilities are being used and *Kavalai* (old method of drawing water from the wells) are obsolete. Use of mechanised ploughing system is in practice. Traditional varieties of paddy like *Kudhiraival Samba* (Tamil) *Chitrai Samba* (Tamil), IR 20, IR 50 which were produced earlier are not cultivated.

The farmers displayed enthusiasm to cultivate traditional varieties of paddy like *Kudhiraival Samba* (Tamil) as it can withstand heavy monsoon season and pest attack. They, however, want the quality seeds to be provided by the government. Due to labour problem, non-availability of regular marketing facilities, low market prices coupled with climatic changes, depletion of groundwater and pollution, agriculture has been becoming a difficult profession. The farmers are aware of the dangers of usages of excess chemical fertilizers on the health of the soil.

In general farmers expressed their displeasure with the present system of Farmers' Markets (Uzhavar sandai) scheme which takes away lot of their times in bringing and selling their produce. The farmers felt that the government should improvise a procedure of collecting their produce and selling it through their outlets.

The farmers did not need subsidy but they expected the government to supply good quality viability-tested and certified seeds. The farmers want to be trained in producing their own compost and biofertilizers. Compulsory crop insurance was suggested by the farmers.

12.2.2.2 Sorapet village

Sorapet village is situated 22 km away from Pondicherry town on the Pondicherry-Thirukkanur road. The main vocation of the villagers is agriculture. The meeting was arranged with the help of two local farmers Mr. Kalivaradhan and Mr. Murthy The meeting was held at Throupathi Amman temple on February 15, 2002 at 3:00 pm. The schedule of the meeting was chosen after discussions with the villagers. Twenty two farmers who actively participated in the hearing were S. Poovaragasamy, P.Kalivaradhan, M.Parthasarathy, S.Iyyanar, M. Srinivasan, P. Jothy, D. Murthy, R.Devaraj, Sivagurnathan, Srinivasan, Purushothaman, A.Annamalai, Govindarassu, A.Susila, R.Rathanambal, S.Malarkodi, K.Rani, K. Muthulakshmi, I. Mangalakshmi, M.Indrani, Kamalakka, Maragatham, There were nine women present in the public hearing.

The farmers informed that two crops of paddy are being cultivated at present, A few of the farmers cultivate paddy as third crop subject to the availability of water. The varieties of paddy under cultivation are *Vellai Ponni* (Tamil), *Ponmani* (Tamil), ADT 39, Trichi 1 as the first crop. ADT 37, ADT 43, ASD 18, Chinna Ponni (Tamil) as the second crop and ADT 36, ADT 37 and *Chinna Ponni* (Tamil) as the third crop.

Apart from paddy, cultivation of sugar cane, groundnut, gingili, tapioca, cotton and causurina is also done. A few farmers grow hybrid varieties of okra, brinjal, capsicum and black gram. At present traditional crops like Ragi and Cumbu are not cultivated which were being cultivated as late as two decades ago. Traditional varieties of paddy are also not being cultivated.

A few farmers are enthusiastic to cultivate the traditional varieties of paddy for their own use if seeds are made available to them by the government. The farmers are aware of integrated pest management through the initiatives of the Department of Agriculture which conducts Farmers' Field Schools every week. The farmers are also aware of the disadvantages and the harmful effects of excessive usage of chemical fertilizers. The farmers were of the view that the government should take necessary steps to encourage organic farming.

During the public hearing it was noticed that the farmers faced many problems like non-availability of marketing outlets, delay in payments, non-availability of drying yards, non-availability of implements for mechanised farming and harvesting. The farmers felt that the agriculture policy should be modified and their concerns need to be addressed. The farmers pointed out that the young men and women do not show needed interest in agriculture due to diminishing returns and less respect in the society. The farmers also felt that a check dam should be built across the Pambai river so as to recharge depleting ground water.

12.2.2.3 Veerampattinam village

Veerampattinam is a fishing hamlet situated 10 km away from Pondicherry near Ariyankuppam village on the Pondicherry-Cuddalore road. The public hearing was arranged with the help of Mr. P. Shakthivel, Secretary, Fishermen Association, Veerampattinam and was held on the sea shore on February 6, 2002 at 3:00 pm. The fisher folk who actively participated in the discussions were S. Mani, P.Deivasigamani, A.Velmurugan, N.Allimuthu, S.Dhanasingam, K.Rajasekar, S.Veeramani, P.Nagaraj,

P.Sakthivel, R.Sathiamurthy E.Prabhu and Appavu. Women did not participate in the discussions.

The fisher folk were not aware of the biodiversity related issues. However, they admitted that certain varieties of fishes like *Porava* (Tamil), *Soodai* (Tamil) and *Kavalai* (Tamil) have become very rare and are hardly found in a catch now, while they were abundant a decade ago. It was felt that the reduction in the type and number of fishes could be due to climatic changes, water current flow, pollution of sea water by the coastal area factories and introduction of large fishing vessels.

Introduction of many mechanized boats, availability of cold storage facilities in the boats and the facility for the fishermen to stay for more than 18 hours in the sea thus allowing them indiscriminate over-fishing could be some of the reasons. In the process fingerlings of *Kasar* (Tamil) do not get chance to grow and breed. The Kasar fingerlings have been sold for production of poultry feed. The availability of some varieties of crustaceans like Lobster (*Singa eral*-Tamil) has also gone down.

The fishermen did express that the fishing holidays for 45 days between April 15, and May 29 are necessary for allowing the fishes to grow and breed and thus ensuring their livelihoods on sustainable fishing. However, during the holidays they do not find suitable alternative arrangements made for their livelihood by the government. They expect more support from the government to compensate their loss during the fishing holidays.

It was felt that the Government of Pondicherry could provide 90 kg of rice during the fishing holiday period. During the holidays the women folk could be trained in making various types of handicraft items including some of them made out of sea products. The government could encourage these activities by promoting sale of such items through cooperative societies. Thus, women could be able to generate extra income. The government could also encourage inland fishing during the period of fishing holiday.

12.2.3 Public hearings in Karaikal region

Three villages, (two agricultural and one fishing), were selected for public hearings in Karaikal region. A summary of these hearings are given in the following sections.

12.2.3.1 Thirumalairayanpattinam village

Thirumalairayanpattinam is situated 12 km away from Karaikal town on the Karaikal-Nagapattinam highway. The public hearing was arranged by informing the village folk well in

advance and Dr. S.Rajagopalan, Veterinary Assistant Surgeon helped in this process. The meeting was conducted at the Veterinary Dispensary, Thirumalairayanpattinam, Karaikal on January 30, 2002 at 10:00 am. Thirty one farmers including fourteen women farmers who attended the hearing were R.Periyanayagam, S.Selvaraj, P.K.Nagarajan, S.Rajadurai, K.Chandramohan, N.Muthusamy, K.Sakthivel, S.Govindaraj, S.Muthu, G.Ramadass, G.Selladurai, K.Sarasu, S.Valarmathi, J.Ramesh, K.Kavitha, P.Kaaliammal, L.Arulmary, V.Rajalakshmi, M. Sundari, M. Sattaiyappan, V.Pitchai, A.Pakkriammal, T.Arulmary, K.Rathinam, M.Thilagavathi, Amirtham, K.Saroja, V.Murugavel, V.Amudha, J.Vasanthi and A.Kannayan.

The farmers informed that currently the varieties of paddy cultivated by them are: *Vellai Ponni* (Tamil), ADT-65, ADT-64, ADT-63, ADT-38, CR1009, IR20. AST-19 and Trichi-1. A few farmers also grow vegetables for their own use. There is no cultivation of gingili, black gram, cambu, ragi, and sugarcane. Single cropping system of paddy is being followed at present due to non-availability of water. The farmers informed that about ten years ago they were able to take two paddy crops in a year when abundant water supply from Cauvery river was available. They told that the ground water is unsuitable for irrigation purposes due to its saline nature.

The farmers informed that most of them are forced to sell their produce to the private parties at a very low rate as the regulated market buys produce only from the farmers who have availed of agriculture loan and that too they are entitled only to the tune of their respective loan amounts. A few farmers expressed that the payments are delayed by the regulated market. Most farmers felt that usage of chemical fertilizers is inevitable. A few big farmers were enthusiastic to cultivate traditional varieties of paddy for their own use but most of the farmers do not find any profits in it.

The local breed of cattle "Umblacherry" is available with farmers in spite of the extensive cross breeding programmes by the government. The local breed is not popular as women encounter difficulties in handling it. Ploughing is done mostly with the help of bullocks. An effluent from the nearby Kothari Chemical Factory was reportedly causing pollution and thus has been adversely affecting human and animal health.

12.2.3.2 Thirunallar village

Thirunallar village is a temple town situated 10 km away from Karaikal. The public hearing was arranged by informing the village folk well in advance and

Dr. S.Rajagopalan, Veterinary Assistant Surgeon helped in this process. The meeting was conducted at the key village centre, Thirunallar, Karaikal on January 30, 2002 at 3:00 pm. Twenty four farmers including seven women farmers who participated in the hearing were M.Marimuthu, K.Chidambram, A.Radha, R. Marudhammal, D. Manonmani, R. Dhanalakshmi, R. Petchiammal , R. Saraswathi, S.Dhanasegaran, S.Nagarathinam, E. Arokiasamy, M.B.Mogan, R.Prabakaran, Purushothaman, T.Rathinavel, M.Vijayakumar, G.Rajendran, C.Suresh, T.Nagamuthu, M.Sundramurthi, M.Balamurugan, R.Baranidharan, K. Sedipavannu, and G.Seemaan.

The farmers informed that the varieties of paddy under cultivation are *Vellai Ponni* (Tamil), CR1009, ADT-38, ADT-45, ADT-43 and ADT-42. There is no cultivation of traditional crops like cumbu, ragi and sugarcane. Black gram and cotton are cultivated, subject to the availability of water. Two cropping system of paddy is cultivated in spite of water scarcity for the second crop. A few farmers are growing vegetables for their own use. The ground water due to salinity is unsuitable for irrigation.

The farmers felt that subsidies are not uniformly available to all the eligible farmers. The farmers informed that the quality of the seeds provided to them was not good. The farmers are forced to sell their produce to private parties at a very low rate, as the regulated market does not entertain the farmers except to them who have availed of agriculture loan facilities and that too to the tune of their respective loan amounts.

A few farmers expressed that their payments are unduly delayed by the regulated market. The farmers are not interested to grow the traditional varieties of paddy as there is water scarcity and they do not find profits in them. Water and air pollution due the presence of SPIC Henkel and Adhithiya Steel Plant was reported by the villagers.People of Thirunallar felt that organised tourism will help to improve their area and their livelihoods. At present there are no proper toilet facilities for the pilgrims.

The local "Umbalacherry" breed of cattle is available and the bullocks are used for ploughing and pulling cart. The villagers feel that breeding of goats will be difficult due to the absence of grazing fields.

12.2.3.3 Pattinamcherry hamlet

Pattinamcherry is a fishing hamlet situated 11 km away from Karaikal town. The meeting was arranged with the help of local community leaders of Pattinancherry, Mr. T.Ravi, Mr. R.Selvaraj and M.Rathinavel, and the meeting was conducted on January

30, 2002 at 7:00 am. The following fisher folk who actively participated in the hearing were S. Kannadasan, Appachetty, T. Machendran, M. Thangamani, .K.Sankar and K.Muthamizhan. No women folk participated in the hearing.

Fishes like *Pokkan* (Tamil), *Surumb* (Tamil), *Thaadikaala* (Tamil), *Vangaraachi* (Tamil), *Thovai* (Tamil), *Manchaparai* (Tamil), *Karthigaivalai* (Tamil), which were caught 10 to 15 years ago are no longer available. Turtles have also been reduced in the past decade. The fisher folk informed that *Poruva* (Tamil), *Navarai* (Tamil), *Vaalai* (Tamil) and *Semakai eral* (Tamil) are mostly found in their catch. *Kaanaankelethi* (Tamil), *Matthi* (Tamil), *Vavval* (Tamil), *Vanchiram* (Tamil) and (*Nettikaal eraal*) are available in less quantity. The growth and breeding of the fishes and prawns have been affected by effluent discharges from Kothari Chemical Factory at Pillaiperumal Nallur and aquaculture farms along the coastal area. However, the fisher folk felt that inland prawn culture could be encouraged. The fisher folk expressed their displeasure on non-availability of suitable alternate support by the government during fishing holidays. The community was almost at the brink of starvation. They feel that at least Rs. 5000/- should be given to each family during fishing holidays.

Though the foundation for the construction of fishing harbour was laid long time ago no action has yet been initiated to build the same. The fisher folk stressed that they very badly need the harbour constructed soon. The mechanized boats belonging to the community are at present fishing at Jagadapattinam, Tamil Nadu due to non-availability of harbour. Cold storage facilities are also required in the fishing villages. The rates of fishes also fluctuate, and the remuneration has been very low. The fisher folk felt that these rates should be revised and fixed uniformly by them. They also felt the need of a regulated fish market with all the facilities. The fisher folk also felt that subsidy on diesel should also be made available to them.

12.2.4 Public hearings in Mahe region

Three villages, (two agricultural and one fishing), were selected for public hearings in Mahe region. Many attempts were made to collect farmers for the hearing but most of them did not respond and we were forced to cancel the meetings. However, a few farmers were contacted individually and discussions were held in their respective villages. A small meeting with a few fisher folk was also arranged. A summary of these hearings are given in the following sections.

12.2.4.1 Pallur village

Pallur is an urbanized village situated 13 km away from Mahe town. The meeting was arranged on February 26, 2002 at 10:00 am with the help of Dr. K. Rajeev, Veterinary Assistant Surgeon, Mahe. During the discussion with Mr. Rajan, of Pandakkal, recipient of best farmer award in mixed farming, it was gathered that the old paddy varieties like *Thonnooran* (Malayalam), *Anakkondan* (Malayalam), *Vadakkan* (Malayalam), *Rangukazhama* (Malayalam), *Kunjikazhama* (Malayalam), *Thambukazhama* (Malayalam) are not available now. Currently IR 8, Jaya, Vijaya and Ponni varieties of paddy are being cultivated. Other crops of this area are tapioca, banana, pepper and areca nut. Vegetables like cucumber, pumpkin, okra, bitter gourd and green vegetables are being cultivated on a small scale.

The traditional varieties are not cultivated at present due to their low yield and long duration. Awareness of the risks involved in using chemical fertilizers is among farmers. Apart from the use of chemical fertilizers farm yard manure and green manure are also used. Scarcity of biofertilizers has been reported in this area. Chemical and biopesticides are being used. Due to labour problem most of the farmers are switching to coconut plantations and agriculture land is being used for construction activities.

12.2.4.2 Chalakkara village

Chalakkara is an urbanized village situated 15 km away from Mahe town. The meeting was arranged on February 26, 2002 at 3:00 pm with the help of Dr. K. Rajeev, Veterinary Assistant Surgeon, Mahe. Discussions were held with Mr. T.O.Sankaran Nambiar, President and Mr. V.Sreedharan, Secretary, Chalakkara–Chembra Farmers' Forum.

The traditional varieties are not under cultivation due to their low yield and long duration. A variety called *Mundane* (Malayalam) takes ten months. The varieties of paddy under cultivation are IR 8, Jaya, Vijaya, Ponni. It was observed that there is only less than one percent of paddy cultivation in Mahe region and most of the paddy fields were converted into coconut plantations and buildings because of labour problems. Apart from coconut cultivation, tapioca, pepper, banana, betel, areca nut, vegetables like bitter gourd, okra, pumpkin and green vegetables are grown on a small scale. Even though the people are aware of the risks involved by the use of chemical fertilizers, they have no alternative

due to short supply of biofertilizers and non-availability of green manure in the surrounding areas. It was pointed out that *Manderi* (Malayalam) disease can result in about 50% reduction in coconut crop.

It was strongly felt that along the stream flowing in Chalakkara, a stone-wall side lining and check dams should be constructed in order to retain ground water. However, a group of persons have been objecting to this plan as it may result in loss of their lands.

During the discussions it was pointed out that there is no proper copra marketing outlet in Mahe region. The need for establishment of a regulated market facility for copra has been felt. A coconut oil extraction unit could be started and the oil could be distributed in place of palm oil through the public distribution system. This would make coconut plantation economically more rewarding to the farmers. The farmers also felt that toddy tapping should be permitted and the shops should be located on the sides of the main roads.

12.2.4.3 Mahe coast

The public hearing was arranged on February 25, 2002 at 5:00 pm. The persons belonging to fishing community who actively participated in the meeting were Jayaraman, Sunil, Sujeet, Suresh, Pramod, Priyash and Dhanesh. No women participated in the discussions.

Mahe has about 1 Km of coastline on the Arabian sea and has about 6000 persons in the fisher folk community. About 1200 of them are active fishermen and nearly 110 are active fisherwomen. At present oil sardines predominate the catch followed by other sardines, mackerals, seer fish, prawns, soles, cat fish, eel, mullets and molluscs. Though no coastal pollution was noticed the depletion of some fishes like rose-mackerals, silver bellies, white sardine, horse-mackerals etc., over the past decade may be due to indiscriminate fishing activity using trawlers and ring seane net. The catch has also been showing reduction in catfish, mullets, hilsa llisha and eel.

Though aware of the advantages of fishing holidays, the fisher folk feel that more compensation package should be given to the families of the fisher folk. They felt that the distribution of 25 Kg of rice as compensation was not sufficient for their survival. However, during fishing holidays, only mechanized boats were not allowed while catamaran were used for fishing. The fisher folk felt that the life insurance should be increased as well as the loan amount for their housing.

12.2.5 Public hearings in Yanam region

Four villages, (three agricultural and one fishing), were selected for public hearings in Yanam region. A summary of these hearings are given in the following sections.

12.2.5.1 Daryiallatippa village

Daryiallatippa village is situated 8 Km from Yanam town. The meeting was arranged on October 8, 2001 at 2:30 pm with the help of Mr. S.Swamy Naidu, Deputy Director, Department of Agriculture, Mr. M. Suryaprakash Rao, Depot incharge, PASIC and Mr. S. Atchuta Rao, Demonstration Assistant, Department of Agriculture. The hearing was conducted at the PASIC depot. The farmers who actively participated in the meeting were Malladi Suriyanaranan, Nalla Venkattarao, Matta Saibabu, Kopi Reddi, Chandra Rao, Cholangi Ramakrishna, Malladi Sathi Babu and Nalla Ganapathi. No woman came forward for the meeting.

The main crop being cultivated is paddy and the varieties are MTU 7029, *Samba Mashuri* (Telugu), BPT 5204, MTU 1001, MTU 1010, MTU 3626. A few farmers also cultivate vegetables like bottle-gourd, okra, brinjal, tomato, green vegetables and beans for their own consumption. Irrigation is done through Godavari river water. Cultivation of traditional crops is not in practice at present due to their reportedly low yield, long crop duration and inability of withstanding heavy monsoon. Though the farmers are aware of the benefits of biodiversity in crops they do not go for traditional crops due to low economical returns.

It was also noted that agricultural activity has been on downward trend due to acute labour problems, non-availability of labour during harvest seasons, and low market rates. Due to sporadic attack of Eurobite, the yield of coconut crop gets adversely affected and the farmers fetch low market price.

12.2.5.2 Mettacur village

Mettacur village is situated about 1 Km away from Yanam town. The meeting was arranged by Mr. S. Swamy Naidu, Deputy Director, Department of Agriculture. In spite of many efforts attendance of many farmers at public hearing could not be ensured. In the absence of a regular hearing discussions were held with Mr. Lakshmanan Rao, Chairman, Marketing Committee, at Mettacur, on October 8, 2001 at 5:00 pm.

The main crop being cultivated in the village is paddy and the varieties are BPT 5204, MTU 1032, MTU 1001, MTU 3626 and MTU 1010. and black gram T- 9, and green gram. The cultivation of traditional crops are not in practice at present due to their reportedly low yield, long crop duration and inability of crops to withstand heavy monsoon. Basumathi variety of paddy was earlier cultivated but was stopped due to low market price. A few farmers use neem cake as pesticide for the past five years. Due to the attack of Eurobite in coconut grove, land has been converted for prawn culture. It was felt that the farmers should be provided adequate training for the production of biofertilizers.

12.2.5.3 Kanakalpetta village

Kanakalpetta village is situated 2 Km away from Yanam town. The meeting was arranged by Mr. S. Swamy Naidu, Deputy Director, Department of Agriculture, Yanam region on October 9, 2001 at 11:30 am. Only a few farmers turned up. Mr. Kona Anjaneyalu and Mr. Kavala Ganapathi actively participated in the meeting. No woman participated in the discussion. The main crop under cultivation is paddy and the varieties are BPT 5204 and MTU 7029 as inter crop in coconut fields, and The farmers cultivate vegetables like brinjal, tomato, okra, green vegetables on a small scale.

The farmers were cultivating chillies, groundnut and maize fifteen years ago. But due to labour problems, coconut cultivation was favoured. The farmers also use organic manure, biofertilizer in addition to chemical fertilizers. The problem of Eurobite is managed by bunch spray and through root. Cultivation of traditional crop is no longer in practice due to low yield, long duration and inability of the crops to withstand heavy monsoon.

12.2.5.4 Savitri Nagar hamlet

Savitri Nagar is a fishing hamlet about 12 Km away from Yanam town. The meeting was arranged on October 8, 2001 at 10:30 am with the help of Mr. Dudala Gonteyya and Mr. Meera Sahib, Inspectors of Fisheries, Department of Fisheries & Fishermen Welfare. The persons who took active part in the public hearing were Malladi Venkateshwar, Rekada Ramalu, Doma Satyam, Malladi Achiyya, Vanamadi Veeraraju, Penupotha Veeraraju and Maskapalli Polayya. No woman participated in the meeting.

During the public hearing, it was noted that many varieties of fishes have been getting reduced or disappearing in the catch during the last two decades. It may be due to developmental activities, modernization and introduction of more mechanized boats. Ribbon fish and Indian oil sardines are being captured and transported to Kerala due to their demand there. The number of lobsters and tiger prawns has also been reducing due to over-exploitation by hatcheries and aquaculture farms. It was pointed out that there are fifty fishing trawlers in Savitri Nagar and Griyampetta hamlets. It was reported that many of the fingerlings are being caught and are being sold to poultry feed manufacturing units. It was felt that the government should initiate immediate action to check these unauthorised activities.

12.3 Annual marine and inland fish production : 2000-2001

Marine fish

Sl. No. 1)	Name of the fish (2)	Pondicherry (3) MT	Karaikal (4) MT	Mahe (5) MT	Yanam (6) MT	Total (7) MT
1.	Elasmobranchs	1020. 000	14. 400	52. 700	293. 000	1380. 000
2.	Clupeides					
	(a) Oil Sardines	1740. 000	244. 000	729. 800	149. 000	2863. 000
	(b) Other Sardines	1270. 000	307. 300	29. 300	7. 000	1613. 200
	(c) Anchovies	270. 000	14. 400	52. 100	41. 000	377. 500
	(d) Trissocles	120. 000	39. 200	0. 000	20. 000	179. 200
	(e) Hilsa llisha	0. 000	0. 000	0. 000	153. 000	153. 000
	(f) Hilsa others	0. 000	0. 000	21. 600	30. 000	51. 600
	(g) Other Clupeoides	180. 000	82. 900	47. 600	192. 000	502. 500
3.	Chirocentrus	30. 000	127. 400	26. 000	0. 000	183. 400
4.	Harpodon nehereus	0. 000	24. 000	0. 000	0. 000	24. 000
5.	Cat fishes	95. 000	646. 400	0. 000	189. 000	930. 400
6.	Saurida spp.	405. 000	307. 000	0. 000	24. 000	736. 000
7.	Eel	0. 000	20. 300	0. 000	26. 000	46. 300
8.	Belone & Hemiramphus	10. 000	23. 900	0. 000	0. 000	33. 900
9.	Exocoetus spp.	470. 000	12. 100	0. 000	0. 000	482. 100
10.	Bregmacerus spp.	20. 000	12. 000	0. 000	71. 000	103. 000
11.	Sphyraena	160. 000	11. 700	0. 000	0. 000	171. 700
12.	Mullets	690. 000	404. 500	0. 000	274. 000	1368. 000
13.	Polynemids	40. 000	56. 200	0. 000	85. 000	181. 200
14.	(a) Perches	1340. 000	759. 400	0. 000	46. 000	2145. 450
	(b) Perch like fish	216. 000	615. 500	0. 000	2. 000	833.500
15.	Lactarius spp.	0. 000	90. 800	0. 000	0. 000	90. 800
16.	Carangids					
	(a) Caranx	900. 000	765.100	77. 800	0. 000	1742. 900
	(b) Chorinemus spp.	120. 000	605. 900	0. 000	0. 000	725. 900
	(c) Elagatis spp.	0. 000	22. 200	0. 000	0. 000	22. 200
	(d) Other Carangids	0. 000	641. 400	0. 000	0. 000	641. 400

(1)	(2)	(3)	(4)	(5)	(6)	(7)
17.	Leiognathus spp.	1090. 000	653. 400	0. 000	1. 000	1744. 400
18.	Sciaenids	140. 000	588. 300	0. 000	0. 000	728. 300
19.	Red mullets	475. 000	616. 900	0. 000	0. 000	1091. 900
20.	Ribbon fish	120. 000	74. 000	0. 000	119. 000	313. 000
21.	Scombridae					
	(a) Mackerals	1360. 000	391. 200	653. 300	134. 000	2538. 500
	(b) Seer fish	1224. 000	136. 000	56. 100	0. 000	1416. 500
	(c) Tunnies	839. 000	24. 900	6. 100	84. 000	954. 000
22.	Pomfrets	205. 000	430. 100	90. 000	174. 000	899. 000
23.	Soles	350. 000	57. 500	282. 500	111. 000	801. 000
24	Crustaceans					
	(a) Penaeid	1236. 000	1699. 500	222. 700	132. 000	3290. 000
	Non-Penaeid	212. 000	994. 000	0. 000	44. 000	1250. 000
	(c) Lobster	0. 000	0. 000	0. 000	0. 000	0. 000
25.	(d) Deep Sea Lobster	0. 000	0. 000	4. 800	0. 000	4. 800
26.	(e) Other crustaceans	770. 000	288. 800	122. 800	37. 000	1218. 600
27.	Molluscs/ Cephalopods	560. 000	106. 700	255. 000	71. 000	992. 700
	Jew fish	0. 000	0. 000	9. 700	0. 000	9. 700
	Miscellaneous	1138. 800	1720. 100	1022. 900	389. 000	4270. 800
	TOTAL	**18659.000**	**13630.000**	**3762. 800**	**2898. 000**	**38950. 000**

Inland fish

Sl. No. (1)	Name of Fish (2)	Pondicherry (3) MT	Karaikal (4) MT	Mahe (5) MT	Yanam (6) MT	Total (7) MT
1.	Major carps	90. 600	973. 000	0. 000	248. 000	1012. 500
2.	Common carps	24. 350	197. 900	0. 000	186. 000	408. 250
3.	Live fishes	7. 650	0. 000	0. 000	0. 000	7. 600
4.	Cat fishes	144. 250	169. 000	0. 000	0. 000	171. 000
5.	Murrels	15. 850	106. 000	0. 000	162. 000	283.850
6.	Other carps	41, 350	285. 400	0. 000	0. 000	326. 750
7.	Hilsa/ Ilisha	0. 000	1. 300	0. 000	0. 000	1. 300
8.	Prawn/ Macrobrachium	6. 700	35. 800	0. 000	0. 000	42. 000
9.	Mullets	74. 700	184. 800	0. 000	0. 000	259. 500
10.	Tilapia	179. 800	0. 000	0. 000	0. 000	179. 800
11	Minor carps	0. 000	0. 000	0. 000	170. 000	170. 000
12	Miscellaneous	352. 950	554. 700	0. 000	266. 000	1173. 650
	TOTAL	**938. 200**	**2208. 800**	**------**	**1203. 000**	**4350. 000**

(***Source: Department of Fisheries & Fishermen Welfare, Government of Pondicherry***)

12.4 Preliminary check list of the flora of Pondicherry region

ACANTHACEAE

Acanthus ilicifolius L.
Andrographis alata (Vahl) Nees
Andrographis paniculata (Burm.f.) Wallich ex Nees
Asystasia gangetica (L.) T. Anderson
Barleria acuminata Nees
Barleria cuspidata Heyne ex Nees
Barleria longiflora L.f.
Barleria nitida Nees
Barleria noctiflora L.f.
Barleria prionitis L.
Blepharis maderaspatensis (L.) Roth
Blepharis repens (Vahl) Roth
Crossandra infundibuliformis (L.) Nees
Dipteracanthus patulus (Jacq.) Nees
Dipteracanthus prostratus (Poiret) Nees
Ecbolium viride (Forsskal) Alston
Elytraria acualis (L.f.) Lindan
Eranthemum capense L.
Hygrophila auriculata (Schum) Heine
Indoneesiella echioides (L.) Sreemadh.
Justicia adhatoda L.
Justicia gendarussa Burm.f
Justicia glauca Rottler
Justicis tranquelebariensis L.f.
Lepidagathis cristata Willd.
Rhinacanthus nasutus (L.) Kurz.
Rostellularia japonica (Thumb.) Ellis
Rostellularia prostrata (Roxb.ex Clarke) Majumdar
Ruellia tuberosa L.
Rungia pectinata (L.) Nees
Rungia repens (L.) Nees
Stenosiphonium rusellianum

AGAVACEAE

Agave angustifolia Haw.
Agave sisalana Perrine ex Engelm
Dracaena sp.
Sanseviera roxburghiana Schultes & Schultes f.

AIZOACEAE

Sesuvium portulacastrum (L.) L.
Trianthema decandra L.

Trianthema portulacastrum L.
Trianthema triquetra Rottler ex Willd.

ALANGIACEAE
Alangium salvifolium (L.f.) Wangerin ssp.*salvifolium* - Turrill &Milne

ALISMATACEAE
Limnophyton obtusifolium (L.) Miq.

ALLIACEAE
Allium cepa L.

AMARANTHACEAE
Achyranthes aspera L.var.*aspera*
Achyranthes lidertata Bheme
Aerva lanata (L.) Juss.
Aerva sanquinolenta (L.) Blume
Allmania nodiflora (L.) R.Br. ex Weight
Alternanthera pungens Kunth
Alternanthera sessilis (L.) R.Br. ex DC.
Amaranthus spinosus L.
Amaranthus tricolor L.
Amaranthus viridis L.
Celosia argentea L. var. *argentea*
Celosia cristata L.
Digeria muricata (L.) C. Martius
Gomphrena celosioides C. Martius
Gomphrena globosa L.
Psilotrichum nudum (Wallich) Maq.
Pupalia lappacea (L.) A.L. Juss var. *lappacea* - C.Towns
Trichurus monsoniae (L.f.) C. Towns.

AMARYLLIDACEAE
Crinum asiaticum L.
Crinum defixum Ker Gawler
Pancratium triflorum Roxb.

ANACARDIACEAE
Anacardium occidentale L.
Buchanania axillaris (Desr.) T.P.Ramamoorthy
Launea coromandelica (Houtt.) Merr.
Mangifera indica L.
Spondias pinnata (L.f.) Kurz
Semecarpus anacardium L.f.-var. *anacardium*
Rhus mysorensis G.Don

ANNONACEAE
Annona muricata L.
Annona reticulata L.
Annona squamosa L.
Artabotrys hexapetalus (l.f.) Bhandari
Polyalthia longifolia (Sonn.) Thwaites
Polyalthia suberosa (Roxb.) Thwaites

APIACEAE
Centella asiatica (L.) Urban
Coriandrum sativum L.

APOCYNACEAE
Aganosma cymosum (Roxb.) Don
Allamanda cathartica L.
Alstonia macrophylla
Alstonia scholaris (L.) R.Br.
Carissa carandas L.
Carissa spinarum L.
Cascabela thevetia (L.) Lippold
Catharanthus pusillus (Murray) Don
Catharanthus roseus (L.) Don
Cerbera odollam Gaertn.
Ervatamia divaricata (L.) Burkill
Holarrhena pubescense (Buch.-Ham.) Wallich ex Don
Ichnocarpus frutescens (L.) R.Br.
Nerium oleander L.
Plumeria alba L.
Plumeria rubra L.
Plumeria rubra L.
Rauvolfia tetraphylla L.
Vallaris solanacea (Roth) Kuntze
Vinca minor L.
Wrightia tinctoria (Roxb.) R.Br.

APONOGETONACEAE
Aponogeton natans (L.) Engl. & K. Krause

ARACEAE
Acorus calamus L.
Amorphophallus paeoniifolius (Dennst.) Nicolson
Amorphophallus sylvaticus (Roxb.) Kunth
Anthurium spathiphyllum N.E. Br.
Colocasia esculenta (L.) Schott

Cryptocoryne retrospiralis (Roxb.) Kunth
Monstera deliciosa Liebm.
Pistia stratiotes L.
Rhaphidophora laciniata (Burm.f.) Merr
Theriophonum trifoliatum
Theriophonum minutum (Willd.) Baillon

ARALIACEAE
Schefflera stellata (Gaertner) Harms
Schefflera racemosa (Wight) Harms

ARECACEAE
Areca catechu L.
Borassus flabellifer L.
Calamus rotang L.
Caryota urens L.
Cocos nucifera L.
Corypha umbraculifera L.
Phoenix loureirii Kunth
Phoenix sylvestris (L.) Roxb.
Phoenix pusilla Gaertn.

ARISTOLOCHIACEAE
Aristolochia bracteolata Lam.
Aristolochia grandiflora Sw.
Aristolochia indica L.

ASCLEPIADACEAE
Asclepias curassavica L.
Calatropis procera (Ait.) R.Br.
Calotropis gigantea (L.) R.Br.
Caralluma adscendens (Roxb.) Haw
Caralluma attenuata Wight
Caralluma lasiantha (Wight) N.E. Br.
Caralluma umbellata Haw.
Ceropegia candelabrum L.
Ceropegia juncea Roxb.
Cryptelepis grandiflora Wight
Cryptolepis buchanani Roemer & Schultes
Cryptostegia grandiflora R.Br.
Gymnema sylvestre (Retz.) R.Br. ex Roemer & Schultes
Hemidesmus indicus (L.) R.Br.var.*indicus*-Hook.f.
Leptadenia reticulata (Retz.) Wight & Arn.
Oxystelma esculentum (L.f.) R.Br. ex Schultes
Pentatropis capensis (L.f.) Bullock

Pergularia daemia (Forsskal) Chior.
Sarcostemma acidum (Roxb.) Voigt
Sarcostemma secamone (L.) Bennet
Telosma minor (Andrews) Craib
Tylophora indica (Burm.f.) Merr.
Wattakaka volubilis (L.f.) Stapf

ASTERACEAE
Acanthospermum hispidum DC.
Ageratum conyzoides L.
Artemisia nilagirica (Clarke) Pamp.
Blainvillea acmella (L.) Philipson
Blumea mollis (D.Don) Merr.
Blumea obliqua (L.) Druce
Chromolaena odoratata (L.) R.King & H. Robinson
Chrysanthemum auethifolium Boruss. ex Willd.
Conyza bonariensis (L.) Cronquist
Eclipta prostrata (L.) L.
Emilia sonchifolia (L.) DC.
Epaltes divaricata (L.) Cass.
Grangea maderaspatana (L.) Poiret
Helianthus aunnus L.
Kleinia grandiflora (DC.) N. Rani
Launaea sarmentosa (Willd.)Schultz-Bip.ex Kuntz
Parthenium hysterphorus L.
Solidago microglossa DC.
Sonchus oleraceus L.
Sphaeranthus indicus L.
Spilanthes calva DC.
Synedrella nodiflora (L.) Gaertner
Tagetes erecta L.
Tagetes patula L.
Tridax procumbens L.
Vernonia cinerea (L.) Less.
Vernonia elaeagnifolia DC.
Vicoa indica (L.) DC.
Wedelia biflora (L.) DC.
Wedelia chinensis (Osbeck) Merr.
Xanthium indicum K. Koenig

AVERRHAOCEAE
Averrhoa bilimbi L.
Averrhoa carambola L.

AVICENNIACEAE
Avicennia marina (Forsskal) Wierh.
Avicennia officinalis L.

BALSAMINACEAE
Impatiens balsamina L. var. *balsamina*

BARRINGTONIACEAE
Barringtonia acutangula (L.) Gaertner ssp.*acutangula* - Payens
Barringtonia racemosa (L.) Spreng
Carerya arborea Roxb

BASELLACEAE
Basella alba L. var. *alba*
Basella alba L. var. *rubra* (L.) J.L. Stewart

BEGONIACEAE
Begonia malabarica Lam.
Begonia subpeltata Wight

BIGNONIACEAE
Crescentia cujeta L.
Dolichandrone falcata (DC.) Seemann
Kigelia africana (Lam.) Benth.
Millingtonia hortensis L.f.
Oroxylum indicum (L.) Benth.ex Kurz
Pyrostegia venusta (Ker Gawler) Miers
Spathodea campanulata P. Beauv.
Stereospermum personatum (Hassk.) Chatterjee
Tabubia argentea (B. & S.) Britt.
Tabubia rosea (Bertol.) DC.
Tecoma stans (L.) Kunth
Tecomaria capensis (Thumb.) Lindley

BIXACEAE
Bixa orellana L.

BOMBACACEAE
Bombax ceiba L.
Ceiba pentandra (L.) Gaertner var. *pentandra* - Robyns
Adansonia digitata L.

BORAGINACEAE
Coldenia procumbens L.
Heliotropium curassavicum L.

Heliotropium indicum L.
Heliotropium nerifolium Retz. ssp. *nerifolium*
Heliotropium supinum L.
Heliotropium zeylanicum (Burm.f.) Lam.ssp. *zeylanicum*
Trichodesma indicum (L.) R.Br.
Trichodesma zeylanicum (Burm.f.) R.Br.

BRASSICACEAE
Brassica juncea (L.) Cosson
Raphanus sativus L.

BROMELIACEAE
Ananas comosus (L.) Merr.

BURSERACEAE
Commiphora caudata (Wight & Arn.) Engl.
Commiphora berryi (Arn.) Engler

CACTACEAE
Cereus pterogonus Lamaire
Opuntia monocantha (Willd.) Haw.
Opuntia stricta (Haw.) Haw.var.*dillenii*(Ker Gawler)L.Benson

CAESALPINIACEAE
Amhertia nobilis Wall.
Bauhinia purpurea L.
Bauhinia racemosa Lam.
Bauhinia tomentosa L.
Bauhinia variegata L.
Caesalpinia bonduc (L.) Roxb.
Caesalpinia sappan L.
Caesalpinia pulcherrima (L.) Sw.
Cassia grandis L.f.
Cassia hirsuta L.
Cassia pumila Lam.
Cassia absus L.
Cassia alata L.
Cassia auriculata L.
Cassia fistula L.
Cassia mimosoides L.
Cassia occidentalis L.
Cassia roxburghii DC.
Cassia siamea Lam.
Cassia tora L.
Delonix elata (L.) Gamble

Delonix regia (Hook.) Raf.
Hardwickia binata Roxb.
Parkinsonia aculeata L.
Peltophorum pterocarpum (DC.) Becker ex K. heyne
Pterolobium hexapetalum (Roth) Santapau & Wagh
Saraca asoca (Roxb.) Wilde
Tamarindus indica L.

CANNACEAE
Canna indica L.

CAPPARACEAE
Cadaba fruticosa (L.) Druce
Capparis brevispina DC.
Capparis divaricata Lam.
Capparis sepiaria L.
Capparis zeylanica L.

CARICACEAE
Carica papaya L.

CASUARINACEAE
Casuarina equisetifolia Forster & Forster f.
Casuarina jungniana

CELASTRACEAE
Maytenus emarginata (Willd.) Ding Hou
Cassine glauca (Rottb.) Kuntze
Loeseneriella obtusifolia (Roxb.) A.C.Smith
Pleurostylia opposita (Wall.) Alston

CHENOPODIACEAE
Suaeda maritima (L.) Dumoit
Suaeda monoica (Forsskal) ex J. Gmelin

CLEOMACEAE
Cleome angustifolia Forsk.
Cleome aspera J.Koenig ex DC
Cleome felina L.f.
Cleome gynandra L.
Cleome monophylla L.
Cleome tenella L.f.
Cleome viscosa L.
Crateva magna (Lour.) DC.
Maerua delongifolia (Forsskal) A.Rich.

CLUSIACEAE
Calophyllum inophyllum L.
Garcinia spicata (Wight & Arn.) Hook.f.

COCHLOSPERMACEAE
Cochlospermum religiosum (L.) Alston

COMBRETACEAE
Anogeissus latifolia (Roxb. ex DC.) Wall. ex. Guill & Perr
Calycopteris floribunda (Roxb.) Poiret
Combretum ovalifolium Roxb.
Quisqualis indica L.
Terminalia arjuna (DC.) Wight & Arn.
Terminalia bellirica (Gaertner) Roxb.
Terminalia catappa L.
Terminalia chebula Retz.

COMMELINACEAE
Commelina attenuata J.Koenig ex Vahl
Commelina benghalensis L.
Commelina clavata Clarke
Commelina erecta L.
Commelina longifolia Lam.
Cyanotis cristata (L.) D.Don
Cyanotis tuberosa (Roxb.) Schultes & Schultes f.
Cyanotis villosa (Sprengel) Schultes f.
Murdannia nudiflora (L.) Brenan
Murdannia spirata (L.) Brueckner
Tonningia axillaris (L.) Kuntze

CONVOLVULACEAE
Argyreia cymosa (Roxb.) Sweet.
Argyreia nervosa (Burm.f.) Boj
Argyreia osyrensis (Roth) Choisy
Cressa cretica L.
Cuscuta chinensis Lam.
Cuscuta reflexa Roxb.
Evolvulus alsinoides (L.) L.
Evolvulus nummularius (L.) L.
Ipomoea aquatica Forsskal
Ipomoea batatas (L.) Lam.
Ipomoea cairica (L.) Sweet
Ipomoea carnea Jacq.ssp. *fistulosa* (Choisy) D.Austin
Ipomoea hederifidia L.
Ipomoea obscura (L.) Ker Gawler

Ipomoea pes-caprae (L.) R.Br.
Ipomoea pes-tigridis L.
Ipomoea quamoclit L.
Ipomoea sepiaria J.Koenig ex Roxb.
Ipomoea staphylina Roemer & Schultes
Jacquemontia caerulea Choisy
Jacquemontia paniculata (Burm.f.) Hallier.f.
Merremia emarginata (Burm.f.) Hallier.f.
Merremia hederacea (Burm.f.) Hallier.f.
Merremia tridentata (L.) Hallier.f.
Merremia turpethum (L.) G.L. Shah & & R.G. Bhat
Porana paniculata Roxb.
Rivea hypocrateriformis (Derr.) Choisy

CORDIACEAE
Carmona retusa (Vahl) Masamune
Cordia monoica Roxb.
Cordia obliqua Willd.
Cordia wallichii Don
Ehretia pubescens Benth.

COSTACEAE
Costus specious (Koen.) J.E. Smith

CRASSULACEAE
Kalanchoe pinnata (Lam.) Pers.
Kalanchoe schweinfurthii Penzig

CUCURBITACEAE
Benincasa hispida (Thunb.) Cogn.
Citrullus colocynthis (L.) Schrader
Citrullus lanatus (Thunb.) Matsum. & Nokai
Coccinia grandis (L.) J.Voigt
Corallocarpus epigaeus (Rottler) C.B. Clarke
Ctenolepis garcinii (Burm.f.) C.B. Clarke
Cucumis melo L. var. *melo*
Cucumis sativus L.
Cucurbita maxima Duchesne ex Lam.
Cucurbita moschata (Duchesne & Lam.) Duchesne ex Poiret
Cucurbita pepo L. var. *pepo*
Diplocyclos palmatus (L.) C. Jeffrey
Kedrostis foetissima (Jacq.) Cogn.
Lagenaria siceraria (Molina) Standley
Luffa acutangula (L.) Roxb.
Luffa cylindrica (L.) M. Roemer

Momordica charantia L. - var. *charantia*
Mukia leiosperma (Wight & Arn.) Thwaites
Mukia maderaspatana (L.) M. Roemer
Trichosanthes tricuspidata Lour.
Zehneria mysorensis (Wight & Arn.) Arn.

CYPERACEAE
Alloteropsis cimicina (L.) Stapf
Bulbostylis barbeta (Rottb.) C.B. Clarke
Carex speciosa Kunth
Cyperus arenarius Retz.
Cyperus brevifolius (Rottl.) Hassk.
Cyperus castanens Willd.
Cyperus compressus L.
Cyperus corymbosus Rottb.
Cyperus difformis L.
Cyperus exaltatus Retz.
Cyperus iria L.
Cyperus kyllingia Endlicher
Cyperus melanospermus (Nees) Valcken
Cyperus nemoralis (Foister & Foister f.) Dandy ex Hutch. & Dalziel
Cyperus pangorei Rottb.
Cyperus panicens (Rottb.) Boeckeler
Cyperus polystachya Rottl.
Cyperus pumilus L.
Cyperus puncticulatus Vahl
Cyperus rotundus L. ssp. *rotundus*
Cyperus squarrosus L.
Cyperus stoloniferus Retz.
Cyperus tenuispica Stendel
Cyperus triceps (Rottb.) Endlicher
Eleocharis atropurpurea (Retz.) C. Presl
Eleocharis dulcis (Burm.f.) Henschel
Eleocharis retroflexa (Poiret) Urban
Fimbristylis argentea (Rottb.) Vahl
Fimbristylis bisumbellata (Forsskal) Bubani
Fimbristylis cymosa R.Br.
Fimbristylis dipsacea (Rottl.) C.B. Clarke
Fimbristylis miliacea (L.) Vahl
Fimbristylis ovata (Burm.f.) Kern
Fimbristylis polytrichoides (Retz.) R.Br.
Fuirena capitata (Burm.f.) J. Koyama
Fuirena ciliaris (L.) Roxb.
Scirpus articulatus L.
Scirpus jacobii Fischer

Scirpus juncoides Roxb.
Scirpus squarrosa L.

DILLENIACEAE
Dillenia indica L.

DIOSCOREACEAE
Dioscorea bulbifera L. var. *bulbifera*
Dioscorea alata L.
Dioscorea oppositifolia L. var. *oppositifolia*
Dioscorea pentaphylla L. var. *pentaphylla*

EBENACEAE
Diospyros ebenum J. Koenig ex Retz.
Diospyros melanoxylon Roxb.
Diospyros ferrea (Willd.) Bakh.
Diospyros montana Roxb.
Diospyros ovalifolia Wight

ELAEOCARPACEAE
Muntingia calabura L.

ERIOCAULACEAE
Eriocaulan quinquangulare L

ERYTHROXYLACEAE
Erythroxylum monogynum Roxb.

EUPHORBIACEAE
Acalypha ciliata Forsskal
Acalypha fruticosa Forsskal
Acalypha hispida Burm.f.
Acalypha indica L.
Aleurites moluceana (L.) Willd.
Breynia retusa (Dennst.) Alston
Breynia vitis-idea (Burm.f.) C. Fischer
Bridelia crenulata Roxb.
Chrozophora rottleri (Geiseler) Adr.Juss.
Cleistanthus collinus (Roxb.) Benth.ex Hook.f.
Croton bonplandianus Baillon
Dimorphocalyx glabellus Thw.
Drypetes roxburghii (Wallich) Hurusawa
Drypetes sepiaria (Wight & Arn.) Pax & Hoffm.
Euphorbia antiquorum L.
Euphorbia cyathophora Murray

Euphorbia heterophylla L.
Euphorbia hirta L.
Euphorbia indica Lam.
Euphorbia nivulia Buch.-Ham.
Euphorbia pulcherrima Willd.ex Klotzsch
Euphorbia rosea Retz.
Euphorbia serpens Kunth
Euphorbia thymifolia L.
Euphorbia tirucalli L.
Euphorbia tortilis Rottl.ex Ainslie
Excoecaria agallocha L.
Hevea brasiliensis (Willd.ex. Juss.) Muell.-Arg.
Hura crepitans L.
Jatropha curcus L.
Jatropha glandulifera Roxb.
Jatropha gossypifolia L.
Jatropha tanjorensis Ellis & Saroja
Mallotus philippensis (Lam.) Muell. Arg.
Manihot esculenta Crantz
Micrococca mercurialis (L.) Benth.
Pedilanthus tithymaloides (L.) Poit.
Phyllanthus acidus (L.) Skeels
Phyllanthus amarus Schum. & Thonn.
Phyllanthus emblica L.
Phyllanthus maderaspatensis L.
Phyllanthus reticulatus Poiret
Phyllanthus urinaria L.
Phyllanthus virgatus Forster f.
Ricinus communis L.
Sauropus androgynus (L.) Merr.
Sauropus bacciformis (L.) Airy Shaw
Sebastiania chamaelea (L.) Muell. Arg.
Securinega leucopyrus (Willd.)Muell. Arg.
Suregada angustifolia (Muell.Arg.) Airy Shaw
Synedenium grantii Hook.f.
Tragia involucrata L.
Tragia plukenetii R-Sm.

FABACEAE
Abrus precatorius L.
Aeschynomene aspera L.
Aeschynomene indica L.
Alysicarpus monilifer (L.) DC
Alysicarpus vaginalis (L.) DC.
Arachis hypogaea L.

Atylosia scarabaeoides (L.) Benth.
Butea monosperma (Lam.) Taubert
Castanospermum australe A. cunn & Fraser ex.Hook
Cajanus cajan (L.) Milsp.
Canavalia cathartica Thomas
Clitoria ternatea L.
Crotalaria medicaginea Lam.
Crotalaria calycina Schrauk
Crotalaria nana Burm.f
Crotalaria laburnifolia L.
Crotalaria angulata Miller
Crotalaria retusa L.
Crotalaria montana Roth
Crotalaria hirta Willd.
Crotalaria pusilla Heyne ex Roth
Crotalaria juncea L.
Crotalaria verrucosa L.
Crotalaria paniculata Willd.
Crotalaria alata Buch.- Ham & Roxb.ex D.Don
Crotalaria prostrata Rottl.ex Willd.
Crotalaria umbellata Wight ex Wight & Arn.
Dalbergia latifolia Roxb.
Dalbergia paniculata Roxb.
Dalbergia sissoo Roxb.
Derris scandens (Roxb.) Benth.
Derris trifoliata Lour.
Derris ovalifolia (Wight & Arn.) Benth.
Desmodium gangeticum (L.) DC.
Desmodium laxiflorum DC.
Desmodium velutinum (Willd.) DC.
Desmodium trifloum (L.) DC.
Desmodium biarticulatum (L.) F.U. Muell.
Dolichos trilobus L.
Eleiotis monophylla (Burm.f.)DC.
Erythrina stricta Roxb.
Erythrina variegata L.
Glycine max(L.) Merr.
Gliricidia sepium (Jacq.) Kunth ex Walp.
Indigofera aspalathoides Vahl ex DC.
Indigofera tinctoria L.
Indigofera trifoliata L.
Indigofera cassioides Rottl ex .DC.
Indigofera hirsuta L.
Indigofera linifolia (L.)f. Retz
Indigofera linnaei Ali

Indigofera longiracemosa Boivin ex Baillon
Indigofera trita L.f.
Lablab purpurens (L.) Sweet var *purpurens* Verdc.
Macrotyloma uniflorum (Lam.) Verdc.
Mundulea sericea (Willd.)A.Cheval.
Mucuna pruriens (L.) DC.
Ormocarpum sennoides (Willd.) DC.
Pongamia pinnata (L.) Pierre
Pseudarthria viscida (L.) Wight & Arn.
Pterocarpus marsupium Roxb.
Pterocarpus santalinus L.
Rhynchosia viscosa (Roth.) DC.
Rhynchosia minima (L.) DC.
Rhynchosia rufescens (Willd) DC.
Sesbania grandiflora (L.) Poiret
Sesbania bispinosa (Jacq.) W.Wight
Stylosanthes fruticosa (Retz.) Alston
Stylosanthes scabra
Tephrosia villosa (L.) Pers.
Tephrosia purpurea (L.) Pers.
Tephrosia maxima (L.) Pers.
Teramnus labialis (L.f.) Sprengel ssp. *labialis* var.*labialis V*erdc.
Vigna aconitifolia (Jacq.) Mere'chal
Vigna mungo (L.) Hepper
Vigna radiata (L.) Wilczek var *radiata*
Vigna trilobata (L.) Verdc.
Vigna unguiculata (L.) Walp.
Vigna radiata (L.) Wilczek- var. *sublobata* (Roxb.) Verdc.
Vigna unguiculata (L.) Walp.- ssp. *cylindrica* (L.) Eselt.
Zornia gibbosa Span
Zornia diphylla (L.) Pers.

FLACOURTIACEAE
Casearia elliptica Willd.
Flacourtia indica (Burm.f.) Merr.
Oncoba spinosa Forsk
Scolopia crenata (Wight & Arn)- var. *crenata*

GENTIANACEAE
Canscora heterodita (L.) Gilg
Enicostema axillare (Lam.) A. Raynal. ssp.*axillare*

HERNANDIACEAE
Gyrocarpus americanus Jacq.

HIPPOCRATEACEAE
Reissantia indica (Willd.) N.Halle'
Salacia chinensis L.

HYDROCHARITACEAE
Blyxa octandra (Roxb.) Planchon ex Thwaites
Halophila ovalis (R.Br.) Hook.f.
Hydrilla verticillata (L.f.) Royle
Ottelia alismoides (L.) Pers.
Vallisneria natans (Lour.) H. Hara

HYDROPHYLLACEAE
Hydrolea zeylanica (L.) Vahl

HYPOXIDACEAE
Curculigo orchoides Gaertner

ICACINACEAE
Pyrenacantha volubilis Wight

LAMIACEAE
Anisomeles indica (L.) Kuntze
Anisomeles malabarica (L.) R.Br. ex Sims
Geniosporum teuniflorum (L.) Merr.
Hyptis suaveolens (L.) Poit.
Leonotis nepetiifolia (L.) R.Br.
Leucas aspera (Willd.) Link
Leucas diffusa Benth
Leucas indica (L.) R.Br. ex Vetke var. *indica*
Mentha arvensis L.
Ocimum americanum L.
Ocimum basilicum L.var.*basilicum*
Ocimum teuniflorum L.
Orthosiphon thymiflorus (Roth) Sleesen
Plectranthus amboinicus (Lour.) Spreng.

LAURACEAE
Cassytha filiformis L.
Cinnamomum verum Presl

LECYTHIDACEAE
Couroupita guianensis Aublet

LEMNACEAE
Lemna gibba L.

Wolffia globosa (Roxb.) Hartog & Vander Plas

LENTIBULARIACEAE
Utricularia aurea Lour.
Utricularia caerulea L.
Utricularia hirta Klein ex Link
Utricularia polygaloides Edgew.

LILIACEAE
Aloe vera (L.) Burm.f.
Asparagus plumosus Baker
Asparagus racemosus Willd.
Gloriosa superba L.
Iphigenia indica (L.) A.Gray ex Kunth
Scilla hyacinthina (Roxb) J.F. Macbr

LINACEAE
Hugonia mystax L.

LOBELIACEAE
Lobelia alsinoides Lam.

LOGANIACEAE
Strychnos nux-vomica L.
Strychnos lenticellata Hill
LORANTHACEAE
Dendropthoe falcata (L.f.) Ettingsh.
Taxillus bracteatus (Wallich) Tieghem

LYTHRACEAE
Ammania baccifera L.
Ammania multiflora Roxb.
Ammania octandra L.f.
Lagerstroemia indica L.
Lagerstroemia reginae Roxb.
Lawsonia inermis L.
Nesaea lanceolata (Wight & Arn.) Koehne
Rotala densiflora (Roemer & Schultes) Koehne
Rotala indica (Willd.) Koehne
Rotala verticillaris L.

MAGANOLIACEAE
Michelia champaca L.

MALPIGHIACEAE
Hiptage benghalensis (L.) Kurz

MALVACEAE
Abutilon indicum (L.) Sweet ssp *indicum* Borssum
Abutilon hirtum (Lam.) Sweet
Abelmoschus esculentus (L.) Moench
Abelmoschus ficulneus (L.) Wight & Arn.
Gossypium barbadense L.
Gossypium arboreum L.
Gossypium hirsutum L.
Hibiscus cannabinus L.
Hibiscus mutabilis L.
Hibiscus ovalifolius (Forsskal) Vahl
Hibiscus rosa-sinensis L.
Hibiscus sabdariffa L.
Hibiscus surattensis L.
Hibiscus tiliaceus L. ssp. *tiliaceus* Borssum
Malvastrum coromandelianum (L.) Garcke
Pavonia odorata Willd.
Pavonia zeylanica (L.) cav.
Sida acuta Burm.f.
Sida cordata (Burm.f.) Borssum Waalkes
Sida cordifolia L.
Sida rhombifolia L.
Sida schimperiana Hochst. ex A.Rich
Thespesia populnea (L.) Sd.ex Corr. Serr.
Urena lobata L. - ssp. *sinnata* (L.) Borssum Waalkes - ssp. *lobata*

MARANTACEAE
Maranta arundinacea L.

MARTYNIACEAE
Martynia annua (Houstoun in Martyn) L.

MELASTOMATACEAE
Memecylon umbellatum Burm.f.
Osbeckia zeylanica L.f.

MELIACEAE
Aglaia elaeagnoidea (Juss.) Benth.var. *courtallensis* Gamble
Azadirachta indica Adr. Juss
Cipadessa baccifera (Roth) Miq.
Melia azedarach L.
Swietenia mahagoni (L.) Jacq.

Walsura trifoliata (Juss.) Harms Chukraria fabulacis A.Juss

MENISPERMACEAE
Cissampelos pareira L. var. hirsuta (DC.) Forman
Cocculus hirsutus (L.) Dtels
Pachygone ovata (Poiret) Hook.f. & Thomson
Tiliacora acuminata (Lam.) Miers
Tinospora cordifolia (Willd) Hook.f. & Thomson

MENYANTHACEAE
Nymphoides hydrophylla (Lour.) Kuntze
Nymphoides indicum (L.) Kuntze

MIMOSACEAE
Acacia catechu (L.f) Willd.
Acacia polycantha Willd
Acacia holecerisia A.Cunn.ex G.Don
Acacia mangium
Acacia auriculiformis A. Cunn. ex. Benth.
Acacia caesia (L.) Willd.
Acacia chundra (Rottler) Willd.
Acacia leucophloea (Roxb.) Willd.
Acacia nilotica (L.) Del. ssp.*indica* (Benth.) Brenan
Acacia sinuata (Lour.) Merr
Adenanthera pavonina L.
Albizia amara (Roxb) Boivin
Albizia lebbeck (L.) Benth.
Albizia odoratissima (L.f.) Benth. var. *odoratissima*
Dichrostachys cinerea (L.) Wight & Arn. ssp. *cinerea*. var. *cinerea*-Brenan & Brummitt
Enteralobium cylocarpum
Enteralobium saman (Jacq.) Merr.
Leucaena leucocephala (Lam.) de Wit
Mimosa intsia L.
Mimosa pudica L.
Neptunia oleracea Lour.
Parkia biglandulosa Wight & Arn.
Pithecellobium dulce (Roxb.) Benth.
Prosopis juliflora (Sw.) DC.
Prosopis spicigera L.

MOLLUGINACEAE
Gisekia pharnaceoides L.
Glinus lotoides L.
Glinus oppositifolius (L.) A. DC.

Mollugo cerviana (L.) Ser.var.*spathulifolia* Fenzl
Mollugo disticha (L.) Ser.
Mollugo nudicaulis Lam.
Mollugo pentaplylla L.
Mollugo stricta L.

MORACEAE
Artocarpus heterophyllus Lam.
Artocarpus incisus L.f.
Ficus benghalensis L. var. *krishnae* C. DC.
Ficus amplissima Smith
Ficus benghalensis L. var.*benghalensis*
Ficus benjamina L. var.*benjamina*
Ficus hispida L.f.
Ficus mollis Vahl
Ficus pumila L.
Ficus racemosa L.
Ficus religiosa L.
Morus alba L.
Plecospermum spinosum Tre'cul
Streblus asper Lour.

MORINGACEAE
Moringa pterygosperma Gaertn.
MUSACEAE
Heliconia psittacoum L.f.
Musa paradisiaca L.
Ravenala madagascarensis Sonner.

MYRISTICACEAE
Myristica fragrans Houtt.

MYRTACEAE
Callistemon citrinus (Curtis) Skeels
Eucalyptus globulus Labill
Eucalyptus tereticornis Smith
Eucalyptus torelliana F.Muell
Eugenia kurzii
Eugenia bracteata (Willd) Roxb. ex DC.
Psidium guajava L.
Syzygium cumini (L.) Skeels

NELUMBONACEAE
Nelumbo nucifera Gaertner

NYCTAGINACEAE
Boerhavia diffusa L.
Boerhavia erecta L.
Bougainvillea spectabilis Willd.
Bougainvillea glabra Choisy
Mirabilis jalapa L.
Pisonia aculeata L.
Pisonia grandis R.Br.

NYCTANTHACEAE
Nyctanthes arbor-tristis L.

NYMPHAEACEAE
Nymphaea nouchali Burm.f.
Nymphaea pubescens Willd

OCHNACEAE
Ochna obtusata DC. var. *obtusata* - Kams

OLACACEAE
Olax scandens Roxb.
Ximenia americana L.

OLEACEAE
Jasminum angustifolium Vahl
Jasminum auriculatum Vahl
Jasminum grandiflorum L.
Jasminum sambac (L.) Aiton
Jasminum sessiliflorum Vahl
Jasminum cuspidatum Rottl.
Chionanthus mala-elengi (Dennst.) P.S. green

ONAGRACEAE
Ludwigia adscendens (L.) H.Hara
Ludwigia perennis L.

OPILIACEAE
Cansjera rheedii J. Gmelin
Opilia amentacea Roxb

ORCHIDACEAE
Aerides ringens (Lindley) C. Fischer
Bulbophyllum sp
Cymbidium aloefolium (L.) Sw.
Dendrobium nutans Lindl.

Eria mysorensis Lindl.
Eria polystachya A.Rich
Eulophia epidendraea (J.Koenig) Schltr.
Eulophia nuda Lindl.
Habenaria roxburghii Nicolson
Vanda spathulata (L.)Spreng
Vanda tessellata (Roxb.) Hook.ex G.Don
Vanilla walkeriae Wight

OXALIDACEAE
Biophytum sensitivum (L.) DC. var. *sensitivum*
Oxalis corniculata L.

PANDANACEAE
Pandanus fascicularis Lam.
Pandanus tectorius Parkinson

PAPAVERACEAE
Argemone mexicana L.

PASSIFLORACEAE
Adenia wightiana (Wight & Arn.) Engl.
Passiflora edulis Sims
Passiflora foetida L.

PEDALIACEAE
Pedalium murex L.
Sesamum indicum L.
Sesamum prostratum Retz.

PIPERACEAE
Peperomia pallucida (L.) H.B.K.Nov.
Piper nigrum L.
Piper longum L.
Piper betle L.

PLUMBAGINACEAE
Plumbago zeylanica L.
Plumbago indica L.

POACEAE
Aeluropus lagopoides (L.) Trin.ex Thwaites
Andropogon pumilus Roxb.
Apluda mutica L.
Aristida adscensionis L.var.*adscensionis*

Aristida hystrix L.
Aristida setacea Retz.
Arundinella setosa Trin.
Arundo donax L.
Bambusa arundinacea (Retz.) Willd.
Bothriochloa pertusa (L.) A. Camus
Brachiaria distachya (L.) Stapf
Brachiaria ramosa (L.) Stapf
Brachiaria remota (Retz.) Haines
Brachiaria reptans (L.) C. Gardner & C.E. Hubb
Chloris barbata Sw
Chrysopogon aciculatus (Retz.) Trin.
Chrysopogon fulus (Sprengel) Chiov.
Chrysopogon orientalis (Desv.) A. Camus
Coelachyrum lagopoides (Burm.f.) Senar.
Coix lacryma - jobi L.
Cymbopogon caesius (Hook. & Arn.) Stapf
Cymbopogon citratus (DC.) Stapf
Cymbopogon coloratus (Hook.f.) Stapf
Cynodon dactylon (L.) Pers.
Cyrtococcum trigonum (Retz.) A. Camus
Dactyloctenium aegyptium (L.) P. Beauv
Dendrocalamus strictus (Roxb.) Nees
Dichanthium annulatum (Forssk.) Stapf
Digitaria ciliaris (Retz.) Koeler
Digitaria longiflora (Retz.) Pers.
Diplachne malabarica (L.) Merr.
Echinochloa colona (L.) Link
Echinochloa glabrescens (Munro ex) Eggel
Eleusine cocacana (L.) Gaertner
Eleusine indica (L.) Gaertner
Eragrostiella bifaria (Vahl) Bor
Eragrostis gangetica (Roxb.) Stendel
Eragrostis japonica (Thumb.) Trin.
Eragrostis nutans (Retz.) Nees ex Stendel
Eragrostis pilosa P.Beauv
Eragrostis riparoa (Willd.) Nees
Eragrostis tenella (L.) P. Beauv. ex Roemer & Schultes
Eragrostis unioloides (Retz.) Nees ex Stendel
Eragrostis viscosa (Retz.) Trin.
Heteropogon contortus (L.) P. Beauv.ex Roemer & Schultes
Imperata cylindrica (L.) Raeusch.
Isachne globosa (Thunb.) Kuntze
Isachne miliacea Roth
Isachne rugosum Salisb.

Menesithea laevis (Retz.) Kunth
Ophiuros exaltatus (L.) Kuntze
Oplismenus compositus (L.) P. Beauv.
Oryza sativa L.
Panicum miliare Lam.
Panicum notatum Retz.
Panicum repens L.
Paspalidium flavidum (Retz.) A. Camus
Paspalidium geminatum (Forsskal) Stapf
Paspalum scrobiculatum L.
Paspalum vaginatum Sw.
Pennisetum americanum (L.) Leeke
Pennisetum typhoides (Burm.f.) Stapf. Hubbard
Perotis indica (L.) Kuntze
Phragmites karka (Retz.) Trin.ex.Stendel
Rottboellia exaltata L.f.
Saccharum officinarum L.
Saccharum spontaneum L.
Setaria indica (L.) Chase
Setaria italica (L.) P.Beauv.
Setaria palmifolia (J.Koenig) Stapf
Setaria pumila (Poiret) Roemer & Schultes
Setaria verticillata (L.) P.Beauv.
Sorghum halepense (L.) Pers
Spinifex littoreus (Burm.f.) Merr.
Sporobolus coromandelianus (Retz.) Kunth
Sporobolus indicus (L.) R.Br. var. *diander*
Sporobolus spicatus (Vahl) Kunth
Sporobolus tremulus (Willd.) Kunth
Sporobolus wallichii Munro ex Trin.
Vetiveria zizanioides (L.) Nash
Zea mays L.

POLYGALACEAE
Polygala arvensis Willd.
Polygala jacobii Chandrabose
Polygala javana DC.
Polygala chinensis L.

PONTEDERIACEAE
Eichhornia crassipes (C.Martius) Solms-Laub.
Monochoria vaginalis (Burm.f.) C.Presl

PORTULACACEAE
Portulaca pilosa L. ssp. *grandiflora*

Portulaca oleracea L.
Portulaca quadrifida L.
Portulaca tuberosa Roxb.
Portulaca pilosa L. ssp. *pilosa*
Talinum portulacifolium (Forsskal.) Asch. ex schweinf.

POTAMOGETONACEAE
Potamogeton pectinatus L.

PROTEACEAE
Grevillea robusta A.cunn.ex R.Br.

PUNICACEAE
Punica granatum L.

RHAMNACEAE
Scutia myrtina (Burm.f.) Kurz
Ventilago maderaspatana Gaertner.
Ziziphus mauritiana Lam.
Ziziphus oenophila (L.) Miller

RHIZOPHORACEAE
Bruguiera cylindrica (L.) Blume
Rhizophora apiculata Blume
Rhizophora mucronata Poiret

ROSACEAE
Rosa centifolia L.
Rosa damascena Mill.

RUBIACEAE
Catunaregam spinosa (Thumb.) Tirvengadum
Gardenia resinifera Roth
Canthium dicoccum (Gaertner) Teijsm. & Binnend.var.*dicoccum*
Canthium parviflorum Lam.
Coffea arabica L.
Dentella repens (L.) Forster & Forster.f.
Guettarda speciosa L.
Haldina cordifolia (Roxb.) Ridsdale
Hamelia patens Jack.
Ixora coccinea L.
Ixora pavetta Andrews
Mitragyna parvifolia (Roxb.) Korth.var. *parvifolia* - Ridsd
Morinda pubescens J.E. Smith
Mussaenda frondosa L.

Oldenlandia affinis (Roemer & Schultes) DC.
Oldenlandia alata J.Koenig ex Roxb.
Oldenlandia biflora L.
Oldenlandia umbellata L.
Neolamarckia cadamba (Roxb.) Bosser
Hedyotis herbacea L.
Hedyotis corymbosa (L) Lam.
Pavetta indica L.
Psilanthus wightianus (Wight & Arn.) J.Leroy
Randia malabarica Lam.
Spermacoce hispida L.
Spermacoca ocymoides Burm.f.
Tarenna asiatica (L.) Kuntze ex K. Schum var. *asiatica*

RUTACEAE
Aegle marmelos (L.) Corr. Serr.
Atalantia monophylla (L.) Corr. Serr.
Chloroxylon swietenia DC.
Citrus medica L.
Citrus aurantifolia (Christm.) Swingle
Citrus limon (L.) Burm.f.
Citrus grandis Osbeck
Citrus sinensis (L.) Osbeck
Citrus reticulata Blanco
Clausena dentata (Willd.) Roemer
Glycosmis mauritiana (Lam.) Yuich. Tanaka
Limonia acidissima L.
Murraya koenigii (L.) Sprengel
Murraya paniculata (L.) Jack
Naringi crenulata (Roxb.) Nicolson
Pamburus missionis (Wight) Swingle
Pleiospermum alatum (Wight & Arn.) Swingle
Ruta graveolens L. var. *augustifolia* (Pers.) Holk.f.
Toddalia asiatica (L.) Lam.
Triphasia trifolia (Burm.f.)P.Wilson

SALVADORACEAE
Azima tetracantha Lam.
Salvadora persica L.var.*wightiana* (Thwaites) Verdc.

SANTALACEAE
Santalum album L.

SAPINDACEAE
Allophylus serratus (Roxb.) Kurz.

Cardiospermum halicacabum L. var *luridem* (Blume) Adelb
Dodonaea angustifolia L.f.
Lepisanthes tetraphylla (Vahl) Radlk. Stizungsber
Filicium decipiens (Wight & Arn.) Thw.
Sapindus emarginata Vahl.
Schleichera oleosa (Lour.) Oken.

SAPOTACEAE
Madhuca longifolia (J.Koenig) Macbr.
Manilkara hexandra (Roxb.) Dubard
Manilkara zapota (L.) P.Royen
Mimusops elengi L.
Chrysophyllum canito

SCROPHULARIACEAE
Angelonia biflora Benth.
Bacopa monieri (L.) Pennell
Limnophila indica (L.) Druce
Lindernia antipoda (L.) Alston
Lindernia ciliata (Colsm.) Pennell
Lindernia caespitosa (Blume) Panigrahi
Lindernia crustacea (L.) F. Muell.
Lingernia oppositifolia (Retz.) Mukarjee
Scoparia dulcis L.
Sopubia delphinifolia (L.) Don var. *delphinifolia*
Striga asiatica (L.) Kuntze

SIMAROUBACEAE
Ailanthus excelsa Roxb.

SOLANACEAE
Brugmansia suaveolens (Willd.) Bercht. & J.S. Presl
Capsicum annum L.
Capsicum frutascens L.
Cestrum nocturnum L.
Datura metel L.
Datura stramonium L.
Lycopersicon esculentum Miller
Phylasis angulata L.
Physalis minima L.
Solanum giganteum Jacq.
Solanum melongena L.
Solanum melongena L.var.*insanum*(L.) Prain
Solanum nigrum L.
Solanum surattense Burm.f.

Solanum torvum Sw.
Solanum trilobatum L.
Withania somnifera (L.) Dunal

STERCULIACEAE
Guazuma ulmifolia Lam.
Helicteres ixora L.
Hildegardia populifolia (Roxb.) Schott & Endll.
Kleinhovia hospita L.
Melochia corchorifolia L.
Melochia nudiflora Sw.
Pterospermum suberifolium Lam.
Pterospermum xylocarpum (Gaertner) Santapan & Wagh
Sterculia foetida L.
Theobroma cacao L.
Waltheria indica L.
Pterospermum acerifolium (L.) Willd.

STILAGINACEAE
Antidesma ghaesembilla Gaertner

SYMPHOREMATACEAE
Symphorema involucratum Roxb.

THUNBERGIACEAE
Thunbergia erecta (Benth.) T.Anderson
Thunbergia grandiflora (Roxb.ex Rottl.) Roxb.

TILIACEAE
Berrya cordifolia (Willd.) Burrett
Corchorus aestuans L.
Corchorus olitorius L.
Corchorus fascicularis Lam.
Corchorus trilochularis. L.
Grewia oppositifolia Buch. - Ham ex Roxb.
Grewia flavescens. A.L.Juss
Grewia hirsuta Vahl
Grewia rhamnifolia Heyne ex Roth.
Grewia tiliifolia Vahl
Triumfetta rhomboidea Jacq.
Triumfetta pilosa Roth.
Triumfetta rotundifolia Lam.

TURNERACEAE
Turnera ulmifolia L. var. *augustifolia* Willd. ex. Urban

TYPHACEAE
Typha angustata Bory & Chamb.

ULMACEAE
Holoptelea integrifolia (Roxb.) Planchon
Celtis tetrandra Roxb.

URTICACEAE
Pouzolzia zeylanica (L.) Bennett

VERBENACEAE
Citharexylum subserratum Sw.
Clerodendrum inerme (L.) Gaertner
Clerodendrum phlomides L.f.
Duranta erecta L.
Gmelina arborea Roxb.
Gmelina asiatica L.
Holmskioldia sanguinea Retz.
Lantana indica Roxb.
Lantana camara L.var. *aculeata*
Phyla nodiflora (L.) E. Greene
Premna corymbosa (Burm.f.) Rottler & Willd.
Premna latifolia Roxb. var. *latifolia*
Premna serratifolia L.
Stachytarpheta jamaicensis (L.) Vahl
Tectona grandis L.f.
Vitex altissima L.f.
Vitex leucoxylon L.f.
Vitex negundo L.

VIOLACEAE
Hybanthus enneaspermus (L.) F.Muell.

VISCACEAE
Viscum orientale Willd.

VITACEAE
Cayratia pedata (Lour.)A.L.Juss.ex Gagnepain - var. *pedata*
Cissus palida (Wight & Arn.) Planch.
Cissus quadrangularis L.
Cissus setosa Wallich
Cissus vitiginea L.

ZINGIBERACEAE
Alpinia galanga Sw.
Curcuma longa L.
Zingiber officinale Roscoe

ZYGOPHYLLACEAE
Tribulus terrestris L.
Guaiacum officinale L.

GYMNOSPERMS

ARAUCARIACEAE
Araucaria excelsa R.Br.

CUPRESSACEAE
Cupressus corneyana Knight & Perry ex Carriere
Cupressus lawsoniana A. Murr.

CYCADACEAE
Cycas circinalis L.
Cycas revoluta Thumb.

(Compiled by N.Balachandran and S.Kichenamourthy, Botanists, Pondicherry)

12. 5 List of rare, endangered and threatened plants of Pondicherry region

Araceae
Acorus calamus (L.)
Amorphallus sylvaticus (Roxb.) Kunth

Aristolochiaceae
Aristolochia bracteolata Lam.

Asclepiadaceae
Calotropis procera (Ait.) R.Br
Ceropegia juncea Roxb.
Gymnema sylvestre (Retz.) R.Br ex Schultes

Caesalpiniaceae
Saraca asoca (Roxb) Wild.

Capparaceae
Crateva adansonii DC

Fabaceae
Abrus precatorius L. (White variety)
Derris ovalifolia Benth.
Ormocarpum sennoides (Willd.) DC.

Hypoxidaceae
Curculigo orchioides Gaertner

Liliaceae
Gloriosa superba L.

Magnoliaceae
Michelia champaca L.

Mimosaceae
Prosopsis cineraria (L.) Druce.

Rutaceae
Aegle marmelos (L.) Corr.Serr

Santalaceae
Santalum album L.

Zingiberaceae
Alpinia galanga Sw.

(Source – N.Balachandran, Botanist, Pondicherry)

12.6 List of flora in Swadeshi Mills Campus

Sl. No.	SPECIES	VERN. NAME	FAMILY	HABIT	DENSITY
1	Abrus precatorius L.ssp.precatorius	Kundumani	Fabaceae	Climber	
2	Abutilon indicum (L.) Sweet ssp.indicum	Tutthi	Malvaceae	Shrub	
3	Acacia leucophloea (Roxb) Willd.	Velval	Mimosaceae	Tree	2
4	Acalypha indica L.	Kuppaimeni	Euphorbiaceae	Herb	
5	Achyranthes aspera L.	Nayuruvi	Amaranthaceae	Herb	
6	Adansonia digitata L.	Aanai moongi maram	Bombacaceae	Tree	16
7	Aeluropus lagopoides (L.) Trin.ex thwaites		Poaceae	Herb	
8	Aerva lanata (L.) Juss	Siru peelai	Amaranthaceae	Herb	
9	Albizia lebbeck (L.) Benth	Vagai	Mimosaceae	Tree	83
10	Allophyllus serratus (Roxb.) Kurz	Eerkuli maram	Sapindaceae	Shrub	
11	Alternanthera pungens Kunth		Amaranthaceae	Herb	
12	Amaranthes bidendata		Amaranthaceae	Herb	
13	Amaranthes viridis L.	Kuppai keerai	Amaranthaceae	Herb	
14	Andrographis alata (Vahl) Nees	Periya nangai	Acanthaceae	Herb	
15	Anisomeles indica (L.) Kuntz	Pai miratti	Lamiaceae	Shrub	
16	Annona recticulata L.	Rama seetha	Annonaceae	Tree	2
17	Annona squamosa L.	Seetappal	Annonaceae	Tree	16
18	Antigonon leptopus Hook. & Arn		Polygonaceae	Climber	
19	Aristolochia indica L.	Eeswara mooli	Aristolochiaceae	Climber	
20	Asystasia gangetica (L.) T.Anderson	Vedikai	Acanthaceae	Herb	
21	Atalantia monophylla (L.) Corr. Serr.	Kattu narathai	Rutaceae	Tree	76
22	Azadirachta indica Adr. Juss,	Neem	Meliaceae	Tree	21
23	Azima tetracantha Lam.	Sangan	Salvadoraceae	Shrub	189
24	Barleria cristata L.		Acanthaceae	Shrub	

Sl. No	SPECIES	VERN. NAME	FAMILY	HABIT	DENSITY
25	Barleria prionitis L.	Kanagambaram	Acanthaceae	Shrub	
26	Berrya cordifolia (Willd.) Burret	Venthekku	Tiliaceae	Tree	7
27	Boerhavia diffusa L.	Mookirattai	Nyctaginaceae	Herb	
28	Bombax ceiba L.	Silk cotton	Bombacaceae	Tree	13
29	Borassus flabellifer L.	Panai maram	Arecaceae	Tree	6
30	Bracharia ramosa (L.) Stapf		Poaceae	Herb	
31	Breynia vitisidaea (Burm.f.) C.Fischer		Euphorbiaceae	Shrub	
32	Butea monosperma (Lam.) Taubert	Murukkan	Fabaceae	Tree	6
33	Cadaba fruiticosa (L.) Druce	Vizhuthi	Capparaceae	Shrub	
34	Caesalpinia coriaria (Jacq.) Willd.		Caesalpiniaceae	Tree	2
35	Calotropis gigantea (L.) R.Br.	Yerukku	Asclepiadaceae	Shrub	
36	Capparis brevispina DC	Aathandai	Capparaceae	Liana	
37	Capparis sepiaria L.	Vembadam	Capparaceae	Liana	
38	Capparis zeylanica L.	Aathandai	Capparaceae	Liana	
39	Cardiospermum helicacabum L. (Kunth) Blume	Mudakathan	Sapindaceae	Climber	
40	Carica papaya L.	Pappali	Caricaceae	Tree	
41	Carrisa spinarum L.	Sirukala	Apocynaceae	Shrub	
42	Cascabela thevitia (L.) Lippold	Arali	Apocynaceae	Tree	16
43	Cassia siamea Lam.		Caesalpiniaceae	Tree	28
44	Catharanthus roseus (L.) Don	Nithiakalyani	Apocynaceae	Herb	
45	Ceiba pentandra (L.) Gaertner var. pentandra	Ilavam	Bombacaceae	Tree	29
46	Chloris barbata Sw.		Poaceae	Herb	
47	Cissampelos pareira L. var. hirsuta (DC.) Forman		Menispermaceae	Climber	
48	Cissus quadrangularis L.	Pirandai	Vitaceae	Climber	
49	Citrus limon (L.) Burm. F.	Lemon	Rutaceae	Tree	4
50	Clausena dentata (Willd.) Roemer	Kattu karuveppilai	Rutaceae	Shrub	

Sl. No	SPECIES	VERN. NAME	FAMILY	HABIT	DENSITY
51	Cleome viscosa L.	Naikaduku	Cleomaceae	Herb	
52	Coccinia grandis (L.) J. Voigt	Kovai	Cucurbitaceae	Climber	
53	Cocculus hirsutus (L.) Diels	Siru kattu kodi	Menispermaceae	Climber	
54	Cocos nucifera L.	Thennai maram	Arecaceae	Tree	4
55	Combretum albidum Don	Odai kodi	Combretaceae	Liana	
56	Cordia obliqua Willd.	Narivizhi	Cordiaceae	Tree	14
57	Cordia sp.		Cordiaceae	Tree	59
58	Corypha umbraculifera L.	Toly panaimaram	Arecaceae	Tree	13
59	Couroupita guianensis Aublet	Nagalingam	Lecythidaceae	Tree	4
60	Crateva magna (Lour.) DC.	Mavilangam	Capparaceae	Tree	14
61	Croton sparsiflorus Morong	Milakai poondu	Euphorbiaceae	Herb	
62	Cynodon dactylon (L.) Pers.	Arukampul	Poaceae	Herb	
63	Cyrtococcum trigonum (Retz.) A.Camus		Poaceae	Herb	
64	Dactyloctenium aegypticum (L.) P.Beauv.		Poaceae	Herb	
65	Dalbergia paniculata Roxb.	Vilangu maram	Fabaceae	Tree	19
66	Delonix regia (Roxb.) Raf.	Senkondrai maram	Caesalpiniaceae	Tree	38
67	Derris scandens (Roxb.) Benth.	Thegil	Fabaceae	Liana	
68	Desmanthus virgatus		Caesalpiniaceae	Shrub	
69	Desmodium gangeticum (L.) DC.	Orelai	Fabaceae	Herb	
70	Desmodiun triflorum (L.) DC.	Nilam purandi	Fabaceae	Herb	
71	Dichrostachys cinerea (L.) Wight. & Arn.spp.cinerea	Vidathara	Mimosaceae	Shrub	
72	Diospyros montana Roxb.	Vakkanai	Ebenaceae	Tree	16
73	Dipteracanthus patulus (Jacq.) Nees	Silanthinmayagam	Acanthaceae	Herb	
74	Ecbolium ligustrinum (Vahl) Vollesen	Neelambari	Acanthaceae	Herb	
75	Eclipta prostrata (L.) L.	Karisalankanni	Asteraceae	Herb	
76	Enterolobium saman (Jacq.) Prain	Thoongumoonji	Mimosaceae	Tree	143

Sl. No	SPECIES	VERN. NAME	FAMILY	HABIT	DENSITY
77	Eragrostis viscosa (Retz.) Trin.		Poaceae	Herb	
78	Euphorbia antiquorum L.	Sadura kalli	Euphorbiaceae	Shrub	
79	Euphorbia hirta L.	Amman patchaiarichi	Euphorbiaceae	Herb	
80	Euphorbia rosea Retz.		Euphorbiaceae	Herb	
81	Ficus amplissima Smith		Moraceae	Tree	2
82	Ficus benghalensis L.	Aala maram	Moraceae	Tree	1
83	Ficus religiosa L.	Arasa maram	Moraceae	Tree	5
84	Flacourtia indica (Burm.f.) Merr.	Sotha kala	Flacourtiaceae	Shrub	
85	Glinus oppositifolius (L.) DC.	Vanni thalai	Aizoaceae	Herb	
86	Gliricidia sepium (Jacq.) Kunth ex Walp	Vivasaya thagarai	Fabaceae	Tree	
87	Glycosmis mauritiana (Lam.) Yuich.Tanaka	Konji	Rutaceae	Shrub	
88	Gomphrena celosioides C.Martius	Koozhi kondai	Amaranthaceae	Herb	
89	Grewia rhamnifolia Heyne ex Roth	Kallai	Tiliaceae	Straggler	
90	Guazuma ulmifolia Lam.	Thenkai maram	Sterculiaceae	Tree	264
91	Gymnema sylvestre (Retz.) R. Br.	Sirukurinjan	Asclepiadaceae	Climber	
92	Hemidesmus indicus (L.) R.Br. var.indicus	Nannari	Asclepiadaceae	Climber	
93	Hibiscus rosa-sinensis L.	Semparuthi	Malvaceae	Shrub	
94	Holoptelea integrifolia (Roxb.) Planchon	Aavi maram	Ulmaceae	Tree	10
95	Hybanthus enneaspermus (L.) F. Muell.	Orithazh thamarai	Polygalaceae	Herb	
96	Ichnocarpus frutescens (L.) R. Br.	Pal valli	Apocynaceae	Climber	
97	Indigofera linnaei Ali		Fabaceae	Herb	
98	Ipomoea obscura (L.) Ker.Gawler		Convolvulaceae	Climber	
99	Ipomoea sepiaria J. Koenig ex Roxb.		Convolvulaceae	Climber	
100	Ixora pavetta Andrews	Koran	Rubiaceae	Shrub	
101	Jacquemontia paniculata (Burm.f.) Hallier.f.		Convolvulaceae	Climber	
102	Jasminum angustifolium Vahl	Kattu malli	Oleaceae	Climber	

Sl. No	SPECIES	VERN. NAME	FAMILY	HABIT	DENSITY
103	Jasminum auriculatum Vahl	Kattu mullai	Oleaceae	Climber	
104	Jasminum sambac (L.) Aiton	Kundu malligai	Oleaceae	Climber	
105	Jatropha curcas L.	Kattamanaku	Euphorbiaceae	Shrub	
106	Justicia prostrata (C.B.Clarke) Gamble	Kodaga saliyan	Acanthaceae	Herb	
107	Lannea coromandelica (Houtt.) Merr.	Odiyan maram	Anacardiaceae	Tree	46
108	Lantana camara L.	Unni poo	Verbinaceae	Shrub	
109	Lepisanthes tetraphylla (Vahl) Radlk	Kugamathi	Sapindaceae	Tree	31
110	Leucaena leucocephala (Lam.) de Wit	Subabul	Mimosaceae	Tree	67
111	Limonia acidissima L.	Vila maram	Rutaceae	Tree	110
112	Madhuca longifolia (J.Koenig) Macbr.	Ilupai maram	Sapotaceae	Tree	8
113	Mangifera indica L.	Mango	Anacardiaceae	Tree	6
114	Melochia nudiflora		Sterculiaceae	Shrub	
115	Micrococca mercurialis (L.) Benth.		Euphorbiaceae	Herb	
116	Millingtonia hortensis L. f.	Mara malli	Bignoniaceae	Tree	23
117	Mimusops elengi L.	Makizha maram	Sapotaceae	Tree	16
118	Mollugo nudicaulis Lam.	Parapadagam	Molluginaceae	Herb	
119	Morinda coreia Bech.-Ham.	Nuna maram	Rubiaceae	Tree	47
120	Mukia maderaspatana (L.) M.Roemer	Musumusukkai	Cucurbitaceae	Climber	
121	Murraya koenigii (L.) Sprengel	Kariveppilai	Rutaceae	Tree	4
122	Ocimum tenuiflorum L.	Thulasi	Lamiaceae	Shrub	
123	Oldenlandia corymbosa L.	Parapadagam	Rubiaceae	Herb	
124	Opuntia monacantha (Willd.) Haw.		Cactaceae	Shrub	
125	Pachygone ovata (Poiret) Hook.f. Thomson	Perung kattukodi	Menispermaceae	Climber	
126	Palm (Ornamental)		Arecaceae	Tree	2
127	Passiflora foetida L.	Poonai pidukkan	Passifloraceae	Climber	
128	Passiflora sp.		Passifloraceae	Climber	

Sl. No	SPECIES	VERN. NAME	FAMILY	HABIT	DENSITY
129	Pavetta indica L.	Pavettai	Rubiaceae	Shrub	
130	Peltophorum pterocarpum (DC.) Backer ex K.Heyne	Manjal kondrai	Caesalpiniaceae	Tree	49
131	Pentatropis capensis (L.f.) Bullock		Asclepiadaceae	Climber	
132	Phoenix dactyloides	Paereecham	Arecaceae	Tree	9
133	Phoenix humilis Royle	Sitheecham	Arecaceae	Shrub	
134	Phoenix sylvestris (L.) Roxb.	Eecham	Arecaceae	Tree	3
135	Phyllanthus amarus Schum. & Thonn.	Keezhanelli	Euphorbiaceae	Herb	
136	Phyllanthus reteiculatus Poiret	Poola	Euphorbiaceae	Shrub	
137	Pithecellobium dulce (Roxb.) Benth.	Kodukkai puli	Mimosaceae	Tree	48
138	Plumaria rubra		Apocynaceae	Shrub	
139	Plumbago zeylanica L.	Chithramoolam	Plumbaginaceae	Herb	
140	Polyalthia longifolia (Sonn.) Thwaites	Nettilingam	Annonaceae	Tree	15
141	Pongamia pinnata (L.) Pierre	Pongam maram	Fabaceae	Tree	26
142	Portulaca oleracea L.	Kozhi keerai	Portulaceae	Herb	
143	Premna corymbosa (Burm f.) Rottler & Willd.	Munnai	Verbinaceae	Shrub	
144	Premna latifolia Roxb.	Paimunnai	Verbinaceae	Shrub	
145	Prosopis juliflora (Sw.) DC	Vela maram	Mimosaceae	Tree	69
146	Pterospermum suberifolium Lam.	Vennathai	Tiliaceae	Tree	18
147	Quisqualis indica L.	Rangon malli	Combretaceae	Climber	
148	Rauvolfia tetraphylla L.	Pamboo kala	Apocynaceae	Shrub	
149	Ricinus communis L.	Aamanku	Euphorbiaceae	Shrub	
150	Ruellia tuberosa L.	Vedikkai	Acanthaceae	Herb	
151	Salvadora persica L.	Umari	Salvadoraceae	Tree	63
152	Sansevieria roxburghiana Schultes & Schultes.f.	Marul	Agavaceae	Herb	
153	Santalum album L.	Sandal	Santalaceae	Tree	37

Sl. No	SPECIES	VERN. NAME	FAMILY	HABIT	DENSITY
154	Scoparia dulcis L.	Sarkarai vembu	Scrophulariaceae	Herb	
155	Securinega leucopyrus (Willd.) Muell. Arg.	Vella polla	Euphorbiaceae	Shrub	
156	Sida acuta Burm.f.	Arival manai poondu	Malvaceae	Herb	
157	Sida cordata (Burm.f.) Borssum Waalkes	Pazham pasi	Malvaceae	Herb	
158	Sida cordifolia L.	Veli pasi	Malvaceae	Shrub	
159	Solanum nigrum L.	Manathakkali	Solanaceae	Herb	
160	Solanum torvum Sw.	Sundai	Solanaceae	Shrub	
161	Solanum trilobatum L.	Thuduvalai	Solanaceae	Shrub	
162	Spermacoce hispida L.	Nathai soori	Rubiaceae	Herb	
163	Spondias pinnata (L.f.) Kurz	Mathi mangai	Anacardiaceae	Tree	3
164	Streblus asper Lour	Kutti pala	Moraceae	Tree	379
165	Synedrella nodiflora (L.) Gaertner		Asteraceae	Herb	
166	Syzygium cumini (L.) Skeels	Naval	Mytraceae	Tree	6
167	Tamarindus indica L.	Pulia maram	Caesalpiniaceae	Tree	182
168	Teramnus labialis (L.f.) Sprengel		Fabaceae	Climber	
169	Terminalia catappa L.	Badham	Combretaceae	Tree	2
170	Theriophonum trifoliatum		Araceae	Herb	
171	Thespesia populnea (L.) Sol.ex Corr.Serr.	Poovarasu	Malvaceae	Tree	3
172	Tinospora cordifolia (Willd.) Hook.f. & Thomson	Seenthil kodi	Menispermaceae	Climber	
173	Trianthema portulacastrum L.	Sattarenai	Aizoaceae	Herb	
174	Tribulus terrestris L.	Nerunji	Zygophyllaceae	Herb	
175	Triphasia trifoliata		Rutaceae	Shrub	
176	Turnera ulmifolia L.var.angustifolia Willd.ex Urban		Turneraceae	Shrub	
177	Tylophora asthmatica (L.f.) Wight & Arn.	Nanjaruppan	Asclepiadaceae	Climber	
178	Vernonia cinerea (L.) Less		Verbinaceae	Herb	
179	Vigna sp.		Fabaceae	Climber	

Sl. No	SPECIES	VERN. NAME	FAMILY	HABIT	DENSITY
180	Wattakaka volubilis (L.f.) T.Cooke	Perukurunjan	Asclepiadaceae	Liana	
181	Wrightia tinctoria (Roxb.) R.Br.	Veppalai	Apocynaceae	Tree	10
182	Zizyphus mauritiana Lam.	Ilandai maram	Rhamnaceae	Tree	46
183	Zizyphus oenopilia (L.) Miller	Sorattumul	Rhamnaceae	Straggler	
	Total				**2450**

(Source: Department of Forests & Wildlife, Government of Pondicherry)

12. 7 List of birds in Pondicherry region

Scientific name	Common name
Accipiter badius	Shikra
Acridotheres tristis	Common Myna
Acrocephalus dumetorum	Blyth's Reed Warbler
Acrocephalus stentoreus	Great Reed Warbler
Aegithina tiphia	Common Iora
Alauda gulgula	Eastern Skylark
Alcedo atthis	Common Kingfisher
Amaurornis phoenicurus	White breasted Water hen
Anas acuta	Pintail
Anas clypeata	Shoveller
Anas crecca	Common Teal
Anas Penelope	Wigeon
Anas poecilorhyncha	Spot bill Duck
Anas querquedula	Garganey
Anastomus oscitans	Open bill Stork
Anhinga rufa	Darter or Snake Bird
Anser indicus	Bar headed Goose
Anthus novaeseelandiae	Paddy field Pipit
Ardea alba	Large Egret
Ardea cinerea	Grey Heron
Ardea purpurea	Purple Heron
Ardeola grayii	Pond Heron
Ardeola Striatus	Little Green Heron
Artamus fuscus	Ashy Swallow-Shrike
Athene brama	Spotted Owlet
Aythya ferina	Common Pochard
Aythya fuligula	Tufted Pochard
Bubulcus Idis	Cattle Egret
Butastur teesa	White-eyed Buzzard Eagle
Cacomantis merulinus	Indian Plaintive Cuckoo

Calidris ferruginea	Curlew-Sandpiper
Calidris minuta	Little Stint
Calidris temminckii	Temminck's Stint
Caprimulgus asiaticus	Common Nightjar
Centropus sinensis	Crow – pheasant
Ceryle rudis	Lesser Pied Kingfisher
Charadrius alexandrinus	Kentish Plover
Charadrius dubius	Little Ringed Plover
Charadrius mongolus	Lesser Sand Plover
Chlidonias hybrida	Whiskered Tern
Ciconia episcopus	White necked Stork
Circaetus gallicus	Short-toed Eagle
Circus aeruginosus	Marsh Harrier
Circus melanoleucos	Pied Harrier
Circus pygargus	Montagu's Harrier
Clamator jacobinus	Pied Crested Cuckoo
Colunda livia	Blue Rock Pigeon
Copsychus saularis	Magpie-Robin
Coracias benghalensis	Indian Roller or Blue Jay
Coracina melanoptera	Black headed Cuckoo-Shrike
Corvus Macrorhynchos	Jungle Crow
Corvus splendens	House Crow
Cuculus varius	Common Hawk Cuckoo or Brain fever Bird
Cypsiurus parvus	Palm Swift
Dendrocitta Vagabunda	Indian Tree Pie
Dicaeum erythrorhynchos	Tickell's Flower pecker
Dicrurus adsimilis	Black Drongo
Dicrurus leucophaeus	Grey Drongo
Dinopium benghalense	Lesser Golden backed Woodpecker
Egretta garzetta	Little Egret
Egretta gularis	Indian Reef Heron
Egretta intermedia	Smaller or Median Egret
Elanus caeruleus	Black winged Kite

Eremopterix grisea	Ashy crown Finch-Lark
Eudynamys scolopacea	Koel
Falco tinnunculus	Kestrel
Francolinus pondicerianus	Grey partridge
Fulica atra	Coot
Gallinago gallinago	Common or Fantail Snipe
Gallinago stenura	Pintail Snipe Pintail Snipe
Gallinula chloropus	Indian Moorhen
Gallinula chloropus	Purple Moorhen
Haemotopus haemotopus	Oystercatcher
Halcyon smyrnensis	White breasted Kingfisher
Haliastur Indus	Brahminy Kite
Himantopus himantopus	Black winged Stilt
Hirundo rustica	Swallow
Hydrophasianus chirurgus	Pheasant – tailed Jacana
Ixobrychus cinnamomeus	Chestnut Bittern
Ixobrychus flavicollis	Black Bittern
Ixobrychus minutus	Little Bittern
Ixodrychus sinensis	Yellow Bittern
Lanius cristatus	Brown Shrike
Lanius vittatus	Bay backed Shrike
Larus argentatus	Herring Gull
Larus brunnicephalus	Brown headed Gull
Lonchura malabarica	White throated Munia
Lonchura malacca	Black headed Munia
Lonchura punctulata	Spotted Munia
Lonchura striata	White backed Munia
Merops orientalis	Green Bee-eater
Merops philippinus	Blue tailed Bee-eater
Metopidius indicus	Bronze winged Jacana
Milvus migrans	Pariah Kite
Mirafra erythroptera	Red winged Bush Lark
Motacilla caspica	Grey Wagtail

Motacilla citreola	Yellow headed Wagtail
Motacilla flava	Yellow Wagtail
Motacilla indica	Forest Wagtail
Motacilla maderaspatensis	Large Pied Wagtail
Muscicapa latirostris	Brown Flycatcher
Muscicapa muttui	Brown breasted Flycatcher
Mycteria leucocephala	Painted Stork
Nectarinia asiatica	Purple Sunbird
Nectarinia zeylonica	Purple rumped Sunbird
Netta rufina	Red crested Pochard
Nettapus coromandelianus	Cotton Teal
Nycticorax nycticorax	Night Heron
Oriolus oriolus	Golden Oriole
Orthotomus sutorius	Tailor Bird
Pandion haliaetus	Osprey
Passer domesticus	House Sparrow
Pelecanus philippensis	Grey or Spotted billed Pelican
Phalacrocorax carbo	Large Cormorant
Phalacrocorax niger	Little Cormorant
Phragamaticola aedon	Thick billed Warbler
Phylloscopus magnirostris	Large billed Leaf Warbler
Phylloscopus trochiloides	Dull Green Leaf Warbler
Platalea leucorodia	Spoon bill
Ploceus bengalensis	Weaver Bird
Pluvialis squatarola	Grey Plover
Podiceps ruficollis	Dabchick
Prinia socialis	Ashy Wren Warbler
Psittacula krameri	Rose ringed Parakeet
Pycnonotus cafer	Red vented Bulbul
Rhopodytes viridirostris	Small Green billed Malkoha
Sterna acuticauda	Black bellied Tern
Sterna aldifrons	Little Tern
Sterna hirundo	Common Tern

Streptopelia chinensis	Indian Spotted Dove
Streptopelia decaocto	Indian Ring Dove
Sturnus malabaricus	Grey headed Myna
Sturnus pagadorum	Brahminy Myna
Sturnus roseus	Rosy pastor
Sylvia curruca	Lesser Whitethroat
Terpsiphone paradise	Paradise Flycatcher
Tringa erythropus	Spotted Redshank
Tringa glareola	Wood or Spotted Sandpiper
Tringa hypoleucos	Common Sandpiper
Tringa nedularia	Green Shank
Tringa ochropus	Green Sandpiper
Tringa stagnatilis	Marsh Sandpiper
Tringa terek	Terek Sandpiper
Tringa totanus	Common Redshank
Turdoides affinis	White headed Babbler
Upupa epops	Hoopoe
Vanellus indicus	Red wattled Lapwing
Vanellus malabaricus	Yellow – wattled Lapwing

(Source: Department of Animal Husbandry, Government of Pondicherry)

12. 8 List of animal biodiversity in Pondicherry region

Reptiles

Scientific name	*Common name*
Calotes versicolor	Common Garden Lizard
Chameleon zeylanicus	Chameleon
Crocodylus palustris	Mugger or Marsh crocodile
Geochelone elegans	Starred Tortoise
Hemidactylus frenatus	Southern House Gecko
Hemidactylus leschenaulti	Bark Gecko
Lepidochelys olivacea	Olive Ridley Turtle
Lissemys punctata	Indian Flap-Shelled Turtle
Mabuya carinita	Common Skink
Melanochelys trijuga	Indian Pond terrapin
Sitana ponticeriana	Fan-throated lizard
Varanus bengalensis	Common Indian Monitor

List of Snakes

Ahaetulla nasutus	Common vine snake
Amphiesma stolata	Striped keel back snake
Boiga trigonata	Common cat snake
Bungarus caeruleus	Common krait
Cerberus rhynchops	Dog-faced water snake
Dendrelaphis tristis	Common bronze back tree snake
Echis carinatus	Saw Scaled viper
Elaphe Helena	Common trinket
Enhydrina schistos	Hook nosed sea snake
Eryx conicus	Common sand boa
Eryx johnii	Red sand boa
Gonyosoma mucosus	Rat snake or Dhaman
Laticanda colubrine	Colubrine Amphibious sea snake
Lycodon aulicus	Common wolf snake
Lycodon striatus	Barred wolf snake
Naja naja naja	Spectacled or common cobra

Oligodon arnensis	Common kukri snake
Oligodon taeniolatus	Russels kukri snake
Pseudoxenodon plumbicolor	Green keel back snake
Pseudoxenodon piscator	Checkered keel back snake
Pseudoxenodon schistosum	Olive keel back water snake
Typhlina bramina	Common worm snake
Typhlina porrectus	Slender worm snake
Vipera russellii	Russels viper

List of butterflies observed in Pondicherry Region.

Anapheis aurota aurota	Pioneer
Argynnis hyperbius hybrida	South Indian fritillary - very rare
Atella phalanta	Common leopard
Castalius rosimon rosimon	Common Pierrot
Catopsilia crocale crocale	Common emigrant
Cepora nerissa phryne	Common gull
Charaxes fabius fabius	Black raja - rare
Chilasa clytia clytia	Common mine - very rare
Colotis Calais modesta	Small salmon arab - rare
Colotis danae danae	Crimson tip
Colotis eucharis	Plain orange tip
Colotis fausta fulvia	Large salmon arab - rare
Curetis thetis	Indian sunbeam - rare
Danais chrysippus	Plain tiger
Danais Melissa dravidarum	Dark blue tiger
Danais plexippus	Common tiger
Delias eucharis drury	Common jezebel
Ergolis ariadne	Angled castor
Ergolis merione taprobana	South Indian common castor
Euploea core core	Common Indian crow
Eurema hecabe simulata	Common grass yellow
Euthalia garuda	Baron - rare
Everes parrhasius parrhasius	Indian cupid
Graphium Agamemnon menides	Tailed jay

Graphium sarpedon teredon	Common bluebottle	
Hebomoia glaucippe australis	Great orange tip	- very rare
Hypolimnas bolina	Great egg fly	
Hypolimnas missipus	Danaid egg fly	
Ixias marianne	White orange tip	
Ixias pyrene sesia	Yellow orange tip	
Jamides celeno celeno	Common cerulean	
Leptosia nina nina	Psyche	
Melanitis leda ismene	Common evening brown	
Mycalesis khasia ochra	Pale brand bush brown	
Mycalesis mineus polydecta	Dark brand bush brown	
Neptis hylas varmona	Common sailer	
Paoilio demoleus demoleus	Common lime	
Papilio polymenstor polymenstor	Blue mormon	- rare
Papilio polytes romulus	Common mormon	
Parthenos sylvia virens	Clipper	- rare
Polydorus aristolochiae	Common rose	
Polydorus hector	Crimson rose	
Precis almana almana	Peacock pansy	
Precis atlites	Grey pansy	- rare
Precis hierta hierta	Yellow pansy	
Precis iphita pluviatilis	Chocolate pansy	
Precis lemonias vaisya	Lemon pansy	
Precis orithya swinhoei	Blue pansy	
Rathinda amor	Monkey puzzle	- very rare
Spindasis vulcanus vulcanus	Common silverline	- rare
Tajuria cippus cippus	Peacock royal	- rare
Telchinia violae	Tawny castor	
Troides helena minos	Common bird wing	- very rare
Valeria valeria hippia	Common wanderer	
Vanessa cardui cardui	Painted lady	- very rare

(Compiled by Mr. Athmavaradhan Reddy, Sri. Aurobindo Ashram, Pondicherry)

12. 9 Check list of marine and inland fishes of Pondicherry

Elasmobranchs

Clupeoides

Oil Sardines

Other Sardines

Anchovies

Trissocles

Hilsa Ilisha

Other Clupeoids

Chirocentrus

Harpodon Nehereus

Cat Fishes

Saurida spp.

Eel

Belone & Hemiramphus

Exocoetus spp.

Bregamacerus spp.

Sphyraena

Mullets

Polynemids

Perches

Perch like fish

Lactarius spp.

Carangids

Caranx

Chorinemus spp.

Elagatis spp.

Other Carangids

Leiognathus spp.

Sciaenids

Red Mullets

Ribbon Fish

Scombridae

Mackerals

Seer Fish

Tunnies

Pomfrets

Soles

Crustaceans

Prawn-Penaeid

Nod-Penaeid

Lobster

Deep Sea Lobster

Other Crustacean

Molluscs/ Cephslopods

Jew Fish

Inland Fishes

Major carps

Common carps

Live Fish

Other Cat Fish

Murrel

Other carps

Feather beaks

Hilsa Ilisha

Prawn/ Macrobrachium

Mullet

Tilapia

Eel

Wallogo attu

(Source: Department of Fisheries & Fishermen Welfare, Government of Pondicherry)

12. 10 Non-Governmental Organisations in Pondicherry

1. Annai Indra Kirama Munnetra Ilaignar Mandram, Pondicherry
2. Ariankuppam Tamil Ilaingar Narpani Mandram, Pondicherry
3. Bharath Rathna M.G.R. Podhunala Samooga Peravai, Pondicherry
4. Centre for Ecology and Rural Development, Pondicherry
5. Environmental Education Club, Pondicherry
6. Evergreen Youth Association, Bahour, Pondicherry
7. Golden Star Ilaignar Narpani Mandram, Pondicherry
8. Karaikal Exnora, Kottucherry, Karaikal, Pondicherry
9. Kottucherry Nugarvor Padhukappu Kuzhu, Kottuchery, Karaikal, Pondicherry
10. M.S. Swaminathan Research Foundation, Pillayarkuppam, Pondicherry
11. Nehru Yuwa Kendra, Pondicherry
12. Pondicherry Environmental & Consumer Protection Organization, Pondicherry
13. Pondicherry Exnora Innovators' Club, Pondicherry
14. Pondicherry Iyarkai Kazhagam, Pondicherry
15. Pondicherry Women's Conference, Pondicherry
16. Prof. Sundra Shanmuganar Arakkattalai, Pondicherry

(Source: Government of Pondicherry Diary-2002)

13. CONTRIBUTORS TO BSAP

Dr. Alfred Gnanou, Director, Department of Animal Husbandry & Animal Welfare Pondicherry

Ms. V. Amouda, Data Entry Operator, Bioinformatics Centre, Pondicherry University

Mr. S. Anantha kumar,Assistant Professor, Pandit Jawaharlal Nehru College of Agriculture & Research Institute, Karaikal

Mr. S. Arumugam, Botanist, Pondicherry

Mr. Ashish Kothari, Coordinator, Technical and Policy Core Group, NBSAP, Kalpavriksh, Pune

Mr. Ashok, Gloria Farm, Sri Aurobindo Ashram, Pondicherry

Mr. S. Atchuta Rao, Demonstration Assistant, Department of Agriculture, Yanam

Mr. Athma Varadhan Reddy, Lake Estate, Sri Aurobindo Ashram, Pondicherry

Mr. N. Balachandran, Botanist, Nallavadu, Pondicherry

Mr. C. Balasubramaniam, Deputy Director, Department of Fisheries & Fishermen Welfare, Karaikal

Mr. Dudala Gonteyya, Sub-Inspector, Department of Fisheries & Fishermen Welfare, Yanam

Mr. S. Durai, Professional Assistant, Central Library, Pondicherry University

Dr. P.S. Easa, Scientist, Wildlife Biology, Kerala Forest Research Institute, Peechi, Kerala

Mr. S. Gautham Reddy, Regional Executive Officer, Yanam

Prof. A. Gnanam, Former Vice-Chancellor, Pondicherry University, Pondicherry

Mr. M.Y. Hussain, Joint Director, Department of Agriculture, Karaikal

Mr. K. Karuppaiyan, Livestock Assistant, T.R.Pattinam, Karaikal

Dr. S. Kasinathan, Reader in Biology (Retd.), Pondicherry University

Mr. S. Kichenamourthy, Botanist, Pondicherry

Mr. V. Krishnan, Vice Principal, Government Higher Secondary School, Pandakkal, Mahe

Dr. Clement Lourdes, Senior Lecturer, Department of English, Pondicherry University, Pondicherry

Mr. Manindrapal, Gloria Farm, Sri Aurobindo Ashram, Pondicherry

Mr. Matthew Samuel, Managing Director, Department of Tourism, Pondicherry

Mr. Meera Sahib, Fisheries Inspector, Department of Fisheries & Fishermen Welfare Yanam

Mr. M. Murugesan, Assistant Archivist, National Archives of India, Record Centre, Pondicherry

Mr. M. Nagendran, Senior Scientific Officer, Department of Science, Technology & Environment, Pondicherry

Dr. G. Narendra Kumar,IAS, Former Secretary , Department of Science, Technology & Environment, Government of Pondicherry

Mr. R. Natarajan, Livestock Assistant, Department of Animal Husbandary & Animal Welfare, Karaikal

Dr. N. Parthasarathy, Reader, Salim Ali School of Ecology, Pondicherry University

Mr. Paul Aderien, Additional Director, Department of Agriculture, Pondicherry.

Mr. Prabhat Thyagi, IFS. Deputy Conservator of Forests & Wildlife, Pondicherry

Prof. Priya Davidar, Head, Salim Ali School of Ecology, Pondicherry University

Mr. Rabindranath Das, Sri Aurobindo Ashram, Pondicherry

Mr. G. Ragesh Chandra, Former Director, Department of Education, Pondicherry

Dr. S. Rajagopalan, Veterinary Assistant Surgeon, Department of Animal Husbandary & Animal Welfare, Karaikal

Dr. R. Rajiv, Veterinary Assistant Surgeon, Department of Animal Husbandry & Animal Welfare, Mahe

Smt. G. Ramalakshmi, Joint Director, Department of Fisheries & Fishermen Welfare, Pondicherry

Mr. V. Ramalingam, Secretary, Pondicherry Iyarkai Kazhagam, Pondicherry

Mr. P. Ramanathan, Librarian, Central Library, Pondicherry University

Dr. M. P. Ramanujam, Lecturer in Botany, Kanchimamunivar Centre for Postgraduate Studies, Pondicherry

Mr. A.S.P.S. Ravi Prakash, Director, Department of Fisheries & Fishermen Welfare, Pondicherry

Mr. N. Sathyanath, Livestock Assistant, Department of Animal Husbandry & Animal Welfare, Mahe

Smt. M.K. Sayekumari, President, Pondicherry Women's Conference, Pondicherry

Mr. S. Sekar, Scientific Officer, Department of Science, Technology & Environment, Pondicherry

Dr. P. Selvaraj, Dean, Pandit Jawaharlal Nehru College of Agriculture and Research, Karaikal. Pondicherry

Mr. R. Selvaraj, Livestock Assistant, Department of Animal Husbandry & Animal Welfare, T.R.Pattinam, Karaikal

Mr. T.O Shankaran Nambiar, President, Chamber of Farmer's Forum, Mahe

Mr. S. Sivabalan, Livestock Assistant, Department of Animal Husbandry & Animal Welfare, Thirunallar, Karaikal

Mr. E.P. Sivakumar, Sub-Inspector, Department of Fisheries & Fishermen Welfare, Mahe

Mr. V. Sreedharan, Chalakkara, Mahe

Mr. C.V. Sreenivasan, Chief Town Planner (Retd.), Department of Town & Country Planning, Pondicherry

Mr. U. Sridharan, Former Director, Department of Science, Technology & Environment Pondicherry

Dr. K. Subramneswara Rao, Veterinary Assistant Surgeon, Department of Animal Husbandry & Animal Welfare, Yanam.

Mr. M. Sundara Mohan, Technical Assistant, Bioinformatics Centre, Pondicherry University

Mr. V.K. Sunil Kumar, Livestock Assistant, Department of Animal Husbandry & Animal Welfare, Mahe

Dr. K. Suriyanarayana Rao, Joint Director, Department of Animal Husbandry & Animal Welfare, Karaikal

Mr. M. Suryaprakash Rao, Depot-in-Charge, PASIC, Yanam

Mr. S. Swamy Naidu,Deputy Director, Department of Agriculture, Yanam

Dr. E. Syed Ali, Veterinary Assistant Surgeon, Department of Animal Husbandry & Animal Welfare, Karaikal

Dr. A.R. Thiagarajane, Veterinarian, Pondicherry

Mr. E. Thirunavukarasu, Environmental Engineer, Department of Science, Technology & Environment, Pondicherry

Mr. Uddipta Ray, Director, Department of Science, Technology & Environment, Pondicherry

Mr. G. Varadharajan, Inspector, Department of Fisheries & Fishermen Welfare, Mahe

Mr. I. Vasanthakumar Reddy, Director, Department of Agriculture, Pondicherry

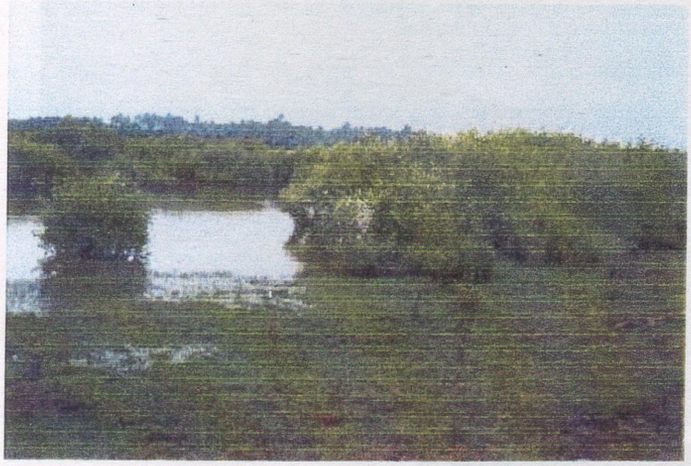
Mr. S. Venkatesan, Executive Engineer, Public Works Department, Pondicherry

Mr. E. Venu, Joint Director, Department of Education, Pondicherry

Dr. M.V.M. Wafar, Scientist, National Institute of Oceanography, Goa

PHOTO ALBUM

MANGROVE VEGETATION IN THE UNION TERRITORY OF PONDICHERRY



Murthikuppam
(Pondicherry)

Ariyankuppam
(Pondicherry)





Karaikal

Yanam



SACRED GROVES



Pondicherry



Pondicherry



Mahe



Mahe

FLORA OF SWADESHI MILLS CAMPUS









POLLUTION IN PONDICHERRY



Sewage Waste

Solid Waste





Solid Waste

Solid Waste



PUBLIC HEARINGS IN PONDICHERRY









PUBLIC HEARINGS IN KARAIKAL









PUBLIC HEARINGS IN MAHE









BIODIVERSITY EDUCATION WORKSHOPS

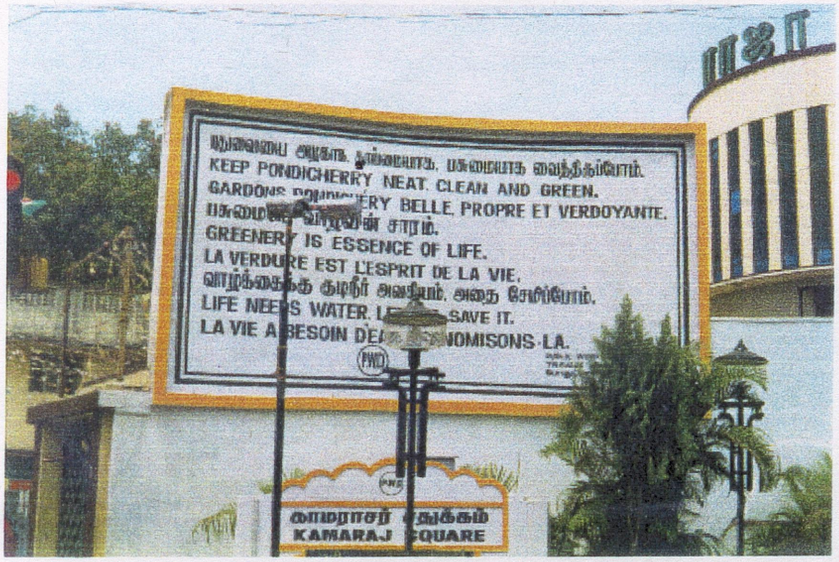








BIODIVERSITY CONSERVATION INITIATIVES IN PONDICHERRY





Plant trees and save mankind



Cleanliness of Pondicherry is in our hands