WILDLIFE CONSERVATION AND MANAGEMENT IN TAMIL NADU

A Historical Perspective

Tamil Nadu Forest Department
2016

FRONT COVER : SKETCH OF PILLAR ROCK KODAIKANAL
- DOUGLAS HAMILTON (1865)

BACK COVER : SKETCH OF SLENDER LORIS
- M. KRISHNAN

MENTOR'S MESSAGE

In recent past, I have mentored the Tamil Nadu Forest Department (TNFD) in taking several initiatives for documenting the unparalleled historical work done by the TNFD over a timeline covering about a century and a half. The first such attempt was the book - "History of Forest Management in Tamil Nadu", followed by bringing out the "Hall of Fame" and the installation of the bust of Dr.H.F.C.Cleghorn**,** the father of forestry in India at TNFA, Coimbatore. In continuation of these efforts this book namely "Wildlife Conservation and Management in Tamil Nadu - A Historical Perspective" is being brought out.

I have constantly encouraged and guided the TNFD to undertake such initiatives which install a sense of pride in the service, a pride in donning the forest uniform and a sense of belongingness. The Foresters should proudly feel that they are the torch bearers of a very rich legacy and they should emulate the pioneering spirit of their heroes, inculcate their work ethics and their rigours of scientific enquiry.

In today's socio-economic-political governance context, a Forester has to play a very crucial role, the impact of which will be felt outside the forest areas. Foresters are natural capital managers and they are as important as the managers of the financial and physical capital of the nation. They play a significant role in providing stability and sustainability to the country's eco-systems. In today's context of looming water shortages, they also ensure water security for the people.

This book focuses on the historical and pioneering trends on wildlife management in our State. This State pioneered study of bird migration in early 1920's and it is the last landmass in the crucial Central Asia flyway zone of migration. It has got unique historical-cultural traditions like, Koontankulam where the migrating birds are protected with zeal and treated lovingly as daughters who come back to the parent's home for delivery and childrearing. There is focus on the life and contributions of stalwarts like M.A.Badshah, M.Krishnan, F.X.Mascarenhas, Dr.V.Krishnamurthy (Elephant Doctor). Their life should inspire the current as well as the future generations of foresters in the TNFD as well as the activists/nature lovers in the civil society. This book with its timelines clearly establishes the indisputable fact

that TN which was the core of the Madras Presidency was the leader and pioneer both in Forestry as well as wildlife management. When a new entrant of the TNFD or a civil society nature lover on reading this book should realize that he/she is a proud torch bearer of an unparalleled legacy and this book will motivate him to raise the bar for wildlife management in TN and take it to world class standards. Any management of the protected areas/sanctuaries which is not world class will mean a sub-optimal utilisation of the natural resources of the State.

Also by displaying the hand written notes of stalwarts, we highlight their original work which should be the inspiration for the modern day conservationists many of whom tend to take the easy way out of the internet based cut, copy and paste approach. If the conservation efforts by the next generation foresters /activists have to meaningfully sustain, then the rigour of forests visits, hardships and camping in tough terrains/landscapes have to be undertaken in the same spirit of our pioneers. A Forester should cover every inch of his jurisdiction on foot several times over and should be familiar with every species of flora / fauna in his area.

The front and back covers which have the hand drawn black and white sketches, convey the passion and a deep sense of attachment to detail by the pioneers and their commitment of time, energy and efforts towards conservation and wildlife management.

As we move to the landscape level management for wildlife, TN which is blessed by nature with three major biospheres namely, Gulf of Mannar, Nilgiris and Agasthiarmalai, is uniquely placed to take the lead and set the benchmarks for landscape management for the entire country.

When a Forester is on camp is one of the beautiful landscapes, he should in the solitude of the forests, ponder over the lives and contribution of the previous stalwarts and then internally evaluate his contribution towards conservation and wildlife management. He should always express his gratitude to these pioneers and stalwarts who through their hardwork and vision have bequeathed to the current / future generations, a well defined and a well conceived system of wildlife management and conservation.

FOREWORD

The Tamil Nadu Forest Department has the distinction of managing forests and the wildlife very successfully for the last over 150 years. The policy of environmental stability mandating afforestation through people's movement has led to Tamil Nadu registering maximum increase of forest cover of 2501 sq.km in the country for the period 2013-15 (Government of India, FSI Report, 2015). The achievement is quite significant keeping in view the continuous challenge faced by the Forest department on account of increasing population and protection of existing forest resources. Tamil Nadu has been a pioneer State in Protected Areas management, including conservation and improvement of terrestrial / marine flora and fauna. The State's sincere efforts in establishing range of Tiger habitats in Western and Eastern Ghats of Tamil Nadu have resulted in increase of tiger numbers from 163 in 2011 assessment to more than 300 in 2015 assessment. The state is having 5 National Parks and 15 Wildlife Sanctuaries, 15 Bird Sanctuaries and two Conservation Reserves besides four Tiger Reserves covering a total protected area of 7069.72 sq.km, which comes to 30.90% of the State's forest area. All this possible because of the State and particularly the Forest department's commitment to serve the cause of conservation. The Forest department has a rich legacy and history in conservation established by its illustrious seniors. This rich history and tradition in wildlife management and conservation should be known by the future generation of young Foresters Scientists and general public. We thought it fit to bring out a book titled "Wildlife Conservation and Management in Tamil Nadu" - A Historical Perspective, based on our experiences covering nearly 35 years of service in this State. It is important to make people understand the rich wildlife history in this State, just not for information alone, but, for meaningful action through programmes and for future policy formulation and perspective planning. We are convinced that future of wildlife depends on a strong bonding between people and forests. This book brought out in a very short time through its various chapters are an attempt to draw the attention of the people to the rich wildlife history, on-going programmes and policies and seek their concern for conservation. We have made efforts to carefully document the rich history and the efforts of the Forest Department over time for conservation gains. The wildlife conservation over the years have prospered in the State because of

massive community participation, use of technology, student and NGOs participation, transparency and above all, the timely support and encouragement of the Government. The learning from our forests and wildlife is to make us to revere and respect them still more and natural resource. Conservation needs innovation and action not just by Foresters alone, but also from people who are the true custodians and have to provide the required support for enhancing the wildlife wealth. We hope, the readers will appreciate the contents of this book, which have been drawn mostly from experiences, reports of senior foresters who have served in the State.

We wish to profusely thank Thiru. Hans Raj Verma, IAS., Principal Secretary and Mentor for his vision to bring out such a book at this most needed juncture. We wish to place on record the excellent work done by Thiru V. Ganesan, IFS., Chief Editor and his team, Thiru S.M. Abbas, IFS., Thiru. Sudhanshu Gupta, IFS., Thiru A. Udayan, IFS., and Tmt. K. Geethanjali, IFS., for their sincere efforts to compile all information available at such short notices. The contributions given by Thiru K.S.S.V.P. Reddy, IFS., Thiru A. Venkatesh, IFS., Thiru A.O. Limatoshi, IFS., Dr. H. Basavaraju, IFS., and Tmt. Jayshree Vencatesan, Care Earth, are deeply acknowledged. We will be very happy to receive your valuable feedback for improvement of the book.

Lot more awareness is required today in the eve of climate change to spread awareness about wildlife, so that people learn to live in harmony with nature to preserve the rich bio-diversity of our beautiful country and the State of Tamil Nadu.

There are miles to go. This is a small endeavor.

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PCCF (HoD)

Dr. V.K. MELKANI, IFS
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CHAPTER-I

WILDLIFE CONSERVATION & MANAGEMENT IN TAMIL NADU

The Past and Present - An Overview

Tamil Nadu has rich history of Forest and Wildlife Management, the ancient literature speak volumes about concerns of Forest and Wildlife, "Thirukural" has numerous quotes dedicated to soil, earth, water, forests and wildlife. The Cholas, Pandyas, Pallavas, Cheras and other illustrious kings had paid reverence to the Natural resources. The Scientific management of Forests and Wildlife in the State commenced with the British Raj and this legacy is continuing till date. Understanding the history and historical actions, efforts and impacts is essential to diagnose some of those actions of the past that continue to impact us and our welfare today and learning lessons for tomorrow for a better future. Diagnosing historical past is important because of its contribution to the process of evolution, growth and sustainability of natural resources.

Some of the early cultures practiced a form of wildlife management when they attempted to reduce animal damage to crops or predation on domestic animals. Many of the first wildlife conservation practices were related to hunting for food and sport, in which hunting customs developed into wildlife laws. The Wildlife game on license met the needs petty kings and landlords who held the trophies as pride possessions Management has been ever changing phenomenon, when it comes to Forests and Wildlife in the State. The term wildlife conjured with wild animals considered as a game for hunting. Rules were framed during earlier part of the history to regulate game hunting as a sport. Hunting blocks were identified. Many of the protected areas of today were the hunting grounds of the erstwhile kings and landlords. Tamil Nadu has been bestowed with Mother Nature with its bounty and grace. The socio-cultural traditions of the state have always been a driving force to conserve and protect the rich natural resources. The concepts of Sthal Vriksha, Nakshatra Vanam, sacred groves linked trees and nature conservation in the socio-economic milieu of the societies. Sastha Kovils and many other temples in the boundary as well as in the interior of forest areas and this very presence of the God in the forests made them as pious places

to be revered and respected. The wild animals as the vahanas of the God and Goddesses like tiger, elephant, peacock and many others adored them with a special status and paved a new approach to conservation of species by placing it at helm of the social order. These have been the real good conservation mindset and strength of the state and its people in making it a pioneering state in wildlife conservation initiatives.

Wildlife management is interdisciplinary in approach and practice. Primarily it deals with preservation, protection of species, and their habitats. Holistic wildlife management has to be based on knowledge and understanding of wildlife ecology, biology, management, education and extension. Broad ecological principles such as carrying capacity of the habitat, preservation, restoration and conservation of habitat, maintaining contiguity of habitats, predator-prey management, re-introduction of extinct species, capture and trans-location of abundant or problem species etc. are covered in the process and practice of wildlife management. Historically, forests in Tamil Nadu during the pre-British period were managed by the community living in and around the forest by people dependent on them for their subsistence and livelihood. Realizing the significance for protection and management of forest in the Presidency of Madras, Madras Forest Act, 1882 was enacted. The preamble of Madras Forest Act 1882 was protection and management of forest in Madras Presidency. Section 7 of Madras Presidency Forest Act, 1882 stipulates that "No patta should be granted without the previous sanction of Chief Conservator of Forests and also prohibits clearing of Forest Areas". Section (50) of the Madras Forest Act provided punishment up to 2 years or with a fine of Rs.1,000/-. Further as per Section 51 offence punishable with imprisonment for one month or up were may be cognizable. Hence this enactment has put great restrictions on assignment of patta on forest land and also on clearing of forest. This in fact has laid a strong foundation for conservation of forest and wildlife in Madras Presidency. With very few amendments, this legislation remains in force in the state of Tamil Nadu even today after more than 135 years of its enactment.

Perhaps as the first step towards wildlife conservation, the Tamil Nadu Wild Elephants Preservation Act, 1873 was enacted to prevent the indiscriminate destruction of wild elephants within the

State. The central legislation as Wildlife (Protection) Act was enacted in 1972 and almost a century ahead Tamil Nadu led the foundation stone for conservation by enacting the Tamil Nadu Wild Elephants Preservation Act in 1873. Further the involvement of the local community in conservation action goes back to that period. We are probably the First State to have recognized the importance of Wildlife management, the Elephant Preservation Act, 1873, the Tamil Nadu Forest Act 1882 illustrates the sense of concern for Wildlife and their management in the State. The 1894 Forest Policy was landmark policy in the history of forest policy in India as it classified Forests according to their functions and gave special status to mountainous areas which were kept under the category of protected forests for environmental security. It is implied that any protection to wildlife, if available could be in these class-I forests. The starting of Colleges and University for Education and inclusion of subjects like botany, zoology, anthropology and other sciences paved way for students of Tamil Nadu to take-up Forestry profession. The Forest College, Coimbatore stated in the year-1912 which rolled out graduates as scientific managers. The entrance of Indian Forest Service officers to the State enriched Wildlife Management initiatives on technical and scientific lines. Later Colleges started new initiatives and degree and postgraduate courses in Wildlife management. Schools also provided opportunities for understanding of wildlife through their curriculums. The FRI and Colleges and later Wildlife Institute of India gave the impetus for Wildlife Education in the Country. Meanwhile the Agricultural Universities also initiated forestry courses at graduate and post graduate levels. This State has produced some of the best Foresters and Scientists, who even today serve many parts of the Country. For the protection of wild birds and animals, the Madras Presidency enacted legislation namely the Wild Bird and Animal Protection Act in 1912. The Vedanthangal Bird Sanctuary in Tamil Nadu, is known to have established much before Hailey National Park (now known as Corbett National Park) the first National Park of the country, established in 1936. The concept of landscape conservation may be an emerging field of management in recent times, the role of the privately owned forests in larger mix of land uses along with reserved and protected forests are important in providing ecological services and goods. To prevent the indiscriminate destruction of private forests and interference with customary and prescriptive rights therein, the government of Tamil Nadu enacted the

Tamil Nadu Preservation of Private Forests Act in 1949. Later after independence in 1947, the National Forest Policy 1952 brought about far reaching impacts on forest conservation in Tamil Nadu. The 1952 Forest Policy after independence in particular gave importance to Animal kingdom and rare and endangered species. It recognized the need for establishment of sanctuaries and National Parks and needs for special laws for protection of Wildlife. The establishment of Central Board of Wildlife and moving Forests to Concurrent lists mandated both the Union and the State Government to enact laws and policies for Forests and Wildlife Conservation and Management. Some of the States initiatives in this direction were lessons for other States. Duly recognizing the need for conservation of the soil and vegetation supported by hilly areas is crucial for the long term ecological and environmental security of the region, the government of Tamil Nadu enacted Tamil Nadu Hill Areas (Preservation of Trees) act in 1955. The hilly tracts harbor significant biodiversity due to altitudinal effect and climatic factors and thus the objectives of conservation of biodiversity are also realized by dedicated implementation of this legal instrument.

The Government of Tamil Nadu enacted the Tamil Nadu Animal Preservation Act in 1958 especially for preservation of certain domestic animals by regulating the slaughter thereof. The Tamil Nadu Animals and Birds Sanctuaries Prohibition Act of 1950 (amended in 1957) encompassed provisions to prohibit the sacrifice of animals and birds in or in the precincts of Hindu temples in the state. These significant initiatives reflect upon the compassion the State held for animal life and protection.

The practice of Social Forestry came to become operational starting from 1980s, after the National Commission on Agriculture recommended in its report in 1976. Whereas in Tamil Nadu, Community Forestry another offset of social forestry dates back to 1960s with the initiation of tank foreshore plantations on community lands.

The threat to conservation and protection of tiger was realized much earlier by the visionary foresters in Tamil Nadu and 'Mundanthurai Wildlife Sanctuary' a sanctuary for tigers was established way back in 1962, almost a decade before the tiger crisis was reported and realized in 1970 in the country. The National Forest

Policy 1988 which envisioned the protection and conservation of Forests by participatory movement was also guided actions for management plans and prescription in support of wildlife in the State. However this State also has a reputation of early Conservation initiatives through visionary approach of keen Forest officers like M.A.Badshah, the Wildlife Warden. The Government initiatives were simultaneously supported by keen naturalists and free lance ornithologists who emerged as votaries in the cause of wildlife conservation. Their call for wildlife were recognized by Policy makers, which enabled good decision making for wildlife in the State.

The Working Plan of yester years, the tour reports of British Foresters are classic documents that have described at length the richness of State's Forests. The Botanists, Taxonomists and many other naturalists, who made countless journeys to Western and Eastern Ghats have also sketched and recorded bountiful flora and fauna of the State. The Forests were at one time looked up as a resource of Commerce. The Working Plans illustrate the Working of timber and fuel coups, extraction of Charcoal, collection of NTFP. The framework and the practice of preparing forest working plans for scientific management of forests and forest based goods dates back to more than 140 years. The inventory of wild animals and plants other than the major timber trees may find place in many of the working plan documents but prescriptions for their scientific management lacks. The working plans did not give prominence to the ecosystem functions which are the results of the dynamic interactions and interdependence between the wild animals (including the microbes, insects, reptiles, birds and many other small mammals) and the non living components – land, water and soil. Managing the forests for goods and resources remained the central theme in the pre independence era of the country. Managing forests as ecosystems providing ecological services for societal welfare did not receive required attention and priority.

Tamil Nadu became pioneer in implementing the Participatory Biodiversity Conservation programme through the process of eco-development as a pilot site in Kalakkad Mundanthurai Tiger Reserve (KMTR) under the World Bank aided Forest Research, Education and Extension Project (FREEP) in 1994. The Eco-development model of KMTR (1994-2001) is recognized as a model for participatory

biodiversity conservation in the country. In 2011 the World Bank recognized and gave KMTR a status of a 'Field Learning Center' where the good practices of participatory biodiversity conservation – mobilization of people, women participation, and evolved awareness generation strategies and continued management of revolving funds at the Village Forest Committees (VFCs) for alternate livelihoods and livelihood enhancement. The project period was over in 2001 but the conservation action by the local community duly facilitated by the department for protection of catchment forests of KMTR with active involvement and vibrant functioning of VFCs and various Self Help Groups continues even after 15 years of the project closure, a truly sustainable effort in people's participation in biodiversity conservation.

Tamil Nadu is one among the four sites where landscape level conservation action is being attempted under GEF – World Bank aided 'Biodiversity Conservation and Rural Livelihood Improvement Project' (BCRLIP) in Agasthiyarmalai Landscape. KMTR is the chief project coordination center to implement the project from Kanyakumari forest division (Kanyakumari district) in the south to Meghamalai Wildlife Sanctuary (Theni district) involving six forest division. The Tamil Nadu part of the landscape covers an extent of 1672.36 Km^{-2}.

The PA network in the State covers 7,069.72 Km^2, about 30% plus of the recorded forest area of the state with 5 National Parks, 15 Wildlife Sanctuaries, 15 Bird Sanctuaries and 2 Conservation Reserves. Some of the PAs also are constituent parts of the four Tiger Reserves – Anamalai, Mudumalai, Kalakkad Mundanthurai and Sathyamangalam Tiger Reserves. Nilgiri Biosphere Reserve, the first biosphere reserve in the country has areas falling in three southern states – Tamil Nadu, Karnataka and Kerala. Gulf of Mannar Biosphere Reserve in the state is the first marine biosphere reserve not only in India but in the entire south and south-east Asia. Agasthiyarmalai Biosphere Reserve is the third biosphere reserve in the state. All the three biosphere reserves find place in the world network of 'Man and Biosphere Reserves' of UNESCO. Out of the 39 sites in four clusters in the recently approved Serial Nomination of Western Ghats as 'World Heritage Site' by the UNESCO, six sites - Kalakkad Mundanthurai Tiger reserve, Tirunelveli and Srivilliputhur Wildlife Sanctuaries, Grass Hills National Park, Karian Shola and Mukurti National Park are in Tamil Nadu.

Tamil Nadu has historical and cultural traditions focusing Wetland Conservation for meeting the requirement of drinking water, irrigation needs as well as to safeguard its ecological functions. The system and non-system tanks and their management is many century old in the state. Government of Tamil Nadu have taken earnest action in notifying a number of wetlands, PWD Tanks, lakes, seascape etc., as bird sanctuaries under the provisions of Wildlife (Protection) Act 1972 and kept them under the control of Tamil Nadu Forest Department for effective Conservation and protection of these important wetlands. 15 such wetlands (PWD tanks and lakes) are notified as Wildlife Sanctuaries covering an extent of 17,666.15 Ha. In addition the department also administers the management and protection of Point Calimere in Nagapattinam district as a Wildlife sanctuary having elements of both coastal and marine biodiversity extending over 38,500 Ha. Point Calimere is also a recognized Ramsar Site in the State. Kazhuveli wetland in Villupuram district extending over 7,400 Ha. is an important destination for the migratory birds. Pallikkaranai marsh land (PKML) about 690.53 Ha in Kanchipuram district is another wetland area crucial for ecological, biological and hydrological services to the Chennai metropolis and surrounding areas. PKML Conservation Authority is the body that steers and guides the management for integrated development, conservation and protection of the marsh land. Muthupet, Pitchavaram and Ramnad mangroves as important wetlands (19,867.98 Ha) are being managed by the Forest Department on scientific lines. 56,000 ha in 21 islands of Gulf of Mannar Marine National Park are rich in fringing coral reefs, sea grass meadows, mangroves and see weeds with more than 4000 species of marine flora and fauna are being conserved and managed as the first Marine National Park of the country (1986).

Today the anthropogenic and developmental pressures on wetlands are high and on rise, putting larger risks to very survival of many wetlands. Conservation and management of wetlands is important to Tamil Nadu as water is too dear to us. Our endeavor shall be to bring important and priority wetlands under the control of Forest Department through more stronger and relevant provisions under Wildlife and Forest laws.

The Western Ghats landscape has recorded a rise in tiger numbers from 534 (500-568) in 2011 assessment to 776 (685 to 861)

in the 2014 assessment. A rise of 45% has been recorded. It is a matter of great satisfaction that in Tamil Nadu has recorded a rise in tiger numbers from 163 (153 to 173) in 2011 assessment to 229 in the 2014 assessment. A rise of 40% has been recorded since the last estimation completed in 2011 in the State.

Population estimates of elephants reveal the trend as stabilized. The census conducted in 2010 and 2012 record population of about 4000 elephants in the state. The general trend in population of other important wildlife species is on rise. The rise in human population coupled with aspirations for more resources for developmental needs and economic growth, many wildlife habitats interfacing with the human habitations are under stress. Dependence on natural resources though is on decline yet the pressures of one kind or other still remain. As fallout of this there is increased number of incidents of human-wildlife conflicts recorded in many parts in the state.

To contain the problem, the state government has taken various preventive and mitigation measures including the payment of compensation to the family of the deceased and other affected families of conflict related damages to property, crop and injuries. The Government supported 'Operation Malai', a unique effort to capture and trans-locate a herd of 6 elephants from Javadhi hills in Vellore district to elephant camps in ATR and MTR was successfully undertaken by the department to provide a lasting solution to the people facing the danger to their life and damage to the properties of four district for more than two decades. The entire operation was completed in 6o hours without any untoward incident. To contain the problems caused to people in many places in the state, the government established two monkey capturing units and rehabilitation centers and ten cluster units in the problem prone districts. In order to contain the wildlife within its habitat, schemes like creation of fodder tree plantations in forest areas was undertaken along with initiatives like providing solar energized water supply systems in forest areas which have a positive impact on bringing down the intrusion of wildlife from forest areas to the nearby agricultural lands significantly.

New ways and approaches have to be planned and implemented to curtail the occurrence and fallout of human-wildlife conflicts. Restoration, enrichment and protection of habitats, crucial corridors,

local community participation in conflict management, rapid response to conflict situations, establishing more numbers of rescue and rehabilitation centers, enhancing capacity and capability in managing of rouge animals, animals in distress are some of the areas where primary focus needs to be provided.

Capacity building of the managers and front line staff in understanding the need and scientific pursuit to management and eliciting local people and other stake holders support for conservation by incorporating their concerns and aspirations and blending the management prescriptions in an appropriate site specific approaches, using new tools and technologies for enhanced management effectiveness and impact becomes very important area of due interventions. Tamil Nadu Forest Academy in Coimbatore (earlier Southern Forest Rangers College with a glorious history and training traditions for over a century now) provides training to the Rangers and Foresters through well-developed modules and through field trainings. Recently the Government of Tamil Nadu has established two Advanced Wildlife Management Training Centers by upgrading the existing facility at Attakatti in Anamalai and Theppakadu in Mudumalai Tiger Reserves to provide trainings on various issues and themes on wildlife management and conservation issues to front line staff and other stakeholders. Tamil Nadu is pioneer in establishing an Advanced Institute for Wildlife Conservation (AIWC) in the state in 2012-13 to fillip the research and monitoring of biodiversity, key species management, habitats and ecosystems for scientific understanding and reshaping management interventions in times to come for enhanced conservation outcomes. This is first such effort in a state in the country to establish its own institute for wildlife research and that indicates the state government's attention and priority to wildlife management and conservation. Recently in 2015, the state government has established a 'Center of Excellence' in Tamil Nadu Forest Academy (TNFA) to function in Society mode named as 'Society for Wildlife Interface and Forestry Training (SWIFT)' to provide focused action on capacity building of diverse stakeholders.

The Forest Department has been implementing various initiatives to holistically manage forest and wildlife for more than 150 years. A pragmatic shift of thinking and approaching conservation from hitherto exclusive management to an inclusive management process

has resulted in empowering people to support and undertake conservation, forest protection and regeneration works and development many grass root level organizations (Community based organizations – CBOs). The Village Forest Committees (VFC); Eco-Development Committees (EDC); Village Forest Councils (VFC); Village Marine Conservation and Village Forest Committees (VMC & EDC); Village Forest Councils and Eco Tourism Management Committees (ETMC) function at grass root level along with Forest Department and implement various activities related to forest conservation and livelihood enhancement following the processes of Eco-development and Joint Forest Management under many prestigious projects and programs of the department.

More than 3,000 such institutions have been formed and functioning significantly well at grass root level. These CBOs are registered under the Tamil Nadu Registration of Societies Act, 1975 are covered under a legal mandate to make them accountable for their functions. These CBOs receive financial support directly to the Bank account of theirs and implement various activities of the micro-plan. The Forest Department facilitates the process and guides and monitors their performance. The government of Tamil Nadu has the distinction of being the first state to permit fund transfer to the joint Bank account of VFCs to implement various reciprocal agreements and approved activities of a site specific village micro-plan in KMTR under eco-development project in 1996.

Under section 38-X of the Wildlife (Protection) Act, 1972 (2006 amendment), the state has established Tiger Conservation Foundations for all the four Tiger Reserves in the state. These Institutions are also registered institutions under Tamil Nadu Registration of Societies Act, 1975 and mandated to augment and mobilize financial resources including recycling of entry and other such fees received by the Tiger Reserve to foster stakeholder development and ecotourism. The Foundations support various activities for the holistic management of the reserve as per the approved Tiger Conservation Plan of the reserve.

To provide fillip to the ex-situ conservation in the state the state has established Zoo Authority of Tamil Nadu. The Authority has under its umbrella, the Arignar Anna Zoological Park, Vandalur a large and widely acknowledged zoo and all the other four mini zoos in the state.

Not alone the Zoological parks, to enhance its focus on conservation of insects and other invertebrate fauna, the state has recently established – Tropical Butterfly Park and Nakshatra Vanam in Trichy and Butterfly Park within Arignar Anna Zoological Park to provide protection and to make people aware about the important role butterflies play in the ecosystem while serving as an important indicator of the health of the ecosystem.

The Project Management Unit (PMU), a Registered Society has been established as a special purpose vehicle, an Institution to coordinate implementation of ongoing JICA aided Tamil Nadu Biodiversity Conservation and Greening Project in the state (2011-12 to 2018-19) through Divisional Management Unit (DMU) at division level and Field Management Units (FMU) at range level.

To enhance wetland conservation efforts and outcomes, the state has established Pallikkaranai Marsh Land Conservation Authority under the Chairmanship of the Secretary, Environment and Forest Department to the government. Important stakeholders represent in the Governing Body. Society for Wildlife Interface and Forestry Training (SWIFT) in TNFA as a Center of Excellence in wildlife and forestry interface issues and themes to various stakeholders has been established by the government in 2015.

In addition many mini local institutions like the Self Help Groups (SHGs) are involved in various forest and wildlife conservation, protection and regeneration activities for a common goal of enhancing greenery in the state, protecting and conserving the rich resources as active partners with the department. All these new institutions now represent the larger human face of the department and are a great strength to the working of the department and its outreach to the general public. With the growing working experience of these Institutions both at the grass root level and at the management level with active engagement of key stakeholders has made the governance of the natural resource like forests and wildlife broad based and more inclusive in the state. The CBOs may need further hand holding and support to build their competence and commitment for conservation and assume stewardship in natural resource conservation and management.

People of Tamil Nadu have been benefitted from the goods and services accruing from the dynamic sets of interactions of ecosystems and biodiversity. However, the focus has primarily been on growth and welfare of humankind alone. The responsibility on part of humans to allow other species to coexist, survive and evolve is therefore, an issue of serious concern that cannot be neglected.

Today it is well understood and appreciated by most sections of the society that natural resources of the State are important for the very survival of the mankind. The natural beauty and bounty which we now possess in Tamil Nadu, needs to be sustained for the future. In the current scenario understanding Wildlife conservation and management needs to be a judicious mix of both the art and the science of management. It is in the best interests of the people of the State to appreciate forests and wildlife, develop a tolerant attitude, which indeed was a part of our culture. Will it not be in our interests for the future generation to realize our mistakes and built corrective action for harmonious future? It is time we realize that we have tread far deep into the terrains and holdings for whom the voices are far less. We need more voices in this favour to emerge from every walks and corner of the State. We should realize that by undertaking wildlife protection and conservation, we are not doing any charity for the wildlife and nature but rather we are ensuring the long term survival of the human race.

CHAPTER-II

WILDLIFE DEVELOPMENT OVER PLAN PERIODS IN TAMIL NADU

Tamil Nadu Forest Department is the pioneer in scientific management of forests in India with the appointment of Dr.H.F.C.Cleghorn as First Conservator of Forests of erstwhile Madras Presidency in the year 1856. The focus of Wildlife in Tamil Nadu has taken a varied paths witnessing multitude of events, covering decades of progress in conservation and development of wildlife. The major events that have taken place in reshaping the conservation and development of wildlife can be traced to pre independent and post independent era in four different cycles/ periods (1950-60), (1960) and (1960-76) and (1976-2016) with 1960 as the year in which a separate organization of Wildlife sanctioned with the appointment of wildlife officer-in-Charge for the State of Tamil Nadu. The brief journey across different cycles and the major developments relating to Wildlife Conservation and Development are as follows:

Period/Cycles		**Major Events relating to Wildlife Conservation and Development**
Pre-Independence Era	:	• First Act for elephant protection in 1873; • Introduction of Nilgiri Game and Fish Preservation Act in 1878; • An Act for preservation of wild animals and birds in 1912, • Official recognition of Vedanthangal as a bird sanctuary in 1936, • Declaration of part of Mudumalai as a wildlife sanctuary in 1940

Tamil Nadu Government took lead in matters relating to wildlife conservation by way of initiating management decisions that mainstreamed conservation and development of wildlife in India and Tamil Nadu which led to evolution of wildlife conservation in the post independence era. Major developments that took place in the post independence are as follows:

Post-Independence Era : The efforts of Wildlife conservation in Tamil Nadu have taken place in four different phases and the same are stated below:

1950-60 : G.O.Ms.No.3480, Development, dated 5th September 1950; the Government accorded sanction for the appointment of nine Honorary Game Wardens, from among the members of the Nilgiris Game Association vesting them with the powers of Forest Officers under the Madras Forest Act. During the year 1952-53, wildlife Protection gained significance and Nilgiris Game Association considered putting up of gates, *two* by the Nilgiris Game Association on the Segur-Anaikatti road and *two* by the Forest department on the main Ootacamund-Mysore road.

The special staffs of one Game Warden and three Assistant Game Wardens were sanctioned in G.O.Ms.No.1047, Agriculture, dated 5th April 1954 for the Mudumalai Wild Life Sanctuary and were employed from 1st August 1954.

In G.O.Ms.No.3154, Agriculture, dated 19th October 1954, the rates of shooting license fees were increased for all divisions except the Nilgiris. One free shooting license was issued to the Taxidermist, Government Museum, Pudukkottai, according sanction vide G.O.Ms.No.668, Agriculture, dated 18th May 1954.

With a view to preserve the fauna of the state and to maintain the balance of nature a State Wild Life Board was constituted in 1954 with the Minister for Agriculture as its Chairman. The functions of the Board were

to advise the Government in respect of the following matters:-

a. Wild Life protection and necessary legislation therefor:
b. creation of public interest in Wild life;
c. selection of areas for the protection of certain species of animals, constitution of National Parks, and Sanctuaries;
d. re-introduction of extinct species and. stricter conservation of diminishing species;
e. Establishment of zoological parks and gardens and ensuring their proper management.

The first meeting of the Board was held at Madras in January 1955 and various subjects pertaining to Wild Life in the State were discussed. The first Wildlife day was celebrated on the 7th July 1955 in a befitting manner throughout the State. An appeal was also issued to all shooting license holders to abstain from shooting wild animals for a week from 7th July 1955.

After State Reorganization (01-11-1956), Game laws and shooting rules were framed, for the preservation of game in reserved forests and Class III panchayat forests were transferred to the control of the Forest Department. The rules prohibited the shooting of certain animals and birds threatened with extinction, as also the shooting of females and immature males designated as Big Game besides regulating the shooting of other animals and birds. These rules mandated a closed season for every class of game animal and birds.

Kodiakadu Reserved Forest in 'Tiruchirappalli Forest Division' was closed for shooting during the period for the purpose of rehabilitating the depleted stock of game which was badly affected on account of cyclone in 1955.

Consequent on the impending reorganization of States, it became necessary to restrict the area of the Mudumalai Wild Life Sanctuary to 114 square miles excluding the area of 40 square miles of Malabar area. Later Government sanctioned the staff of one Assistant Conservator of Forests, three Rangers (Wild Life) and three Forest Guards (Wild Life) for the improvement of Mudumalai Wild Life Sanctuary under Second Five Year Plan scheme.

The Wild Life Week was celebrated during the first week of October 1956 in a fitting manner throughout the State and the same practice continues till date.

In the Tirunelveli district at Papanasam, a check post was opened in 1957 to check vehicles for illegal arms to prevent shooting of tiger and deer. As the said animal life was frequently noticed on the main roads of Mundanthurai, Tharvittamaprai and Puckles path. A black list of offenders was maintained by the District Forest Officer. Prescriptions in the management plan can be traced for constitution of a sanctuary and for imposing of a ban on shooting for 10 years with the idea of preserving the available game, accordingly following

areas were declared as closed to shooting for a period of three years from 1957-58.

a. The forests in Thindivanam Range, Cuddalore Division.
b. The forests of Tunacadavu Range, Coimbatore South Division.
c. The forests of Sathiyamangalam Range, Coimbatore North Division.
d. Kodiakadu Reserved Forest, Tanjore Division.
e. Anchetty Range, Salem North Division.

The management of part of the Guindy Park Reserved Forest was transferred to the department with its animal stock of about 300 black bucks, 200 spotted deer, etc., and its location was within the limits of Madras City.

The Ponniar reserved forest in Vellore West Division was closed to shooting during 1958-59. Proposals to prohibit shooting of wild birds and animals in the reserved forests lying between Kambugudi and Singarapet in Tirupattur Range of Vellore West Division were conceded.

In Vedanthangal Bird Sanctuary, steps were taken to improve the sanctuary such as planting of fruiting trees along bunds. The shooting of water-birds congregating at the sanctuary and, found anywhere within the radius of 20 miles from Vedanthangal lake, was prohibited throughout the year (1958-59). A Forester was employed to look after the sanctuary. The Children's Park.

Deer Park at Guindy was inaugurated in April 1959 by Hon'ble Prime Minister Jawaharlal Nehru.

The following areas where the game was reported to be scarce was also closed for shooting during the year -1959-60.

Vellore West Division	Singarapet Reserved Forest. Singarapet Extension Reserved Forest. Mambakkam Reserved Forest. Mambakkam Extension Reserved Forest. Govindapuram Reserved Forest Part of Inner Jawadies.
Salem South Division	Attur Ghat Road and its Extension. Kurichi Reserved Forest. Pungamadhavu Nagalur Reserced Forest. Pattimedu and its Extension. Arana Thumbal. Jadayagoundan. Ariyursolai. Puliyansolai. Shelur Reserved Forest and its Extension.

1960 **G.O. No. 1211, Food and Agriculture dated 28. 03.1960 paved the way for a separate organization for Wildlife and the post of State Wildlife Officer-in-Charge was sanctioned.**

With the setting up of a separate State Wildlife Organization in July 1960, the Gudalur Forest Division was abolished and the Territorial jurisdiction of the Division was restored to the Ootacamund Division.

Ootacamund Division was in turn, renamed as the Nilgiris Division.

The management of Wildlife Sanctuary at Mudumalai came under the newly appointed State Wildlife Officer, Madras. The Management of Vedanthangal Bird Sanctuary and Guindy Deer Park and its Children's Corner was also transferred to the control of the State Wildlife Officer.

Mr. M.A. Badshah, a Specialist in Wildlife was appointed as the First State Wildlife Officer of Madras State (Tamil Nadu) with effect from 01.07.1960 and continued for eight years and till he retired in 1968.

Mr.P.R. Basheer Ahmed succeeded Mr. M.A. Badshah and continued up to 1975 in the post with some break in between. Mr. Basheer Ahmed was a promising young officer, who received a P.G Degree in Wildlife Management and was sent abroad for training before taking over as the State Wildlife Officer.

The post of Chief Wildlife Warden, came into being in the place of State Wildlife Officer, as per the requirements of Wildlife Protection Act, 1972. A Conservator rank post was created as Chief Wildlife Warden.

The first full-fledged Chief Wildlife Warden was Thiru S.A.Rehmatullah, IFS. The post in due course the post got elevated to Conservator of Forests, Additional Chief Conservator of Forests, Chief Conservator of Forests, Additional Principal Chief Conservator of Forests and Principal Chief Conservator of Forests. Initially, the Headquarters of the post of Chief Wildlife Warden was at Coimbatore and in due course got shifted to Chennai.

The list of Chief Wildlife Wardens who have worked till today in Tamil Nadu Forest Department are stated below:

Sl. No	Name	Period
1.	S.A. Rehmatullah, IFS	28.10.76 to 21.08.78
2.	A.M. Md. Hussain, IFS	22.08.78 to 4.11.78 22.12.78 to 23.03.79 01.04.81 to 16.06.82
3.	T.B. Jambulingam, IFS	05.11.78 to 21.12.78 08.05.79 to 07.11.79 20.02.80 to 28.11.80
4.	K. Venkata Krishnan, IFS	24.03.79 to 07.05.79 08.11.79 to 19.02.80 31.03.80 to 28.04.80 28.11.80 to 31.03.81
5.	P. Bhaskaradoss, IFS	28.04.80 to 05.09.80
6.	K. Shanmuganathan, IFS	17.06.82 to 30.09.83
7.	K.R. Venkatesan, IFS	07.04.84 to 07.08.86
8.	P. Padmanabhan, IFS	08.08.86 to 30.04.90
9.	S. Subburayalu, IFS	16.07.90 to 30.11.90
10.	K. Viswanathan, IFS	01.12.90 to 03.06.91

Sl. No	Name	Period
11.	V.R. Chitrapoo, IFS	04.06.91 to 08.11.94
12.	S. Shanmugasundaram, IFS	09.11.94 to 05.02.95
13.	B. Arulprakasam, IFS	06.02.95 to 31.03.96
14.	R. Sundararaju, IFS	17.04.96 to 21.06.96
15.	K.K. Somasundaram, IFS	21.06.96 to 17.10.96
16.	R.R.S. Katwal, IFS	18.10.96 to 02.10.2000
17.	Dr. Sukhdev, IFS	23.10.2000 to 05.12.2004
18.	Dr. Sukhdev, IFS	06.12.2004 to 07.12.2005
19.	C.K. Sreedharan, IFS	08.12.2005 to 01.06.2006
20.	Dr. Sukhdev, IFS	01.06.2006 to 31.01.2008
21.	R. Sundararaju, IFS	01.02.2008 to 31.03.2011
22.	Gautam Dey, IFS	31.03.2011 to 02.09.2011
23.	R.K. Vashisht, IFS	06.09.2009 to 31.08.2012
24.	R. Gunasekaran, IFS	01.09.2012 to 08.11.2012
25.	Bhagwan Singh, IFS	09.11.2012 to 30.04.2013
26.	Lakshmi Narayanan, IFS*	01.05.2013 to 09.07.2013
27.	Vinod Kumar, IFS*	10.07.2013 to 01.08.2013
28.	R.K. Ojha, IFS*	02.08.2013 to 25.08.2013
29.	Lakshmi Narayan	26.08.2013 to 31.07.2014
30.	Dr. V.K. Melkani IFS	01.08.2014 to till date

* In charge

1960-1976 : During 1960, the State Wild Life Officer inspected Muthukulivayal in Kanyakumari District, Top slip in Coimbatore district, Kukkal Reserved Forest of Madurai district and Kodiakadu in Thanjavur district to ascertain the possibilities of opening new sanctuaries. The Kodiakadu area in Thanjavur district was found to have excellent possibilities for development into a holiday resort and sanctuary.

With a view to introduce species from one area to another in the State, steps were taken to procure 'Capchur' guns. Black Buck concentrated only in two places in

Madras State, viz., (1) Kodiakadu Reserved Forest of Thanjavur district, and (2) Guindy Deer Park, were considered to be transferred to other areas, exercising abundant caution to avoid injury and mortality. Action was also initiated to afford special protection to the species of animals in danger of extinction such as tiger, four-horned antelope and Black Buck.

It was proposed to raise the status of tiger and of panther (treated up to now as vermin) to that of "Big Game" and limit the bag per season to one for each shooting license and also to constitute a sanctuary for tiger as resolved in the VI meeting of the State Wild Life Board.

In order to prevent poaching and regulate shooting of game by licensees, four ante-poaching gates at strategic points one at Thorapalli, second at Kakkanahalla, third at Benne and the fourth at Masinagudi were put up and manned by watchers in Nilgiris. Vehicles passing through these gates are stopped and checked. The Anti-poaching gate at Sethumadai functioned satisfactorily during the period in preventing poaching. The State Wildlife Officer also inspected Maravakandy Dam in Nilgiris district and noticed a small flock of about 40 Teals a few red lapwings. The area was frequented by sportsmen and local shikaries. The State Wildlife Officer took action and steps to prohibit shooting in the area.

Large congregations of migratory water fowl were also noticed in the Gangaigondan

tank in the Tirunelveli district and in the Madurantakam and Arapakkam lakes in Chingleput district. The Home Minister broadcast a talk in Tamil over the All-India Radio, Madras, on 1st October 1960, inaugurating Wild Life Week, 1960. The Chief Conservator of Forests and the State Wild Life Officer also put on air talks over All-India Radio on "Wild Life Sanctuaries in Madras State" and "Lessons from Wild Life Conservation Practices in other lands" on 4th and 5th October respectively.

At Vedanthangal Bird Sanctuary, four new species of birds, namely *Painted storks, Tufted ducks, the Curlew and Purple Moorhen* were seen during this year (1960). In the lake at Vedanthangal Bird Sanctuary and about 1,000 "*Barringtonia*" seedlings were planted and eight cement benches were provided along the bund for the visitors to sit and watch the birds.

Shooting of black buck and four-horned antelope was prohibited in North Coimbatore division vide G.O.Ms.No.2033, Food and Agriculture Dept, dated 3.6.1961. There were prescriptions for declaring Minchukuli valley as a sanctuary. Sathyamangalam range area around Bhavanisagar reservoir and Talamalai range were closed for shooting.

In 1962, Vedanthangal lake, by then a recognized bird sanctuary was notified as R.F and a decade later it was declared as Vedanthangal Lake Wildlife Sanctuary. A new anti-poaching gate was put up at

Sujjalkuttai (1961-62) in Talamalai Range on the Bhavanisagar - Thengumarahada road. This gate is looked after by the subordinates of Coimbatore North, Coimbatore Central, Nilgiris Divisions in turn.

The State Wild Life Officer continued as in charge during (1960-62) and undertook intensive work in surveying the States' wildlife resources. In Mudumalai Sanctuary, six dens of tigers, two dens of panthers, and two dens of bears were located; and their territory, habits and behavior was studied. Wallowing grounds of elephants at Benne, concentration points of gaur (Indian Bison) and spotted deer in Teppakkadu and Avarahalla blocks were ascertained, in order to enable visitors being taken to these spots. Teppakkadu and Avarhalla thus became popular for visitors. A watch tower was constructed in Avarahalla.

The Forests in Tirunelveli and Kanyakumari districts were closed for shooting with effect from 1st October 1962 for three years as resolved in the VII Meeting of the State Wild Life Board held at Ootacamund in May 1962.

As per G.O.Ms.No.2256, Food and Agriculture Department dated 2.8.1962, the entire Papanasam R.F and Singampatti ex-zamin forests of Tirunelveli North and South divisions were closed for shooting of all wildlife and the closed area was termed as the sanctuary for tiger.

The following Reserved Forests of Vellore East Division were ordered to be closed for shooting videChief Conservator's Reference No.33902/W1, dated 4th February 1963 and 8th November1963:-

(1) Patrokad Reserved Forest.
(2) Veerappanur Reserved Forest.
(3) Malayalam Reserved Forest.
(4) Puthur Reserved Forest.
(5) Mulakad Reserved Forest.
(6) Thelli Reserved Forest.

A tree sanctuary for conservation of Painted Storks and other birds was formed by declaring that the period commencing from 1st November to 31st August was to be closed throughout the areas of Kudankulam and Moonradaippu villages and its surroundings to a width of 35 km vide G.O Ms.No.3367, Food and Agriculture department dated 12.11.1963. Same restrictions were followed for a 16 km radius of Gangaikondan lake for other eight variety of birds vide G.O Ms.No.3074 dated 14.10.1963.

G.O.Ms.No.3074, Food and Agriculture, dated 14th October 1963, the area within a radius of 16 kilometres from Gangaikondan lake in Tirunelveli district and the area within 15 kilometres from Vaigai Reservoir in Madurai district were declared as closed for shooting of certain birds from 1st October 1963 to 30th April 1964.

G.O.Ms.No.3367, Food and Agriculture. Dated 12th November 1963: the areas

comprising Kundrakulam and Moonradaippu village and their surroundings to a width of 35 Kilometres in Nanguneri taluk of Tirunelveli district have been declared as closed for shooting of Painted Storks from November 1963 to August 1964.

G.O.Ms.No.1469. Food and Agriculture, dated 1st May 1964, the area comprising Seethaparapanallur tank and its surroundings within a radius of 15 Kilometres from the tank in Seethaparapanallur village in Tirunelveli district were declared as closed for shooting Painted Storks.

With a view to prevent the killing of tigers by folidol and other poisons by ryots residing in the vicinity of Sanctuaries, a scheme of payment of compensation to ryots whose cattle was killed by tigers, was approved vide G.O.Ms.No.17, Food and Agriculture, dated 2nd January 1965.

His Highness Shri Jaya Chamaraja Wadiyar Bahadur, Governor of Madras visited the Vedanthangal Birds Sanctuary on 13th December 1965 and had recorded the following remarks in the Visitors' Book :- "*Apart from the great improvements made for bird watching since my last visit I was interested to hear that nearly 30,000 young birds are born in a year. Pelicans too have bred successfully here. This is a wonderful place and I hope many more people with be able to admire nature's glory and its bird and animal life*".

On 23rd December 1965, His Highness Shri Jaya Chamaraja Wadiyar, Governor of Madras visited Point Calimere and the Kodaikadu Reserved Forest. The remarks of His Highness are stated "*Saw a wonderful collection of birds of all kinds. It was also pleasant to see a sanctuary when Black Bucks which is a species that is fast disappearing elsewhere in India. Are being well preserved. I hope this sanctuary for birds and Black Buck will invite many others to visit its premises frequently*".

The State Wild Life Officer attended the VI Session of the Indian Board for Wild Life Meeting held at Dhikala. Corbett National Part, Utter Pradesh, from the 3rd to 5th June 1965.

During the year (1966-67) Rs.1,290 was paid to eleven cattle owners towards compensation for cattle lifting by Tiger in Mundanthurai area.

G.O.Ms.No.1748, Agriculture Department, dated 5th June 1967, Nilgiris Tahr has been given protection under the Madras Game Laws and Rules.

To discourage wasteful killing of big game and to act as a disincentive, Government fixed a higher royalty fee for those big game, which did not carry prohibitory orders through G.O.Ms.No.2692, Agriculture Department dated 13.09.1967. For instance, a fee of Rs.50/- for spotted deer, Rs.100/- for sambhar and Rs.500/- for gaur was fixed in

Coimbatore North Forest Division.

At Veeracholam in Ramanathapuram District, more then 500 peafowl's were seen in and around the village throughout the year. An annual subsidy of Rs. 500 was granted to Islamia Uravinmurai Trust to feed and protect these birds. (1967-1968). In Veppalodai Salt Factory near Tuticorin, a few Flamingo birds were also recorded.

G.O.Ms.No.1821, Agriculture, dated 13th June 1967. Government approved the proposal for the formation of a Wild Life Sanctuary covering the areas of Kodiakadu Reserved Forest and its extension. The area of the sanctuary was 4,27181 acres and it was named as "Point Calimere Wild Life Sanctuary".

Noteworthy feature of this year Wildlife Week Celebration of 1967-68 was the printing of coloured wildlife picture post cards of sanctuaries in Madras State. 20,000 picture post cards were printed for sale to the tourists and for distribution among the Indian Missions in the foreign countries. The Chief Minister of Madras had taken with him 1,000 picture post cards for presenting them to the people in foreign countries.

During the year (1968-69) a sum of Rs. 645 was paid to nine cattle owners as compensation for cattle lifting by Tigers. Shooting block system was introduced in Srivilliputhur Range of Ramanathapuram Division as an experimental measure. G.O.Ms.No.1358, Agriculture, dated 28th

April 1969. – Shooting of Birds in Arappakkam lake in Chingleput District was prohibited throughout the year.

G.O.Ms.No.2720, Agriculture, dated 4th September 1969. – Government have declared the whole year to be a close time in respect of Python in the entire area outside the Reserved Forests in the State of Tamil Nadu.

In G.O.Ms.No.3763, Agriculture, dated 31st December 1969, - Government have ordered closure for shooting in Tiruthuraipoondi taluk of Thanjavur District from November 1969 to February 1970.

G.O.Ms.No.150, Agriculture, dated, 27th January 1970, - Government have issued amendments to rules prohibit shooting, etc. to within the limits of Point Calimere Wildlife Sanctuary.

A ceiling was fixed in regard to the number of licenses to be issued in each division with a view to restrict the hunting of animals. The royalties for animals (Cheetal, Sambhur and Gaur) continued to be collected at the rate prescribed in Government Order Ms. No. 2692, Agriculture, dated 13th September 1967.

G.O.Ms.No.145, Agriculture, dated 20th January 1969 the Government ordered that a royalty of Rs. 200 to be collected from the Shikaries for each Nilgiri Tahr ((Ibex) shot by them, in addition to the license fee which was collected during the period.

G.O.Ms.No.1057, Agriculture, dated 28th March 1969, the Government granted two prizes (i.e.) 1st prize valued Rs. 200 and the second prize valued Rs. 100 to lbe awarded to the Panchayata which have evinced interest in the detection of poaching and other cases of violation of game laws.

The Bombay Natural History Society took up ringing of birds in the sanctuary to study bird migration. (1969)

The XIV meeting of the Tamil Nadu Wild Life Board was held at Ooty on 18th April 1970 and discussed various matters for the preservation of wildlife. On a resolution at this meeting, the issue of plural shooting license was stopped with effect from 1st January 1971.

The VIII meeting of the Indian Board of Wild Life was held at New Delhi. The Chief Conservator of Forests and the State Wild Life Officer attended the meeting. The State Wild Life Officer also paid a visit to the Delhi Zoo and Hyderabad Zoo to study their management.

G.O.Ms.No.1453, Agriculture, dated 18th April 1973, the Government declared the following tanks as waterfowl refuges under the wild Birds and Animals Protection Act, 1912:

(a) Karikili tank – Maduranthakam taluk
(b) Ramanathapuram Big Kanmoi – Ramanathapuram taluk

A Project Report was prepared and submitted for the protection of the

endangered species the *lion-tailed macaque* – in Kalakkad forests (Tirunelveli South division at a cost of Rs. 5.00 lakhs (1974-75).

Proposals were submitted for financial assistance from the Government of India to set up a Preserve for "Nilgiris Tahr" in the Western catchment of Kundah at a cost of Rs. 4.00 lakhs(1974-75). Nilgiris Tahr was considered as one of the endangered species.

Under the Wild Life (Protection) Act, 1972 *(Central Act No. 53 of 1972).* State Government framed "The Wild Life (Protection) Tamil Nadu Rules. 1975". The Rules have come into force on 21st January 1976.

Formation of Wild Life Youth Clubs,-(a) As per G.O.Ms.No.749, Forests and Fisheries Department, dated 1st October 1974, Wild Life Youth Clubs were started at Coimbatore. Madurai and Tirunelveli during the year (1974-75).

A Wild Life Association was formed at Tiruchirappalli during the year (1974-75).

G.O.Ms.No.455, Forests and Fisheries Department dated 22.05.1976 issued orders declaring their intention to constitute an area of 281.94 hectares in Guindy Park Reserved Forests as a National park under Section 35(1) of the Wildlife (Protection) Act, 1972 (Forests and Fisheries Department notification No.II (2) /FRFI/2882/76 dated 22nd May, 1976 Published at page 326 of Part II - Section 2

of the Tamil Nadu Government Gazette dated 9th June, 1976.

G.O.Ms.No.884, Forests and Fisheries Department dated 22.09.1976 the Government sanctioned the implementation of the scheme for the development of Kalakkad Sanctuary for *Lion-tailed Macaque* on a phased programme at a non-recurring expenditure of Rs.4.25 lakhs. Similarly, Anamalai Wildlife Sanctuary was also declared in the year 1976.

1976-2016 : After extending the wildlife (Protection) Act, 1972 and the rules framed came into force with effect from 21.01.1976 the Government vide order Ms.No.980, Forests and Fisheries, dated 26.10.1976 created a post of Chief Wildlife Warden in the rank of a conservator of Forests. The Chief Wildlife Warden, assumed office on the after-noon of 28.10.1976. The following units were brought under his control:-

(i) Wildlife Warden, Madras.
(ii) Wildlife Warden, Coimbatore.

G.O.Ms.No.285, Forests and Fisheries dated 25.03.1977, the Government constituted a Task Force to guide and supervise for the development of Kalakkadu Sanctuary for *Lion-tailed Macaque*.

(i) Chief Wildlife Warden, Madras;
(ii) Wildlife Warden, Coimbatore;
(iii) The Assistant Director, Regional Wildlife office, Government of India, Madras.

As required under the Wildlife (Protection) Act, 1972 the first meeting of the State Wildlife Advisory Board (as constituted in G.O.Ms.No.485, Forests and Fisheries dated 03.06.1976) was held on 24.09.1976 at Madras.

During 1976-77, 479 game licenses, dealership, taxidermist, trapping, ownership certificates etc., were issued under the provisions of the Wildlife (Protection) Act, 1972.

The Chief Wildlife Warden and Wildlife Wardens conducted several meetings in District headquarters and explained the salient points of the Act and Rules to the press, hoteliers and District Wildlife Associations at Tiruchirapalli, Coimbatore, Tirunelveli and Ootacamund.

During February, 1977 the Secretary (Commercial Taxes), Board of Revenue; Commissioner, Hindu Religious and Charitable Endowments and all District Collectors were informed of the salient features of the Wildlife (Protection) Act, 1972.

During September, 1976, the Government of India accorded their administrative approval for the implementation of the scheme Captive Breeding of Crocodiles Farms Establishment at Sathanur Dam at a cost of Rs.2.40 lakhs.

In G.O.Ms.No.485, Forests and Fisheries dated 03.06.1976 the Government constituted the Tamil Nadu Wildlife Advisory Board under subsection (1) of

Section (6) of the Wildlife (Protection) Act, 1972 with the Chief Secretary to Government as Chairman, and nineteen other Members including eminent Naturalist like M. Krishnan. The first meeting of Wildlife Advisory Board was held on 24.09.1976 at Madras.

During the year (1976-1977) Game license, Dealership, Taxidermist, ownership certificates etc. were issued under the provision of the Wildlife (Protection) Act, 1972 and offences relating to Wildlife (Protection) Act, 1972 were booked. The three mini-zoos in the following centres were maintained:

1. Amirthi Zoo in Vellore Division.
2. Kurumbapatti in Salem Division.
3. Mini Zoo, Hogenekkal of Dharmapuri Division.

Vettangudi Bird Sanctuary final notification in 1977.

G.O.Ms.No.1107, Forest and Fisheries dated 8th December, 1978 the Government directed that every year about 100 young crocodiles of adequate size be released, to start with in the reservoirs at Krishnagiri, Papanasam and Kodaiyar. In addition to what were raised in the Departmental nurseries, 40 young crocodiles were given by the Director, Madras Crocodile Bank for release in reservoirs in the State.

Wildlife Research :- (i) Thiru. Rauf Ali continued his research work on BNHS projects upto 30th July 1978. (ii) Thiru.A.Periaswamy, Research Scholar sponsored by the Madurai University has

reported about his pioneering research work relating to wildlife in Tamil Nadu on 19th May 1978.(iii) Thiruvalargal. T.Mayamuthu and T.J.Rasool of the Zoological Survey of India, carried out studies under the guidance of Dr.C.V.Kurup, Chief Investigator, Primate Research Project. (iv) Thiru.Hussainy contined his studies on Black Buck in Point Calimere Santuary.

Zoo at Madras: The Government in G.O.Ms.No.110, Forests and Fisheries dated 16.02.1979 ordered the transfer of the present Zoo at Madras managed by the Madras Corporation to bring the same under the control of the Forest Department and further ordered the shifting of the entire zoo to Vandalur where a Zoological Park to be established at an estimated cost of Rs.300 lakhs. For undertaking the work a master plan has been prepared by Thiru.K.Vishwanathan, I.F.S., who was appointed as Special Officer. The work was to be done in phases. The first phase estimated to cost Rs.105 lakhs.

Phase-I Operations: During 1979-80 the Government sanctioned the establishment required for the execution of the first phase of the project. As a first step for the construction of the project, Art director Thiru.P.Angamuthu was entrusted with the preparation of plaster of Paris model of the park showing details of roads, cages etc. The Ground water cell of the Public Works Department took up the work of digging bore wells.

Pulicat Lake Bird Sanctuary was notified in the year 1980.

Nilgiri Tahr Sanctuary sanctioned in G.O.Ms.No.420/ Forests and Fisheries dated 8th March 1982.

The Indian Railways handover the lands under the control of the Corporation of Madras, for establishing a modern Zoological Park at Vandalur Reserve Forest 30k.m. Irom Madras City. Out of the total project cost of Rs.300 lakhs, a sum of Rs.105 lakhs was also sanctioned for the development of the first phase of the project. The management of the Zoological park was kept under the control of the Forest Department. The said project was headed by a Director, in the rank of Conservator of Forests. He was assisted by a Deputy Director in the rank of Deputy Conservator of Forests, and also by an Executive Engineer. The first phase of the works of the Vandalur Zoo got completed by 1984.

The new site at Vandalur was selected for the Zoological Park in an area of more than 350 acres of land located on the Main Grand Southern Trunk Road and is only 30 KM. from Madras connected by suburban trains. Because of the vast area available there was lot of scope for extending and improving the Zoo at Vandalur and the Zoo.

Wildlife orphanage was maintained in the Mundanthurai Sanctuary in which 2 lion-tailed macaque, 1 spotted deer and 1 Python were maintained.

Protection of Sea turtles: In order to save the sea turtle and their eggs from the depredatory activities of men hatcheries were set up in Kodaikarai, Arkatuthurai, Vannavanmachadevi in Thanjavur division, Perianeelankarai, Vadaniveli in Madras Wildlife Unit and Veera pandiyapattinam, Kanyakumari and Uvasi in Kalakkadu Wildlife Unit. Out of 93,873 eggs collected, 77,122 hatched accounting for 82 percent and 76,042 hatching were released into the sea. Permission was granted to the central Marine Fisheries Institute at Madras to collect eggs and they released about 5,011 hatchlings. (1982-83).

Hon'ble Chief Minister of Tamil Nadu presided over the Wildlife Week Celebration (1982) and the inaugural address was given by his Excellency the Governor of Tamil Nadu. During 1983-84, at Vandalur Zoological Park wild animals including different species of birds numbering 160 in all have been transported from the Corporation Zoo to Vandalur Zoological Park and were housed in their new enclosures. One male Rhino was purchased from the Government of Assam at a cost of Rs.2.98 Lakhs and it was housed in the Rhino enclosure on 24th April 1985 in Vandalur Zoo.

The Nilgiris biosphere spread over Tamil Nadu, Karnataka, Kerala was formally declared open in September 1986. The Nilgiris biosphere reserve covers a forest area of 5520 Sq.km. in the southern states of India, the largest area is in Tamil Nadu. It covers the Forest divisions of Mudumalai, Sathyamangalam, Erode

Nilgiris-North, Nilgiris-South and Coimbatore.

A modern veterinary research centre was set up in the Zoological Park with full equipments (1986-1987). The animals were taken care of by a Veterinary Doctor and two Veterinary Asst. Surgeons. Provisions were made in the veterinary centre to look after the sick animals. Some enclosures of important animals were divided into two parts, one for keeping animals for the public to see and the other for scientific breeding purpose.

Vallanadu Black buck Sanctuary notified in the year 1987.

Wildlife Circle, Southern Region, Rajapalayam was formed during January 1988 as per G.O.Ms.1054, Forests and Fisheries Department dated 23.10.1987 consisting Kalakkadu and Mundanthurai Sanctuaries and later the newly formed Grizzled Squirrel Sanctuary, Srivilliputhur came under the jurisdiction of this circle. According in the guidelines of Government of India, the policy of the circle is to evince keen interest and to take care for the preservation of wildlife.

An area of 11,710.53 ha. was declared as National Park in The Government of India declared Kalakkadu and Mundanthurai Sanctuaries as "TIGER RESERVE" in their letter No.3.14/88 FRY/(PT) dated 07.10.1988. As such this became the 17th Tiger Reserve in the country.

Indira Gandhi Wild life Sanctuary as per G.O.Ms.No.58, Environment and Forests dated 23 01 1989.

Grizzled Squirrel Wildlife Sanctuary, Srivilliputhur:G.O.Ms.No.389, Environment and Forests dated 26.12.1988 sanctioned Srivilliputhur Grizzled Squirrel Wildlife Sanctuary over and area of 48020.20 ha. which shall work under the control of the Conservator of Forests, Wildlife Circle, Southern Region, Rajapalayam.

Mudumalai Wildlife Sanctuary and Mukurthy (Nilgiiris Tahr) Wildlife Sanctuary in Nilgiris Circle and the Indira Gandhi Wildlife Sanctuary in Coimbatore Circle were put the control of the Chief Wildlife Warden in order to have unified technical control.

Gulf of Mannar which represents a unique marine eco-system in the Indian Part of the gulf situated near India and Sri Lanka was declared as Biosphere reserve by the Government of India and this has come into force with effect from 18.02.1989. The Marine National Park comprised of 21 islands In the Gulf of Mannar and four of them off the coast of Chidambaranar District in the East and 17 islands off the coast of Ramanathapuram District in the south. The total area of these 21 islands is about 623.12 ha.

The Wildlife Advisory Board was reconstituted by the Government vide G.O.Ms.No.420, Forests and Fisheries dated 24.04.1986. As per the G.O., the

Hon'ble Minister for information and Religious Endowments was made the Chairman of the Board. There were 10 officials and 7 non-officials as members. During the year the first meeting of the reconstituted Board was held on 13.09.1987.

Vedanthangal Wildlife Sanctuary was given final notification during 1988.

Formation of Deer Park on the southern side of Uthagai Lake was an added attraction to the tourists who come for enjoying the boating. Sambar, spotted deers are displayed in the park (1989-90).

Karikili Bird Sanctuary, Kanjirankulam Bird Sanctuary, Chittirangudi Bird Sanctuary were notified during 1989.

G.O.Ms.No.343, Environment and Forests Department, dated 1.6.90, One post of Field Director in the cadre of Conservator of Forests to look after the Project Tiger, Kalakkad Mundanthurai Wildlife Sanctuary was created.

G.O.No.481, Environment and Forests Department, dated 16.07.1990, the wildlife southern Region, Rajapalayam was abolished and utilized to form a new Wildlife Circle at Coimbatore as Wildlife circle at Coimbatore as Wildlife Western Region, Coimbatore. This circle was functioning with effect from 01.06.1990.

Wildlife Circle, Western Region, Coimbatore: The Chief Wildlife Warden based at Coimbatore exercised overall

administrative control over the entire wildlife wing within his jurisdiction. The Mudumalai Wildlife Sanctuary, Mukurthi Wildlife Sanctuary and Indira Gandhi Wildlife Sanctuary, were under the direct control of the Chief Wildlife Warden, Coimbatore. Apart from the above, two Conservator of Forests (i.e. Northern Region, at Madras and Southern Region at Rajapalayam) were brought under the control of the Chief Wildlife Warden, Coimbatore. To enable the Chief Wildlife Warden to function more effectively, vide G.O.Ms.No.481, Environment and Forests (FR-V) department, dated 12.07.1990, Government ordered to shift the Headquarters of the Chief Wildlife Warden to Madras. Government ordered to form a new wildlife circle at Coimbatore known as Western Region with separate Conservator of Forests for Mudumalai Wildlife Sanctuary and National Park, Mukurthi Wildlife Sanctuary, Indira Gandhi Wildlife Sanctuary and National park, Srivilliputhur Wildlife Sanctuary, Crocodile Farm etc. As per Government order, Wildlife circle, Western Region was formed at Coimbatore with effect from 05.09.1990.

The entire area of Mukurthi Wildlife sanctuary was upgraded as National Park vide G.O.Ms.No.716, Environment and Forests, dated 15. 10.90 with headquarters at Bitherkadu, Nellakottai Range was formed on 25.03.91 and attached to Mudumalai Wildlife sanctuary.

Koonthankulam and Kadankulam Bird Sanctuaries were declared during 1994.

Hon'ble Minister for Forests was made the Chairman of the Wild Life State Advisory Board. The First meetings of State Wild Life Advisory Board after it was reconstituted vide G.O.Ms.No.398, E&F Department dated 14.12.1995 was held on 30.05.1997 at Mundanthurai.

Central Zoo Authority of India chose Arignar Anna Zoological Park as the breeding center for endangered species such as *LTM, Nilgiri Langur, Black Buck, Wild dog and sangai* and till today it has an excellent record of breeding these species in captivity to have a viable population without loss of genetic diversity. Three Wildlife Biologists are at present employed in Arignar Anna Zoological Park. Several scientific publications were brought out during 1999-2000. A sum of Rs.165.50 lakhs. 100% assistance has been provided by Central Zoo Authority for housing rescued animals to be taken over from circus companies (1999-2000).

Karaivetti Bird Sanctuary and Vaduvoor Bird Sanctuary were notified during 1999.

Vaduvur Bird Sanctuary (final) notification was issued during 2000.

Kanniyakumari Wildlife Sanctuary notification was issued during 2007.

Sathayamangalam Wildlife Sanctuary was declared during 2008.

Megamalai Wildlife Sanctuary was declared during 2009.

Melselvanoor and Keelaselvanoor Tanks Bird Sanctuary and Therthangal Birds Sanctuary were declared during 2010.

Sakkarakottai Tanks Bird Sanctuary was declared during 2012.

Point Calimere Wildlife Sanctuary Block A & Block B, Kodaikanal Wildlife Sanctuary, Gangaikondan Spotted Deer Wildlife Sanctuary were declared during 2013.

Nellai Wildlife Sanctuary and Oussudu lake Birds Sanctuary were declared during 2015.

The history of wildlife preservation and development in Tamil Nadu had its origin in pre independence era and the first step towards wildlife conservation in the country started with the Tamil Nadu Wild Elephants Preservation Act, 1873.

The concern for wildlife can be traced in the history of conservation in Tamil Nadu. In the Post Independence era the journey of wildlife conservation can be traced to four different phases (1950-60), (1960), (1960-76) and (1976-2016) and various efforts taken have been stated above.

The history of erstwhile working plans and efforts taken during the said four phases reveal the development of Wildlife Conservation in Tamil Nadu. The Budgetary Estimates for Wildlife Conservation in the Table below show the concerns of Government of Tamil Nadu in different Plan Periods towards Wildlife Conservation and Development in the State.

Plan Periods	Rs. in lakhs
1997-1998 to 2001-2002	1172.670
2002-2003 to 2006-2007	3493.580
2007-2008 to 2011-2012	6472.973

2012-2013 to 2016-2017	6776.121

The history of wildlife in Tamil Nadu is important as it teaches lessons to maintain viable wildlife population, evaluating Conservation Status, maintaining the genetic flow and preserving this natural heritage for posterity.

CHAPTER-III

EMINENT WILDLIFERS

Tamil Nadu has a pre-eminent position in the field of Forest and Wildlife Management in the country. We have had eminent professionals in the field of forestry and wildlife starting from Dr.HFC. Cleghorn since 1856. Some of the eminent foresters who were wildlifers by passion are Lt.Col.Douglas Hamilton, Lt.Col. R.H.Beddome, H.A.Gass, who were Britishers and served the Tamil Nadu Forests. In the recent times we have great wildlifers in the Department like Mr.M.A.Badshah and S.A.Rahamathullah. The State has had eminent naturalists like Padmashri M. Krishnan, J.C.Daniel of the BNHS, We have eminent veterinarian like Dr.F.X.Mascarenhas and Dr.V.Krishnamurthy. In the recent times Tamil Nadu Forest Department has had illustrious foresters like Dr.S.John Joseph, S.Mangalraj Johnson, S.Subarayalu and many others who contributed for wildlife conservation in Tamil Nadu. The works of eminent NGOs like Richard Radcliff of the Nilgiri Wildlife and environment association are remembered even today. A long line of wildlife biologists trained in AVC college of Mayavaram played vital role in wildlife conservation studies in Tamil Nadu and India. Details about some eminent foresters, biologists, naturalists and NGOs are furnished in this chapter. This is to inspire and groom youngsters to take up the field of wildlife biology.

DOUGLAS HAMILTON (1818-1892)

Douglas Hamilton was a British Indian Army Officer. He was known for his surveys in his areas Madras Presidency. He was very much interested in forest and wildlife conservation. He visited Anamalai Hills Wildlife Hills with General James Michael in the middle of 19th century. When Michael was ill, Hamilton was appointed temporarily to manage the Anamalai forests. He served as the Assistant Conservator of Forests under Dr.HFC Cleghorn, the first Conservator of Forests of Madras Presidency, Hamilton accompanied Dr. Cleghorn during his explorations to Anamalai and recorded the plants, animals and landscapes. Hamilton's painting skills helped him very much in the survey works at Anamalai, Palani and Shervarayan hills.

The Sketches of Douglas Hamilton for Shervarayan hills and Palani hills are available in the Madras Literary Society Library which is a store hose for rare books and works of very rare nature. The cover page of the book is depicting pillar rocks with Nilgiri Tahr which was sketched by Mr.Douglas Hamilton in the year 1865.

R.H.BEDDOME

R.H.Beddome was appointed in the Madras Forest Department in 1856, he went on to become an Assistant to Dr.Hugh Cleghorn, and his devotion to botany and natural history saw him succeed Cleghorn in 1863 and he remained in the post of conservator of Forests upto 1876.

A wholesome botanist by heart, he devoted his time to the study of flora in South India and published a series of valuable works with striking illustrations with great accuracy. He also studied the species of reptiles, amphibians, was an authority on molluscs and provided descriptions of over 40 new reptiles and amphibians. He also described over a thousand species of animals and plants.

His fine and rare collections of land shell specimens were placed at the British and Indian Museums. He has reported on the The Flora of Pulney Hills, Courtallam Hills, Eastern & Western Ghats and Tirupati Hills. He accompanied Dr. Cleghorn during 1858 for the expedition and explorations of Anamalais. He served as a Forest Officer of Tirunelveli District and explored every inch of the forests and documented the flora.

Wall (1921) has paid tribute to Colonel Beddome with the remark, "He has exploited the South Indian Hills that he has hardly left a snake for any later enthusiast to discover." His collection and description of the reptile, "Golden Gecko" worth mentioning and distinct plant species, "Cycas" was named after him as Cycas beddomei.

H.A.GASS

H.A.Gass served as Forest officer in Madras Presidency. He served as Conservator of Forests in 20th Century incharge of Southern

Circle, Coimbatore and also Grade I Conservator, officiating as Head of the Department.

He initiated steps to set up a Museum for forest matters and it materialized in the year 1092. The Gass Museum which is housed in the building near Tamil Nadu Forest Academy was established by the tireless efforts of Mr. H.A.Gass. For valuable services rendered by Mr.Gass, it was named after him by the Government.

By his efforts, Mr.Gass collected lot of plant, animal materials including timber products, woodcrafts, wildlife articles, anthropological specimens which has a great educational value to understand the rich biodiversity of the region.

F.X. MASCARENHAS
(The First Elephant Doctor)

Dr.F.X.Mascarenhas born on 02.11.1872, graduated from the Bombay Veterinary College in the year 1899 and joined the Civil Veterinary Department in India. With the formation of Madras Veterinary College in the year 1903, Mascarenhas joined as the Senior Lecturer and Vice Principal. In the year 1905, the services of Dr.F.X.Mascarenhas was placed at the disposal of Madras Forest Department as the Inspector of Government Elephants for a period of one year. His services were sent to the Conservator of Forests, Southern circle, Coimbatore. Dr. Dr.F.X.Mascarenhas reported for duty under Mr.F.A.Lodge, the Conservator by sincere and hard work Dr.F.X.Mascarenhas continued in the Forest Department till his retirement in the year 1927.

Following the footsteps of Dr.Lt.Col.G.H.Evans, Superintendent, Civil Veterinary Department, Burma who published the book " Elephants and their Diseases- A treatise on Elephants" which was published in 1901, Dr.F.X.Mascarenhas prepared management notes for handling camp elephants and treatment. He evinced interest in training the foresters and managing elephant campus and tendered advices to Forest Officers.

He was very committed for the cause of managing camp elephants and cattle in the forest department.

MOHAMMED ANSAR BADSHAH (1910-1974)
(The First State Wildlife Officer)

Tamil Nadu was fortunate to have a very eminent Forester and Wildlife as the first State Wildlife Officer in 1960. He was a "Naturalist par Excellence. He served in the post of State Wildlife Officer with distinction continuously for eight long years. As the State Wildlife Officer he commanded over Mudumalai Wildlife Sanctuary, Vedanthangal Birds Sanctuary, Guindy Deer Park and Children's corner. His contribution for tiger conservation much ahead of the Project Tiger speaks for his vision. It was through his tireless efforts, the Mundanthurai Tiger Sanctuary was born in the year 1962. He was a good orator, writer and nature photographer. He had published several books, wrote several articles, given many speeches on wildlife during his long tenure (1960 - 68). It was by his efforts Point Calimere Black Buck sanctuary was declared in 1967. He served as a panelist in the First World Conference on National Parks, held in Seattle., USA in July 1962. He travelled extensively visiting Wildlife Parks, Sanctuaries and Zoological Gardens in Canada, USA, UK, Switzerland, Germany, Italy, France, Hawaii, Japan, Hongkong and Malaysia. His services to the cause of Wildlife conservation remain golden letters in the animals of the Tamil Nadu Forest Department. Mr. M.A.Badshah, a keen naturalist and bird watcher was a member of the American Ornithologist Union and the International Council for Bird preservation besides being a member of many other wildlife societies. His publications include, wildlife in Madras State, Vedanthangal Bird's Sanctuary, some large Reptiles of Madras state, and check list of birds of Tamil Nadu besides numerous articles on wildlife which have appeared in the dailies, weeklies and other magazines. Thought his eight year career as State Wildlife officers, he paid personal attention for wildlife Research and Conservation in Tamil Nadu.

M. KRISHNAN (1912-1996)

Mr. M. Krishnan born in Tirunelveli, received M.A. in Botany from the Madras Presidency College under P.F.Fyson and B.L. Degree from Madras Law College. He was endowed with wide range of interests and he was writer both in English and Tamil. A pioneer in the field of nature photography, Krishnan’s contribution to wildlife photography and writing on natural history in India, since 1930’s.

He had written guide books of Vedanthangal and Mudumalai Sanctuaries of Tamil Nadu, Bandipur Tiger Reserve of Karnataka and Corbett Tiger Reserve in Uttarkhand. He conducted surveys for 14 States in their Forest department across India. From 1950 he wrote a bi-weekly column in the Statesman of Calcutta called "Country Notebook", about natural history. This column continued for 46 years upto 18th February 1996, the last day of his life.

E.P.Gee, a Tea Planter and Naturalist praised M.Krishnan as one of the best naturalists in 1964 with a forward from Mr. Jawarhalal Nehru. His first article was published in "The Hindu" during August 1938. He received Nehru Fellowship for his work on "India Wildlife, 1959-70. He diagnosed that conversion of black-bucks; grassland and decline of the antelope played a role in wiping out the cheetah in the Deccan. The last cheetah was recorded in Chittoor during 1952.

He is a Padmashree awardee, insisted for keep 5% of the total land area of the country ought to be left aside in its natural state to protect rich wildlife in India.

He advocated against the planting of exotics in forest areas, a true patriot in every sense.

S.A. RAHMATULLA
(First Chief Wildlife Warden, Tamil Nadu)

Mr.S.A.Rahmatullah, born on 15.06.1921, a native of Chennai received his College education at St.Joseph College, Tiruchi and earned B.Sc.,(Hons) Degree in Physics, then joined the Superior Forest Service of Madras State as Assistant Conservator of Forests in the year 1945.

He received two years professional training in forestry during 1945-47 batch at Indian Forest college, Dehradun, stood first in his batch, the then composite India.

As District Forest Officer, he served in Madurai (East) Vishakapattinam, Kurnool, South Kanara and Palghat Divisions of Madras Presidency. He wrote working plans for both the Wildlife Forest divisions, Tirunelveli (South) and Tirunelveli (North) divisions covering the present day KMTR, Kanyakumari, Nellai and Vallnadu wildlife sanctuaries.

He served as Conservator of Forests, Madurai circle and Salem circle again covering rich wildlife areas of Western Ghats and Eastern Ghats. As Conservator he officiated as the first Chief Wildlife Warden for 2 years during 1976 to 1978.

He narrates his Chief Wildlife Warden days in the following lines.

"Having spent early fifteen years at Satyamangalam Famous for its wildlife and Shikar, it is in fitness of things that I became Chief Wildlife Warden".

As the first independent Chief Wildlife Warden, my attention was on the preliminary works in the management of the sanctuaries namely Kalakad Mundanthurai, Indira Gandhi Sanctuary in Pollachi and Mudumalai, Two dormitories were put up besides extending the 'Wood House' at Theppakad. In Top Slip 'Ambuli Illam' and 'Cheetel Lodge' were added. Some of the Wildife centres not easily accessible till then were opened up and made motorable. At Top Slip and Mundanthurai roads were Block topped with Bitumin. In Mudumalai a small reservoir was created by damming a stream at Ombetta.

At that time the only Centrally Sponsored Progress was about the Lion tailed Macaque which was a success. A small zoo was formed at the foot of the Javadhi Hills, 20 kms. from Vellore which became very popular. Few Crocodile breading centres were opened at places like Hogenikkal, Sathanur Dam and Amaravathi Dam. In addition to Vedanthangal Bird Sanctuary important centres for birds Tirunelveli, Ramnad districts were protected. The importance of the Wildlife was propagated by observing Animal Wildlife week celebrations.

DR. V. KRISHNAMOORTHY (1929-2002)

Dr. V. Krishnamoorthy (1929-2002) had put in an eventful thirty five and a half years of service as a Veterinary Doctor and of these 26 years were with the Forest Department and he was consulted internationally in various areas of elephant medicine, management and conservation. He had become one of world's leading experts on elephants. His contribution to our knowledge of elephants is monumental His determined post mortem efforts even on elephants whose bodies had decomposed considerably and in inaccessible terrain

to ascertain the cause of their death, his contribution to the health of elephants in captivity and his surgery and treatment on elephants are seen as seminal contributions. Dr. Krishnamoorthy's extensive field life resulted in papers that were published in renowned journals such as 'Nature'. He was well read and his discussions on literature were as absorbing as his live narrations over elephant post-mortems. Many remember him for his dedication and hard work and frugal personal needs. Dr. V. Krishnamoorthy, as he had come to be known, is remembered by all who knew him as the very embodiment of the principal of 'simple living and high thinking'. As for the countless elephants that knew him, we can never fathom, but there is every reason to believe that Dr.K has a place of deep affection in the collective elephantine memory!

J.C. DANIEL

J.C. Danel, born in Nagercoil is a well-known naturalist has a dedicated and devoted career as curator of the BNHS for a long time and retired as Director of the BNHS. A Zoologist by academic qualifications and an Ecologist, Ethnologist, Naturalist of high order wrote many monographs on Indian mammals like elephant, panther and tiger. His book on Reptiles of India is well known to persons who are interested in biology. He has been associated with various committees concerning wildlife conservation in the country. The establishment of Kalakkad Wildlife Sanctuary for conserving the endangered lion-tailed macaque is due to the plea made by Mr. Daniel to the Government of Tamil Nadu during 1971 and it became a reality in the year 1977. Natural history and the Indian Army published in the year 2009 in connection with 125th year of BNHS by him is a master piece. His association with BNHS is since 1950. He guided ten Ph.Ds. He was a member of the Indian Board for Wildlife and Vice-Chairman, Species Survival Commission, WCU. He has been awarded the Peter Scott Award for conservation merit by the WCU. The Indira Gandhi Paryavaran Puraskar by the Government of India and the Distinguished Service award were given to him by the Society for Conservation Biology, USA.

CHAPTER-IV

PROTECTED AREAS IN TAMIL NADU

Tamil Nadu Rich in Biodiversity

Tamil Nadu comprises of parts of Western Ghats, Eastern Ghats and Coastal Eco-system which support rich biological diversity.

Tamil Nadu ranks first among the States in the Country in angiosperm diversity. It accounts for nearly one-third of the total flora of India. This includes 533 endemic species, 230 red-listed species, 1,559 species of medicinal plants and 260 species of wild relatives of cultivated plants.

The gymnosperm diversity of Tamil Naduis represented by Podocarpus, Cycas and Gnetum. The pteridophyte diversity of Tamil Naduis about 184 species. Tamil Nadu's wild plant diversity also includes vast number of bryophytes, lichens, fungi, algae and bacteria. The analysis provided the total number of plants in Polypetalae, Gamopetalae and Monochlamydae to be 1,944, 1,720 and 642, respectively. Distribution of plants in different plant taxa shows there are a total of 4,306 dicots and 1,241 monocots.

Tamil Nadu's faunal biodiversity is equally impressive. According to recent publication of Zoological Survey of India, the faunal diversity of the State includes 165 species of fresh water fishes, 76 species of amphibians, 177 species of reptiles, 454 species of birds and 187 species of mammals. According to the CAMP reports the red-listed species include 126 species of fishes, 56 species of amphibians, 77 species of reptiles, 32 species of birds and 40 species of mammals. The endemic fauna includes 36 species of amphibians, 63 species of reptiles, 17 species of birds and 24 species of mammals. Many faunal species have been included in the various schedules of the Wildlife Protection Act 1972, considering their endangered status. Schedule I animals include 22 species of mammals, 42 species of birds and 9 species of reptiles. Schedule II includes 13 species of mammals. Schedule III includes 5 species of mammals and Schedule IV included 5 species of mammals, 367 species of birds, 109 species of reptiles and 23 species of amphibians. Schedule V incorporates 13 species of mammals and 13 species of mammals and 1 species of birds.

Biodiversity conservation in Tamil Naduhas a long history with the 15 Wildlife Sanctuaries, 5 National Parks, 4 Tiger Reserves, 15 Bird Sanctuaries and two Conservation Reserves as on date. The various protected areas notified are presented in this chapter.

1. Mudumalai Tiger Reserve

Mudumalai Tiger Reserve is located between 11° 31' 54.9" and 11° 42' 18.5" North latitudes and between 76° 21'28.9" and 76° 45' 21.5" East longitudes. The reserve is situated in Gudalur, Udhagai and Pandalur Taluks of the Nilgiris District, Tamil Nadu. Considering its importance as a key Tiger Conservation Unit, the Mudumalai Wildlife Sanctuary and National Park (321 km^2) was upgraded as Mudumalai Tiger Reserve during 2007.

The Mudumalai Wildlife Sanctuary was formed back during 1940 in G.O.Ms.No.193, development department, dated: 27.01.1940

The Mudumalai Tiger Reserve, which is located at the tri-junction of three states, viz, Karnataka, Kerala and Tamil Nadu plays a unique role by forming part of the Nilgiris Biosphere Reserve, which was the first Biosphere Reserve in India, declared during 1986. It provides a significant corridor for the wildlife, enabling the movement of animals from Western Ghats to Eastern Ghats and vice versa. It is the best breeding ground for the tigers and also allows for the maintenance of genetic diversity of various other fauna and flora.

The Mudumalai Tiger Reserve harbours excellent habitat diversity for several species of rare, endangered and endemic Flora and Fauna. This reserve is one of the richest wildlife areas in India, being particularly noted for its diverse assemblage, it acts as a source for populating the northern and eastern parts of the Western Ghats landscape. This tiger population is capable of existing at reasonably high density due to the deciduous nature of the forest tract.

The heritage of these rich faunal, floral assemblages, diverse habitats, terrain, climate, the location of the sanctuary along with the tribal communities gives an important scientific, educational and recreational value for Mudumalai Tiger Reserve. Mudumalai remains one of the most popular and largely visited sanctuaries of the country, where more than a lakh tourists visit every year. The predominantly

deciduous vegetation interspersed with *vayals* in the tourism area provide greater visibility during the dry months followed by abundant herbaceous and grass growth in the pre-monsoon periods offering scope for best wildlife sightings.

2. Kalakkad-Mundanthurai Tiger Reserve

The Kalakkad-Mundanthurai Tiger Reserve (KMTR) is the 17th and Southern most Tiger Reserve in India and the one of the four Tiger Reserves in Tamil Nadu. As per the provisions of section 38 V Government of Tamil Nadu had issued a notification declaring this area as Tiger Reserve vide G.O.Ms.No.28, Environment and Forests Department Dated: 5.1.1989.

The core area has already been declared vide Government of Tamil Nadu, Environment and Forests Department G.O.Ms.No.145 dated 28.12.07 and published in the Tamil Nadu Government Gazette dated 31.12.2007. KMTR is located between 77° 10'E and 77° 35' E longitudes and between 8° 25'N and 8° 53'N latitudes . The KMTR is spread over an area of 895 sq.km. encompassing portion of Tirunelveli and Kanyakumari Districts of Tamil Nadu.

Kalakkad Mundanthurai Tiger Reserve includes two adjacent sanctuaries namely Kalakkad Sanctuary (1976) and Mundanthurai Sanctuary (1962) in Tirunelveli District. It is also includes part of Kilamalai and Veerapuli Reserved Forests of Kanyakumari Wildlife Sanctuary (2002). All these three conservation Units are the unified administration of KMTR. KMTR also includes non-sanctuary RFs to the extent of 2705.69 ha. Proposal has been sent to the District Collector for declaration this area as sanctuary.

KMTR is the source of as many as fourteen rivers and is rightly known as the River Sanctuary of Tamil Nadu. The perennial river Tambiraparani, the life line of Tirunelveli, Thoothukudi and Kanyakumari is sustained by the conservation of Kalakkad Mundanthurai Tiger Reserve.

KMTR forming part of the Southern Western Ghats includes part of the Agasthiyarmalai Biosphere Reserve which is recognized as one of the five important centers of Plant species diversity in India and as one of the 24 Micro centers of endemism in India.

As many as 448 endemic species of angiosperms have been identified from this region. The major endemic species of the reserve include: *Hopea utilis, Gluta travancorica, Humboldtia unijuga* (var. *unijuga* and *trijuga) Eugenia singampattiana, Popowia beddomeana, Palaquium bourdilloni, Psychotria beddomei, Symplocos marcrocarpa,* and *S. macrophylla* to name a few. 79 genera and 161 species of ferns have been reported from this reserve.

KMTR bears a large contiguous tract of about 400 sq.kms of wet evergreen forests located away from the equatorial region. Besides a rich array of flora and fauna, it harbours a large number of threatened species including the Lion Tailed Macaque (*Macaca silenus*), a flagship species of rainforests in the Western Ghats.

Richest from the faunal point of view**:** This tiger reserve also supports a large number of mammalian fauna. All the 5 primates of Peninsular India are found in KMTR. All the 14 endemic mammals of Western Ghats are found in KMTR. There are 19 endemic birds formed in Western Ghats are of Tamil Naduand out of this, 15 are found in KMTR. The threatened species include the Lion Tailed Macaque (*Macaca silenus)*, Nilgiri Langur *(Seminopethicus johnii)*, Nilgiri Marten *(Martes gwatkinsi* sub sp.,), Brown Palm Civet *(Paradoxurus jerdoni)*, and Nilgiri Tahr *(Nilgiritragus hylocrius).* Fifteen bird species that are endemic to Western Ghats are reported from KMTR viz., Nilgiri Pipit *(Anthus nilghiriensis)*, Travancore White Breasted Laughing Thrush *(Garrulax jerdoni)*, Grey Headed Bulbul *(Pycnonotus priocephalus)*, Blue Winged Parakeet *(Psittacula columboides)*, Nilgiri Wood Pigeon *(Columba elphinstonii)*, Rufous Babbler *(Turdoides subrufus)*, Malabar Grey Hombill *(Tockus griseus)* and Black and Rufous Flycatcher *(Muscicapa nigrorufa).* The reserve has a very diverse fish fauna including 32 species (Annamalai 2004). Butterfly fauna with rare species such as Spot Puffin *(Appias lalage).* Herpetofaunal assemblage is high with many endemic and rare species such as *Dasia haliana*, *Calotes andamanensis* and the Black Microhylid Frog, *Melanobatrachus indicus.*

KMTR houses quite a number of religious places like Nambikoil in Thirukurungudi Range, Karumandiamman and Pattarayan koils in Kalakkad Range, Amman koil in Ambasamudram Range, Agasthiar and Sorimuthuayyanar Koil in Papanasam Range, Siva temple in

Mundanthurai Range, Gorakanathar Temple and Dhangha in Kadayam Range. Among these, two main places of religious importance viz, Sorimuthuayyanar Koil on the Mundanthurai plateau, and Nambi Kovil in the Thirukurungudi foothills. These places are visited by a large number of pilgrims that has already impinged on the biological values of the reserve.

Further Agasthiyarmalai (1868 M above msl), named after the Sage Agasthiyar, who is a legendary father of Tamil language and literature, is considered to be the sacred mountain and thousands of pilgrims used to visit during the full moon day of Tamil month *Chithirai*. River Tambiraparani originates from here.

Agasthiyar falls, Manimuthar falls, Karaiyar Dam, Banathritham falls, Servalar Dam, Mundanthurai plateau and the Kalakkad Thalayani river attract large number of National and International tourists**.**

3. Point Calimere Wildlife Sanctuary

Point Calimere Wildlife Sanctuary is situated in Vedaranyam Taluk of Nagapattinam District, Tamil Nadu. It is located 60 kilometres south of Nagapattinam and lies where the Bay of Bengal meets the Palk Strait. The sanctuary was created in 1967 as per G.O.Ms.No.1821, Agriculture, 13th June 1967.

The sanctuary is home to the largest population (about 1000) of the Blackbuck in Southern India and second Largest population of India as a whole. **It harbours the single largest stretch of the unique dry-evergreen forest in the country**. With about 154 species of medicinal plants in the dry-evergreen forest, the sanctuary is a rich genepool of dry-tropical species. Two species of insectivorous plants viz., *Drocera indica* and *Drocera burmani* are also found in the sanctuary.

The sanctuary and its surrounding wetlands are important wintering grounds for water birds from the North.

The sanctuary coast has been a regular nesting site of the endangered Olive Ridley turtle.

Point Calimere Wildlife Sanctuary Block (A) (Muthupet) notified vide G.O(Ms.)No.59, Environment and Forests (FR.5) department dated 26.04.2013 Statement of significance.

The recently notified Block (A) is a sanctuary mangrove wetland, is located in the southern most end of the Cauvery delta it occupies and area of approximately 12,000 ha, including 1700 ha. a lagoon (Muthupet).

4. Anamalai Tiger Reserve

Anamalai Tiger Reserve is carved out of the Tamil Nadu portion of the Anamalais.

It lies South of the Palakkad gap in the Southern Western Ghats. Geographically it is located between the longitudes 76° 49.3' and 77° 21.4'E and latitudes 10° 13.2' and 10° 33.3' N. The tiger Reserve falls in four revenue taluks namely; Pollachi, Valparai in Coimbatore district and Udumalpet in Tiruppur District and Kodaikanal taluk in Dindigul district in the State of Tamil Nadu.

The Anamalai Tiger Reserve has a long management history since 1848. The erstwhile Coimbatore South Forest division, a model Forest Division for the Madras State was declared as Wildlife Sanctuary in 1976 and named "Anamalai Wildlife Sanctuary" vide G.O.Ms.No.288 Forests and Fisheries dated 14.10.1976. Consequently it was renamed "Indira Gandhi Wildlife Sanctuary" in 1987. The total extent of the notified protected area is 958 sq km. Karianshola (Tamil Nadupart), Grass Hills and Manjampatti have been declared as National Parks and have been protected as the "Indira Gandhi National Park" (108 sq km).

Considering its importance as a key Tiger Conservation Unit, being part of a landscape that holds promise for future survival of Tiger, the Government of India accorded in principle approval for declaration of "Indira Gandhi Wildlife Sanctuary and National Park" vide IGF and Director, Project Tiger GOI, Ministry of Environment and Forests, New Delhi, Letter No.3-1/03PT Dated 5.8.2006. The Government of Tamil Nadu has notified entire Anamalai Wildlife Sanctuary and National Park as Tiger Reserve vide Government of Tamil Nadu, Environment and Forest (FR V Department) G.O.Ms.No.49 dated 02.04.2007. The entire 958 Sq. km area of Anamalais has been

notified as "Critical Wildlife habitat or Core of Tiger Reserve" vide G.O.Ms.No.145, Environment and Forests (FR. 5) Dept. dated 28.12.2007 and notified in Tamil Nadu Government Gazette No. 363 dated December 31, 2007. The post Wildlife Warden, Pollachi was upgraded to the level of Conservator of Forests. This post was subsequently upgraded to the level of Chief Conservator of Forests w.e.f. 30.07.2010.

The Anamalai Tiger Reserve possesses diverse fauna and flora, well representative of the region. The Tiger Reserve supports diverse habitat type's viz. wet evergreen forests, semi-evergreen forests, moist deciduous, dry deciduous, dry thorn and shola forests. Other unique habitats like montane grasslands, savannah and marshy grasslands are also present.

A revision of flora of the Anaimalais done by Thiru. V. Ganesan, I.F.S., with reference to the Flora of Tamil Nadu revealed that the Tiger Reserve supports around 2500 species of Angiosperms. From field explorations conducted in the Tiger Reserve, certain interesting groups of plants which have rich diversity are Balsams, Crotalarias, Orchids and Kurinchi. There is rich diversity of wild genetic resources of crop plants like Mango, Jack, Banana, Ginger, Turmeric, Pepper, Cardamom, Solaipuli, Nutmeg, Cinnamom, Amla, Jasmine, Capparis, Nervilia, Bittergourd, Snakegourd, Ivygourd Drumstick, Yams, Elephant foot yam, Malabar tamarind, Rice, Strawberry, Rose, Raspberry, Wild guava, Nilgiri lily, Carrisa, Ber. Elaeocarpus, Elaegnus etc.,

Endemism of the vegetation is very rich in the tiger reserve. There is a long list of red, endangered and threatened species of plants (≥ 39) distributed and well protected in the Tiger Reserve, Gymnosperms like *Podocarpus wallichiana*, *Cycas circinalis, Gnetum ula* are distributed in fairly good population. Insectivorous plants like Drosera are found distributed in grass land ecosystem. Ficus, one of the keystone species responsible for supporting important avifauna like hornbills is well represented with over 12 species. The staple food source of Lion Tailed Macaque, the *Cullenia exarillata* is represented by two varieties in the Tiger Reserve. Interesting plant groups like Ceropegias and Hoya are also represented well. There is a rich diversity of medicinal plant wealth and Kariyan shola is protected as

one of the Medicinal Plants Conservation Area (MPCA) in the country. Highly threatened medicinal plants like *Utleria salicifolia, Decalepis hamiltonii* are well represented in the tiger reserve.

The diversity of bamboos, canes, reeds, palms is also unique and interesting. Rich diversity of ferns including tree ferns with endemic elements are noticed. Bryophytes, Thallophytes diversity is also very high due to moist evergreen, shola, and grassland habitats. There is rich diversity of fungi both edible and non-edible categories.

The Tiger Reserve supports healthy population of several endangered wild animals (Fishes ≥ 70 species, Amphibians ≥ 70 species, Reptiles ≥ 120 species, Birds ≥ 300 species, Mammals ≥ 80 species. The presence of more than 20 tigers underscores the healthiness of this eco system. Most of the herbivores species of the Western Ghats viz. Asian elephant, Sambar, Spotted deer Barking deer, Mouse deer are well represented. Anamalais supports one of the highest densities of Gaur population in Southern India. A report of white (albino) variety of Gaur is made from Manjampatti area. The only South Indian wild goat, and the State animal of Tamil Nadu, the Nilgiri Tahr is found in sizeable number (600+) on the high altitude rocky hills and grass lands in the Tiger Reserve. It is commonly seen at the 9th hairpin bend rocky portions on the Pollachi – Valparai ghat road. Grass Hills National Park which is contiguous with Eravikulam National Park is supporting the largest Nilgiris Tahr population in the world. A healthy population of more than 600 Lion Tailed Macaque found in evergreen fragments of the Tiger Reserve supports all the five primate species found in Tamil Nadu viz. Lion Tailed Macaque, Nilgiri langur, Common langur, Bonnet macaque and Slender loris. Interesting two giant squirrels both Malabar and the Grizzled are found in healthy numbers in the Tiger Reserve, so also two flying squirrels.

Other important wild animals like Wild pig, Sloth bear are also found in large numbers. Canids like Jackal, Wild dog, Indian fox, Felids other than Tiger, viz. Leopard, Jungle cat, Leopard cat, Rusty spotted cat, Fishing cat, Mustelids (Otters) like Smooth coated otter, Small clawed otter, Marten (Nilgiri marten), Viverrid civets – (Small Indian civet) Palm civet – (Common palm civet, Brown palm civet), Herpestids - Mongoose viz. Grey mongoose, Ruddy mongoose, Brown mongoose, Stripe-necked mongoose, Edentates like Indian pangolin,

Lagomorph like Indian Hare and Insectivores like House shrew, Day's shrew, Kelaart's long clawed shrew, Hedge hog (Madras hedge hog), rodents like Porcupine, Giant squirrels (2), Striped squirrels (Three striped, Dusky striped, Layard's striped), Flying Squirrels (2), several Rats, Mice including Malabar Spiny Dormouse, Tree Shrew (Madras), Bats awaiting to be documented are available in Anamalais.

Anamalais support rich diversity of reptiles. Interestingly all the fresh water turtles and tortoises in the South like Tranvancore tortoise, Cochin forest cane turtle, Indian flap shell turtle, Indian Black turtle, Leith's soft shell turtle are distributed. Uropeltid snakes are interesting. Unique species of lizard, *Salea anamalayana*, a Western Ghats endemic is also found in these hills. Avifaunal diversity is amazing with more than 260 species of birds documented representing 16 of the 17 endemic species in the Western Ghats. Amphibian diversity is very unique where new records like *Rhacophorus pseudo malabaricus*, *Naisikabatrachus sahyadrensis* are found in Anamalais. Caecilians diversity is very interesting. Fish faunal diversity hitherto was unknown. A recent study made has recorded six new species.

Interesting invertebrates like butterflies and moths, mites and spiders, beetles and weevils, bugs, etc. are also well represented in the Tiger Reserve.

Anamalais is worth to be designated as 'Anthropological Reserve' as it supports 6 indigenous people viz. Malasar, Malai malasars, Kadars, Eravallars, Pulayars and Muduvars. This is very unique in the entire Tamil Naduand probably the only Protected Area with diverse groups of indigenous people. These indigenous people protect several traditional varieties of agricultural crops like Rice, Ragi, Tenai, Grain amaranth etc.

It has interesting scenic spots like Waterfalls, Nallamudi Pooncholai, Punganodai view point, Chinnakallar waterfalls, Monkey falls etc. and important peaks like Pandaravarai, Koochimalai, Perumkundru, Vellimudi, Thanakamalai etc.

The forests of Anamalais since 1850's is a well-managed scientifically for timber (teak) and subsequently converted into teak

plantation which forms sizeable area and are economically ecologically important.

The Anamalai Tiger Reserve is dotted with culturally and historically important areas. Many temples of local and historical importance are found inside the Tiger Reserve as enclosures. In the eastern part of the Anamalai Tiger Reserve falling in Udumalpet, Amaravathy ranges, historic sites like ruins of forts of Vijaynagar kings, Pandavar kuzhis are seen.

With biological richness, the Protected Area offers excellent scope for scientific research on, anthropological, biological, cultural, historical, aspects as this remains even today one of the least studied PAs in the country. The studies provide scope for making the international importance of the area for its rich biodiversity.

5. Guindy National Park

Guindy National Park is situated in Mambalam-Guindy Taluk of Chennai District in south-west corner of Chennai City. The area was taken over for management by Forest Department in the year 1958. Prior to 1958 the area was under the control of Raj Bhavan. Considering the ecological, faunal, floral geomorphological and zoological importance an area of 270.57 ha of the Guindy Park Reserved Forest, was declared as National Park by the Government of Tamil Nadu in G.O.Ms.No.773, Forest and Fisheries dated 4.9.1978.

The presence of dry evergreen forests and endangered Blackbuck, makes the Park more significant.

6. Mukurthi National Park

Mukurthi Park is located in the Nilgiri District of Tamil Nadu. It lies between latitude 11°.10' to 11°.22' North and longitudes 76°.26' to 76°.34' East.

Mukurthi was first declared as a Wildlife Sanctuary in the year 1982. Subsequently its status was enhanced to a National Park in 1990). Final notification of Mukurthi National Park as a National Park was issued in 2001. At present the extent of the National Park is 78.46 sq.km.

The park holds the endangered Nilgiri Tahr *(Hemitragous hylocrius)*, population, the State animal of Tamil Naduand endemic to Western Ghats.

7. Vallanadu Black Buck Sanctuary

The Vallanadu area was declared as Sanctuary as per G.O.Ms.No.1028 Forest & Fisheries Department dated 28.09.1987.

This Sanctuary is located in Vallanadu village of Srivaikundam Taluk of Thoothukudi in district in Tamil Naduon Tirunelveli-Thoothukudi road at a distance of 16 kilometers from Tirunelveli town. Thoothukudi district is situated in the extreme southeastern corner of Tamil Nadu. Vallanadu Reserved Forests is the southernmost location where Blackbuck is naturally available, which speaks for itself the need for their conservation.

8. Gulf of Mannar Marine National Park and Biosphere Reserve

The Gulf of Mannar, the first Marine Biosphere Reserve in the South and South East Asia, running down south from Rameswaram to Kanyakumari in Tamil Nadu, India is situated between Longitudes $78^0$08'E to $79^0$30'E and along Latitudes from $8^0$35'N to $9^0$25'N with a total area of 10,500 Km^2. This marine Biosphere Reserve encompasses a chain of 19 islands and adjoining coral reefs off the coasts of the Ramanathapuram and the Tuticorin districts forming the core zone; the Marine National Park. The surrounding seascape of the Marine National Park and a 10 km strip of the coastal landscape covering a total area 10,500 sq. km., in the Ramanathapuram, Tuticorin, Tirunelveli and Kanyakumari Districts forms the Gulf of Mannar Biosphere Reserve.

The South and South-east Asia region in the southern hemisphere is one of the richest coastal and marine biodiversity area in the World with the maximum diversity of coral reef systems. In India, in addition to the Gulf of Mannar region in Tamil Nadu, the Gulf of Kutch in Gujarat, Lakshadweep and Andaman and Nicobar islands are the other important coral reef systems supporting regions. The importance of the Gulf of Mannar region dates back to the 2nd Century AD because of its highly productive pearl banks and other religious significance. The Gulf of Mannar has drawn attention of

conservationists even before the initiation of the Man and Biosphere (MAB) program by the UNESCO in 1971. With its rich biodiversity of 3600 Species of various flora and fauna part of this Gulf of Mannar has been declared as a Marine National Park in 1986 by the Government of Tamil Nadu and later as the first Marine Biosphere Reserve of India in 1989 by the Government of India.

In 2002, assisted by the UNDP and funded through a Global Environmental Facility (GEF) support, the Tamil Nadu Government through a project assigned the task of development of a management regime model for the Gulf of Mannar Biosphere Reserve, to their specially created Agency called the 'Gulf of Mannar Biosphere Reserve Trust (GOMBRT)' in a manner that ensures:

1. The conservation and sustainable utilization of the globally significant coastal and marine biodiversity by various stakeholders in the multiple-use areas of the Gulf of Mannar Biosphere Reserve.

2. Establishment and effective participatory management of the Gulf of Mannar Biosphere Reserve through the application of strengthened protection and conservation programs in the core area and enabled sustainable livelihood development in the Biosphere Reserve as a whole.

While the Gulf of Mannar Marine National Park (GOMNP) is protected and managed by the Wildlife Wing of the Tamil Nadu State Forest Department, the activities in the GOMBR is facilitated, supported and managed by the multi-agency GOMBRT, wherein besides the Tamil Nadu Forest Department, Environment, Fisheries, Animal Husbandry, Rural Development and other government departments of Tamil Nadu, national and local NGOs, CBOs and academic institutions are also involved. The GOMBR Trust is chaired by the Chief Secretary of Tamil Nadu and its functional Chief Executive is a Chief Conservator of Forests of the Tamil Nadu Government. The GEF-UNDP project is operational upto 2008 and through this project it is envisaged to develop a new "community participation" based management model of sustainable development wherein the livelihood options linked to renewable coastal and marine resources are safeguarded.

9. Srivilliputhur Grizzled Squirrel Wildlife Sanctuary

The Srivilliputhur Grizzled Squirrel Wildlife Sanctuary lies in the Western Ghats falling in the revenue districts of Virudhunagar and Madurai between North latitudes 9^0 23' and 9^0 48' and East and 77 ^{0} 26' 77^0 46'.

The area was declared as a sanctuary in G.O.Ms.No.399, Environment and Forests (FR.II) dated. 26-12-1992 consisting the Reserved Forests of erstwhile Kamarajar Forest Division and Saptur R.F of Madurai Forest Division with the sanctuary headquarters at Srivilliputhur.

It is an important landscape for elephant conservation programme in Periyar Tiger Reserve. Owing to its large contiguous forests and connectivity with adjoining Reserve Forest Divisions, this Division has wide varieties of endangered species such as Grizzled Squirrel, Elephant, Tiger, Leopard, Nilgiri tahr, Gaur, Lion Tailed Macaque and Hyena. The diversity of habitat has got an assemblage of several species of rare plants, invertebrates, fishes, amphibians, and reptiles. Srivilliputhur Grizzled Squirrel Wildlife Sanctuary has also got several species of endemic flora and fauna. The total extent of the sanctuary is 48891.91 ha.

It is one of the six potential habitats with viable population of Grizzled Squirrel in India. Grizzled Giant Squirrel identified as flagship species for this protected area. The area serves as catchments and assures continuous water supply to the Towns and Villages in the District and sustains the agricultural production.

10. Kanyakumari Wildlife Sanctuary

Kanyakumari Wildlife Sanctuary is the southern-most sanctuary of India and forms the part of Southern-most end of Southern Western Ghats, and also forms a part of the Agasthiyarmalai Biosphere Reserve.

In G.O.Ms.No.152 E& F Department dated: 16.7.2002 the Kanyakumari Forest division was declared as Wildlife Sanctuary.

Administratively out of 45,777.57 ha area of Kanyakumari Forest Division, an area of 40239.55 ha is carved out from reserved forests of Kanyakumari Forest Division, is declared as Kanyakumari Wildlife Sanctuary. The ecological significance of the Kanyakumari Wildlife Sanctuary is of paramount importance as the forests play a vital role in sustaining the water security of the district.

The richness and diversity of the flora of this region are due to the variation in its elevation from sea level to about 1800 m, tropical climate, heavy rainfall and the mountainous configuration.

The dry deciduous forests of the Panagudi side of the Mahendragiri, the moist deciduous forests of the Asambu Hills and the wet evergreen forests of the Veerapuli and Kilamalai forests are a joy to behold with bamboos, canes, reeds, orchids, endemic palms like *Bentinckia condapanna* and grasslands abound. The peaks of Varayattumottai, Mahendragiri, Muthukuzhivayal, Upper Kodayar and waterfalls such as Olakkai aruvi, Kutharapanchan aruvi and Kalikesam enchant the unsuspecting tourists.

The area is a part of wildlife corridor with high biodiversity, and in addition to tigers, is home to the threatened species: Indian Bison, elephant, Indian Rock Python, Lion-tailed Macaque, Mouse deer, Nilgiri Tahr and Sambar deer. There are a few tribal villages in the sanctuary and adjoining reserve forests. In addition to large number of species of birds, arthropods and other invertebrates a variety of wildlife can be seen in the division.

11. Sathyamangalam Tiger Reserve

Sathyamangalam Forest Division encompasses large contiguous Reserve Forests extending over 1455 sq km with diversity of vegetation types from dry thorn shrub to patches of semi-evergreen forests in the upper regions. The southern portion of the division covering an area of 524.34 sq km has been declared as Sathyamangalam Wildlife Sanctuary, vide G.O.Ms.No.122 dated 3.11.08 in the G.O.Ms.No.93, Environment and Forests (FR V) Department dated 11.08.2011, an area of 141,160.94 ha. was notified as Sathyamangalam Wildlife Sanctuary.

Subsequently the above has been notified as Sathyamangalam Tiger Reserve in the G.O.Ms.No.41, Environment and Forests (FR V) Department dated 15.03.2013.

The Sathyamangalam Wildlife Sanctuary is the meeting place of two distinct geographical regions of bio diversity landscape; Western Ghat and Eastern Ghat. It is an important landscape for elephant conservation programme in Nilgiris and Eastern Ghats. Owing to its large contiguous forests and connectivity with adjoining reserve forest divisions, this division has wide varieties of endangered species such as Elephant, Gaur, Blackbuck, Tiger, Leopard, White backed vulture and Hyena. The diversity of habitat has got an assemblage of several species of rare plants, invertebrates, fishes, amphibians, and reptiles. This sanctuary also harbours several species of wild relatives of cultivated plants including, Wild ginger, Turmeric, *Solanum*, and Mango that act as a gene pool for the cultivated plants. Sathyamangalam Wildlife Sanctuary has also got several species of endemic flora and fauna.

12. Megamalai Wildlife Sanctuary

Megamalai Wildlife Sanctuary is carved out of Madurai and Theni Division forest areas in the Southern Western Ghats. Geographically it is located between the Longitudes 77^0 45' N and Latitudes 09^0 31' to 09^0 58' E. The territorial jurisdiction of the sanctuary falls in two taluks, Uthamapalayam and Periyakulam in Theni district and two taluks, Thirumangalam and usilampatty in Madurai District.

The areas included in the Sanctuary have a long management history. Megamalai Wildlife Sanctuary was declared in 2009 vide G.O.(D)No.63, Environment and Forest (FR-V) Department dated 26.06.2009. Total extent of the notified sanctuary is 269.10 Km^2 (26910.815 Ha).

Megamalai Sanctuary falls in Western Ghats bio-geographic zone. A part of the sanctuary falls in Periyar Elephant Reserve. The biota of the region is highly diverse. Sanctuary is known for it's rich diversity. It harbours large number of Endemic, endangered and vulnerable flora and fauna.

Sanctuary is a home for indigenous tribal group - Paliyars. With biological richness, the sanctuary offers excellent scope for scientific research on biological, anthropological, historical and cultural aspects as this area remains as one of the least studied protected areas in the country.

Megamalai Wildlife Sanctuary provides important ecological services for Theni and Madurai region as it forms the catchment of Vaigai River, the life line of the region. Sanctuary also supports some irrigation cum hydroelectric Project like Periyar and Suruliar Hydro Electric Projects. The agricultural and economic prosperity of the region thus depends heavily on the sanctuary.

Megamalai Wildlife Sanctuary is thus very rich biologically with floral, faunal and anthropological uniqueness in the Western Ghats with Himalayan faunal associates like Nilgiri Tahr. Sanctuary qualifies as Elephant Reserve, Tiger Reserve, Anthropological reserve, Primate Sanctuary and Wild gene sanctuary. It plays vital role in the water security of the region as water sanctuary and enhances quality of life as very great oxygen sanctuary. Conservation of Megamalai is therefore very crucial for the physical, mental and spiritual well-being of humanity as a whole.

13. Kodaikanal Wildlife Sanctuary

The Forests of Kodaikanal Wild Life Sanctuary falls between 77^0 16' and 77^0 45' of East longitude and 10^0 20' and 10^0 5' of North latitude. The Kodaikanal Wild life Sanctuary is spread over an area of 655.70 sq.km encompassing portion of Dindigul and Theni Districts of Tamil Nadu.

Kodaikanal Wild Life Sanctuary is formed in G.O.No.143, E&F Dept. Dated 20.9.2013. Major water source for two districts, Dindigul and Theni.

Owing to wide variations in the topographical geomorphological, edaphic and climatic features, the forests of Kodaikanal Wild Life Sanctuary consequently justify their wide variations in floristic composition.

This sanctuary also supports a large number of mammalian fauna (44 numbers). The threatened species include Nilgiri Langur, Nilgiri Marten, Brown Palm Civet and Nilgiri Tahr. Ten bird species that are endemic to Western Ghats are reported from this sanctuary viz., Nilgiri Pipit, Grey Headed Bulbul, Blue Winged Parakeet, Nilgiri Wood Pigeon, Rufous Babbler and Black and Rufous Flycatcher. The reserve has a very diverse fish fauna including 8 species. Butterfly fauna with rare species such as Spot Puffin, Herpetofaunal assemblage is high with many endemic and rare species such as Dasia haliana, Calotes andamanensis and the Black Microhylid Frog, Melanobatrachus indicus.

Kodaikanal Wild Life Sanctuary offers excellent opportunities for practicing restoration ecology particularly shola.

14. Nellai Wildlife Sanctuary

The entire reserved forest areas to the extent of 3573.33 ha. of Tirunelveli Forest Division was declared as "Nellai wildlife Sanctuary" in G.O.Ms.No.12, Environment and Forests (FR.V) Department dated: 04.02.2015.

This forms part of the broader landscape of Kalakkadu Mundandurai Tiger Reserve, Tirunelveli as link between Kanyakumari Wildlife Sanctuary, Kalakkadu Mundandurai Tiger Reserve and Srivilliputhur Grizzled Giant Squirrel Sanctuary with compare floral and faunal diversity similar to the other adjoining areas.

15. Gangaikondan Wildlife Sanctuary

Tirunelveli Wildlife Preservation Association during the year 1976 took initiative to form 'Deer Park' on a leased forest land of 500 acres in Gangaikondan Village in Tirunelveli Division vide G.O.Ms.No.406, Forests and Fisheries Department dated: 11.05.1976.

Recently the above park has been notified Gangaikondan Deer Sanctuary in G.O.Ms.No.150, Environment and Forests (FR.V) Department dated: 01.10.2013.

Bird Sanctuaries of Tamil Nadu

Tamil Nadu's deep roots to conservation of avifauna are well demonstrated by the presence of 15 well managed bird sanctuaries and two conservation reserves spread across the state. Wetlands, either fresh water or brackish are the principal ecosystems in all these bird sanctuaries. Each of the bird sanctuary is unique in character with their varied water quality, fish population, floral and bird diversity and attract large number of resident and winter migratory birds. The water bodies comprising of bird sanctuaries are mostly PWD tanks and are also beneficial to the local population by benefitting them with the guano enriched irrigation water.

The history of conservation of birds in the state is centuries old. It is reported that local villagers have been protecting the heronry in Vedanthangal bird sanctuary since 1790. The villagers knew its beneficial effects much before they were scientifically discovered, and have been using this water as organic fertilizer in their fields.

The wetlands in bird sanctuaries provide direct services like water, food, source for pollination and indirect services like climate and water regulation, flood control, nutrient cycling, purification of water, educational, cultural and aesthetic services. The focus of management in all these bird sanctuaries is to enrich the aquatic habitat and its species diversity along with the terrestrial and aquatic floral and faunal biodiversity in their peripheries.

Water birds are often abundant in wetlands with the greatest diversity of plant species and vegetation types, or where there is permanent water. Ramanathapuram, Kancheepuram and Tirunelveli are districts with the highest number of wetlands in the State of Tamil Nadu, and consequently are districts which are significantly dependent on wetland irrigation systems for agriculture. It is also well known that the State of Tamil Nadu has a recorded history of over 2000 years of settled agriculture, with a well-established system of manmade tanks and supportive water bodies. The state has also had a historical system of tank maintenance and upkeep known as "Kudimaramathu".

The maximum number of heronries has been reported from Kanchipuram, Ramanathanpuram and Tirunelveli Districts with an overall presence of 12 active heronries. This is followed by

Kanyakumari district with 9 nesting sites. Nineteen of the twenty six species of colonially nesting large water birds that are known to breed in Indian heronries breed at Vedanthangal. Tamil Nadu is the only state in India wherein all three Ibis species nest together. Oriental White Ibis is the most common nesting species among them, and its most established heronry is Koonthankulam. The Black Ibis seems to prefer the southern districts for nesting. Nests of birds such as the Darter, Asian Open bill Stork and Oriental White Ibis were found in less than 15 sites, while the Great Cormorant and the Eurasian Spoonbill was found to nest in 10 sites. Glossy Ibis is the least common of the nesting species, found only in 2 sites. More recently, there are records from the Pallikaranai Marsh.

In terms of habitat utilisation, those heronries in Tamil Nadu that have partially submerged trees within a water body to be most preferred habitat type (examples include Vedanthangal, Melaselvanur-Keelaselvanur, etc). A majority of heronries in the state are multi species nesting, some of which have records of more than 17 species nesting in them. The larger colony size with greater number of nesting species can be correlated to the age of the colony, availability of adequate nesting substrate and the quality of protection at the nesting sites.

In most of the heronries in Tamil Nadu, the neighbouring agricultural fields constitute predominant feeding grounds for the visiting birds. This is evident from the fact that during lean years, when there is very scanty rainfall, the number of birds arriving to the sanctuaries also drops. This can be attributed to less water storage in the tanks as well as lack of cultivation in the neighbouring agricultural fields. In temperate and tropical regions, agricultural conversion of natural habitat typically has negative impacts upon the diversity and functional complexity of bird communities. In arid environments it is reported that the irrigation associated with agricultural fields can lead to an increase in local abundances of plant and insect resources, so has the potential to benefit bird communities.

Migration of Birds

Birds migrate from areas of decreasing resources like food and nesting locations to areas where these resources are available in

plenty. Birds of the northern hemisphere tend to migrate northwards in spring owing to the increasing availability of budding plants, insect populations and nesting locations in those areas. Before winter, they move southwards as all the above resources starts declining in the northern hemisphere. In addition to declining resources, avoiding cold temperatures could also be a motivating factor for migration of many species.

Birds may migrate short, medium or long distances and different species of birds and populations within the same species may have different patterns of migration. Migration can be attributed to several biological and environmental factors like increasing or decreasing temperatures, day-length, availability of food and water and genetic pre-disposition.

Migration is a behavioral response to adversity that makes migrants from geographical areas of low suitability with respective food availability, habitat and climatic conditions to locations of higher suitability. Migrations in birds is a continuum form partial migrations were only some individual of a population migrate to complete migrations where all populations leave the breeding range of the species and move in some cases considerable distances to occupy a non-breeding range of the species. Populations that were isolated during glacial are other climatic extremes often have distinct DNA and sometimes also distinct taxonomic status, as well as separate breeding and wintering areas. Loop migrations in which birds take different routes in spring and autumn probably occurs in response to seasonal differences in conditions, notably weather (especially wind) and good supply. When the breeding population expands and become more migratory, as they spread from lower to higher latitudes, the competition is likely to take place in the common wintering areas.

Migrating birds face several hazards like physical stress of continuous long flight, exposure to predators, lack of food supply along their flight and brightly lit tall buildings in urban areas and fall prey during their long flight.

Central Asian Flyway and Stop Over Sites in Tamil Nadu

Migrating birds cover long distances during their annual migration and how they navigate their flight path is still not fully

understood. Birds seem to navigate by a combination of senses, position of sun and stars, setting of sun, earth's magnetic field, etc. Water birds generally follow the same route year after year for migration owing to the presence of stop over points enroute which provide food supplies. The stop over sites where migrating birds refuel and rest for several hours to few days are very critical in the survival and success of migrating birds.

Sanctuaries which are lying on the migratory route of migrating birds act as stop over sites. Point Calimere and wetlands in Rameswaram and Kanyakumari are not only major stop over sites for water birds during their southward migration but also are wintering sites for portion of the migratory population. Point Calimere is the stop over site for passerine birds and Western Ghats are the major wintering sites.

The Central Asian Flyway is spread over more than 30 countries from the Arctic to Indian Ocean. Tamil Nadu is the last landmass in this flyway. The Flyway comprises several important migration routes of water birds, most of which extend from the northernmost breeding grounds in Russia (Siberia) to the southernmost non-breeding (wintering) grounds in West and South Asia, the Maldives and the British Indian Ocean Territory.

Bird Migration Studies in Tamil Nadu

BNHS has conducted large scale bird ringing studies in Point Calimere, Gulf of Mannar, Kanyakumari, Pulicat, Kaliveli, Nilgiris, Palani hills and some other parts of southern Western Ghats and generated data on the distribution and movement of migratory birds all over Tamil Nadu.BNHS is undertaking ringing and colour flagging studies in Point Calimere and this can be extended to other wetlands of Tamil Nadu. Department staff could be trained on bird ringing and identification at Bird Migration Study Centre, Point Calimere.

History of Bird Migration Studies by BNHS in Tamil Nadu

In the year 1959, BNHS took up the first ever organised scheme on bird ringing and migration study in the sub-continent, funded by World Health Organisation. The organisation worked on extensive bird ringing of resident and migratory birds from 1969 to 1973 under the

Migratory Animal Pathological Surveys Project, and later from 1980 to 1992, under the *Avifauna* and *Bird Migration* projects funded by the U.S. Fish and Wildlife Service. The intensive bird banding sites for water birds during this project and some projects later on included Point Calimere-Great Vedaranyam Swamp, Pulicat lake, Rameswaram and Gulf of Mannar in Tamil Nadu apart from Chilika (Odisha), Bharatpur (Rajasthan) and Pulicat Lake (Andhra Pradesh) in the Indian sub-continent.

The *Avifauna Project* (1980-86), funded by U.S. Fish and Wildlife Service aimed at obtaining further data on migration routes, stop-over locations and important factors affecting the migratory phenomenon. Year-round banding, ringing and research efforts involving trained teams were established at Bharatpur, a well-known bird sanctuary in the Gangetic Plain of north-central India and Point Calimere Sanctuary along the south-eastern Tamil Nadu coast. Further, seasonal banding was also carried out at Kodaikanal Hills in Tamil Nadu. Over 100,000 birds of 300 species, both migrant and resident, were ringed and data on many ecological parameters collected which provided valuable insights in identifying the movement pattern of the migratory birds.

Under the *Bird Migration Project* launched in 1986, this project, bird ringing was continued at the permanent field station established at Point Calimere Wildlife Sanctuary, Tamil Nadu with subsidiary field stations for ringing established at various locations to cover the major ecological regimes of the Subcontinent. In Tamil Nadu, ringing was carried out at Mandapam, Kaliveli Lake, Kodaikanal and Palni Hills. Substantial data was obtained on species composition, distribution, dispersal as well as migratory movements of the region's avifauna. Recoveries of the ringed birds indicated long distance migration patterns as well as trends in migration strategies of individual species. Disturbances and threats to major bird habitats were identified and recommendations made for mitigating measures for the same to the appropriate authorities. Many bird ringing demonstrations and training programmes were held for schools, research organizations, naturalists, and Forest Department personnel.

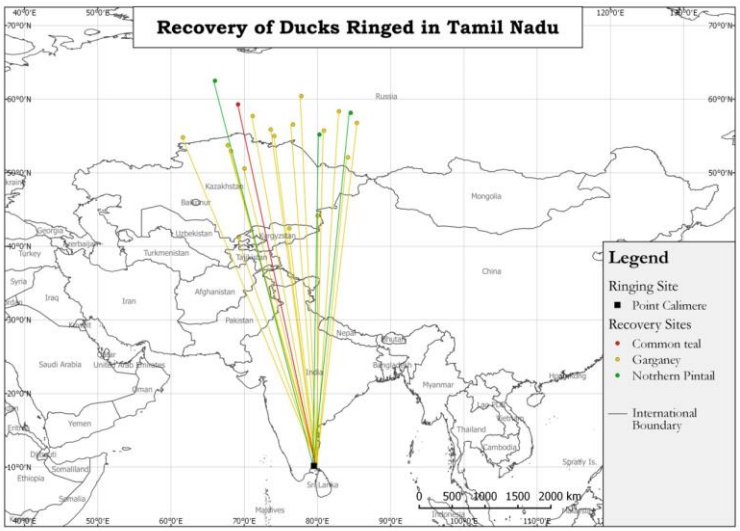
During the BNHS *Avifauna* and *Bird Migration* projects, it became evident that with the limited number of paid staff that could be

supported in these projects, the number of birds banded each year (approximately 25,000 per year) would not provide sufficient feedback for using the data in a meaningful way. Since other countries such as the United Kingdom and the United States are able to conduct large banding programs of a million birds per year with the assistance of organized networks of volunteer groups and individuals, the Society set out to develop a similar network of volunteers who could help in banding a larger number of birds. In 1998 six main field training centres were selected including Point Calimere Wildlife Sanctuary in Tamil Nadu to impart bird ringing training.

Ring Recoveries with reference to Tamil Nadu

The BNHS Bird Migration Study Centre documented in their studies about Ring Recovery Study about different bird species:

Ducks: Of the Ducks that were ringed in Tamil Nadu, one Common Teal and three Northern Pintail ringed at Point Calimere were recovered in central Russia. Several recoveries for Garganey ringed at Point Calimere were obtained from Russia, Kazakhstan, Kyrgyzstan and Uzbekistan.



Terns: Scarce recoveries were also obtained for Terns. A lesser crested Tern ringed at the Persian Gulf in Iran was recovered at Kanyakumari, a Sandwich Tern ringed at Turkmenbashi Bay of Caspian Sea in Turkmenistan was recovered at Mandapam. A Black Tern ringed along

Caspian Sea in Turkmenistan was recovered in Point Calimere, while a Gull-billed Tern ringed at Point Calimere was recovered near Quetta in Pakistan. For Common Tern, one marked in southern Russia and one marked in Poland were recovered at Point Calimere and one marked at Point Calimere was recovered in Ukraine. Caspian Terns have provided many recovery records. Four Caspian Terns ringed at Alakol Lake in eastern Kazakhstan were recovered in Tamil Nadu, at Point Calimere, Mandapam, Tuticorin and Tiruchirapalli one ringed at Akkol Lake in southern Kazakhstan was recovered at Point Calimere and one ringed at Tengiz Lake in central Kazakhstan was recovered at Mandapam. One Caspian Tern ringed along Caspian Sea in Russia was recovered at Ousteri Lake near Pondicherry and one ringed at Aydar Lake in Uzbekistan was recovered at Valamarakottai Lake near Pattukkottai.

Neck Collar Studies by BNHS

Bar-headed Geese marked with red neck collar engraved with a white serial number, at Koonthankulam wetland were recorded to visit the wetland in the subsequent years as well. One bird marked with a red collar at Chilika Lake was recorded at Koonthankulam. Geese marked with green collar from Mongolia are also observed at Koonthankulam every year.

Satellite Tracking Studies by BNHS

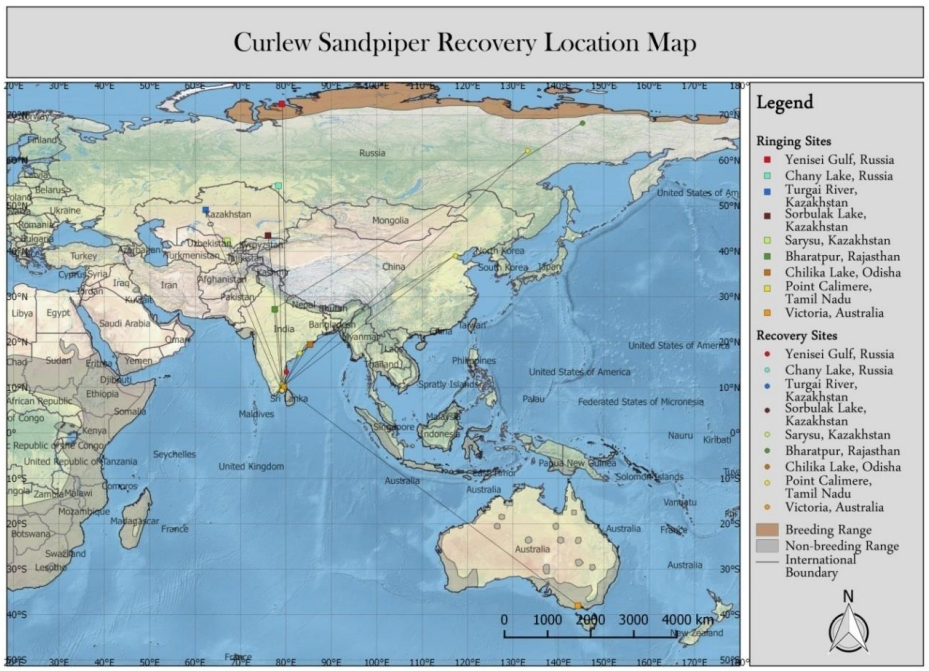
The Bar-headed Geese marked with Satellite Transmitters at Koonthankulam were recorded to cross the eastern Himalayas and recorded up to central Mongolia during summer which is presumed to be their breeding locations. The detailed movement of the Greater Flamingo marked at Kanyakumari and Point Calimere was useful in identifying the network and nature of wetlands utilized in Tamil Nadu, along with summering locations in Northern Province of Sri Lanka.

Colour Flagging Studies

BNHS initiated colour flagging of water birds in 2015, where the birds were marked with a black colour flag with white engraving. Already there have been sighting of a Redshank marked at Point Calimere from Kerala and a Curlew Sandpiper from Bohai Bay in China.

Future prospects

Various techniques employed for migration like banding, satellite tracking can be increasingly used for different species and different populations of the same species of birds to identify important stop over locations. The results of the studies of BNHS can be used for suitably managing the habitats in stop over locations. The movement pattern of bar-headed goose *anserindicus* have been studied and marked through satellite imageries at Koonthankulam, Tamil Nadu, South India.



Feather isotopes study

It has been reported that Feather isotopes study is an emerging concept in the field. Feathers of birds carry chemical information of the area where they were moulted. The building blocks of a feather are analysed using a mass spectrometer and these building blocks are used as chemical finger print. Satellite based tracing of migratory water fowl is an important tool for understanding the potential role of wild birds in the long distance transmission of highly pathogenic avian influenza. However, employing this technique on a continental scale is prohibitively expensive. Stable isotopes from feathers could inform

disease models by characterizing the degree to which regional breeding populations interact at common wintering locations. Feather Isotopes also could aid in surveying wintering locations to determine were high resolution tracking techniques (e.g. satellite tracking) could most effectively be employed. Moreover intrinsic markers such as stable isotopes offer the only means of inferring movement information from birds that have died as a result of infection.

Bird Sanctuaries in Tamil Nadu

All the sanctuaries in Tamil Nadu including Point Calimere, Vedanthangal and Pulicat are significant for nesting of resident birds. Koonthankulam and Karaivetti sanctuaries support thousands of migratory ducks and geese as well. Sanctuaries like Vedanthangal are situated amidst agrarian landscapes and birds spend the day out there in the fields feeding and return back to the lake in the evening for shelter. Out of 223 species of birds recorded from the coastal wetlands of India, the highest number of species was recorded from the east coast. The order Charadriiformes was highest in dominance followed by Falconiformes and Ciconiiformes. 31 threatened birds species were recorded from the coastal wetlands. Hence, there is a need to protect coastal and marine areas with high priority conservation for future research on bird communities.

The brief details of Bird Sanctuaries in Tamil Nadu (as on 01-01-2016) are stated below:

Sl. No	**Name of Sanctuary**	**Area in ha**	**Legal status**	**G.O.Ms. No.in which declared**	**District in which located**	**Major Species found**	**Section of Wildlife (Protection) Act under which declared**
1	Vedanthangal Birds Sanctuary	30.000	PWD TANK	199 E&F Department dated 3.7.98	Kanchee puram	Cormorants, egrets, grey heron, Open billed stork, Pelicans, migratory birds like garguney, teals, shovallers	Final notification issued u/s 26A(1)
2	Karikili Birds Sanctuary	61.210	PWD TANK	332 E&F Department dated 23.5.89	Kanchee puram	Cormorants, egrets, grey heron, spoon billed stork,	18(1)
3	Vettangudi birds Sanctuary	38.400	PWD TANK	574 E&F Department dated 3.6.77	Sivagangai	Cormorants, egrets, herons, teals, pelicans	18(1)
4	Kanjirankulam Birds Sanctuary	104.000	PWD TANK	684 E&F Department Dated 21.9.89	Ramanatha puram	Cormorants, egrets, herons, teals, pelicans	18(1)

Sl. No	Name of Sanctuary	Area in ha	Legal status	G.O.Ms. No.in which declared	District in which located	Major Species found	Section of Wildlife (Protection) Act under which declared
5	Chitrangudi Birds Sanctuary	47.630	PWD TANK	684 E&F Department dated 21.9.89	Ramanatha puram	Cormorants, egrets, herons, teals, pelicans	18(1)
6	Udayamarthanda puram Birds Sanctuary	45.280	PWD TANK	379 E&F Department dated 31.12.98	Tiruvarur	Little cormorant, darter, spoon bill, Indian Reef Heron, Grey heron, white necked stork	Final notification issued u/s 26A(1)
7	Vaduvoor birds Sanctuary	128.100	PWD TANK	169 E&F Department dated 22.7.99	Tiruvarur	Cormorants, egrets, ibis, herons and many variety of birds	Final notification issued under section 26A(1)
8	Koonthankulam-Kadankulam Birds Sanctuary	129.000	PWD TANK	301 E&F Department dated 30.11.94	Tirunelveli	Grey pelican, painted stork, white Ibis, jackal, rat snake	18(1)
9	Karaivetti Birds Sanctuary	453.710	PWD TANK	92 E&F Department Dated 5.4.99	Arialur	Egrets, pelican, Grey heron, White Ibis, Spoon bill	18(1)

Sl. No	Name of Sanctuary	Area in ha	Legal status	G.O.Ms. No.in which declared	District in which located	Major Species found	Section of Wildlife (Protection) Act under which declared
10	Vellode Birds Sanctuary	77.180	PWD TANK	44 E&F Department dated 29.2.2000	Erode	Spoon bill, Teals, Pintail ducks, Darter	Final notification issued u/s 26A(1)
11	Melaselvanur-Kilaselvanur Birds Sanctuary	593.080	PWD TANK	57 E&F Department dated 10.3.98	Ramanatha puram	Grey Pelican, Painted Stork	18(1)
12	Theerthangal Bird Sanctury	29.290	PWD TANK	G.O.Ms No.220 E&F Department dated 15.12.2010	Ramanatha puram	White -breasted Kingfisher, Spot-billed Pelican, Brahminy Kite	18(1)
13	Sakkarakottai Tank Birds Sanctuary	230.490	PWD TANK	G.O.Ms. No 114 E&F Department dated 17-04-2012	Ramanatha puram	Spot billed Pelican, Egret, Common Myna, Grey Heron , Little Cormorant, Black Kite etc	18(1)
14	Oussudu Lake Birds Sanctaury	331.785	PWD TANK	G.O.Ms. No 49 E&F Department dated 31-03-2015	Villupuram	Spot billed Pelican, Egret, Common Myna, Grey Heron , Little Cormorant, Black Kite etc	18(1)

Sl. No	Name of Sanctuary	Area in ha	Legal status	G.O.Ms. No.in which declared	District in which located	Major Species found	Section of Wildlife (Protection) Act under which declared
15.	Pulicat Lake Birds Sanctuary	15367.000	LAKE	1247E&F Department dated 22.9.80	Tiruvallur	Spot billed Pelican, Egret, Common Myna, Grey Heron , Little Cormorant, Black Kite etc	18(1)
	Total	**17666.155**					

Threats & Issues:

Insufficient Water availability

Almost all the sanctuaries are chiefly dependant on the monsoon for water storage. Delay in the onset of monsoons, scanty rainfall lead to late or poor water storage in the tanks. Apart from runoff from rainfall, most of these tanks are dependent on an external source like water channel bringing in water from a dam or tank or river for input of water. Consistent and prolonged drought situations exist in some areas, for instance Kanjirankulam, Mel-Keelselvanur. More often, delayed rainfall results in delayed bird arrival.

Pollution of water bodies

Unscrupulous use of pesticides and fertilisers in present day agriculture is a major source of contamination of our water bodies. The runoff waters from these fields carry with them loads of pesticide and nutrient load into the tanks leading to nutrient accumulation. Organic wastes like bird excreta, dried plant material also add upto the load. Over a period of time, the nutrient load has given to algal blooms and invasion of exotic weeds. *Eichhorniacrassipes, Salviniaauriculata, Pistia stratiotes, Lemnaminor, Wolffia*sp*, Azollapinnata*, etc often form thick mats in different areas of the tanks and affect the native vegetation. The algal blooms and invasive species replace the native macrophytes which are the major attractants to duck varieties. Due to the high Biological Oxygen Demand (BOD), the water will turn foul soon and eliminate all the aquatic organisms including fish.

In areas like Pulicat lake and Point Calimere, the effluents of aquaculture farms alters the water quality of water bodies causing degradation of biodiversity. Prawn-and crab-farms set up by private entrepreneurs along the margins drain water from the lake all round the year. More than this, the untreated effluent waters from the culture ponds discharged back into the lake degrades the quality of water and substratum in the lake, bringing about changes in the benthos (bottom biodiversity), nekton (swimming organisms), including fish, diversity.

Changes in water dynamics of rivers

In brackish water ecosystems like Pulicat lake, freshwater brought in by rivers and streams are crucial in maintaining the hydrology of the lake.

Impact of Lake-Mouth Closure on Hydrology

The lake-mouth tends to become narrower and shallower during the post-monsoon months primarily due to the accretion of sand, resulting in the formation of a sand-bar across the lake-mouth. As a result, the impact of the ebb (low) and flow (high) tides in the lake tends to be feeble and hence depth of the water in the lake tends to decline. This has major consequences on the biodiversity and fisheries in this lake. The impounded lake water subjected to evaporation reaches hyper saline levels.

Siltation

Loads of silt and substratum carried into the lakes and tanks reduce their water holding capacity. For instance, Pulicat Lake has been getting silted up at the rate of about one metre per century. The average depth of about 3.8 metres of the lake prior to the 17th century, when Pulicat Lake served as a natural harbour for the Dutch, is reduced to less than a metre today. This can be attributed to the loads of silt brought in by rivers and streams and also the closure of mouths of the lake.

Invasive alien species

Many of the water bodies in sanctuaries are invaded by Invasive Alien Species like *Prosopisjuliflora* and *Ipomeacarnea*. *Prosopisjuliflora* actively takes up water from the tanks/lakes and release into the atmosphere through evapotranspiration depleting the water body. *Ipomeacarnea*is a fast invader and tends to replace native vegetation of the water bodies.

Land use changes

The agricultural lands in the vicinity of sanctuaries like Vedanthangal and Karikili situated adjacent to urban areas are

increasingly being converted into real estate plots and sites, thus decreasing the feed availability for the avifauna.

Insufficient food availability in the lakes and tanks

African catfish, an invasive fish owing to its ability to thrive even in hardy anaerobic conditions has invaded many water bodies. It is a voracious feeder and eradicates most of the native fish population in the water body rendering it unsuitable for birds. Periodical culling of African catfish during summer months and release of fingerlings of native fish in the water bodies would be required.

Potential threat of poaching

The threat of poaching of birds always looms around the sanctuaries. There are areas like Vedanthangal where there is totally no poaching in the tank. But, birds do not always stay in the tank and move out for feeding during the day time when they fall prey to poachers. Controlling poaching in places like Oussudu which share interstate boundaries is all the more challenging.

Grazing

When water recedes from the tanks/lakes during summer, the cattle of the villagers living around the sanctuaries use the areas for grazing. Grazing alters plant communities inside the area by trampling of natural regeneration, spread of weeds and diseases in the area.

Other than the above, the following are other important challenges in the management of bird sanctuaries which impede the conservation of Avifauna in the State of Tamil Nadu,

- Settlement Issues in Sanctuary management;
- Conflict among communities in adjacent villages claiming for rights in the tank/sanctuary;
- Unclear boundary demarcation;
- Lack of training among the staff handling the areas;
- Chronic shortage of funds

Future Road Map

Identifying sustainable solutions for water scarcity

It is absolutely important to take efforts to retain and harvest rain water in the tanks/lakes. Rain water harvesting structures and mechanisms can be created in places wherever possible. Alternate sources of water from adjacent water bodies can be identified for permanent solutions. Holistic approach towards arriving at solutions for water stressed areas should be emphasized like restoring entire wetland complexes rather than individual water bodies. Extensive infrastructure developments and degraded flowing water systems like rivers and streams have resulted in shrinking of rivers and thinning of water flow. Reduced fresh water inlet into brackish water bodies like Pulicat have led to transformations in water quality like salinity adversely affecting the various aquatic life forms and the dependent avifauna.

Satellite water bodies in the periphery of the sanctuaries could be improved in terms of water availability and food for birds to provide beneficial habitats.

Community Participation in Conservation

The local community could be coordinated by forming of eco development committees to bring in community participation and a sense of belongingness and responsibility in conservation. Site specific eco-tourism initiatives could be formulated keeping the local carrying capacity in consideration. The benefits arriving out of these initiatives could be shared among the community as an appreciation for their efforts in conservation for ensuring sustainability of participatory initiative in conservation

Research and monitoring

Scientific studies and research are insufficient pertaining to individual bird habitats. Sponsored programmes in specific areas of interest could be thought of to encourage more knowledge inflow. Technological advances available in the field of conservation should be made use of effectively.

Recognition

Wetlands qualifying the criterions of Ramsar site convention could be identified and efforts taken to get them declared as Ramsar Sites which will bring international focus on these wetlands providing new impetus to wetland conservation.

CHAPTER-V

EX-SITU CONSERVATION INITIATIVES IN TAMIL NADU

India has a very long history and tradition of keeping wild animals in captivity, dating back to the age of the epics, the Ramayana and Mahabharata. It is fascinating to trace the evolution of Indian Zoos and their roles before Independence and during the year's thereafter right upto the current scenario.

In ancient times most kings and queens had private collection of animals in their palaces, especially of chital, panthers and birds. Emperor Ashoka's edicts speak of an impressive collection of elephants in captivity and even veterinary facilities for their upkeep. Moghul emperors too had impressive collections of animals and birds, and the miniatures of the time depicted these rather lucidly. However, if all these 'collections' did not correspond to the description of zoos as we now know, it is only because they were mostly for royal pleasure and not for commoners.

Forests were an inherent part of man's life in the past, and as human societies evolved to become urbanized, zoos had to be established for recreation and conservation.

1. Evolution of Zoos in India

Period	Type of collection	Ownership	Organization purpose
Pre 1855	Private Menageries	Feudal lords or chieftains	Recreation, mostly for the lords and vassals.
1855 to 1947	Zoos, but more like 'prisons' for animals, some deer parks	Governments, municipalities, princess collections	Recreation and entertainment both for locals and people from villages and towns.

Period	Type of collection	Ownership	Organization purpose
1947 to 1992	Private and Public zoos, less of 'prisons' for animals, but very constricted enclosures. Beginning of Safaris and more Deer Parks.	Governments, municipalities, private trusts, etc.,	More for recreation, more exotics among inmates; very little conservation or captive breeding.
1992 onwards	Mostly public zoos with better enclosures after the Central Zoo Authority came into being.	Governments, and Public bodies	Recreation, education and conservation; more exchange of animals.

2. History of Zoos in India

In a series of papers in 1994 on 'Evolution of Zoos', Dr. George Rabb, Director of Chicago Zoological Society and former Chairman of the Species Survival Commission, IUCN, traced the basic trends and attitudes as reflected in the themes, major subject matters and enclosure design of zoological institutions through history. The history of Indian Zoos can be catalouged according to the Rabb model of the evolution of the Zoo, into five periods.

1. Religious Park Period (400 BC)
2. Collection Period (1600 – 1800)
3. Menagerie Period (19th century 1803 – 1950)
4. Zoological Park Period (20th century 1950 – 2000)
5. Conservation Centre Period (21st century 2000 onwards)

In ancient times the emperors and maharajas kept animals in captivity in their palace complexes for the amusement of their family members and other dignitaries, and also as status symbols. These captive animals included exotics, as indicated by the depiction on the stone panels of the Sun Temple of Konarak built in the 14th century, of a giraffe being presented to a king.

Interestingly, the word 'menagerie' as opposed to the organized or 'Conservation conscious' Zoo Community, conjures up visions of small enclosures, stark iron bars, dingy concrete, congestion, bad smells and misery. A menagerie could refer to a collection of animals with no purpose beyond education and / or entertainment.

A little known but significant 'official' menagerie was established in 1803, and intended as an ambitious attempt to catalogue all fauna of India. This was the Indian Natural History Project that came up at Barrackpore near Calcutta (now Kolkatta), the first such systematic initiative in Asia and probably the world.

India's oldest zoo came up in Calcutta in 1854, the Marble Palace Zoo, opened by Raja Rajendra Mullick Bahadur in the heart of Calcutta city. This small zoo which is still in existence happens to be the oldest surviving zoo in the country.

In 1855, another zoo was established by Madras Municipality in Madras (now Chennai). In tune with the concept of being meant solely for recreation, it was described as 'Peoples' Park. This was a place to which people from different strata of society flocked, primarily to commune with nature and let their children enjoy looking at the birds and animals lodged in cages.

In the 19th century four other zoos came up viz., Trivandrum (now Thiruvananthapuram) in 1857, Bombay (now Mumbai) in 1862, Calcutta in 1875, Jaipur in 1876 all promoted by the British Government or the ruling princes. Such new developments were to commence only after Independence and the desire of people in many cities or towns to have their own recreational areas and zoological parks.

Many major zoos came up in quick succession, with the one in Ahmedabad in 1951, Delhi in 1955, Darjeeling in 1958, Hyderabad in 1959, Guwahati in 1960, Visakhapatnam in 1975, Tirupati in 1983 and Chennai in 1985. Around 1993, there were reportedly 430 zoos / mini zoos / deer parks in the country.

3. Major events and trends in Ex-situ Conservation since independence

Probably the first major wildlife and zoo event after Independence came five years after the new nation began. In 1952, the Indian Board for Wildlife (IBWL) was set up. A prestigious government committee, the IBWL, from its inception, was very supportive of zoos.

About the same time, in the first week of May 1955 the first All Indian Zoo Superintendent's Conference was held in Madras. The stated objectives were to discuss problems of zoo administration, find methods for improvement of existing zoos and to assess the scientific, educational, recreational and aesthetic values of zoos in the community life of the nation. The meeting was attended by all the Superintendents of the major zoos of India. Their resolutions and recommendations included exchange of animals between zoos, formation of an All India Zoo Association, expansion of scope of zoos to include rehabilitation of 'denuded areas' by rearing important species in zoos and introducing them into these areas; recognition of zoos, a training centre for zoo personnel in India etc.

At the third meeting of the Executive Committee of the IBWL held about three weeks later at Ooty, the recommendations of the Zoo Superintendents Conference were on the agenda and approved by the committee. A review of the deliberations was also included in the proceedings of IV meeting Executive Committee of the IBWL held at Sasan, Gir.

4. Zoo Wing of the Indian Board for Wildlife

By 1956, the Board had formed the Zoo Wing of the IBWL, which formally met for the first time on 16th May 1956. The deliberations at the meeting included concerns regarding animal welfare including size and amenities of accommodation, the provision of company (if not mates) for social animals, with prevention of inbreeding, education with labels for enclosures and educational publications, adequate representation of indigenous as opposed to exotic animals, research, nutrition, inventory and records, transports and even breeding rare species for reintroduction.

By 1973, the Zoo Wing was replaced by an Expert Committee which toured the zoos and made a report which was discussed subsequently. The Expert Committee of IBWL functioned as an early Zoo Authority, discussing matters of concern to all zoos such as exchange of animals, procurement of foreign animals, surplus population in zoo, import of drugs, etc. It is significant that there was always some high level body which made an attempt to contend with the challenges and concerns of zoos in India.

5. The Indian Wildlife (Protection) Act, 1972

The passage of the Indian Wildlife (Protection) Act in 1972 was the next significant event in Wildlife and Zoo history, after Independence. The Act made some provisions for zoos and museums, capture of animals for zoos and keeping of skins and trophies for museums. Between the passage of Zoo Wing of the Indian Board for Wildlife 1956 and the Wildlife (Protection) Act 1972, more than three hundred zoos were set up. These zoos were under many different administrative heads – State Forest Department, Municipal Corporation, private, industry, trust, society and central government.

In 1973, there was great concern over the proliferation and quality of zoos in India. An expert committee was formed to tour the major zoos in India and come out with a comprehensive report and recommendations. The committee pinpointed all the major problems faced by Indian zoos and suggested reasonable and effective solutions for these problems. American zoo experts in 1980 evaluated the zoos of India and suggested methods for improvement, which were most interestingly, very similar to those of the early experts.

6. Wildlife Action Plan

The Wildlife Action Plan was brought out in 1983, as a 12-point plan to address various wildlife issues in the country. The Wildlife Action Plan included several items pertinent to zoos, e.g. captive breeding, rehabilitation of endangered and threatened species, wildlife education and interpretation, research and monitoring and collaboration with voluntary bodies.

The National Zoological Park with the backing of Department of Environment, Wildlife Wing, called a meeting of Directors of Indian

Zoos on 24 & 25th May 1983 at National Zoo, New Delhi. This was the first time an All-India Zoo Directors meeting had been held since 1955. One of the very significant working groups was concerned with captive breeding of rare and threatened species. This group assigned different zoos to be responsible for certain rare species and these would be considered as 'approved' breeding programme to be implemented with 100 percent funding from the Central Government.

In 1988, a zoo consulting project was initiated at the Wildlife Institute of India. This project was to have profound influence on the pace and directions of the zoo movement in India. Under the project, a comprehensive report on the status of zoos in India was to be prepared; standards and guidelines for management were to be evolved along with healthcare and disease control, master plan and management plan, education and interpretation programme and research. The project was to make recommendations for achieving the objectives of conservation breeding programme and to suggest the structure, role and function of the proposed central coordinating body for zoos, the Central Zoo Authority of India. Finally the project was to develop and conduct training programmes for professional and technical levels. A major shot in the arm for Indian zoos was also the creation of an additional post of a Joint Director in the Ministry of Environment and Forests, especially to look after zoo affairs.

In the Expert Report, one of the recommendations was that India must have a National Zoo Policy. In 1987, the then Director of National Zoo pushed for the idea and approached the Joint Secretary in the Ministry for Environment who, together with the National Zoo Director, drafted a policy. It was approved by Zoo Directors at the Sakkarbaug Zoo meeting and submitted to the Ministry in 1990.

7. The Zoo Act and Central Zoo Authority

The Indian Zoo Act, 1991 could possibly be the strongest piece of Zoo legislation in the world. It provides for an autonomous Central Zoo Authority with a membership of 12 persons (half official and half non-officials) chaired by the Minister for Environment. The objectives of the Authority concerned the following aspects of zoos.

1. Minimum standards
2. Evaluation and recognition

3. Captive breeding management
4. Training, professional development and research
5. Public education

The Central Zoo Authority has a generous budget, the major portion of which is distributed to zoos on a 50% matching scheme with their administration authority to improve their facilities for animals and for visitors.

Soon after the first Zoo Authority members were selected, a committee was appointed to formulate the recognition of Zoo Rules (1992), which laid down norms and standards by which zoos should be assessed. An inspection committee consisting of at least a manager, a veterinarian and an educationist was set up and directed to systematically inspect the zoos in India and recommend for full recognition of a three year period or the zoo would be given six months to 'show cause' why it should not be closed. The Central Zoo Authority closed 46 of the mini zoos and 18 more were refused recognition, which effectively meant closure after a grace period in which the zoo had opportunity to improve the standards themselves. Currently, almost all the zoos have been inspected and given improvement programme. Many of them have been given financial assistance as well as extensive technical advice.

8. History of Madras Zoo (People's Park)

In 1853, Dr. Edward Balfour, Officer – in - charge of the Madras Museum began exhibiting two large cats -a leopard and a tiger, kept near the Museum itself. Soon a Zoological Garden was started as an adjunct to the museum in 1855. This was later on transferred to the People's Park and since then remained in Municipal concern. The zoo covered an area of 11 acres, 13 grounds and 561 sq. ft. inclusive of a small lake on which boating was allowed. It also exhibited 149 species numbering 860 animals.

8.1. The Time Line of Madras Zoo (Consider depicting this as a time line)

1854 – 55 A young cheetah and a young tiger were exhibited in the Madras Museum.

1855 With the collection of wild animals gifted by H.E. the Nawab of Carnatic, on 23-11-1855, a small zoo was established in the Museum as an adjunct under the care of Dr.Balfour who can be said to be the father of the Madras Zoo. Admission to the Zoo was free. Govt. sanctioned Rs. 1,000/- for the construction of cages and a recurring monthly expenditure of Rs. 180/- for maintenance.

1861 In October, zoological collections were transferred from Museum to People's Park under the management of the People's Park Committee. Government sanctioned Rs. 3,500/- for the purpose.

1865 Maintenance of the Zoo was transferred to the Madras Municipality.

1869 Contribution of Rs. 3,960/- was received from Government. The animals were caged or penned in different parts of the park but wild animals were caged in one compact area.

1871 An elephant and a gaur with calf were acquired.

1874 Wolf's cage was built.

1877 Zoo received some rare additions - Orangutan from Calcutta Zoo (in exchange for a young lioness), a rhinoceros and some black swans and Emus. Rhino's enclosure was put in good repairs.

1878 Government granted Rs. 2,000/- which was spent for acquiring more animals, such as one ostrich, two kangaroos, two tigers, two sambars, one wolf, four crocodiles, etc. A Howdah was made for joy rides on the elephant.

1895 The menagerie enclosure was extended on the northern side and the Llama brought from South America was housed there.

1902 Shed with enclosure was constructed for the Ostrich.

1903 A new aviary was constructed at a cost of Rs. 3,000/- on the Island to house rare birds.

1904 Government gave a special grant of Rs. 10,000/- for improvements to the Menagerie and Park. Zinc fencing was put up and new cages and closures were provided for animals and birds.

1910 An elephant was presented by the Government to the zoo.

1911 A new wooden bridge was constructed over the lake on the eastern side of the zoo connecting the Monkey Island.

1913 A cage was constructed for bears. Further improvements were made.

1915 Deer's enclosure was fenced and completed; road ways were formed round the new bears' cage. The zoo and park were placed in charge of the Licensing Officer of the Municipality.

1921 Entrance fee was raised from 1/2 anna to 1 anna. Further improvements were made.

1923 The Licensing Officer ceased to have control over the Park and the Zoo. These two areas were placed in charge of separate officials. A few more cages and sheds were put up and the old ornamental red cage of the tiger was completely renovated.

1925 A monkey house, an elephant shed and a rest house for sheltering visitors were constructed. Wild animals' cages were provided with outing yards, bars and iron gates.

1929 Further extension towards the South was carried out. A sum of Rs. 33,600/- was sanctioned and substantial improvements were taken up on hand. The Napier Terrace with cages and moats was constructed to house the lions giving them larger freedom of movement. Barred outing yards were provided for some cages. Tiled canopies were put over old cages to give protection to animals. A Kangaroo Shed and a new Aviary was constructed.

1931	A cage for baboons and an enclosure for ducks and crocodiles were built and gifted to the Zoo by Sri C. Cunniah, Proprietor of the Royal Theatre.
1933	A shelter was constructed for the deer, within deer enclosure. The Zoo was placed in charge of a qualified Superintendent, and Dr.S.G.Manavala Ramanujam, Professor of Zoology, Presidency College, Madras was nominated as Honorary Visitor of the Zoo.
1946 – 47	15 boats were newly purchased from Messrs. Brunton & Co., Cochin, out of which 7 plied in the zoo lake and 4 in the pond in front of the Stadium in the People's Park.
1947 – 48	Camels were hired to the public for use on ceremonial occasions. Sheds for camels and Sambar deer were completed and other improvements were made.
1948 – 49	A number of valuable animals were acquired. A female Silvery Gibbon of Java, male black Hoolock Gibbon and coloured Macaw parrots were gifted by His Excellency, the Maharajah of Bhavanagar, Governor of Madras.
1949 – 50	One Red-Faced Pigtail Monkey was received from Sri.T.R.Mahalingam and four Albino Bucks were presented by His Excellency, the Maharajah of Bhavanagar.
1950 – 51	As a measure of economy and with a view to solve the accommodation problem, three adult lions and a pair of lion cubs were sold to a circus company. Reetha, the 'favourite' giraffe, died that year. Giraffe enclosure was extended and reconstructed. Fencing of the deer enclosure was raised. The two wooden bridges over the zoo lake were renovated and a small enclosure to keep an Indian Python was constructed. A pictorial guide book describing each animal, its habit, food and feeding habits and other useful information was printed, for the first time. Young animals were trained 'to behave well towards children'. Hyaenacubs, bear cubs, tiger cubs, lion cubs, wallaby,

young donkeys, lambs, zebra filly, young monkeys, cockatoo, parrots, fish, etc. chosen to form the children's zoo.

1951 – 52 A Pets Show organized and conducted by the Corporation of Madras was opened by His Excellency, the Maharajah of Bhavanagar on 6-1-1952. There were a fair number of exhibits. 29 pets were exhibited, including one baby elephant, two pythons, parrots, dogs, cats, a deer and some rare varieties of fish. The zoo's exhibits were three lion cubs born on campus, a stump-tail monkey and a bonnet monkey which greeted His Excellency by presenting him a copy of the zoo guide! There was a record receipt from Zoo during the year amounting to Rs. 1,01,632/-.

1952 – 53 Many gifts were received, prominent among them being a fine specimen of South Indian Bison secured by Sri.M.Kesava Unni Nayar, Chief Conservator of Forests, Madras. The Government of Assam supplied at cost a pair of 'Tragopan Pheasants'. An automatic refrigerating unit with water pipe and electric motor connections was installed under an ornamental umbrella shed within the zoo near the lion's moat. Zoo receipts during the year totaled Rs. 96,603/-.

Owing to drought, the zoo lake completely dried up in the earlier part of the year and pleasure boats could not be plied then. From May 1952, the lake filled up and boating was resumed.

1953 – 54 A rhinoceros, Kusha, was acquired through the kindness of Hon'ble Sri Bishnuram Mehdi, Chief Minister of Assam, through the good offices of His Excellency the Governor of Madras, Shri Sri Prakasa. From the date of arrival of rhinoceros in the zoo, was noticed a record receipt from the Zoo which was let on lease for Rs. 1,03,000 plus Rs. 300 per mensem.

1955 On October 31st 1955, 4.30 pm, Zoo Centenary Celebrations celebrated under the distinguished presidency of His Excellency, the Governor of Madras, Shri Sri Prakasa.

8.2. Centenary Celebrations of Madras Zoo

The Centenary of the Madras Zoo was celebrated on 31st October 1955 in a grand manner. Many philanthropists came forward to give donations for enclosures inside the zoo. It was inaugurated by the Governor of Madras, Shri. Sri Prakasa and the commemoration address delivered by Prof.R.P.SethuPillai, Professor of Tamil, Madras University. The entire credit for the success of the Centenary celebrations was due to the effort of the Major Shri.M.A.Chidambaram, who planned and designed the celebrations. The Centenary messages of Pandit Jawaharlal Nehru, Prime Minister of India, Dr.S.Radhakrishnan, Vice-President of India, Dr.C.Rajagopalachari and Shri.K.Kamaraj, Chief Minister of Tamil Nadu were carried in the Centenary souvenir.

8.3. Shifting of Madras Zoo

The question of shifting the Zoo in Madras city was by that period, under active consideration of Government. Factors like air and sound pollution, were posing health hazards to the animals. Also, there was insufficient space for accommodating both the animals and highly dense human population around the Zoo's location.

The situation necessitated the shifting of the Zoo to a more conducive and ideal place for establishment of a modern Zoological Park. In January 1972, on the advice of the Government, Thiru.C.B.Bhatia, Director, Delhi Zoological Park and Thiru.Pushp Kumar, Curator, Nehru Zoological Park, Hydrabad visited the various alternative places viz., Guindy Reserve Forest, Pallikaranai marsh, Nanmangalam Reserve Forest and Vandalur Reserve Forest, and went on to select Vandalur Reserve Forest for this express purpose. The Tamil Nadu Government after careful consideration of all recommendations, decided that a Zoo on the lines of the one at Hyderabad should be started at Vandalur Reserve Forests and that the Forest Department should be in charge of establishing and running the zoo.

In the G.O.Ms.No.259, Forests and Fisheries Department, dated. 07.12.1973, the Government sanctioned the post of Special Officer in the cadre of Deputy Conservator of Forests, headquarters at Madras to draw up an integrated plan and to implement it in stages,

over a period not exceeding five years. The Special Officer took charge on 7th January 1974 to prepare detailed lay-out plan indicating the location of roads, animal enclosures, aviaries etc. The officer was also permitted to visit the zoos at Delhi, Hyderabad and Kanpur to collect details for preparation of Master plan. In 1974, the Master Plan was drawn up for the Zoo by Thiru.K.Viswanathan, Special Officer.

8.4. Shifting the Madras Zoo to Vandalur

The chronological sequence of events in the development of Vandalur zoo is given below.

1972

As days passed on, various civic welfare activities, industrial and commercial developments took place in the vicinity of this Corporation Zoo Complex. Madras Central Station and Madras Harbour were on the Eastern side. Ennore Thermal Power station, Binny Textiles and various engineering industries were on the Northern side. Besides, a number of commercial complexes cropped up on the peripheral areas of the zoo. This eventually led to environmental pollution due to the smoke and dust emanating from the Central Station and noxious fumes from the Thermal Power Stations and the industries. The animals and birds in the zoo suffered badly on account of this polluted atmosphere. Further, this zoo could not keep pace with the advancement expected of a modern zoo in the capital city of Tamil Nadu for want of space and other infrastructural needs.

Therefore, the Government of Tamil Nadu took up the issue in 1972-73 of shifting the Zoo to a more suitable and congenial place.

1973

A team of officials of zoos and Government of Tamil Nadu including the Joint Secretary to the Government, Agriculture Department, Commissioner, Corporation of Chennai and others inspected and unanimously decided to shift the Zoo to Vandalur Reserve Forest. Subsequently, the Government, in G.O.Ms.No.259 F&F dated. 07.12.1973 sanctioned a Special Officer in the cadre of Deputy Conservator with staff to draw up an Integrated Plan to be implemented in stages over a period of 5 years.

1974

A Master Plan was drawn up in 1974 by Thiru K. Viswanathan, Special Officer appointed for this purpose. In the meanwhile, the Ministry of Railways had applied to the Government of Tamil Nadu for transfer of the lands and buildings situated in the Zoo, People's Park and Moore Market area for expansion of Madras Central Station for the purpose of construction of a Suburban Railway Complex.

1976

Due to the pressure given by the Railways, as an interim arrangement, it was ordered in G.O.Ms.No.929 F&F dated 8.10.1976 that the Zoo be shifted to the Children's Corner, Guindy.

1978

Subsequently, the Government of Tamil Nadu (in G.O.Ms.No.2179 Revenue dated 26.09.1978) ordered the transfer of an area of 12.03 acres to the Railways, which included also the areas occupied by the zoo. Thus, the necessity of shifting the Zoo became imminent.

As the Government had apprehensions about the availability of potable water in sufficient quantity at Vandalur, an Expert Committee was ordered to be formed (G.O.Ms.No.2179 Revenue Department 26.09.1978) with Dr. Ruben David, Superintendent Zoological Park, Ahmadabad as Chairman to advise the Government on suitable location of the Zoo. The Committee inspected various sites and found that the topography of Vandalur with hills and scrub jungles an ideal site and favoured setting up the Zoo at Vandalur.

1979

In G.O.Ms.No.110 F&F dated 16.02.1979 the Government accepted the recommendation of Dr. Ruben David Committee and ordered the shifting of the zoo and locating at Vandalur. The Government had also accorded sanction for the project at a total cost of Rs. 300.00 lakhs. Phase I was sanctioned in the same G.O. at a cost of Rs. 105.00 lakhs. The following were the works included in Phase I.

Name of the work	Rs. In Lakhs
Bore wells, pump sets, pipelines, overhead tanks	10.00
Electricity posts, Transformer	10.00
Peripheral fence	15.00
Cost of animals & birds	4.00
Transport charges	1.00
Construction of road & pathway	10.00
Enclosures	30.00
Residential buildings	15.00
Equipment	5.00
Staff	5.00
Total	**105.00**

Finding adequate water resources was one of the main problems. This was examined by the Government in consultation with Chief Engineer, Ground water, TWAD Board and Alandur Municipality. The requirement of water was then one lakh gallons or 5 lakh liters per day throughout the year. TWAD Board assured to bring Palar Water through Alandur Mains to supplement 20000 gallons per day that could be tapped locally by sinking bore wells at the site. Adequate water supply was thus assured as directed in G.O.Ms.No.110, F&F 16.2.1979. The Government in G.O.Ms.No.1258, F&F dated 19.11.1979, sanctioned the staff required for the implementation of the project in the initial stages, which included a Director in the cadre of Conservator of Forest.

1980

Thiru. K.Durairaj took charge on 6.2.1980 and formed the office at Adayar in a private building. Thiru S. Subbarayalu Naidu joined as Director on 24.4.1980 and continued till 6.8.1986. The order issued in G.O.Ms.No.408 F&F dated 26.3.1980 enabled the Department to make a big headway towards the objectives & goals. The salient features of this G.O. were:-

About 5 acres of land immediately to the North of Vandalur – Kelambakkam road to be acquired in order to locate the main entrance & exit gate.

Wetland lying to the East of the G.S.T Road & to the North of S.No. 208 to be acquired for the zoo.

All wetlands under the minor irrigation tank, (Otteri) lying to the west of GST road to be acquired and reassigned as dry lands, so that the irrigation rights be extinguished to ensure sustained storage in Otteri.

Lands lying North to the tank, running close to the foot of the hillock and to the East of the GST road to be acquired for the Zoo.

By this order, an additional extent of 38.74 acres of Government lands (dry and wet) was added to the zoo bringing the total effective area for the park to 814.74 acres.

The revised layout of the Vandalur Zoological Park was approved by the Government in G.O.Ms.No.987, F&F dated 02.08.1980 (Para 3). The Government (in the same G.O. in Para 4) instructed the Collector to stop quarrying in two localities in S. No. 250 of Nedungundram Village. Preliminary works such as survey, demarcation, preparation of estimate and calling for tenders were started.

In G.O.Ms.No.1204, F&F Dept. 17.9.80, the Government approved the proposal for formation of a new alternative road from Perungalathur to Kelambakkam via Sadanandapuram, Alapakkam and Nedungundram, with a view to avoid smoke and noise pollution caused by the vehicular traffic on this road and to close the existing road from Vandalur and Kelambakkam. But subsequently, during the 33rd meeting of the Governing Board held on 19.6.2000, it was decided that closure of main road was not feasible, as it would affect the public.

1981

A study was made by Chief Engineer (Ground Water) in February 1981. It was found that a quantity of 7,43,000 litres of water per day will be obtained from 5 bore wells and 1 open well in and around the areas of the Zoo, which was only 50% of the total requirement.

In B.P.Ms.no.157 TWAD Board, sanction was given for diverting necessary quantity of water to Vandalur Zoological Park from Alandur and Pallavaram Municipal Mains. The work of construction of bore

wells, OHT and laying pipelines were started by the PWD (Ground water). An old open well that was existing was used initially.G.O.Ms.No.406 F&F dated 03.04.81 enabled the zoo authorities to capture certain animals and bird species to be kept in zoo. The Hon'ble Chief Minister held discussions on 8.6.1981 and issued a directive to examine the inclusion of Northern portions of the Vandalur hill also (60 ha) within AAZP and to increase the height of the compound wall along Vandalur - Kelambakkam Road from 2.1 m height to 2.7 m height.

Thiru.S.Subbarayalu Naidu, Director, along with Deputy Director, Thiru. N. Ramesan visited UK and other European countries from 1.8.81 to 20.8.81 to study Zoo Design. Constitution of a Governing Board was ordered in GOMS No.1027 F&F dated 26.8.81 with a view to shorten the administrative procedure and take quick decisions. There was difficulty in getting the works executed through the private contractors. Further, as per Government orders in force then, all works costing more than Rs.5.00 lakhs should be handed over to the Tamil Nadu Construction Corporation. It was ordered by the Government to hand over the work to the Corporation on a turnkey basis vide G.OMs.No.1271 F&F dated 29.10.1981.

Considering the emergent situation for acquisition of land for the zoo, the Government ordered in G.O.Ms.No.1514, F&F dated 29.12.1981 that provision of Section 5 A of the Land Acquisition Act shall not apply to Arignar Anna Zoological Park. Construction of compound wall and enclosures for Hippo, Zebra and Deer complex was started.

In order to initially accommodate the animals transferred from the corporation zoo, fabrication and construction of transit enclosure with compartments were started. A site situated along Vandalur - Kelambakkam Road was selected for the following recorded reasons:

1. The site is in a secluded area away from the sites selected for the animal enclosures of the zoo.
2. The site is situated along Vandalur - Kelambakkam road which is convenient for transport and unloading of the animals from corporation zoo.

3. The site is nearby the proposed location of the Veterinary Hospital, which in course of time will facilitate frequent observation of the animals kept in quarantine by Veterinarians.

Electricity supply was given. Three pumps attached to the open wells at Peria Eri, Fodder Bank and Otteri were energised and water pumped from these wells was used for raising nurseries, fodder banks and construction works. An area of 5 ha with fodder trees (Subabul) and 9 ha with fodder grass were raised. These areas were opposite to Veterinary Hospital.

1982

The first enclosures to be completed were those for the Zebra and a common bird cage. This bird transit enclosure was fabricated by TANSI. Seven Sambars, five Macaw Parrots and one African grey parrot were transported from the old Corporation Zoo.

By an order dated 7.7.1982 (G.O. 945 F&F), the Government directed that the elephant calves born in captivity should not be sold to any organisation within the country, but reserved for exchange purposes for obtaining animals from other countries for Vandalur Zoological Park.

Since Government architects would not be able to design animal enclosures which was a specialised type of work, proposals were sent to the Government, to entrust this work to private architects. A panel of architects was sent for approval. The Government in G.O. Ms.No.723, F&F dated 27.5.1982 ordered engaging the following private architects for designing various animal enclosures, Nocturnal Animal House etc.

1. M/s. Kingsway Consulting Engineers, for major Madras - 8 works
2. Gupta Associate Architect, Madras - 1
3. DhalaKuppusamyRebello, Madras - 10 for minor works
4. S.F. Rajarathinam, Madras – 28

Transport of animals and birds from Corporation Zoo to Vandalur posed a major challenge. Various organisations such as Heavy Vehicles Factory, Avadi, Public Works Department workshop

and Madras Race Club were approached with no result. At last, Sri Rama Vilas Service (S.R.V.S.), a Transport company could handle the situation and with their great effort and cooperation, the animals such as Zebra, Hippo, Black buck, Sambar and some birds were transported.

1983

The Bear Enclosure Animal House was to have a rock facing in the front. Since this type of work was new, the then Range Officer, Thiru.A.Selvaraj, was sent to the Hyderabad Zoo to study the execution of this type of work. The works for major enclosures for Lion, Tiger and Panther were started.

For the Lion and Tiger enclosures, a huge quantity of earth work excavation had to be done. So, the excavation works were done using heavy machinery 'such as Poclain and Tippers' for early completion. Simultaneously the formation of circular road and other foot paths were started. Avenue trees were planted using tall seedlings of 2m height.

An area of 7 hectare was selected for construction of staff quarters with an approach road from GST road and in close proximity to Vandalur Railway Station. A layout for location of all staff quarters and approach roads leading to quarters had been prepared by then. Construction of quarters for Assistant Engineer and two Range Officers was started on priority basis.

That year, due to drought, water availability in the zoo was very much reduced and this was affecting the progress of work. During the Governing Board Meeting prospects of buying water were also discussed. However, the available water resources were tapped fully and used prudently. Thus the works were pushed through without any impediment.

1984

Compensation for the lands acquired was sanctioned in G.O.Ms.No.1345 dated 28.11.1984.Most of the major enclosures such as Lion, Tiger, Panther, Elephant, Bear, Rhino and staff quarters, Veterinary Hospital and stores were completed.

There was a small hillock centrally situated in the layout of the zoo, called 'Chinna Kunnumalai', extending over an area of 15 ha (37.35 acres). While selecting the area for construction of enclosures, the enclosures for Lion and Tiger were located on the slope of this hillock taking advantage of this natural landscape. This was found ideal for depicting 'Prey-Predator Theme'. The enclosure for Lion (Predator) was located on the top portion of the hillock on the Southern part and below that is the Prey-enclosure viz., Nilgai with a common moat. Similarly, Tiger (Predator) Enclosure was located on the top portion of the Northern part of the hill slope and at lower portion is the prey enclosure viz., Sambar. These enclosures could be viewed by visitors even while walking along the circular road. Other enclosures viz Elephant, Bear and Rhino were constructed based on the availability and requirement of the area of each animal.

All the animals and birds (155 in number) were gradually shifted from Corporation Zoo. During March 1984, one Thamin deer was born in captivity, which was 'a highly endangered species' in the world.

To supplement the ground water resources for the zoo, water from the Palar River bed was also sought for. The Alandur Municipality agreed to divert necessary quantity of water from its water mains. For this, a branch line of 3.5 km length from the 32nd km. of the Alandur Main had been laid to bring the water to the Zoo. The laying of pipeline, erection of booster pumps and provision of allied facilities had been taken up on priority basis by TWAD Board and the works completed. Palar water started flowing to Vandalur Zoo from 17.7.1984.

1985

The Zoo was opened by the then Chief Minister Dr.M.G.Ramachandran on 25.7.1985 and named the Arignar Anna Zoological Park. The inaugural function was organised on a grand scale. A *pandal*was erected in front of Office Building stretching up to Kelambakkam Road on the South. There was a huge gathering of participants in the function, which included Hon'ble Ministers, dignitaries, MPs, MLAs, Officials and thousands of public from the City and the villages around.

The students of Shalom Nursery School welcomed the Chief Minister by spreading a floral carpet. Light music programme was arranged. The first entrance ticket was issued by the Hon'ble Chief Minister Dr. M.G.R to Selvi B.R.Rajitha, a student of Shalom Nursery School. The function was a grand success and there was a wide coverage by press and TV Channels. This eventually resulted in great publicity and there was steady inflow of visitors from then on. Deer Safari and Lion Safari fencing work also started during this year.

The revised layout of the Vandalur Zoological Park was approved by the Government in G.O.Ms.No.987 F&F dated 02.08.1980. Most of the works were completed during the tenure of Thiru Subbarayalu Naidu. He was the mentor and father of Arignar Anna Zoological Park.

1986

The entrance was designed as per the suggestion of the Chief Minister by the leading architect M/s Kingsway Consultants and the Cine Art Director Late Thiru P. Angamuthu. A Pre-historic Animal Park was sanctioned in G.O.Ms.no.10 dated 6.1.86 for Rs. 5.50 lakhs and the work started.

On 22.3.1986, the Hon'ble Minister for Forests inaugurated the Battery operated vehicle and also released Baboons and Bears in the enclosures.

The Malabar Squirrel, a rare endemic species found in Western Ghats, breeds rarely in captivity. But due to the conditions created and maintained in its enclosures similar to its natural habitat, breeding was successful, which was a noteworthy feature during that period.

With the increasing number of visitors, the parking area facility was planned and executed. The State Transport Corporation also consented to have bus terminals at Vandalur Zoo premises in public interest. Therefore, designs for developing the parking area were obtained from an approved architect and parking area development works were taken up.

In a labour dispute filed by one of the unions, it was held that Arignar Anna Zoological Park would not come under the purview of

Industrial Disputes Act as per G.O.Ms.No.1322 Labour department dated. 18.7.1986.

1987

The Serpentarium and Nocturnal Animal House construction works were completed. An elephant was gifted to New Zealand by the Prime Minister of India. One male Hippo calf was born on 12.3.87.

On 11.3.87 and 12.3.87, Mr.Dong Woodhouse the first Secretary, Australian High Commission visited the Zoo. He expressed keen enthusiasm for the zoo facilities and informed that he would be recommending to the Australian National Park and Wildlife Service that the AAZP be an approved zoo for accepting Australian animals.

1988

Main entrance work commenced. Three kangaroos were received from Sydney Zoo, Australia on 21.5.1988.

1989

On 2.10.1989, the Hon'ble Chief Minister of Tamil Nadu along with other Ministers visited the zoo and inaugurated the Wildlife Week celebrations and also opened to the public four newly constructed enclosures, the Lion Safari, Walk through Aviary, Reptile House and Nocturnal Animal House.

1990

On 10.1.90, Mr.Rahul Gandhi S/o former Prime Minister of India visited the Zoological Park, and particularly the Lion Safari and Nocturnal Animal House.

On 13.3.90 Dr.M.S.Swaminathan, President, I.U.C.N. and Member, State Planning Commission, opened the Common Langur Enclosure and appreciated the plan of the zoo and the upkeep of animals. He said, "This is a unique zoo not only with reference to the area covered but also with regard to the imagination and dedication displayed in planning the zoological garden and making the animals feel happy. I congratulate all involved in planning, establishing and

maintaining the zoo. I wish this zoo continued growth, since it can help to instill among the youth a love of nature and of biological diversity".

On 5th October, 1990, the new entrance complex of AAZP was inaugurated by the Hon'ble Chief Minister of Tamil Nadu. Construction of museum with dismantled materials from the old Corporation Zoo was also completed.

1991

Aquarium work was commenced. The design for the Aquarium was in the shape of a large fish with its mouth open and the visitors enter through the simulated 'gills'.

1992

The Central Zoo Authority, a statutory body of Ministry of Environment and Forests, Government of India was established to oversee the functioning of zoos and provide them technical assistance. AAZP is one of the recognized zoos in the country and renewal of recognition is sought from the CZA once in every three years.

1993

AAZP was nominated as Official Stud Book Keeper for LTM for the whole of India.

1994

One Lion cub was sent to Singapore Zoo.

Hon'ble Thiru. S.Thondaman, Minister of Tourism Sri Lanka visited the Zoo and appreciated efforts.

1996

An additional breeding house for the Tiger and watch tower in Lion Safari Park were constructed.

1997

Deer translocation: The Tambaram Air Force station, located about 3 Km from Arignar Anna Zoological Park, was facing acute threat from the free ranging deer within their campus. The officers and staff

found it difficult to operate the aircrafts with the free ranging deer very often moving on the run way at crucial take – off and landing hours. To get over this problem an “Operation Deer drive” was carried out by creating a chain link corridor 10 m wide 1.3 km long from Tambaram Air Force to Arignar Anna Zoological Park. About 329 deer were driven into Arignar Anna Zoological Park. The "Operation Deer Drive" continues to be a success story in wildlife management.

1998

Two King Cobras were obtained on exchange for one male Asiatic Lion from Shimoga Zoo. A unique habitat was created to make them feel totally at home providing air-conditioned rooms with adequate enclosure enrichments. An Interpretation Centre for Birds was opened.

As a unique effort, a small mammal house for the squirrels - the Giant Malabar Squirrel and the Grizzled Giant Squirrel was constructed. This house offer unique experiences to visitors and a good natural abode for the mammals. Giraffe House was constructed to house the Giraffes. The Otter House constructed on modern concepts, enables the visitors to see the Otters at close quarters in its original habitat.

1999

The Central Government banned the training and exhibition of five species of animals viz. Tiger, Lion, Panther, Bear and Monkey in 1998 and requested the State Government to set up Rescue and Rehabilitation Centre. Accordingly a Rescue and Rehabilitation Centre was established. To tide over the problem of overcrowding, additional cells were constructed for Lion, Tiger and Panther. Kangaroo House was constructed providing good living space for the animals Butterfly House was constructed in the new invertebrate section in the zoo.

An Amphibian House was constructed, the first such breeding centre in India. Common tree frog, Indian cricket frog, common Indian toad, Ramanella, Indian pond frog, Indian bull frog were some of the species exhibited providing a completely unique experience for the visitors, particularly the students.

2000

The Zoo school was opened within Arignar Anna Zoological Park campus to educate the general public and the students about wildlife and its conservation The zoo has an attractive Aquarium constructed in the form of a shark, on entering through the gills of the shark, the visitor gets to see 21 fish tanks. The entire aquarium has been given a facelift by painting the structure in the natural colour of a shark.

Breeding enclosure for 11 species of birds have been constructed and terrestrial species of birds housed in the new enclosure for captive breeding. Rat and Mice Rearing Centre was created to support and supply feed to the Reptile Centre. This is the first attempt made in the mass production of rats and mice to feed the snakes in a scientific and hygienic way.

2001

Breeding house for Reptiles was constructed contiguous to the animal cell on the rear side to give a disturbance free natural environment for the reptiles for successful breeding. This area is also used as quarantine for snakes.

Arignar Anna Zoological Park opened a website: www.aazoopark.in, where information on all the salient features of the zoo is available. An informative and illustrative zoo guide was prepared in collaboration with the Centre for Environment Education, Ahmadabad. A separate ticket issuing counter for Battery Operated vehicles was constructed.

2002

A wild Panther entered the zoo premises on 22.01.2002 from the adjoining forest area and was subsequently captured on 02.03.2002, after sustained efforts by the zoo management. As an additional attraction at the zoo entrance, animal models of Elephant and Bison were set up near the entrance in the lush green lawn. These life size models apart from being an additional attraction to all, also helped to educate the visually disabled visitors about these animals by touching and feeling. An additional animal house for the Panther along

with a yard was created. A modern animal house for wild boar with two animal cells and service area was also constructed.

A small mammal house was improved and large yard was provided for free movement and exercise. A facility for housing the birds received from the public and animal welfare organization was created. A convalescing yard was constructed in zoo hospital to provide better movement and space for the convalescing animals. The balance works in the Rescue Centre viz drainage, electrical fitting and water supply were completed and the centre became fully operational. An incinerator was installed. Interpretative display boards were improved. Additional animal house in Lion safari was constructed. Development works for Deer and Bison Safari were carried out. Database for zoo management was created. An electronic screen board at the entrance was installed as a visitor amenity.

2003

A Deer Safari in about 30 ha area was created adjoining the Lion Safari. Percolation ponds and fodder plot for foraging by the deer were completed during the year. Closed Circuit Television (CCTV) was erected to cover the store and reception area of the zoo.

2004

There were 21 fish tanks of size 3mx2mx2m in the Aquarium. Utilizing the extra space the number of tanks in the aquarium was increased to 32. The new entrance was constructed at the GST road and that would lead the public to the ticket counter. The approach wall and pillars were constructed with bricks and covered with polish granite tiles. The floor and the walking paths were covered with rough granite.

The Tamil Nadu Government in the G.O.Ms.No.314 dated 03.12.2004 accepted the proposal for the constitution of the Zoo Authority of Tamil Nadu for better management of Arignar Anna Zoological Park and for expedition of the funds released by the Central Zoo Authority. It was registered under the Registration of Society Act, 1975 (Tamil Nadu Act 27 0f 1975).

2005

The chambers of the Director and Deputy Director were improved by painting and providing ceramic tile flooring. New phone connection and computer facilities were also provided. The number of participants in Zoo school activities was on the increase every year. To accommodate them, a dormitory was constructed with all facilities. For the safety of the zoo inmates, a compound wall was constructed for 325 feet distance from the parking areas to the point of zoo dormitory at the cost of Rs 7.0 lakhs. The existing water falls at zoo entrance were improved by erecting a three ringed water fountain to attract the public at the zoo entrance.

2006

The existing guest house dining hall infra-structure was modified to cater better services to the visitors. The rest sheds located in the important junctions of the zoo were improved for the visitors by providing ceramic floors.

During this year, the balance of 950.35m length of compound wall was completed at Kelambakkam road which ensured the safety of the captive population. The existing water points were covered with plastic sheets to avoid any kind of contamination to ensure potable water to the visitors. The black topping was carried out for the length of 300m from circular road to children's play ground. In order to provide the safety and to avoid the entry of stray animals in the enclosures of Indian Gaur, Manipur Deer, Hippopotamus etc., the height of walls was further increased.

2007

To further strengthen the breeding and as a next step towards introducing the Lion-tailed Macaque in the wild, a new off-exhibit naturalistic enclosure was constructed. A modern wet moat enclosure for a rhesus macaque was built adjacent to the common langur enclosure for the better management of the species. A separate heronry was constructed near the Point Calimere Aviary and herons from the Point Calimere and Vedanthangal Aviary were shifted to the new heronry. The roof interior of the serpentarium was refurbished and ceramic tiles paved on the walls and floor of the visitors area to

improve cleanliness. Walk path with concrete tiles for the comfort of visitors was provided outside the Indian Gaur, Manipur Deer, Flightless birds, Wetland birds, Aquarium and Chimpanzee enclosures. New bitumen road was laid for the entire stretch of the deer safari and a percolation pond was created for the benefit of the deer.

2008

An Additional Director post was created and Mr.Yuvaraj, I.F.S., Conservator of Forests joined duty. A separate nursery was established for the plants to be planted in the rescue centre area. A new ticket counter was constructed before the waterfall entrance to avoid congestion. Parking area was leased out to a private contractor. The black topping was carried out in the circular road and other link roads. Elephant ride and Deer Safari were inaugurated by then Honorable Local Administration Minister on the 31st of August 2008. Two elephants, Pari and Ashwini, were brought from Indira Gandhi Wildlife Sanctuary, Pollachi for elephant rides.

The services of five more ten seater, battery operated vehicles for the benefit of the visiting public were added. A Junior Research Fellow was appointed for the conservation breeding of Lion tailed Macaque project. Seedlings of the tree species preferred by the LTM in their natural habitat from Valparai were brought and raised in the newly constructed off-exhibit LTM enclosure.

Under the CZA sponsored project on the 'Population control of prolifically breeding animals, surgeries were performed on selected male Marsh Crocodiles to control breeding. A conference hall was constructed in the first floor of the Zoo Veterinary Hospital to take classes for the visiting students, faculty members and internees of different colleges.

The black topping was carried out for full length in the circular road and wild dog road. For the convenience of visitors a paved walk path was laid out in Sloth Bear, White Tiger, Point Calimere and Vedanthangal Birds' Aviary. Rest shed was renovated in the Panther area. Additional cells were constructed in the Sloth bear House in order to accommodate more bears. Replacement of weathering courses were carried out in the animal cells of Chimpanzee, Lion tailed Macaque, and Zebra enclosures.

2009

Deepening of Otteri lake, strengthening of bund and laying of foot path were completed with funding from Department of Rural Development. Terrestrial aviary was renovated and lawns, fountains, streams and gardens were developed. The space in between the lion and tiger enclosures was developed into a garden with landscaping, fountain, streams and walk paths. A pair of Ostriches was procured from the Livestock Research Station, Kattupakkam, a unit of Tamil Nadu Veterinary and Animal Sciences University. A new road was laid from the peafowl enclosure to Otteri Lake.

2010

Four elephant calves rescued from different parts of the state were brought to the zoo for hand rearing. A five day hands-on training sponsored by Central Zoo Authority for the veterinarians and biologists of Indian Zoos on the SPARKS software of ISIS was conducted. Nutritional requirements and the diet sheet of AAZP were reviewed by the Department of Animal Nutrition, TANUVAS. Improvements to the Veterinary hospital like semi-auto analyzer, deep freezer were procured. Motorized double gates were provided in the Lion safari. A new enclosure for the Siamese crocodile was constructed.

2011

20,02,545 visitors visited the zoo during the year 2011-12 and Rs.5.15 crores revenue was realized. A natural open air combined serpentarium for non-venomous snakes and Combined Chelonial Display Centre were constructed. Rain water harvesting structures were constructed in the Deer Safari, and one pump house, near Wild Dog enclosure and birds area. A watch tower was constructed in Otterilake. Two troops of LTMs were released in the off-sight breeding enclosures. Renovation of wild ass enclosure was carried out. 5000 tree saplings were planted in the spaces available in the zoo to improve tree cover. Interpretive signage boards were improved.

2012

Initiatives like kraals in Deer Enclosure, redesign of Jackal Enclosure, improvement of Wild Dog Enclosures and modification of Birds of Prey Enclosure were carried out.

Establishment of open bird park, improvement of frontage, conversion of Tata Ace vehicles into road trains and creation of mud islands in Otteri lake were been carried out. Then Hon'ble Chief Minister of Tamil Nadu inaugurated the zoo frontage on 19.06.2012.

2013

Replacement of rusted iron gates with stainless steel within Lion Safari enclosure and all carnivore enclosures, construction of additional rooms for white tiger, partition yard for wild boar, redesigning and construction of new enclosure for birds were the priority activities during this year.

This year also witnessed the establishment of the Advanced Institute for Wildlife Conservation (Research, Training and Education (AIWC) and establishment of Forest and Wildlife Museum.

Construction of 28 Nos. of peculation ponds, purchase of garbage vehicle, formation of water channels, relaying of road using plastic waste and Interpretation Centre were carried out. The Hon'ble Chief Minister of Tamil Nadu, visited Arignar Anna Zoological Park on 15.03.2013 and 12.11.2013.

2014

Redesigning and improvement of hand rearing facilities in zoo veterinary hospital, redesigning of the existing animal house of Nilgirilangur, replacement of rusted iron gates and grills and redesigning of animal house for striped hyaena, construction of underwater viewing gallery for Gharials and construction of addition enclosure for Otter were carried out.

2015

Construction of additional enclosure for White Tiger, King Cobra, redesigning and remodeling of store, kitchen and commissary building, environmental enrichment works for animal exhibits, general surveillance cum strengthening the security system at the zoo and establishment of new butterfly park were carried out.

9. Ex-situ Conservation of Wildlife Emergence of the Concept

In the recorded history of human development, the faunal species were thriving extremely well till about 18th century, when human population was less, forests were abundant and the needs limited. But the gradual decline of population and communities of wild fauna started with progress of human development, when they were hunted indiscriminately for sport and recreation, passion and prestige. Adding further to their plight was a host of anthropogenic disturbances.

During their struggle for continued survival in the developing world, few species have perished, while others continue to struggle to exist.. Realization set in around the 20th century, by which time hundreds of thousands of animals and birds were lost to the ruthless shooting.

Many efforts were taken to prevent this trend of declining wildlife population in the State by closing of shooting areas, declaration of sanctuaries, National Parks, Tiger Reserves, regulating gun licenses, legislation for protection of wildlife etc., These are all part of 'in situ' conservation measures taken up in the habitat of the animals. But an imperative need was felt to initiate conservation of wildlife, particularly of those species that were categorized into endangered (or) vulnerable lists, outside their natural habitat as per the strategies to be adopted for wildlife conservation and management. Thus emerged the notion of initiating ex-situ conservation activities in the country.

Ex-situ conservation emphasizes the conservation of biodiversity outside their natural homes. This method of species conservation also helps for fostering large scale awareness among people about the significance of wildlife conservation, in general and of a species, in particular. The process of ex-situ conservation involves setting up of a zoo, zoological park, nature park, gene bank, animal park, aquarium, wildlife breeding centre, biological park, wildlife safari, species conservation centre, co-ordinated breeding programme, breeding loan centre etc.

There has been a long tradition of private ownership of wild animals in the country. While *madaris* maintained bears and monkeys to indulge in road side shows, snake charmers organized snake shows

and elephants held in captivity by individuals / mutts / temples etc., were frequently paraded in public. Circuses holding large array of wild animals like elephant, lion, tiger, rhino for public performance was also common. In addition, certain wild birds and animals were bred in captivity for illegal (or) legal for trade of animals and their products. All these activities continued to flourish till the enactment of the Wildlife (protection) Act, 1972.

10. Zoos as Successful Ex-situ Conservation Centres

The Government of India realized the need for ex-situ conservation of wild fauna soon after Independence, and the then Indian Board for Wildlife (now the National Board for Wildlife) made important recommendations in this regard. In tune with the recommendation of the Board in its meeting in 1952, the first modern zoological park of the country was established in New Delhi, the national capital. An expert committee on management of zoos was set up in November 1972, and its recommendations accepted in June 1973, which has relevance even in the current period.

While the National Wildlife Action Plan of 1983 emphasized the role of ex-situ conservation in the national conservation efforts, the Action Plans during the period 2002-2016 have continued to lay emphasis on the role of zoos for ex-situ breeding of endangered species of wild fauna and their rehabilitation in the wild as per the IUCN guidelines.

A central agency, the Central Zoo Authority (CZA), was established in 1992 under the provisions of Sections 38A to 38J of the amended Wildlife Protection Act, which was empowered to accord recognition and to oversee the functioning of the zoos. With the inclusion of the Rescue Centre and Circus in the definition of Zoo in 2003, their recognition has also been brought within the ambit of Central Zoo Authority. The CZA has also been identified as one of the organizations for developing capabilities in this field.

To give proper direction and thrust to the management of the zoos in the country, the National Zoo Policy was framed and adopted by the Government of India in the year 1998. The main objective of establishing zoos as outlined in the National Zoo Policy was to complement and strengthen the natural efforts in conservation of rich

bio-diversity of the country, particularly the wild fauna. This objective could be achieved 'by supporting the conservation of endangered species by giving species, which have no chance of survival in the wild, a last chance through co-ordinated breeding programme under ex-situ conditions and raise stock for rehabilitating them in wild, as and when, it is appropriate and desirable'.

Conservation education and research for conservation of wildlife are other objectives of zoos which are enshrined in the National Zoo Policy. As per the policy, the Zoo shall continue to function as a Rescue Centre for orphaned wild animals.

11. Arignar Anna Zoological Park

(a) Present Status and Practices

The Arignar Anna Zoological Park is situated at Vandalur which is 32 km away from the metropolitan city of Chennai on the G.S.T. Road. In the eastern side of the G.S.T. is the zoo over a sprawling area of 602 hectares. In the initial stages, the establishment of the zoo was done over an area of 510 hectares including the lands acquired from Revenue Department and Patta lands adjoining the areas selected for establishment of the zoo. By 1999, as per the guidelines from the CZA (Central Zoo Authority), a Rescue and Rehabilitation Centre was formed over an area of 92 ha. of adjoining Reserve Forests taken over from the Research Wing of Forest Department.

(b) Vegetation

The vegetation of the Arignar Anna Zoological Park comprises of tropical dry evergreen forests. The existing vegetation was scrub forests invaded by weeds and gradually due to sustained efforts it has been planted with dry evergreen species. In some places there are a few cashew and eucalyptus trees. About 138 plant species are found in the area. It was so planned in early stages that the natural vegetation of the areas were to be kept intact except where the enclosures, roads and structures had to be constructed. Further, this entire campus has been protected by 9 ft high walls. Therefore, there is absolutely no biotic interference in this area.

(c) Species exhibited

The AAZP is managed by dedicated staff consisting of 265 full time staff and contract labourers. As per the Zoo Inventory as on 20.03.2016 there are 170 species of animals (mammals, birds & reptiles) numbering 2142 animals exhibited for public. These animals and birds are housed in large naturalistic enclosures with dry, wet moats and spacious cages.

The Zoo maintains a viable population of threatened and endangered species of the Western Ghats.

(d) Theme of Display of Animals

The Arignar Anna Zoological Park exhibited the animals as per the taxonomical classification. This is the most traditional method as animals are assembled in particular blocks of reptiles, birds, carnivores, herbivores, primates etc., The Arignar Anna Zoological Park has also thematic exhibits like prey predator enclosure (Tiger & Sambar; Lion and Nilgai), Nocturnal Animal House, Walk-through Aviary (Bio-centre) for terrestrial birds, replica of Point Calimere and Vedanthangal Birds Sanctuary, Safari Parks (Deer & Lion), Reptile House, Aquarium and Rescue and Rehabilitation Centre for Lion and Tiger , (rescued from the circuses).

(e) Vision of the Zoo

The vision of Arignar Anna Zoological Park is to inspire environmentally sensitive people who care for the wild fauna and flora and conserve it for long term welfare of mankind.

(f) Mission of the Zoo

1. Conservation of the fauna of Eastern and Western Ghats with special reference to LTM, Nilgiri Langur, Indian Bison and small mammals.
2. To provide to all the animals housed in the zoo highest standard of housing, upkeep and health care.
3. To provide zoo visitors opportunities for viewing of wild animals to develop an empathy towards them.

4. To carry out research on aspects of biology, behaviour and genetic makeup of endangered species of wild animals and facilitate their breeding.
5. To provide requisite housing, upkeep and health care to the distressed animals rescued from various source.

(g) Strategy for achieving the Mission of the Zoo

1. To maintain viable population of various species housed at the zoo through appropriate nutrition, housing, health care and behavioural management.

2. To provide thematic display of healthy and active animals in naturalistic enclosures and facilitate the visitors to appreciate and understand the ecological linkages of nature though use of appropriate signage and interpretation facilities.

3. To provide the zoo visitors a hassle free stay in a secure environment and conduct them through the zoo in such a manner that their visit to the Zoo is rewarding.

4. To upgrade the technical knowhow and the professional efficiency of the zoo personnel at all levels to implement the aforesaid strategy successfully.

(h) Conservation Breeding

The zoo has been engaged in developing self-sustaining population of various species of animals. This needs detailed inputs regarding biology, behaviour and genetics of individual species. The zoo has done extremely well in breeding endangered species, as listed below.

1. Lion tailed Macaque (Macacasilenus)
2. Nilgiri Langur (Trachipithecusjohnii)
3. Indian Gaur (Bosgaurus)
4. Brow-antlered Deer (Cervuseldieldi)
5. Indian Wild Dog (Cuonalpinus)
6. Bengal Tiger (Pantheratigris)
7. Black Buck (Antelope cervicapracervicapra)
8. Sloth Bear (Melursusursinus)

9. Indian Peafowl (Pave cristatus)
10. Indian Rock Python (Python molurusmolurus)
11. Marsh Crocodile (Crocodyluspalustris)

The Arignar Anna Zoological Park is the Coordinating Zoo for the Lion tailed Macaque and Nilgiri Langur. The zoo has two off-exhibit breeding enclosures for Lion tailed Macaque. An extensive database of animals is maintained under a planned breeding programme in the format prescribed by ZIMS (Zoological Information and Management System). The AAZP has published a number of research articles on various aspects of animal breeding, behaviour, nutrition etc., on various national and international journals.

The Arignar Anna Zoological Park is one of the largest scientifically managed and recognized zoos in the country and follows meticulously the guidelines of Central Zoo Authority for upkeep of health, hygienic and breeding of animals. The zoo's currently approved master plan extends for the period of 2013-2023.

(i) Governing Board

In order to discuss management and development issues of the zoo and to take timely decisions, a Governing Board was constituted in 1981. Zoo experts were co-opted as members as and when necessary for any specific matters (G.O.Ms.No.1027 E&F Department, dated. 26.08.1981). The Governing Board consisted of Secretary to the Government E&F as a Chairman, the Secretaries of Government RDLA Department, Revenue Department, Finance Department, Principal Chief Conservator of Forests were members and the Director, Arignar Anna Zoological Park served as Member Secretary.

(j) Zoo Authority of Tamil Nadu

In accordance with the guidelines of Central Zoo Authority and with an objective to facilitate supervision, control and management of Arignar Anna Zoological Park, and for flow of funds for development and improvement activities, the Government of Tamil Nadu approved the Zoo Authority of Tamil Nadu in the G.O.Ms.No.314 E&F (FR-V) Department, dated. 03.12.2004. The Governing Board was further reconstituted to include the Hon'ble Chief Minister of Tamil Nadu as

the Chairperson on 6th March, 2013, to further efficient administration of the zoological parks.

(k) Other Ex-situ Conservation Centres in Tamil Nadu

The Central Zoo Authority has recognized the following the zoos / zoological parks run by the Forest Department and Private Trusts in Tamil Nadu.

1. Arignar Anna Zoological Park, Vandalur, Chennai
2. Guindy Children's Park, Chennai
3. Amirthi Mini Zoo, Vellore
4. Kurumbapatti Zoo, Salem
5. Proposed Tiruchirapalli Zoo
6. Madras Crocodile Bank Trust & Centre for Herpetology
7. Chennai Snake Park Trust, Guindy

12. Guindy Children's Park

The Guindy Children's Park is situated in the area known as the Guindy Lodge. A former hunting preserve, it had originally belonged to a British national Gilbert Rodericks, who died in 1817 with his property heavily mortgaged. The Madras Government purchased the land for a sum of Rs.35,000 in 1821.

Soon after, the area of 500 ha began to be used as the country house and weekend resort of the Governor of Madras. The Guindy National Park owes its existence to the decision of the Governor of Tamil Nadu, who offered to relinquish about 400 ha of the Guindy Reserve Forest area from the Raj Bhavan management so as to reduce cost of maintenance and to contribute to the public amenities. This proposal was readily accepted by then Prime Minister Shri Jawaharlal Nehru, who suggested that the area should be preserved and a small part of it developed as Children's Park. The area was taken control by Tamil Nadu Forest Department in 1958.

As per the vision of the then Prime Minister, the Guindy Children's corner was developed in 1959 and maintained as a medium zoo in natural and wooded surroundings. Significantly, the park is one of the last patches of the remnant vegetation representing the Carnatic coast, viz. tropical dry evergreen forests. The wealth of plant life is

amazing with over 350 species of flora including trees, shrubs, herbs, climbers and grasses recorded. Equally impressive in the animal life with an array of mammalian species like Black buck, Spotted deer, Jackal, Jungle cat, Civet cat, Hedgehog, Shrew, Mongoose, Bonnet macaque and Pangolin. There is an important place called the Polo Ground for black buck and chital in the Guindy reserve.

As the Guindy Children's Park is located in 8.8 ha areas of the Guindy Reserve Forest, the native plant diversity includes 75 species. The Park has a total of 35 enclosures, housing 16 species of mammals, 29 species of birds and 8 species of reptiles.

13. Amirthi Mini Zoo, Vellore District

Amirthi Mini Zoo was started in 1969 on a 10 ha area of Thellai Reserve Forest in the foot hills of Jawadhis, known as the land of the Sandal. The Jawadhi Hills are comprised of mainly dry deciduous forest with abundance of many timber and MFP yielding tree species. Flanked by the semi-perennial Amirthi river dropping from the hills, the picturesque location is at an altitude of 815 ft above MSL. Initially, the zoo housed a large number of animals including Asiatic Lion, Leopard, Sloth Bear, Asian Elephants, Python, Peafowl, Parakeets etc. However, in order to conform to Central Zoo Authority specification, many larger animals were shifted to Arignar Anna Zoological Park and a few released into the wild.

14. Kurumbapatti Zoo, Salem District

Kurumbapatti Mini Park was established in 1981 over an area of 11 ha in Kurumbapatti Reserve Forest at the foothills of Shevaroy hills along the Salem – Yercaud Ghat road. The park is a typical representation of deciduous forests. Possessing a gentle topography, the zoo is designed with a watch tower which provides the visitor a glimpse of the western slope of the Yercaud hills.

As it is located at the edge of the natural forest, free ranging wild animals like Indian Gaur, Spotted Deer, Barking Deer, Wild Boar are frequently sighted by visitors here. Currently, the zoo has separate animal enclosures for deer, primates, snakes, crocodiles, turtles, otters and for birds. The Asiatic Elephant and Aviary are other attractions at the park.

15. Proposed Tiruchirapalli Zoo

Tiruchirapalli city is heart of the education, manufacturing, trade, commerce and pilgrimage in the state. An area of 63 ha in the M.R.Palayam Reserve Forest along the Tiruchi-Chennai National Highways has been chosen to locate the zoo. The design of the new zoo will involve creating ecotypes in consonance with the five forms of landscape described in Sangam literature and to display the animals and birds associated with each of the ecotype.

16. Crocodile Farms

The country has three species of crocodiles in the wild - the mugger (or) marsh crocodile (crocodylus palastris), the gharial (or) gangetic crocodile (crocodiylmgangeticus) and the salt water crocodile (crocadytusporosus). Earlier, these crocodiles were heavily poached in those days for their skin for international markets. The Government of India, through the states, protected all the three species under the Wildlife Protection Act, 1972. There are three Crocodile Farms maintained by the Forest Department and two private farms run by societies as listed below.

1. Amaravathi Crocodile Farm, Coimbatore
2. Sathanur Crocodile Bank, Tiruvannamalai
3. Hoganekkal Crocodile Bank, Dharmapuri
4. Madras Crocodile Bank and Centre for Herpetology.
5. Madras Snake Park Trust.

CHAPTER-VI

VETERINARIANS IN TAMIL NADU FOREST DEPARTMENT

Introduction:

The State of Tamil Nadu has undergone a revolution in wildlife veterinary care, with illustrious veterinarians serving the Forest Department from 1905. The traditions of the senior veterinarians, we even today upheld by the stream of young veterinarians who serve us today in zoos and in tiger, elephant landscapes. The decades of work done by veterinarians have given this state a wealth of information in wild animal care. Some veterinarians have penned down their experiences and treatment practices in the animal care register maintained in the elephant camps at Anamalai Tiger Reserve and Mudumalai Tiger Reserve. The Arignar Anna Zoological Park Veterinary hospital, has built treatment of veterinary knowledge to support wildlife disease treatment. Wildlife veterinarians from Tamil Nadu have done innovation treatments for all wildlife. They have been experts in captive elephant treatments and treatment of rescued wildlife. They have supported the Department in controlling man-wildlife conflict.

Situation and helped avoid untoward incidences from unruly public in many instances.

The Illustrious veterinarians who served the cause of Elephants and Wildlife in Tamil Nadu Forest Department for over 110 years are as follows:

1. **Dr.F.X. Mascarenhas,** a Graduate of Bombay Veterinary College, Married to Alice Saldanha and were blessed with 5 daughters and 4 Sons.

He had a brilliant career in the Madras Civil Veterinary Department served as Senior Lecturer and Vice-Principal, Madras Veterinary College during 1903-1905.

It appears that though initially deputed for a year to the Madras Forest Department, he continued to serve the department with all sincerity. He served the department till his retirement during 1927.

For looking in to the Veterinary care of the animals, a post of Inspector of Government Elephants was created in 1905, which got re-designated as special Veterinary Inspector in 1906 and then as the Forest Veterinary Officer (FVO) in 1957.

Senior Lecturer and Vice-Principal of the Madras Veterinary College got appointed as Mr. Mascarenhas, Inspector of government Elephants in March 1905.

Under the orders of Mr. Gass, he prepared two notes on care of and diseases of bulls and elephants for the guidance of Forest subordinates in charge of Government elephants and bulls.

He was requested to take every opportunity on instructing the subordinates in charge of Government animals regarding their keep, feed, treatment of simple ailments, symptoms of diseases, etc., and for this purpose, to hold classes at difference centres in consultation with the District Forest-officers.

Pit Capturing Method

General rules for catching elephants by the pit method were framed by Government (vide G.O.Ms.No.2963 Revenue, dated 25th July, 1895). Except for minor or local deviations these rules regulate elephant catching in this State even today. It may be of interest to learn of the methods actually adopted.

Elephant circular :-

Elephants circular was issued by Mr. P.M. Lushington, District Forest Officer, Coimbatore (South) way back in 1910 for the care and maintenance of captured elephants in camps.

2. Dr. S.D. Devadoss Pillai

Dr. S. D. Devadoss Pillai, succeeded Dr. F.X. Mascarenhas as Special Veterinary Inspector and served the department for about two decades.

3. Dr. S. Gopalan

Dr. S. Gopalan succeeded Dr. Devadoss Pillai and served the department about 20 years. He is well known in the Madras forest department. During his tenure, in the year 1957, the post got re-designated as Forest Veterinary Officer. He received one year extension after his retirement during mid-1960s.

4. Dr. V. Krishnamurthy

Dr. Vaidyanathan Krishnamurthy (1929-2002), Popularly known as Dr. K. graduated from the Madras Veterinary College and stated his career as Veterinary Asst. Surgery and served in Top sleep for few years managing camp elephants. Later he was elevated to the rank of Asst. Director of Animal Husbandry and occupied the post-Forest Veterinary officer since 1987 and continued file his retirement from Government service during 1987. He was responsible for instruction of Temple Elephant Rejuvenation camps.

He hard rich experience in post mortem and chemical immobilizations and translocated of problem elephants. A considerable feat was the capture of the 'Makhna' elephant in Gudalur area which killed above 15 persons, which has been named 'Murthy' at Theppakadu Camp.

Dr. Krishnamurthy served as Honorary Wildlife Warden, Nilgiris after retirement. He received Venu Manon Allies Award for Animals Welfare. He is popularly known as 'Elephant Doctor' in Tamil Nadu. He decorates our "Hall of fame" at Chennai and Coimbatore.

5. Dr. Zackariya

Dr. Zakariya who succeeded after Dr. V. Krishnamurthy was appointed as Forest Veterinary officer and served the department and cause of elephants well. He retired from the Department of Animal Husbandry in the rank of Addl. Director.

6. Dr. S. Shanmuga Sundaram

Dr. S. Shanmuga Sundaram succeeded Dr. Zackariya and served for the cause of elephants from 2000 to 2005. During his tenure he was responsible for conducting many Rejuvenation camps

for temple elephants, treatment of temple elephants and general up-keep of camp elephants at Mudumalai and Anamalai.

7. Dr. N.S. Manoharan

Dr. N. S. Manoharan the current Forest Veterinary Officer served this department as Veterinary Asst. Surgery, initially and served about 23 years for the cause of elephants and wildlife with varied experience, handling problem animals be is elephant or carnivores.

Dr. N.S.Manoharan, M.V.Sc, as Forest Veterinary Officer joined in 2005 in the office of the Conservator of Forests, Coimbatore Circle, Coimbatore-43. Presently, he is attached to the Additional PCCF, Project Tiger and carries out his duties and responsibilities from Coimbatore. Prior to joining as Forest Veterinary Officer he was working as Zoo Veterinary Officer in Aringnar Anna Zoological Park, Vandalur, Chennai (six years) and Zoo Director in VOC Park Zoo, Coimbatore (five years) for more than a decade.

The nature of duties over period have changed. Due to biotic pressures and various developmental activities on the forests the last two decade has seen an increased number of variety of wildlife related issues involving different wild animals like elephants, gaur, bear, leopard, tiger, primates, crocodiles, turtles, snakes, birds, pea fowls, wild boar, sea mammals etc.

The duties of the FVO include :

- Healthcare and management of department of elephants in Anamalai Tiger Reserve, Mudumalai Tiger Reserve, Sadivayal Elephant camp in Coimbatore, Kurumbapatty zoo in Salem, Amtithi zoo in Vellore, Deer parks in Ooty and Yercaud, Crocodile rearing center in Amaravathy, Sathanur and Hogenakkal.
- Providing treatment, performing surgery and convalescent care to the sick and needy wild animals.
- Prescribing treatment protocol and suitable suggestions for handling the wild animals in confinement and their management technique.

- Wild animals straying out of natural habitats into human inhabitations often trapped in open wells, deep pits, slushes, snares etc., require rescue and rehabilitation.
- Chemical capture of problematic wild animal species, securing, loading, transportation, releasing and rehabilitation. All Wildlife issues are highly sensitive in nature, delicate, stressful, require meticulous planning and high degree of professional skills, invite public, TV, media attention and physical and mental strength.
- Recommendation of diet schedule to the Department elephants, zoo animals and orphaned/abandoned young wild animals.
- Abandoning or orphaning of young ones which require stabilization, reassurance, reunion, relocation, rearing etc,
- Population management technique.
- In-situ, ex-situ exchange programmes.
- Identification of poached/seized wildlife materials.
- Deposing in courts in Vetero-legal cases for successful completion of cases.
- Awareness programmes.
- Extension activities.
- Other important area which require technical man power is wildlife deaths (due to diseases, poisoning, parasites, electrocution, poaching, accidents, infighting etc.,)
- Collection, preservation, labeling, dispatching of biological samples for laboratory and forensic analysis to assess the cause of death. Following up and recording of events is crucial in Vetero legal cases.
- Based on the findings and diagnosis carrying out preventive and prophylactic measures and ring vaccination programmes around Protected Areas.

Dr.Manoharan also observed, treated, immobilized, prescribed diet schedule, raised orphaned and abandoned young ones of many species, seen them growing old, deaths due to natural and unnatural causes, breeding and other behavioral aspects, tranquilization techniques, diseases of many wild animal species and suggesting preventive and prophylactic measures. These professional activities enabled him to understand their biological life cycle, dietary and nutritional requirement, husbandry practices, medical and surgical needs.

Dr.Manoharan's experiences include many other areas of wildlife diseases management support. He had also conducted post mortem of various species of wild animals in captivity and free ranging conditions which made him to master in Anatomy, Physiology, Pathology, Diseases course, biological sample collection, laboratory analysis and different causes of death. His Master degree in Veterinary Surgery is an added advantage for his successes in chemical immobilization and treatment including surgical intervention in wild animals.

The knowledge, expertise, experience in different situations which he gained in ex-situ facilities for more than a decade enabled him as a successful wildlife veterinarian when he joined as Forest Veterinary Officer in Coimbatore Forest Circle and worked in free ranging conditions.

Thus, the experiences, exposures, dedication, involvement, continuity for more than two decades in ex-situ and in-situ conditions provided him good knowledge on the life cycles, intra and inter species relationships, diseases, their management, ecological balance, population dynamics, emerging issues like HWC and contributed to their management.

His suggestions on wild animal behavior, field situation, requirement of technical assistance etc., formed basis for planning strategy in wildlife management and tackling conflict crisis.

Increasing Conflict Scenarios:

Tamil Nadu during the last 15 years faced increasing human wildlife interactions, conflicts and problems in the interfaces. This was mainly due to reduced forest cover, fragmentation, degradation, loss of corridor, landscapes changes, disturbances in buffer Zone (activities like educational institutions, places of worship, resorts, amusement parks etc.,), agricultural practices, pollution, mining, development activities in forest areas, roads, tourisms, diseases, natural calamities etc.,

The main issues posed and faced by wild animals include,

Straying out of forest areas and entering into agricultural fields and human inhabited areas causing damages and property loss.

Stranded outside forest areas endanger them and also become problematic.

As fallout trapped in pits, slushy areas, falling into wells, entrapped in snares, getting electrocuted, contract pathogens, lose their way back and astray.

Become aggressive, out of fear and self defense, charge people resulting in injuries or death.

All the above situations require good planning and skill to bring back normalcy.

When containment, confinement, driving operations fails Chemical immobilization and rehabilitation of the wild animals to natural habitat or captivity is resorted to. This is a specialized and skilled operation.

Few interesting case and Episodes:-

- Successful tranquilization enkralling and training of a problematic wild tusker aged about 20 years in **Kuppam area in Andhra Pradesh** during 1996.
- Successful tranquilization, enkralling and training of wild tusker aged about 20 years which killed three persons in **Ramakuppam area in Chitture Forest Division in Andhra Pradesh** and translocated to Thirupathi during 1997 which is now in Thirumala.
- Successful tranquilization, training of wild tusker aged about 25 years which killed 3 persons in **Ambur Range of Tirupathur Forest Division** and translocation to Anamalai Tiger Reserve during 1999 which is now a Kumki named Surya.
- Successful tranquilization of wild tusker aged about 30 years old which killed one person and a habitual crop raider in **Sirukundra Estate in Valparai** in 1999.
- Successful tranquilization of a wild tusker aged about 20 years in **Manjavadi area in Salem division** and translocated to Denginikotta area in 2001.

- Successful tranquilization, transportation enkralling and training of a 25 years old wild female elephant which created problems in **Pollachi division** for more than a year in 2003. Presently maintained in ATR and named as Kalpana.
- Successful chemical capture of wild tusker aged about 25 years which killed more than 10 persons in **Peppara Sanctuary in Kerala** State during 2006.
- Capture of problematic juvenile tusker which frequented human inhabitation in **Mankarai area in Coimbatore Forest Division** by chemical immobilization technique and subsequent translocation and training at Anamalai Tiger Reserve during 2007.
- Successful chemical immobilization of wild tusker aged about 20 years in a sugarcane field which strayed out of **Coimbatore Forest Division** and travelled through villages, towns crossed two National Highways and Railway lines for about 75 kilometers and entered **Sathyamangalam Forest Division** and subsequent translocation to deep forest in Thengumarahada area during 2010.
- Successful rescue of a 15 years old female wild elephant which accidently fell into a farm well about 60 feet deep by employing Kumki elephants in **Palakkadu Forest Division** of Kerala State in 2011.
- During 2013-14 two elephants (one juvenile male (April-2013) and one makhna (May-2013) tranquilized using kumkies from MTR and translocated in **Neelambur and Wayanad areas of Kerala.** These operations were carried out based on the request from the Kerala Govt. and orders of the CWLW, Tamil Nadu.
- A 20 years old wild tusker in **Hosur Forest Division** strayed into the town and took shelter in Ashok Leyland Campus. All efforts to drive it back to forest area failed and subsequently Dist. Administration, Police and Public mounted pressure to capture the animal. Later as per the orders of the CWLW the animal was successfully tranquilized on 28.07.2013 and for the **first time only using machineries like Crane, JCB, pulleys etc.,** the sedated animal was loaded, transported and released in Jawalagiri area.
- During August 2013 the **Historic "Operation Malai" in Thiruvanamalai Division** was carried out. Good observation,

analysis, inferences, successful planning, execution, precise tranquilization technique, capture, loading, transportation, training of six elephants and team work resulted in remarkable success. A milestone effort in the history of TNFD. A unique and first of its kind operation in the Country.

- On 03.04.2016 and 04.04.2016 two elephants were successfully tranquilized in Gudalur division and one released in Kottamangalam RF area after treatment and the other was taken to MTR for further maintenance due to its aggressive behavior.
- Many chemical immobilizations of captive elephants in the **camps, zoos, temples, circuses and private holdings.**
- Several Successful driving operations of straying out wild elephants, herds and individuals using Kumkies and elephant men.
- **Successful treatment of 6 elephants in wilderness** which suffered from severe verminous gastroenteritis, deep injuries and severe sprain.
- **Successful immobilization, treatment and release of a wild male elephant** with the assistance of kumkies in Segur range of Nilgiris North division during June 2015.
- Successful rescue and reunion of elephant calves with mother or herd. **Rescue and successful rearing of more than 25 elephant calves** which are abandoned, orphaned, washed in floods and maintained in Arignar Anna Zoological Park, Anamalai Tiger Reserve and Mudumalai Tiger Reserves.
- Successful chemical immobilization of a Female leopard which strayed out in to **Pollachi town** and subsequently released back in deep forest in Topslip area of Anamalai Tiger Reserve during 2010.
- Successful chemical immobilization of a male leopard in **Valparai town** which was injured badly and suffered fracture in the vertebral column and housed in the rescue centre in Rottikadai area during 2014 in ATR. **Good line of treatment, physiotherapy, radiation therapy, oral medicines, balanced and fortified diet and care resulted in complete revival of the animal from sure death.**
- **Successful combination of chemical and physical immobilization techniques to capture an injured leopard** in

Nilgiris South division during July 2015, subsequent treatment and translocation to AAZP, Chennai.

- **Successful combination of chemical and physical immobilization techniques to capture a snare injured leopard** in Nilgiris South division during March 2016, subsequent treatment and translocation to AAZP, Chennai.
- About **35 leopard rescues by chemical immobilization** in Valparai, Nilgiris, Coimbatore, Sathy, Karaikkal, Perambalur, Villupuram, Kanchipuram areas and by facilitating (Eg., by using ladder, poles etc.,) over a period of 15 years.
- **Successful chemical immobilization of an Indian gaur which strayed, injured few people and wandered in Salem city and translocation** to Yercaud hills during 2009.
- **Successful chemical immobilization and lifting of three Indian gaurs** from a 70 feet deep well in **Attur Forest division** during 2013. A challenging and risky operation from many points of views.
- **Five successful Indian gaur rescues from wells in Theni, Dindigul, Trichy Forest Divisions** and releasing them back into forests.
- **Five successful Indian gaur chemical immobilization, translocation and release in Anamalai Tiger Reserve** areas which strayed out of forest area, injured curious people and posed threat to public.
- **On 28.02.2016 tranquilized an adult Indian Gaur in Coonoor range in Coimbatore Circle** and removed a broken PVC pipe which struck in the right foreleg of the animal. The animal was treated and released in the wilderness successfully. The gaur operations were challenging, risky and required professional skills.
- **Five wild Tiger rescues** (Kalakkadu Mudunthurai Tiger Reserve, Mudumalai Tiger reserve, Anamalai Tiger Reserve, Coimbatore circle) by Chemical Immobilization technique and traps which strayed out of forest and killed human beings and lives stock and successfully either released or translocated to Vandalur Zoo for further maintenance in the last 15 years. These were emerging issues and required skill and planning.
- **Operation extermination of two problematic, strayed out and human attacking/eating tigers,** one in Nilgiris North

Division (2014) and one Gudalur Division (2015) along with Forest and STF officials after CWLW orders.

- **Seven sloth bears (snared, stranded, strayed out, problematic etc.,) successfully chemically immobilized, rescued, translocated and released** into suitable habitat in Nilgiris, Villupuram (1) and Sathyamangalam rehabilitated in AAZP in the last 15 years.
- **Successful chemical immobilization and rescue of wild monkeys/primates**. (Bonnet monkeys, Rhesus monkeys, common and Nilgiri Langurs and rehabilitation). Few Eg. Coimbatore city, Attur division, Erode town, Vazhapadi town, Courts, Hindu Office, Jail compound, Private house holdings, Hospitals etc.,
- **Successful chemical immobilization, rescue and translocation of different deer species** (spotted deer, Sambar, Black buck and Nilgiri Tahr). Few Eg. Wells, Farms, Educational institutions, pilgrim centres, Marriage halls, Medical College, drainage etc.,
- Mass translocation of about 250 spotted deer during 1998 from **Tambaram Air Force Station to Vandalur Zoo using BOMAS technique** successfully.

Elephant camps and Veterinary support:

In the year 1910, Mudumalai's first camp started in the Game Hut area. Madras Presidency can be duly credited for establishing permanent elephant camps at Sungam in the Anamalai in 1920 (which got shifted to Varagaliar later in 1956 upon the State reorganization) and at Teppakadu in Mudumalai in 1927. That the stock of elephants in the camps also came from captive born calves bore testimony to the point that the State had developed excellent rearing practices for its captive elephants for well over a century.

One of the 36 tribal communities, two communities in Tamil Nadu *viz.*, Malasars and Kurumbars are known for their ability to capture and handle elephants in the department over a Century. In Anamalais, majority of the Mahouts and Cavadis are drawn from Malasar. There are few Pulayars and Kaders are as well recently. Kurumbars of Mudumalai are experts in handling elephants and all the

mahouts and cavadis there are drawn from Kurumbar tribal community.

The above communities have traditional knowledge and also scientific knowledge acquired from the forest veterinarians. In future, there should be periodical training for the interested youth so that their 'symbiosis' with elephants are allowed to flourish. On the lines of Kerala, we need to establish schools for training Mahouts and Cavadis with due preference for the traditional communities of Malasars and Kurumbars.

Thus the veterinarians have served the Forest Department efficiently. Fortunately today many young veterinarians are jointly the forest service. This is in tremendous advantage for the department's efforts in handling wildlife.

CHAPTER-VII

BIOSPHERE RESERVES IN TAMIL NADU

1. Tamil Nadu, Land of First Marine and Terrestrial Biosphere Reserve in India

The Biosphere Reserves are internationally designated landscape/seascape units under UNESCO's flagship programme "Man and the Biosphere(MAB)". Designation of a site cannot be an end in itself; it leads to a second process of management to achieve the desired goals in a holistic manner at the site itself and in the case of global networks, to contribute to wider goals to safeguard the special characteristics of sites, which may be regarded as 'global common goods'. Biodiversity Reserves help ensure the environmental, economic, and social sustainability of the region, by encouraging wise and judicious use of Natural and Social capital. The Biodiversity Reserves may cover multiple Protected Areas integrating different concepts of preservation and protection. "*Preservation*" implies keeping an object safe and free from harm or decay. Stronger advocates of preservation however, adopt a less human-centred approach to environmental protection, recommending that nature does not relate to the needs and interests of human beings. "*Reservation*" involving protected areas inclusive of refuges and other reserves, aim to prohibit use or exploitation of an area, '*zoning*' or '*segregation*' seeks multipurpose use by careful management of resources. "*Protection*" implies adhering to set of regulation measures, keeping outside interference at bay. "*Conservation*" in its modern sense is a broader concept, comprehending all of these limited approaches and more and this all-encompassing aspect of conservation in any terrestrial or marine ecosystem, has been the basic theme of MAB Programme of UNESCO.

Today, environmental problems are increasingly reaching an alarming level and this has drawn strong attention to the subject of "protection and sustainable usage of environmental resources". The main reason of the problem is the disagreement between the human use in the area and the conservation of natural and cultural values. It has been realized that the reason of the failure in the efforts of protection in protected areas was at the point of avoiding the local residents. Therefore, integration of the local people with the protection

efforts is required. It is seen that over the last few decades, the participation-paradigm has grown in research, policy, and practice of natural resource management, biodiversity conservation, and stewardship of ecosystem services. In 1984, Man and the Biosphere Programme International Coordinating Council (MAB-ICC) approved the concept "Human is a part of biosphere reserve" in "Action Plan for Biosphere Reserve Areas". Therefore involvement of local people and their support is very important, while designating "Biosphere Reserves". At the same time, while describing a biosphere reserve area and its management, the importance of local residents and their socio-economic development is included in the description. In fact, this cooperation becomes more meaningful in "Trans-boundary Biosphere Reserve Areas" for building trust, harmony and coexistence. Thus the role of Biosphere Reserves in nature and ecosystem protection is unique and important.

2. Biosphere Reserve: Landscape Approach for Nature Conservation

The origin of Biosphere Reserves goes back to the "Biosphere Conference" organised by United Nations Educational, Scientific and Cultural Organization (UNESCO) in 1968. This was the first intergovernmental conference examining how to reconcile the conservation and use of natural resources, thereby foreshadowing the present-day notion of sustainable development. This Conference resulted in the launching of the MAB Programme in 1970. One of the original MAB projects was designed to establish a coordinated World Network of sites representing the main ecosystems of the planet in which genetic resources would be protected, and where research on ecosystems as well as monitoring and training work could be carried out. Biosphere Reserves are representative parts of natural and cultural landscapes extending over large area of terrestrial or coastal/marine ecosystems or a combination thereof and representative examples of bio-geographic zones. Biosphere Reserves are nominated by national governments and remain under the sovereign jurisdiction of the states where they are located. Biosphere Reserves are thus sites established by countries and their status is internationally recognized under UNESCO's "Human and the Biosphere" to promote sustainable development based on local

community efforts and sound scientific principles. Biosphere Reserves are 'Science for Sustainability support sites' special places for testing interdisciplinary approaches to understanding and managing changes and interactions between social and ecological systems, including conflict prevention and management of biodiversity. Each Biosphere Reserve is intended to fulfill three basic functions, which are complementary and mutually reinforcing.

1. conservation function – to contribute to the conservation of landscapes, ecosystems, species and genetic variation;
2. development function – to foster economic and human development which is socio-culturally and ecologically sustainable;
3. logistic function – to provide support for research, monitoring, education and information exchange related to local, national and global issues of conservation and development.

Biodiversity Reserves are ideal to test and demonstrate innovative approaches to sustainable development from local to international scales. A Biosphere Reserve is a unique and representative ecosystem of terrestrial and coastal areas which are internationally recognized, within the framework of MAB programme. According to the Seville Strategy for Biosphere Reserves, the biosphere reserve should fulfill the following three objectives:

- In-situ conservation of biodiversity of natural and semi-natural ecosystems and landscapes
- Contribution to sustainable economic development of the human population living within and around the Biosphere Reserve.
- Provide facilities for long term ecological studies, environmental education and training and research and monitoring.

The three zones provide the identity to the Biosphere Reserves and are described in the (figure-1). Only the core area requires legal protection. Core zone can be one or more in number. It is a securely protected site for conserving biological diversity, monitoring minimally disturbed ecosystems and undertaking nondestructive research and other low-impact uses; buffer zone is the part which usually surrounds or

adjoins the core area, and is used for co-operative activities compatible with sound ecological practices, including environmental education, recreation, ecotourism and applied and basic research; and a flexible transition/development zone, or area of cooperation, is the part which may contain a diversity of agricultural activities, settlements and other uses and in which local communities, management agencies, scientists, non-governmental organizations, cultural groups, economic interests and other stakeholders work together to manage and sustainably develop the area's resources.

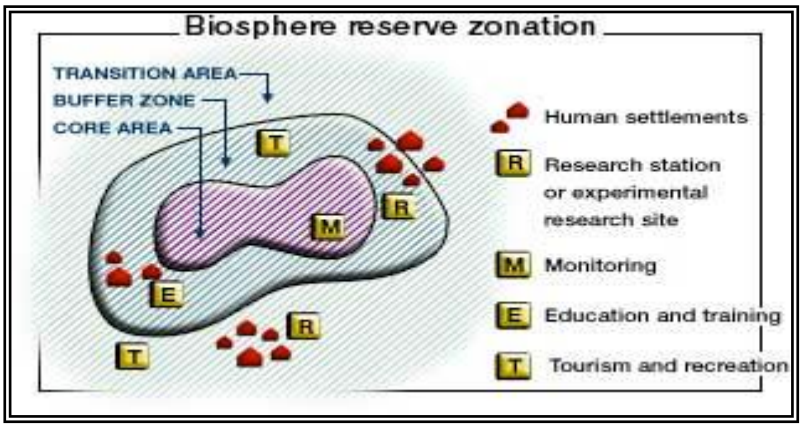


Figure-(1) – Biosphere Zoning Scheme: (UNESCO 2004)

The zone plan is a theoretical concept. UNESCO encourages countries to develop innovative, cooperative approaches to achieve the biosphere reserve's purposes. What is paramount while choosing approaches is that it should work. UNESCO encourages countries to develop their own criteria, according to the special conditions in each country. Establishment of buffer zones, and strict management policies for such zones, are not possible in many countries, so cooperative conservation strategies and mechanisms have to be developed. The key idea is not to sanction those people who do not wish to take part in biosphere reserve activities, but to encourage the people who do. As it is for all protected areas, the theory and management of Biosphere Reserves is responsive to changes in the larger society around them. The Biodiversity Reserve concept is thus used as a framework to guide and reinforce projects to enhance people's livelihoods and ensure environmental sustainability. The designation of a site as a Biosphere Reserve can raise awareness among local people, citizens and government authorities of environmental and development issues. It

can help to attract additional funding from different sources. At the national level, Biosphere Reserves can serve as pilot sites or 'learning places' to explore and demonstrate approaches to conservation and sustainable development, providing lessons which can be applied elsewhere. In addition, they are a concrete means for countries to implement Agenda 21, the Convention on Biological Diversity, Sustainable Development Goals etc. Furthermore, in the case of large natural areas which straddle national boundaries, trans-boundary Biosphere Reserves can be established jointly by the countries concerned, testifying to long-term cooperative efforts. **According to "1978-Protected Area Classification of IUCN- Biosphere Reserves were in the status of protected areas, later in 1994 they were removed from this status, but were transformed into an area which has international importance including other categories as well**. The differences between protected areas and Biosphere Reserves are indicated in Table- 1.

Protected Area	Biosphere Reserve
One type of land, a single category of land, usually relatively small in size and managed for a single purpose (e.g. nature conservation)	A Mosaic of different types of land, generally managed for different purposes (e.g. conservation, development, etc.)
One type of purpose and function Conservation	Harmonization of different types of purposes and functions Conservation, development, logistical support
One main category of interests Natural, Landscape, Cultural, Historical	Multitude of interests often conflicting: farming, forestry, fisheries, tourism, science, local and national Government
One manager identified, directly in charge of the management of the territory	Several Managers, working more or less independently without consultation
Simple zonation	Complex zonation, three zones transition/development area without demarcated outer limit

Protected Area	Biosphere Reserve
Protection through regulation	Protection, Regulation limited to core areas, existence of management agreements or contracts
Management Plan, Single planning scenario applied to well defined land area	Guide to Biosphere Reserve coordination harmonisation of different planning scenarios for different areas in line with Biosphere Reserve concept; emphasis on local participation
Single ecosystem approach populations, ecosystem functioning	Landscape approach complex of ecosystems
Manager /Officer in charge	Coordinator
Table- 1:-Differences between Protected Areas and Biosphere Reserve	

The present day approaches of landscape conservation in India increasingly reflect the objectives of MAB Programme of UNESCO.

3. Framework for Commissioning Biodiversity Reserves in India:

National land and water use planning measures take full account of the functions and values of Biodiversity Reserves and Conservation of biodiversity is guaranteed by rules and regulations enforced by Government of India. The guidelines of Government of India state that the Biodiversity Reserves is not intended to replace existing protected areas, but it widens the scope of conventional approach of protection and further strengthening the Protected Area Network. Existing legally protected areas may become part of the Biodiversity Reserves without any change in their legal status. On the other hand, inclusion of such areas in a Biodiversity Reserves will enhance their national value. It, however, does not mean that Biodiversity Reserves are to be established only around the National Parks and Wildlife Sanctuaries. However, the Biosphere Reserves in India differ from protected areas due to their emphasis on conservation of overall biodiversity and landscape, rather than some specific flagship species, secondly to allow natural and evolutionary processes to continue without any hindrance, mitigation of conflicts between

development and conservation, thirdly to increase broad-basing of stakeholders, especially local people's participation and their capacity building, fourthly to achieve convergence amongst different development organizations and agencies further research and monitoring to understand the structure and functioning of ecological system and their mode of reaction, when exposed to human intervention.

The Indian National Man and Biosphere Committee constituted by the Central Government identifies new sites, advises on policies and programmes, lays down guidelines, reviews progress and guidelines in the light of evaluation studies and feedback. As per the constitutional framework, the States' are the proprietors and custodians of 'Land' and 'Forests'. Accordingly, the local management of the Biodiversity Reserves is the responsibility of the concerned State Government/UT Administration. The management activities are to be implemented involving effectively the local communities, local govt. agencies, Scientists, economic interest groups, cultural groups and other stakeholders. The State Government is expected to ensure that each Biosphere Reserves will have effective and long term management policy or plan and an appropriate 'Authority' or 'mechanism' to implement it.

The details of notified Biosphere Reserves in India are stated below:

S. No	Name of the Biosphere Reserve & total geographical area (Km^2)	Date of Designation	Location in the State(s)/UT
1	**Nilgiri (5520)***	01.08.1986	Part of Wynad, Nagarhole, Bandipur and Madumalai, Nilambur, Silent Valley and Siruvani hills in Tamil Nadu, Kerala and Karnataka
2	**Nanda Devi (5860.69)***	18.01.1988	Part of Chamoli, Pithoragarh and Almora districts in Uttarakhand
3	**Nokrek (820)***	01.09.1988	Part of East, West and South Garo Hill districts in Meghalaya

S. No	Name of the Biosphere Reserve & total geographical area (Km^2)	Date of Designation	Location in the State(s)/UT
4	Manas (2837)	14.03.1989	Part of Kokrajhar, Bongaigaon, Barpeta, Nalbari, Kamprup and Darang districts in Assam.
5	**Sunderban (9630)***		Part of delta of Ganges & Brahmaputra river system in West Bengal
6	**Gulf of Mannar (10500)***	18.02.1989	India part of Gulf of Mannar extending from Rameswaram island in the North to Kanyakumari in the South of Tamil Nadu
7	Great Nicobar (885)	06.01.1989	Southern most island of Andaman and Nicobar Islands.
8	**Similipal (4374)***	21.06.1994	Part of Mayurbhanj district in Orissa.
9	Dibru-Saikhova (765)	28.07.1997	Part of Dibrugarh and Tinsukia districts in Assam.
10	Dehang-Dibang (5111.5)	02.09.1998	Part of Upper Siang West Siang and Dibang Valley districts in Arunachal Pradesh
11	**Pachmarhi (4981.72)***	03.03.1999	Part of Betul, Hoshangabad and Chhindwara districts in Madhya Pradesh
12	**Khangchendzonga (2931.12)***	07.02.2000	Part of North and West districts in Sikkim
13	**Agasthyamalai (3500.36)***	12.11.2001	Part of Tirunelveli and Kanyakumari districts in Tamil Nadu and Tiruvanthapuram, Kollam and Pathanmthitta districts in Kerala
14	Achanakmar-Amarkantak (3,835. 51)	30.03.2005	Part of Anuppur and Dindori districts of Madhya Pradesh and Bilaspur district of Chattisgarh.

S. No	Name of the Biosphere Reserve & total geographical area (Km^2)	Date of Designation	Location in the State(s)/UT
15	Kachchh (12,454)	29.01.2008	Part of Kachchh, Rajkot, Surendranagar and Patan districts in Gujarat.
16	Cold Desert (7,770)	28.08.2009	Pin Valley National Park and surroundings; Chandratal & Sarchu; and Kibber Wildlife sanctuary in Himachal Pradesh.
17	Seshachalam (4755.997	20.09.2010	Seshachalam hill ranges in Eastern Ghats encompassing part of Chittoor and Kadapa districts in Andhra Pradesh.
18	Panna (2998.98)	25.08.2011	Part of Panna and Chhattarpur districts in Madhya Pradesh
Table- 2:- * **World Network of Biosphere Reserve(**WNBR (2015)			

The thrust of the management in the Biospheres is to augment appreciation of people for nature, generate income through eco-tourism, provide means for the people who live and work within and around Biodiversity Reserves, to attain a balanced relationship with the natural world and to show a more sustainable future while contributing towards the needs of the society. Research and monitoring in existing Biosphere Reserves are not only crucial but constitute the very basis of designing development strategies and solutions for Management of relevant problems.

It is seen that out of 18 Biosphere Reserves in the Country, Tamil Nadu is the only State in India, finding place for three Biosphere Reserves, Nilgiri, Gulf of Mannar and Agasthiyarmalai. The biodiversity of the State of Tamil Nadu is diverse and uniquely represented, spread across different bio-geographic regions as is evident from the fact that whereas Nilgiri and Agasthiyarmalai Biosphere Reserve are terrestrial landscapes, Gulf of Mannar is a Marine Biosphere Reserve. It is most interesting to observe that the State of Tamil Nadu is abode to first Marine and Terrestrial

Biosphere Reserve in the Country and all three Biosphere Reserves of the State are part of World Network of Biosphere Reserves (WNBR).

4. Tamil Nadu: Land of First Marine and Terrestrial Biosphere Reserve in India

The Gulf of Mannar Biosphere Reserve(GOMBR) is the first marine biosphere reserve declared in India and in south and Southeast Asia. It is located in the southeastern side of Tamil Nadu extending from Rameswaram in the North to Kanyakumari in the south. It has an area of 10,500 Sq.km with the core area covering 560 km (Rameshwarm to Tuticorin), maintained as Gulf of Mannar National Park (GOMNP). Due to its extensive biological wealth, it was declared as a Marine National Park in 1986 and a Biosphere Reserve in 1989. The GOMBR encompasses 21 islands and are uninhabited ranging in size from 0.25 ha to 130 ha, spreading along the coast for 170 km with the closest being 500 m and the farthest over 4 km from shore. (Figure 2 and 3).

The GOMBR is the last refuge for a unique set of ecosystems that include coral reefs, sea grass beds, wetlands and oyster beds, all maintained by a thin ridge that connects Sri Lanka to India. The unique geologic feature known as Adams Bridge or Ram Sethu, acts as a breakwater wall to protect the shallow seas of the Gulf of Mannar causing unique habitats of rare and endangered biodiversity. The importance of the Gulf of Mannar region dates back to the 2nd Century AD because of its Pearl Banks of *Pinctada fucata* and *Pinctada radiata*. Despite of being an expensive activity the extraction of natural Pearls still takes place in the gulf. The Gulf of Mannar region in Tamil Nadu is one among the four major coral reef areas and the others are Gulf of Kutch in Gujarat, Lakhsadweep and Andaman and Nicobar islands. Besides key coastal habitats like coral reefs, seagrass beds and mangroves, the Gulf of Mannar Biosphere Reserve supports several globally important species such as the critically endangered Dugong dugon (sea cow), all protected sharks including whale shark, sea horses, green and hawksbill sea turtles, dolphins and sea cucumbers and several endemic species of seagrasses, crabs and mangroves. The

buffer zone comprises of Gulf waters to the south and an inhabited coastline to the north.

The GOMBR has been selected as an international priority site based on bio-physical and ecological uniqueness, economic, social, cultural, scientific importance, national and global significance. The IUCN Commission on National Parks and Protected Areas, with the assistance of UNEP, UNESCO and WWF, identified the Reserve as being an area of "particular concern" as the landscape displays living synthesis of biodiversity, which needs to be sustained and represents a distinct identity of the region with enough scope of special, multiple-use management opportunity. The Reserve was one of six areas chosen for inclusion into an action programme to save India's protected areas, for future generations on the basis of richness of biological wealth and its threatened status.

5. Gulf of Mannar: First Marine Biosphere Reserve in India

The GOMBR region is enriched with productive habitats such as coral reefs, sea grasses, mangroves, estuaries, rocky shores and sandy beaches. The diverse nature of ecosystems in the Gulf of Mannar supports a wide variety of significant species including (181) species of seaweeds,(15) species of sea grasses, (117) species of corals, (158) species of arthropods, (856) species of mollusks, (1147) species of finfish's, (5) species of sea turtles apart from the seasonally migrating marine mammals like whales, dolphins, porpoises and turtles. The Park's Krusadai Island exemplifies the biological significance of the Gulf. The island's surrounding shallow waters harbors three species of sea grass that are found nowhere else in India. The island is also home to an endemic organism called *balanoglosus (Ptychodera fluva*), a taxonomically unique living fossil that links vertebrates and invertebrates. The island is referred to as a biologist's paradise. ***The GOMBR is characterized by four specialized ecosystems namely Sea grass beds, coral reefs, mangroves and islands.***

The sea grasses adapt to the marine environment and complete their life cycle underwater. The sea grasses are the only flowering plants that can live underwater. More closely related to terrestrial lilies and gingers than to true grasses, they grow in sediment on the sea

floor with erect, elongate leaves and a buried root (rhizome). The sea grasses maintain water quality, provide food and habitat for marine organisms and stabilize the sea bottom. The Sea grasses are often confused with sea weeds or algae. In contrast to sea-grasses, algae do not have a true root system. It is reported that sea grasses hold key to climate change and are a vital part of the marine ecosystem due to their productivity level. A range of fishes, mollusks, crustaceans and echinoderms are among the predominant fauna of sea grass habitats. The macro fauna living in these habitats mainly comprise *oligochaetes, polychaetes, crustaceans* and *nematodes*, while the meiofaunal groups mainly consist of *turbellarians, nematodes* and *harpacticoids.* Seagrass meadows thus play a significant role in the processes and resources of near-shore coastal ecosystems as they have physical, chemical and biological effects on habitats. In recent decades, destruction of sea grass meadows has occurred worldwide and the loss is as a result of natural events, such as high-energy storms, but it is observed that most sea grass loss has resulted from human activities, such as eutrophication.

The GOMBR is well known for its rich diversity of sea grasses, along with the dugong. The Wildlife Institute of India estimated that the total extent of sea grass beds around all islands of the Gulf of Mannar Biosphere Reserve is about 80.7 km^2. Most commonly cited species in Reserve are from family hydrocharitaceae (*Enhalus acoraides with ribbon-shaped blades, Thalassia hemprichii, Holophila ovalis, H.ovata, H.beccari,H.spipulacea*) and Potamogetonaceae *(Cymadocea serrulata, C.rotundata, Halodule uninervis, Syringodium isoetifolium*). Sea grass beds in the Reserve are extensively distributed across the islands, particularly Krusadai and are found to be rich in species diversity.

A mangrove can either mean a woody plant or a group of plants which live between the sea and the land in areas which are flooded by tides for part of the time. Mangroves are unique because they grow where no other trees can survive i.e. between the ocean and land. Mangrove plants and animals are especially adapted to this lack of oxygen, movement water and soil and changing saltiness. Many mangroves have roots that stretch out from the main trunk (stilt roots)

to better attach them to the shifting soil. They also have roots that poke out into the air from the soil, seeking oxygen.

The GOMBR harbors mangroves with a considerable diversity. The mangrove vegetation includes Rhizophora conjugata, Avicennia alba, Bruguiera gymnorrhiza, Ceriops tagal, Lumnitzera recemosa. It is reported that the region was once covered with thick mangrove forests. There are indications that there was overexploitation that led to vanishing of mangroves species. As a result, species such as Bruguiera gymnorrizha and Acanthus ilicifolius are rarely seen. The increase in the extent of salt pans is perhaps leading to the shrinkage of mangroves particularly around Tuticorin (Kathiresan, 2008)10; (Kathiresan et al., 2008)9; (Daniel and Uma Maheswari, 2001)3. In GOMBR, a total of 11 mangrove species, 17 mangrove associates and 196 flowering plants can be identified.

Coral reef system is known as rain forest of the Sea. They play an important role in global biochemical processes and are also important breeding, spawning, nesting, and feeding areas for many economically important varieties of fishes and other marine organisms. Coral reefs act as a barrier against wave action along coastal areas thus preventing coastal erosion. The people living along the coast obtain a considerable proportion of their food and earnings from the productivity of coral reefs.

The reserve is widely known for having a large coral reef that provides shelter to many plants and animals. Different types of reef forms such as shore, platform, patch and fringing type are observed in the Gulf of Mannar. There are 117 coral species identified so far in Gulf of Mannar. They belong to 40 genera and 14 families. Of this, 106 species grouped in 30 genera are *hermatypic* and 11 species grouped in 10 genera are *ahermatypic*. The conspicuous species belong to the families *Acroporidae, Poritidae and Faviidae*.

The coral reefs in the GOMBR were degraded due to human interference such as coral mining, destructive fishing methods, seaweed collection, commercial shell collection, introduction of exotic seaweed cultivation, changing land use practices, deforestation and industrial waste input etc. However, because of actions of Tamil Nadu

Forest Department and enhanced awareness the health of coral reefs in the Reserve is on the path of recovery. The notable features of islands in GOMBR are *Acropora* sp., *Turbinaria* sp, *Platygyra* sp and *Porites* sp, *Favia* sp., *Goniasterea* sp., and *Montipora* sp and sacred Chank beds.

6. UNDP Project and Formation of Gulf of Mannar Biosphere Reserve Trust:

United Nations Development Programme (UNDP) acknowledged the abundance of marine biodiversity in GOMBR and further recognized that the region is one amongst the most biologically, economically productive ecosystems and is increasingly becoming vulnerable for source of livelihood, and for a range of ecological services. Accordingly UNDP, Global Environment Facility with the active support of Ministry of Environment and Forests sanctioned a project for US$ 26,735,000 (US$1=Rs 44.67) for a period of ten years (2002-2012) to conserve the GOMBR globally significant assemblage of coastal Biodiversity. The main objective of UNDP project for the period was to empower local communities to manage the coastal ecosystem and wild resources in partnership with the Government and other stakeholders and making all accountable for the quality of the resulting stewardship. The major outputs and associated activities are stated below in Table (4)

Outputs	Activities
Output 1: **GoMBR Trust and Corresponding Appropriate Long-term Funding Mechanism**	• Establish the statutory body called the GoMBR Trust; • Establish the Project Coordination Unit (PCU); • Conduct a feasibility study for Long-term Funding Mechanism (LTFM) to support the Trust and associated conservation activities within the Biosphere Reserve; • Legally established operational structure of the LTFM & US$ 5 million (or Rs equivalent) of capitalized Fund.
Output 2: **Strengthen the Management of the Marine National Park**	• Secure full National Park status; • Develop GoMNP participatory management plan; • Strengthen law policy framework and law enforcement activities; • Develop and implement a training programme for Park staff;

Outputs	Activities
	• Develop and implement species/ habitat management plans; • Develop and implement a systematic research, monitoring and information management programme for the park and reserve; • Develop framework and guidelines for restorative eco-tourism in the park; • Develop and implement a programme of environmental education and awareness.
Output 3: **Strengthen the infrastructure of the Park**	• Demarcate park boundaries and strengthen physical infrastructure.
Output 4: **Operational Gulf of Mannar Bioshpere Reserve Management**	• Develop a management plan for the reserve and a biodiversity overlay for the framework; • Strengthen the biodiversity conservation capacity; • Develop an adaptive management approach and implement a comprehensive monitoring programme; • Implement a targeted research programme for the reserve's biological resources; • Define and manage priority habitats within the GOMBR and assist communities in developing their own village marine conservation plans.
Output 5: **Stakeholders Enabled to Apply Sustainable Alternative Livelihoods**	• Improve near-shore marine resource management; • Survey and assessment of untapped EEZ resources in the Gulf area • Improve existing government enforcement programmes; • Strengthen local fisher cooperatives and establish user rights agreements; • Assist communities in developing their own village marine conservation plans; • Improve infrastructure in key reserve areas; • Operationalize "Eco-technology" demonstration programme comprised of two demonstration components; • Operationalize micro-credit programme for local stakeholders in the reserve area;

Outputs	Activities
	• Resource mobilisation in the UNDP sub-programme.
Table 4: Output Activity Matrix: UNDP sponsored Conservation and Sustainability of Coastal Biodiversity in GOMBR**.**	

The major achievement of the UNDP project has been handholding by the Government of Tamil Nadu, after the termination of the project period. The government has taken over the UNDP project with effect from 01.01.2013, vide GO 265 dated 16-11-12. The co management of marine resources with the community is perhaps the key to survival and sustainability of GOMBR.

7. Nilgiri Biosphere Reserve: First Terrestrial Biosphere Reserve in India

Nilgiri Biosphere Reserve (NGBR), the first Biosphere Reserve designated by the Government of India in 1986 exemplifies the tropical forest biodiversity that falls within the Western Ghats, Nilgiri Hills range of South India. The Western Ghats, joining the Nilgiri Biosphere Reserve, is under consideration by the UNESCO World Heritage Committee for selection as a World Heritage Site. The landscape of NBGR encompasses 5,520 km² in the states of Tamil Nadu (2537.6 km²), Karnataka (1527.4 km²) and Kerala (1455.4 km²). The landscape forms an almost complete circle around the Nilgiri Plateau.

The natural vegetation changes from tropical wet evergreen forest along the western slopes to montane stunted Shola forest amidst the grassy down on the upper plateau and on the east, progressively drier deciduous forests ending in thorny scrub. This location and setting is most appropriate home for a variety of animals-the lion-tailed macaque in the evergreen forests, the Nilgiri tahr in the grassy downs, the black buck in the dry scrub and the tiger and the elephant throughout the region.

The Protected Areas within the Biosphere Reserve includes Mudumalai wild life sanctuary and national park (321.1 km²), Wayanad wildlife sanctuary (344km²), Bandipur national park (874km²), Nagarhole national park (643 km²), Nugu wild life sanctuary, Mukurthi national park (78 km²) and Silent Valley national park

(89.52km²) are protected areas within this reserve. The Biosphere Reserve also includes zones of the Nilgiris open to forestry and tourism including: Nilgiris District (North (448.3 km²) and Nilgiris District South (198.8 km²)), Erode District (Sathyamangalam forest (745.9km²) and Erode (49.3 km²)) and Coimbatore District (696.2 km²) in Tamil Nadu.

The reserve extends from the tropical moist forests of the windward western slopes of the Ghats to the tropical dry forests on the leeward east slopes. Rainfall ranges from 500 mm to 7000 mm per year. The reserve encompasses three eco-regions, the South Western Ghats moist deciduous forests, South Western Ghats montane rain forests, and South Deccan Plateau dry deciduous forests. The habitat types include montane rain forest, semi-evergreen moist forest, thorn forest and scrub, montane grassland, and high-elevation Shola forests.

Fauna includes over 100 species of mammals, 350 species of birds, 80 species of reptiles; about 39 species of fish, 31 amphibians, 60 species of reptiles 316 species of butterflies and innumerable invertebrates. Rare animals include the tiger and the Nilgiri Tahr. The reserve has very rich plant diversity and out of 3300 species, 1232 are endemic.

The Conservation and management of the Nilgiri Biosphere Reserve depends on the coordination between government agencies and the local people. For effective management, the Nilgiri Biosphere Reserve has been zonalised as (a) core zone (1240 sq.km), (b) buffer zone (4280 sq.km). The buffer zone is further divided into manipulation zones like forestry, tourism and recreation zones. These zones are located in all the three states of Tamil Nadu, Karnataka and Kerala into which the Nilgiri Biosphere Reserve extends. Most of the plantations are seen only in the manipulation zone. Being one of the hotspots of biodiversity, the Nilgiri Biosphere Reserve has some national parks and wildlife sanctuaries within its boundaries. Conservation of wildlife is the main objective of these national parks and wildlife sanctuaries. Some of these areas have been designated by the government as Project Tiger and Project Elephant areas.

The NGBR forms an abode for a number of tribes, the forest dwelling people, with striking countenances and unique rituals-their traditions, particularly relating to healthcare and nature reverence are remarkable. The Kerala and Tamil Nadu part of the Biosphere Reserve is inhabited by Todas, Badagas, Kothas, Kurumbas, Irulas and Paniyas, with agriculture and pastural activities as mainstay of livelihoods. The inhabitants of the reserve, particularly the tribes are culturally, socially and emotionally attached to the area and enjoy symbiotic relationship with the biosphere Reserve. The Karnataka portion of the reserve is seated within this region is the famous shrine of Shree Gopala swamy Temple, which has a religious and cultural significance to the indigenous people and others in the vicinity.

The NBGR serves as an important catchment for the main rivers such as Bhavani, Kadalundi, Kabbini, Kunthipuzha, Moyar, etc., It also acts as an oxygen reserve and carbon sink apart from providing potable water in the lower valleys. The area helps in the conservation of soil, water, minerals, etc., and allows flow of nutrients, which in turn results in improved crop yields in and around these river valleys. The practice of agri-silvi-horticulture and enormous availability of NTFP's including medicinal plants serve the livelihood needs of people. The increase in influx of population from the surrounding areas has led to deforestation and consequent habitat destruction. The shoals in Nilgiris were destroyed in the past for plantations. Monoculture of eucalyptus, wattle, blue gum, cash crops like tea, coffee, cardamom and food crops like potato have degraded the soil quality along with excessive use of fertilizers. The excessive use of fertilizers in tea crops, monoculture of tree species has deteriorated the ecological services in the area, affecting the porosity of soil and excessive landslides are being noticed. The Nilgiri Biosphere Reserve has been enduring human interference, the recent problems faced by the people of the region are relating to human animal conflict, forest fires, grazing, construction activity and development projects. All this has brought about substantial change in the ecology of the area.

The conservation oriented development programmes in the reserve are essentially needed which will not only check the erosion of the resource base but also improve the living conditions of the

indigenous communities. In this context, eco development programmes are envisaged to take care of the basic needs of the people. Emphasis has been given to a visible clear-cut change in land use pattern associated with those schemes which generates additional income and security to the people. This includes popularization of energy alternatives, forest and grassland management, habitat improvement, animal husbandry, agriculture and aquaculture development of crafts, education, health and immunization, and most importantly development of ecotourism as the landscape includes host of oldest areas within the Biosphere Reserve, such as Silent valley, Wyanad Nagarhole, etc. which are pristine locations for ecotourism and can create awareness and can create conservation values for future generations. The special area development programme(s) relating to NBGR and people oriented programme with intervention of marketing and scalability across the biosphere reserve perhaps can save the ecology and environment of the area.

8. Agasthyamalai Biosphere Reserve:

The Agasthyamalai Biosphere Reserve (ABR) was established in 2001 and includes 3,500.36 km^2 out of which 1828 km^2 is in Kerala and 1672.36 km^2 is in Tamil Nadu. Agasthiyarmalai Biosphere Reserve was declared by the Ministry of Environment and Forests, Government of India on 12th November 2001 (Kerala portion) and subsequently the BR was expanded by adding Tamil Nadu portion on 4th August 2005 due to phyto-geographical similarity and significance.

The ABR represents unique kind of forest ecosystems ranging from dry deciduous, evergreen and shola-grasslands are containing areas of exceptional natural beauty and aesthetic importance including outstanding examples of ecosystems and communities of plants and animals that signify ecological and biological processes. The ABR is one of the important Hot Spots' in the Western Ghats.

This ABR covers parts of Tirunelveli and Kanyakumari Districts in Tamil Nadu and Thiruvananthapuram, Kollam and Pathanamthitta Districts in Kerala. The border of Kollam and Thiruvananthapuram districts in Kerala overlaps Tirunelveli and Kanyakumari districts in Tamil Nadu, at the southern end of the Western Ghats.

The rich forests of the Reserve form the catchment area for 14 rivers and streams. Among them the Tambraparani, Ramanadi, Karayar, Servalar, Manimuthar, Pachayar, Kodaiyar, Kadnar, Kallar form the back-bone of the irrigation network and drinking water for people of Tirunelveli, Turicorin and part of Kanyakumari district. Sever major dams - Karaiyar, Lower Dam, Servalar, Manimuthar, Ramanadi, Kadnanadi and Kodaiyar - owe their existence to these rivers.

A sizable portion of the proposed biosphere reserve enjoys protected status at present. The biosphere recognizes the need to involve the people subsisting on the resources of the region in the conservation efforts. The eastern side of the hills in Tamil Nadu includes the Kalakkad Mundanthurai Tiger Reserve (KMTR), a 895 square kilometers protected area. The Kerala side of the hills hosts the 128 square kilometres Neyyar Wildlife Sanctuary, the 53 square kilometers Peppara Wildlife Sanctuary, the 171 square kilometers Shenduruny Wildlife Sanctuary including Kulathupuzha and Palode Reserve forests near Courtallam. Rare animals include the tiger, Asian Elephant, and Nilgiri Tahr. Agastyamalai is also home to the Kanikaran, one of the oldest surviving ancient tribes in the world.

The ABR is a pristine region with a very high floral endemism and tremendously rich biodiversity, locked up in an area exhibiting an overall representation of the biota of the southern Western Ghats. The site represents the richest centre of endemic plants, abode of all vegetation types met within the peninsula, richest repository of medicinal plants, the southern-most haven of endangered animals including primates, amphibians, reptiles and fishes and a treasure house of wild relatives of domesticated crops.The ABR is the habitat for 2,000 varieties of medicinal plants, of which at least 50 are rare and endangered species. The Biosphere reserve is split into three major zones viz. Core Zone, Buffer Zone and Transition Zone. The description of core, buffer and transition zone in Kerala and Tamil Nadu is as follows:

State	Core	Buffer	Transition
Tamil Nadu	691 Sq. Km	198.36 Sq. Km.	1672.36 Sq. Km
Kerala	352 Sq. Km	691 Sq. Km	1828 Sq. Km

The core zone is a protected zone where human interference is kept barest minimum. The area coming under the core zone consists of Pandimottai, Alwarkurichi, Umayar, Aruliyar, Kariyar, Kannikatty, Narathar, Dharbhakulam etc areas of ABR. All forms of biotic interference are strictly regulated except scientific studies contributing to better management and enhancement of the quality of biodiversity. The vegetation of buffer zone mainly consists of southern secondary moist mixed deciduous forests and west coast semi-evergreen forests.

The ABR is located in close proximity to many town land villages and therefore facing heavy population pressure on the resources and which affect the ecosystem functioning to some extent. Further the reserve is being subjected to cater the need of developmental projects like hydroelectric schemes, extension of agriculture, road and townships, grazing, encroachment, collection of NWFPs etc. However, the impacts are now contained to the barest minimum by the authorities with the help of local participation. The State level steering committees for Biosphere reserve have been constituted in Tamil Nadu for co-ordination between various government departments, organizations, etc. District co-ordination committees have also been setup for local co-ordination. Facilities are being created for undertaking research programmes funded by National and International organizations on conservation, eco-restoration and related areas. In Kerala, a local committee and a state level Biosphere Management Committee co-ordinate the activities of various departments in the ABR area.

The Livelihood Improvement Programme initiated under Eco Development Programme at Kalakkad Mundanthurai Tiger Reserve (KMTR) has been considered as successful model and has enhanced people's participation in the programme. The success stories include, protection against grazing, illicit collection of timber firewood, poaching, smuggling, fire, habitat improvement and restoration of degraded forests with local flora, eco-development activities in the villages adjoining the biosphere reserve to effectively reduce human pressure on the protected area, regulation of pilgrimage to Agasthyamala during holy season, collection of NWFPs by the tribals through Eco-development committees, regulated ecotourism activities at Shedurnny, Peppara and Neyyar Wildlife Sanctuaries and effective disposal of plastic wastes by manual collection. The Government of

India led Biodiversity Conservation and Rural Livelihood Improvement Project (BCRLIP) proposes to follow landscape approach extending the model of KMTR.

The BCRLIP requires coordinated support from various government institutions functioning in the area, beyond the responsibility of a single agency of Forest Department. The approach requires different heterogeneous landscape mosaics to be studied along with available socio-economic data layers for explicit analysis of the actors influencing and governing different landscape mosaics. To convert heterogeneous landscape into homogeneous unit enhancing sustainability of biodiversity improving rural livelihood is perhaps the biggest challenges in ABR landscape and is swivel of UNESCO,s flagship programme "Man and the Biosphere (MAB)".

9. Biosphere Reserves and Learning Opportunities:

The Ministry of Environment and Forests, under its National Natural Resource Management System (NNRMS) programme, has come up with a countrywide project to study temporal changes in the land use dynamics (at 5 year interval starting from 1990 or from the date of designation) as a result of Biosphere Reserve management and to help in the formulation of a Comprehensive Management Plan with respect to each Biodiversity Reserve as the major components. This country wide project of Biosphere Reserves of India specifically meets the global expectations of UNESCO-MAB programme, which promotes the idea of biodiversity related research through in-situ and remote observations using space technologies for the monitoring of Biosphere Reserves.

In addition to initiatives for bringing all representative bio-geographic units under Biosphere Reserve network in India, there is an urgent need to put in vigorous efforts for increasing the number of globally accepted Biodiversity Reserves. As seen from the list of Biosphere reserves, India lags far behind China (31 Biodiversity Reserves), Australia (14 Biodiversity Reserves) and Iran (10 Biodiversity Reserves) in the Asia & Pacific region. The scholarship for Indian Programme is that it needs to infuse dynamism in the entire Biosphere programme and it calls for:

- Developing National Parks on the concept of Biosphere reserves so that potential sites of Biodiversity Reserves, *Namdapha,*

Arunachal Pradesh, *Thar Desert,* Rajasthan, *Little Rann of Kutch,* Gujarat, *Kovalam,* Kerala, *Kanha,* Madhya Pradesh, *North Islands of* Andaman and Nicobar, *Abujmarh,* Chhattisgarh, *Chintapalli,* Andhra Pradesh, *Lakshadweep Islands,* Lakshadweep, *Blue Mountain of* Mizoram, are immediately brought on the map of Biosphere Reserves.

- Developing network of Terrestrial and Marine National Parks in the country so that good practices of one could be replicated in another.

- Linking Biosphere Reserves with concerted promotion of local level economic development, that is sustainable both in terms of ecology and socio-cultural milieu.

- Establishing mechanisms for long-term researches to capture the changing dimensions of bio-physical values of the reserves.

- Developing infrastructure to ensure research, monitoring, education and information exchange on local, regional and global issues.

- Building skills and capacity of Biosphere Reserve managers and field staff so as to appropriately address issues of local to global dimensions in relation to conservation, development and communication.

The MAB programme of UNESCO is more than 45 years old. Designated by UNESCO, Biosphere Reserves can be seen as models for community-based sustainable development. The biosphere reserve as a concept and a tool of UNESCO has an origin in the protected areas domain, but has now evolved into an international designation that allows context-specific conservation in areas comprising terrestrial, marine and coastal ecosystems to achieve conservation and sustainable development at varying scales. The model of Biosphere Reserve has retained its scientific core structure for conservation of biodiversity and sustainable development. Despite this strong core design, new learning about community-based management and governance still can be integrated over a period of time adhering to paradigm of “think globally, act locally”.

Biosphere Reserves are widely viewed as "living laboratories" and have been identified as innovative mechanisms for involving local communities in whole-landscape approaches. Many authors consider them ahead of their time as flexible approach is followed at different geographical scales, encouraging an efficient multi stakeholder decision making process of different ecological networks. *However, the Biosphere Reserves struggle to define sustainability for specific landscapes and resources, yet integrate the conservation of biodiversity with human development and sustainable livelihoods.* In order to build resilience for future, the creative and adaptive strategies need to be formulated to safeguard the interests of future generation.

The continuity and reliability of the MAB and the biosphere reserve designation, over the last four decades reveal the depth and range of changes that the concept and the practice of Biosphere Reserves have undergone. World Network of Biosphere Reserves currently counts 669 sites in 120 countries all over the world, including 16 trans-boundary sites.

The MAB programme, since its foundation in 1971, has delivered many innovations such as "zonation", "trans-boundary sites" and ecological corridors. The most important innovation however is conservation with and through people. There are various reasons why Biosphere Reserves try to pursue a participatory approach, four of which stand out as key motives: first, it supports international exchange of knowledge and experiences and applying science to human ecosystems interactions, safeguarding ecosystem services, second, it paves the way forward with a broader range of players, providing to get involved, thus providing inherent opportunity of adaptation to climate change. The third motivation is related to effectiveness and creating enhanced support for new initiatives of decisions and management practices which ensure sustainability of the processes and outcomes. The fourth important outcome has been reshaping the environment and forest policies throughout the World making co-management of natural resources, with the communities as the focal point of sustainability.

A set of seventeen Sustainable Development Goals (SDGs) set for 2030 Agenda set by global community in 2015 are inspired by the MAB concepts of Biosphere Reserves and recognize that social and

economic development depends on the sustainable management of natural resources.

In order to further improve the working of Biosphere Reserves, the following learning needs to be considered in the MAB Programme:

- To Revitalize and formalize MAB national committees in line with newly laid Sustainable Development Goals.
- Considering that the MAB program has no guidelines for planning required to be allocated to each zone, it would be worth considering making standards with respect to each zone, so that against these standards, performance is evaluated.
- UNESCO conceived Biodiversity Reserves to support sustainable societies but, until now, it was unable to quantify their performance against the desired objectives. It is clear, that protected areas alone cannot guarantee those objectives. Systematically zoned Biodiversity Reserves can create better accountability of MAB programme to provide amendable alternative to such objectives for achieving better results.
- To identify the appropriate authorities that can influence governance and management regimes not only in the legally protected core but in the entire core, buffer and transition zones.
- To promote cooperation between BR managers and MAB national committees in each country.
- To develop a global network for Marine and Terrestrial Biosphere Reserves to learn from experiences of one another.

The future of MAB programme has arrived at a point where combining knowledge generated from scientific research and practice-based learning from policy instruments, together with accumulation and transfer of knowledge to all relevant stakeholders, will be key to the future of Biosphere Reserves. Given that the Biodiversity Reserves are increasingly being considered as suitable candidates for long-term monitoring of biodiversity, including its ecological, economic and socio-cultural dimensions, it would be appropriate to identify representative Biodiversity Reserves across diverse bio-geographic conditions in each

country for establishing thematic and bio-geographic networking for replicating the lessons learnt from one another. With Climate Change looming across the global community a strong commitment for strengthening Biosphere Reserve network is required to further give impetus to MAB by way of reorienting it to address challenges of local to national and global dimensions.

CHAPTER-VIII

ELEPHANT LANDSCAPE IN TAMIL NADU

The Elephant Reserves in Tamil Nadu have been formed based on the landscape approach and are being managed according to the population, movements and sustaining their natural habitats. The four Elephant Reserves in Tamil Nadu covering following forest divisions / protected areas were notified in the year 2003 and are being scientifically and successfully managed by the State of Tamil Nadu.

S. No	Name of the Elephant Reserves	Forest Divisions/ protected areas
1	Nilgiris Elephant Reserve:	Mudumalai Wildlife Sanctuary, Gudalur Forest Division, Nilgiris North Forest Division, Sathyamangalam Forest Division, Erode Forest Division, Dharmapuri Forest Division, Hosur Forest Division and Nilgiris South Division.
2	Coimbatore Elephant Reserve:	Coimbatore Division, Mukurthi National Park and Nilgiris South Division
3	Anamalai Elephant Reserve	Indira Gandhi Wildlife Sanctuary, Dindigul Forest Division and Kodaikanal Forest Division
4	Periyar Elephant Reserve:	Grizzled Squirrel Wildlife Sanctuary, Theni, Forest Division and Tirunelveli Forest Division.

The details of Elephant Reserve(s) and the associated landscape statistics are as follows:

Nilgiris Elephant Reserve

Sl. No	**Name of the Division**	**Area (Km^2)**	**Range of Elephant Population**	
			Min	**Max**
1	Nilgiri North Division	537.36	82	100
2	Mudumalai Wildlife Sanctuary	321.00	347	500
3	Sathyamangalam	1455.31	873	900
4	Erode	816.00	60	175

Sl. No	Name of the Division	Area (Km^2)	Range of Elephant Population	
			Min	Max
5	Gudalur (part)	70.39	32	50
6	Dharmapuri	725.00	243	280
7	Hosur	907.00	590	650
	TOTAL	**4832.06**	**2227**	**2655**

Coimbatore Elephant Reserve

Sl. No.	Name of the Division	Area (Km^2)	Range of Elephant Population	
			Min	Max
1	Coimbatore Division	693.47	53	90
2	Nilgiri South Division (Korakundah range)	76.00	6	18
3	Mudumalai Sanctuary (Mukkhurthi National Park)	78.46	12	18
	TOTAL	**847.93**	**71**	**126**

Anamalai Elephant Reserve

Sl. No.	Name of the Division	Area (Km^2)	Range of Elephant Population	
			Min	Max
1	Indira Gandhi Wildlife Sanctuary, Pollachi	958.00	386	480
2	Dindigul Division	190.00	14	35
3	Kodaikanal Division	45.00	5	10
	TOTAL	**1193.00**	**405**	**525**

Periyar Elephant Reserve

Sl. No.	Name of the Division	Area (Km^2)	Range of Elephant Population	
			Min	Max
1	Tirunelveli Division	512.00	20	28
2	Theni Division	548.00	18	30
3	Srivilliputhur Division	486.00	43	82
	TOTAL	**1546.00**	**81**	**140**

The terrain of each landscape in the elephant reserves is mostly undulating with low hills and altitude varying from 400 meters to 2207 meters with highest altitude being located in Nilgiri North Division. The

Elephant Reserves in Tamil Nadu reflect mosaic of all habitats ranging from dry deciduous forest type to mountain type besides shola grasslands and are a continuous source of learning for conservation of Elephants and to avoid human animal conflicts.

Elephant Corridors in Tamil Nadu

The elephant conservation priorities for the landscape include maintaining habitat connectivity through creation of corridors by acquisition of adjoining lands thus connecting habitats which are presently not in possession of forest department.

In spite of strenuous efforts of the Forest Department, a major threat to the viability of elephant population is connectivity of microhabitats. The diversions of patches of forest lands in the past have impeded the vital migratory routes resulting in increased human animal conflicts and it calls for entire landscape connecting microhabitats, irrespective of ownership to be under the complete control of the Forest department.

The Government of Tamil Nadu provides the technical and financial support to protect elephants, their habitat & corridors addressing issues of human animal conflict. The Forest Department is making all efforts to bring such lands which create disturbance in the migratory path of Elephants under the absolute ownership of Forest department through conversions, diversions and acquisition of such lands, mainstreaming the landscape connectivity in Wildlife Management and Planning to prevent human animal conflicts. The Government of India also provides financial support to conserve and protect elephant populations and to ensure that any population remains healthy and viable within its ecosystem.

The Government of India in order to streamline the habitat connectivity constituted a study team and the said team after detailed investigation identified 12 number of important elephant corridors in Tamil Nadu adjoining to neighboring states which are vital for conserving, protecting, and opening up traditional migration corridors linking the different habitats. After detailed study the Tamil Nadu Forest Department and Wildlife Trust of India have identified the following Elephant Corridors in Tamil Nadu and adjoining landscapes.

Sl. No.	Name of the Elephant Corridor	Location
1	Tali Elephant Corridor (Chattiramdoddi – Hunsamhali)	Karnataka & Tamil Nadu
2	Chamrajnagar – Talamalai at Muddahalli Elephant Corridor (Talavadi – Muddahali)	Karnataka & Tamil Nadu
3	Talamalai – Guttiyalattur Elephant Corridor (Sujalkatti – Bannari)	Tamil Nadu
4	Avarahalla – Sigur Elephant Corridor (Mavinhalla – Chemmanatham)	Tamil Nadu
5	Kalhatti – Sigur at Glencorin Elephant Corridor (Glencorin)	Tamil Nadu
6	Moyar – Avarahalla Elephant Corridor (Masinagudi – Moyar)	Tamil Nadu
7	Kalmalai – Singara and Avarahalla Elephant Corridor (Singara – Masinagudi)	Tamil Nadu
8	Kallar at Gandhapallayam Elephant Corridor (Kallar)	Tamil Nadu
9	Boolavampatti – Attapadi Elephant Corridor (Anaikatty)	Tamil Nadu
10	Anamalai at Punachi Elephant Corridor (Attakati – Upper Aliyar)	Tamil Nadu
11	Anamalai at Waterfalls Estate Elephant Corridor (Ayenpadi – Waterfalls Estate)	Tamil Nadu
12	Anamalai Between Siluvaimiedu – Kadamparai Elephant Corridor (Siluvaimedu – Kadamparai)	Tamil Nadu

Learning lessons from the study of the Government of India the Government of Tamil Nadu identified and declared Sigur Elephant Corridor as per G.O. (Ms.) No. 125, Environment and Forests Department dated 31-08-2010. The Sigur Elephant Corridor includes Avarahalla – Sigur Elephant Corridor (Mavinhalla – Chemmanatham), Kalhatti – Sigur at Glencorin Elephant Corridor (Glencorin), Moyar – Avarahalla Elephant Corridor (Masinagudi – Moyar) and Kalmalai – Singara and Avarahalla Elephant Corridor (Singara – Masinagudi). The issue of corridor transcends social, environmental and ecological boundaries and as a result creates series of conflicts and in this regard presently there are 32 Special Leave Petitions pending the Hon'ble Supreme Court of India against the Government Order dated 31-08-2010.

The Government of Tamil Nadu realizing the importance of landscape connectivity requested the Government of India, vide letter

No. 22345/FR.5/2010, dated 06.04.2011 to allot additional funds to connect habitats and provide for compensation.

The Government of India, Ministry of Environment and Forests acknowledged the requirement of connectivity of habitats and vide their letter No 26-7/2009/WL1 dated 30.03.2009 conveyed administrative approval for a sum of Rs. 400.00 lakhs and released Rs. 325.00 lakhs as first installment for implementation of the Integrated Development of Wildlife Habitats (Component –Protection of Wildlife Outside Protected Areas) in Tamil Nadu during 2008-2009. Continuing with the programme the Government of India, Ministry of Environment and Forests in their letter F.No.26-7/2009/WL,1 dated 30.11.2010 also revalidated the amount of Rs. 325.00 lakhs for the financial year 2010-2011. The Government of Tamil Nadu vide G.O.Ms.No.207, Environment and Forests (FR.5) Department, dated 03.12.2010, issued orders to the Collector of Nilgiris District for acquiring patta lands in Moyar Valley Elephant Corridor and Kallar Jaccanari Elephant Corridor in Tamil Nadu during the year 2010-2011. The Government also accorded permission to the District Collector, Nilgiris to draw and disburse the amount which is actually due to the respective landowners for acquiring the patta lands for the above purpose following the rules in force entering into negotiation wherever required. Further action in this regard is being taken by the Collector of Nilgiris, Udhagamandalam and a sum of Rs. 325.00 Lakhs has been kept in readiness for settlement. It is also seen that Government accorded permission to the District Collector of Nilgiris to draw and disburse the amount to the pattadars for acquiring the patta lands in Jackanari-Kallar Elephant corridor.

The details of patta land acquired and amount spent are as follows:-

Village	**Survey No**	**Extent (in acres)**	**Date of Registration**	**Amount disbursed in Rs**
Jackkanarai	246/1	13.49	28-03-2011	62,49,728.00
Jackkanarai	246/3	24.98	07-09-2011	66,81,655.00
Total		**38.47**		**1,29,31,383.00**

The Collector of Nilgiris District is also pursuing actions to acquire the remaining area of 29.73 acres in S. No. 246/2 of

Jackkanari village by Revenue Divisional Officer / Land Acquisition Officer, Coonoor required for further linking the habitats and mitigating human animal conflicts.

The Tamil Nadu Forest Department in collaboration of Wildlife Trust of India also identified new Elephant Corridor in Tamil Nadu. The identification of the new Elephant Corridors is based on the frequency of elephant movement in the landscapes based on time series data. The geographical details of different forest divisions lying within the landscapes of each corridor are as follows:

Sl. No.	Corridor Name	Forest Division
1	Srivilliputhur – Saptur corridor	Srivilliputhur Grizzled Giant Squirrel Sanctuary
2	Vazhachal – Anamalai via Sholayar corridor	Anamalai Tiger Reserve
3	Vazhachal – Anamalai via Ryan corridor	Anamalai Tiger Reserve
4	Mudumalai – Mukurthi corridor	Mudumalai Tiger Reserve, Nilgiri South FD, Mukurthi National park
5	Mudumalai – Nilambur via O' Valley corridor	Mudumalai Tiger Reserve, Nilgiri South FD, Gudalur FD
6	Bolampatty Block 3 – Block 2 corridor	Coimbatore Forest Division
7	Bilikkal – Javalagiri corridor	Hosur FD and Cauvery WLS (Karnataka)

The Elephants like Tigers are flagship species and their management is of immense importance for this State because of its historical geographical connections with the society. The Elephant Reserves are also home to the Tribal Population. The State of Tamil Nadu has the reputation of managing the best Elephant Camps in the Country and this knowledge is continuously being shared for in-situ management of Elephant habitats. The Forest Department is evolving management of the designated 'Elephant Reserves' and other Elephant Habitats and is continuously trying to conserve the traditional migratory paths to minimise the problem of human-animal conflicts and to create viable mechanisms to ensure inter-state and inter regional coordination in protecting and conserving the Elephants. The Socio-religious sentiments which Elephants share with the People of

Tamil Nadu are one of the major reasons for conservation of Elephants habitats in the wild and the State of Tamil Nadu is committed to strive towards habitat connectivity following the landscape approach and constitution of Elephant Reserves as per requirement.

CHAPTER-IX

TIGER LANDSCAPE IN TAMIL NADU

The Tamil Nadu is a pioneer and visionary State when it comes to managing tiger and its habitat. Landscape level management was in vogue to a large extent even before deliberations commenced at National level on this subject. The State of Tamil Nadu has more than 300 Tigers with four unique landscapes supporting Tiger conservation.

Apart from considering the existence value of tiger and associated biodiversity, the conservation of the tigers is aimed as an important step in achieving the food and water security of the state and nation. The important ecological role of tigers as an umbrella species for conservation of other biodiversity and the co-benefits tiger habitat conservation offers for maintaining vital ecosystem services including carbon sequestration and water provisioning cannot be over emphasized. The sustainable socio-economic development of the human communities in and adjacent to the tiger habitats in consonance with tiger conservation in its landscape should be targeted as a vital spinoff.

Science of Tiger Conservation

The St. Petersburg Declaration recognizes the important ecological role of tigers as an umbrella species for conservation of other biodiversity and the co-benefits tiger habitat conservation offers for maintaining vital ecosystem services including carbon sequestration and water provisioning.

Tiger being one the largest land predators needs large home ranges for its survival. Factors like prey density, presence of large tracts of relatively undisturbed habitat decide the presence and extent of tigers in a landscape. The high human population in most of the tiger range countries is a major factor which has led to local extinctions and low tiger density across the previous range of the tiger. Habitat loss, habitat degradation, fragmentation of habitat and the poaching of prey animals as well as the tiger have been important reasons for the disappearance and reduction of tigers in most parts of the tiger's original range.

It is an accepted scientific fact that conservation of the tiger will depend upon a landscape approach to manage tigers as metapopulations. A landscape approach that goes beyond the reserve boundaries is imminent considering the scientific facts of the tiger's ecological and demographic requirements, and genetic consequences of isolated tiger populations. Tigers are known to disperse over 100 km from their natal areas to establish territories and hence the presence of contiguous, suitable habitat across the landscape has played a large role in population sustenance and recovery in many areas. Tigers are reluctant to cross more than a few kilometers of unsuitable land cover and hence any break in the tiger habitat could easily lead to local extinctions.

Tiger Conservation Landscapes have been defined as large blocks of connected tiger habitat that can support at least five tigers and where tiger presence had been confirmed in the past 10 years. These tiger conservation landscapes have been identified as the best options for securing tiger metapopulations for the long term conservation of the tiger. However, in most of the tiger conservation landscapes, the core reserves where tigers breed are already small, and the incident and imminent serious land-use changes further threatens to increase reserve and population isolation. Site-level protection and landscape-scale interventions to secure habitat connectivity/corridors are two of the most essential interventions that need to be simultaneously taken up to conserve the tiger in the present landscapes.

The human communities in the landscape who usually pay the costs of conservation need to be compensated effectively and promptly and it is to be ensured that the benefits of conservation are also shared with them.

Tiger Conservation in Tamil Nadu

Though the Project Tiger launched in India in 1972 started with the concept of protection of the core reserves, it has matured into a landscape approach towards conservation of tigers. The four important tiger landscapes in Tamil Nadu which in the course of the last three decades have been declared as Tiger Reserves are:

1. KalakkadMundanthurai Tiger landscape
2. Mudumalai Tiger landscape
3. Anamalai Tiger landscape and the
4. Sathyamangalam Tiger Landscape

It has been recognized that these landscapes possess the varied and best representations of tiger habitats and have the greatest probability of long-term persistence of tigers.

Tamil Nadu has four out the forty five tiger reserves notified in the country and the in terms of the core, buffer and total tiger reserve area, Tamil Nadu accounts for about 8% of the corresponding country total. The Kalakkad-Mundanthurai sanctuaries were notified as the first tiger reserve in 1988 and this reserve represents the southern-most range of the tiger in the Indian subcontinent. The Anamalai and Mudumalai tiger reserves were notified during 2007 and the Sathyamangalam tiger reserve was notified in 2013.

The Grizzled Giant Squirrel Wildlife sanctuary and the middle and upper ridges of the Megamalai wildlife sanctuary represents an important landscape for a variety of endangered animals including the area and for its contiguous border with the Periyar Tiger Reserve in Kerala. A proposal has been prepared by the Forest department to declare the landscape as Srivilliputhur – Megamalai Tiger Reserve.

Key threats/Issues for tiger conservation in Tamil Nadu

Though the tiger population in the recent country level assessments has shown an increase in the tiger landscapes in Tamil Nadu, there are several threats faced by these landscapes in the cause of long term tiger conservation. Some of the key issues in tiger conservation in general as well as in Tamil Nadu are discussed below:\]

a. **Small and a few Source sites which can support good breeding of tigers** –Fragmentation has ensured that the core breeding populations or source sites of tigers in these landscapes are already small and few. Hence, it is an absolute necessity that these few source sites are secured at any cost for the conservation of the species in the state.

b. **Protection of corridors and the adjacent tiger habitats** – Though challenging, it is imperative that in addition to the total protection of the source sites, steps be simultaneously taken to conserve the corridors and adjacent habitats that connect and surround the source sites in order to allow the tiger populations to form metapopulations. All efforts need to be taken to ensure that adjacent tiger habitats are not isolated and the habitat quality for the tiger needs to be improved. The conservation strategies would certainly need to take into account the greater human presence in this habitat.

c. **Adopting the landscape approach to Tiger Conservation –** Though the important tiger habitat in Tamil Nadu have been declared as tiger reserves to be managed on a landscape approach, lot needs to be done at the ground level to get the concept moving forward. The issue of mainstreaming conservation in the development scenario is crucial for any landscape approach towards conservation. Conservation of the tiger as well as other biodiversity needs to be mainstreamed. As habitats are expected to shift with climate change, improving connectivity within and between landscapes will be an important adaptation measure against the impacts of climate change.

d. **Tackling human-wildlife conflicts** – With the increase in the human population around the tiger habitats, the eventual land-use changes and the increase in the tiger populations in certain reserves, the conflicts between humans and tigers are bound to increase. Conflicts between humans and species like the leopard, elephant, wild pig, macaque are already serious in certain tiger landscapes and this issue further lowers the tolerance towards tiger conflicts. It is important that steps are taken to minimize the conflicts with a variety of measures both inside and outside reserves. Apart from the ability to provide quick and effective medical care, it is also important that adequate ex-gratia and compensation is paid to the affected people promptly. The Reserve management also needs to be equipped to redress the conflicts with steps like trapping, transquilisation, release, treatment etc.

Key steps that need to be taken for the tiger conservation in Tamil Nadu are discussed below

1. Connectivity between landscapes – All the tiger conservation landscapes in Tamil Nadu share borders with adjacent states and the landscapes across the border also have protected areas in all cases and Tiger Reserves in most. While Sathyamangalam Tiger reserve shares border with Karnataka, the Mudumalai Tiger reserve shares border with both Karnataka and Kerala and the Anamalai and Kalakkad-Mundanthurai tiger reserves share border with Kerala alone. Hence it is vital that interstate cooperation in the management of the tiger landscapes is of a very high level so that there is harmony as well as coordination in the management and conservation of the tiger landscape.

   The connection between the Sathyamangalam and Mudumalai tiger landscape is very strong through forests of Tamil Nadu as well as through the forests of Karnataka. These two landscapes are part of the large and relatively stable Nilgiris biosphere reserve and it is important that the narrow and vulnerable connections between the various habitat tracts within the two landscapes are maintained and improved further. The forests of the Coimbatore Division are crucial in providing the link between the two landscapes and the vast tract of forests in Kerala and this fact needs to be recognized and taken into account while planning for the two landscapes. The Palghat gap across the Western Ghats breaks the wild habitat contiguity between these two tiger landscapes and the other two tiger landscapes south of the Palghat gap.

   Though there exists habitat contiguity between the Anamalai and Kalakkad-Mundanthurai Tiger landscapes, across Tamil Nadu and Kerala, the delicate and vulnerable Shencottah gap habitat which connects the two landscapes needs to be strengthened. This is paramount in ensuring the southernmost tiger landscape in the Indian sub-continent is not isolated.

2. Connectivity within a landscape –Tigers are known to make a quick recovery as long as the habitat quality can be restored but tiger habitats and corridors once lost will be difficult to retrieve and restore. There are several vulnerable and fast disappearing connections between the various patches within each tiger

landscape. The maps and imageries of each landscape as fairly high scale/resolution needs to be studied in detail and all efforts to restore and protect them should be undertaken. If the connections involve areas other than Government forests, acquisition of such lands with necessary compensation and through legal means should be resorted to without any hesitation. This step would be crucial in the long term conservation of large mammals and other biodiversity in each landscape. E.g., a) the Naduvattam area in Nilgiris which connects Mudumalai and Nilgiris South division b) the Gudalur region which connects Mudumalai and Nilambur-Ambarambalam-Silent Valley landscapes.

The role of the riverine forests/ vegetation acting as a corridor for various large mammals to move across habitats and patches cannot be over emphasized and hence riverine vegetation needs to be restored and protected.

3. Landscape frontiers to be expanded with more protected areas - The crucial connections within as well as between the four tiger conservation landscapes in Tamil Nadu need to be identified, notified and protected. Such areas could be notified as Wildlife sanctuaries or conservation areas in order to ensure strong and stable connections. E.g., Parts of the Coimbatore forest division could be considered for such a step as the forests are vital in connecting core habitats.

4. Relocation of people from core reserve wherever feasible – All the tiger conservation landscapes in Tamil Nadu have human settlements enclosed within their boundaries. Considering the feasibility and potential impact of the relocation, people living within the critical habitats for tiger in the core areas could be relocated on a voluntary basis.

5. Poaching control both tigers as well as prey – It is absolutely essential to bring the poaching of tiger and the prey species to a near zero both in the core tiger breeding sites as well as in the adjacent tiger habitats. Strong patrolling measures coupled with good intelligence network can ensure this. With adequate support, the Tamil Nadu Forest Department is in a position to achieve this

scenario. The use of technology in making the protection measures more effective should be encouraged.

6. Sambhar conservation – Sambhar is one of the most important prey species of the tiger in the sub-continent and is associated with the tiger in all the tiger habitats of the country sane one. The tiger density has a good correlation with sambhar density as sambhar is one of the ideal prey species for the tiger. Hence steps need to taken to conserve the sambhar in the tiger areas. Also, if efforts are taken to increase the sambhar in the adjacent habitats, the possibility of tigers recolonising the area is very high.

7. Socio- economic development–The cost of conservation to a large extent is borne by the human communities living within and beside conservation landscapes. In order to ensure long term conservation of a habitat and its associated biodiversity, it is important that these human communities are helped economically and otherwise to meet the costs of conservation. They should be involved to the extent that the benefits of conservation flow to them. Interventions must include finding new ways of channeling revenues to communities from wildlife tourism, Payment for ecosystem services, earning forest carbon credits, and transfer mechanisms from infrastructure projects that generate annual revenues. Traditional eco-development activities to reduce the dependency of the local people on the tiger habitat should be undertaken. Ecotourism is seen as a major avenue for socio-development of the human communities in the tiger landscape and hence needs to be tapped judiciously. Ecotourism has the added advantage of galvanising the public opinion in favour of conservation.

8. Regulate landuse changes - In order to ensure that the quality of tiger habitat is maintained and the conflicts are minimized, the landuse changes are to be strictly regulated. Rapid and drastic landuse changes are quite disastrous for the quality of the habitat as well as the contiguity between patches. Large scale projects should be avoided in the landscape. The human community which adjusts their landuse to the needs of conservation need to be appreciated and compensated adequately. Greater emphasis on silviculture and agro-forestry would make the landscape more friendly for the conservation of the large mammals.

9. Conflict resolution – The human-wildlife conflict across the country is on the rise due to various reasons. An action plan to tackle the conflicts from various angles needs to be worked out. Research, barriers, advance warning mechanisms, safeguards and awareness can reduce the extent of conflicts to a great extent. An approach to increase the tolerance of the people towards conflicts can be increased with adequate and prompt compensation and a greater capacity on part of the Forest department to handle the conflicts. Adequate manpower, financial resources, veterinary equipment and training would be important to increase the capacity of the Forest department. Standard Operating Procedures (SOP) or protocols need to be developed various types of conflicts to make the efforts more effective. Traps, cages, enclosures, ladders, nets, tranquilising equipment, special transport vehicles, and other equipment needed in conflict situations should be available in each Tiger conservation landscape. The management of the Tiger conservation landscape should be in a position to provide assistance to all the neighboring divisions in this sector.

10. Intelligence gathering and organized fight against crime – It is well known that intelligence gathering plays a key role in the prevention and detection of offences. This is a sector in which the Forest department is generally found wanting. Adequate personnel, mechanisms and training would be needed to strengthen this capability in the department. Extensive and effective patrolling methods complemented by Anti-poaching camps are important in fighting against crime in the forests. Training of field methods, self defence, weapon handling, forensics, capability to file and follow up cases in the law courts etc would be important. It is also suggested that every forest beat is manned by a Forest Guard and three Forest watchers instead of the present arrangement of a single Forest Guard and Forest watcher.

11. Habitat management – Based on research and pilot plots, some very basic ways to improve the habitat for the tiger and associated species can be identified and taken up. All the tiger landscapes are presently facing the problem of invasive species and this needs considerable attention. At the same time, NTFP removal needs to be either stopped or regulated strictly as NTFP is crucial as food for a

variety of wild animals but is also a key factor in the regeneration and maintenance of wild habitats.

12. Tribal welfare and employment – All the tiger landscapes are endowed with tribal human resource. This strength needs to be utilized for the purpose of conservation and simultaneously, the welfare and development of the tribal communities need to be taken care of. Apart from the potential of offering permanent jobs to the tribals residing within reserves, the works in the tiger reserves should primarily be labour oriented so that the tribals get considerable wage earning opportunities right through the year.

13. Research – Great emphasis needs to be laid on inventory, mapping, population estimation, change analysis and other research aspects in the Tiger conservation landscapes. The management plan for the tiger reserves should bank greatly on the studies and findings of research rather than hypotheses and presumptions.

14. Training – Apart from training on protection aspects, training on scientific aspects of wildlife management especially on the practical field level assessments and studies needs to be provided to the officers and field staff of the tiger conservation landscapes. Emphasis also needs be to be provided on training to handle the human-wildlife conflicts that are likely to happen in the landscape. Important stakeholders from outside the forest department like veterinary doctors, police, fire service personnel, conservation NGOs, village volunteers in the landscape can also be involved in such trainings.

15. Wildlife veterinary care – Each tiger conservation landscape should have a dedicated team of veterinary doctors and team to deal with the health issues and conflict situations effectively. The unit needs to be well equipped including medicines to handle any injured, diseased animal, conflict issues and post mortems. The monitoring of the wildlife disease outbreak as well as the steps that need to be taken to counter the wildlife diseases would be carried out by this unit. The immunization of the livestock in and around the Tiger conservation landscape would be supervised by this unit.

16. Functioning of tiger foundations –The tiger foundations to be made independent and vibrant to meet the prescribed objectives. The foundation can be used to ensure that funds are made available without delay for the smooth and effective functioning of the management activities.

Details of the Tiger Reserves in Tamil Nadu

Core and buffer areas of Tiger reserves in Tamil Nadu as on 2014

Sl. No.	Name of Tiger Reserve	Year of notification	Area of core tiger habitat (sq. kms.)	Area of buffer/ periphery (sq. kms.)	Total area (sq. kms.)
1	Kalakkad-Mundanthurai	1988	895.00	706.54	1601.54
2	Mudumalai	2007	321.00	367.59	688.59
3	Anamalai	2007	958.59	521.28	1479.87
4	Sathyamangalam	2013	793.49	614.91	1408.40
	Total for State		**2968.08**	**2210.32**	**5178.40**

1. KalakkadMundanthurai Tiger Reserve (KMTR)

It covers an area of 895 sq. kms of which 550 sq. kms form the core and is part of the Agathiarmalai Biosphere Reserve. It is located in the Nanguneri and Ambasamudramtalukas of Tirunelveli districts and Thovalai and Vilavancodutalukas of Kanyakumari districts. The western border of the reserve coincides with the crest line of the Western ghats. About 14 rivers originate from this area.

The KMTR is the southern most tiger landscape in the range of the tiger in the Indian subcontinent. It is a scientific fact that populations at any edge in the range of a species are always more vulnerable and the density will be poorer.

The KMTR shares boundaries with Tirunelveli Division and Kanyakumari wildlife sanctuary in Tamil Nadu and Neyyar wildlife sanctuary, Shendurney wildlife sanctuary and Peppara wildlife sanctuary in Kerala.

Challenges: lower population density of tigers, extremely rugged terrain, several private estates scattered around and inside KMTR,

weeds, temple pilgrimage. The connection of this landscape with the forested landscape north of the shencottah gap is vulnerable and this needs to be addressed for the long term conservation of the tiger and other large mammal species.

2. Mudumalai Tiger Reserve

Covers an area of 321 sq. km. and is located in the Gudalur and Udhagamandalam taluks of Nilgiris district. River Moyar traverses the reserve from south to north, parallel to which runs the Udhagamandalam-Mysore highway for some distance.

Shares boundary with Niligiris north division and Gudalur division in Tamil Nadu and Bandipur Tiger Reserve in Kerala and the Wynaad Wildlife Sanctuary in Kerala. The Gudalur forest area provides the connection to the Nilgiris south division, Mukurti National Park, Nilambur, New Ambarambalam and Silent Valley areas. The forests of Bandipur Tiger Reserve and Nilgiris north division provides the connection connects to the Sathyamangalam TR and Coimbatore division.

Threats: Lantana dominated areas, shares the southern boundary with fragmented and conflict ridden forests of Gudalur forest division, human population within the core area, poaching as faced in the entire NBR area, major highway passing in the core area.

3. Anamalai Tiger Reserve

Covers an area of 959 sq. Km in Coimbatore and Tiruppur districts. It comprises the Indira Gandhi Wildlife Sanctuary and Indira Gandhi National Park. Several rivers originate in the Reserve providing water to reservoirs such as Parambikulam, Aliyar, Sholayar and Amaravathi. It has unique shola habitats at karian shola, Grass Hills and Manjampatty.

The reserve shares boundary with Dindigul and Kodaikanal Forest Divisions in Tamil Nadu and Parambikulam Tiger Reserve, Eravikulam National Park, Chinnar Wildlife Sanctuary, Chalakudy, Maraiyur, Vazhachal and Malayatoor divisions of Kerala.

Challenges: large human population in the core area, several high traffic roads passing through the Tiger Reserve, Valparai conflict zone, Weeds like lantana and Mikenia, restoration of areas under mono-culture plantations, poaching in the northern boundary of the reserve.

4. Sathyamangalam Tiger Reserve

It is the most recently notified Tiger Reserve in Tamil Nadu and falls entirely in Erode district. It has area of 793 sq. kms as the core. The area displays a variety of forest types and provides the contiguity between the Western and Eastern Ghats.

Shares boundaries with Erode Division, Coimbatore Division and Nilgiris North Division of Tamil Nadu and Bandipur Tiger Reserve, BRT Tiger reserve and Malai Mahadeshwara (MM Hills) wildlife sanctuary of Karnataka.

Challenges: Large revenue and forest settlement areas within the tiger reserve, existence of several major hill roads in the landscape, crop damage and consequent challenges in the southern part, poaching of prey species and cattle conflicts, Prosopis & lantana weeds, temple pilgrimage.

The State's sincere efforts in establishing range of Tiger habitats in Western and Eastern Ghats have resulted in record raising of tiger numbers from 163 in 2011 assessment to more than 300 in 2015 assessment. Though overall increase at National level is 30%, the increase in number of tigers is more than 40% in the State of Tamil Nadu since the last estimation in the State. This is in no measure a small achievement, considering the fact that the State is one among the most developed States in the Country, with high per capita population and industrial growth. The State intends to hold on to this pride by continuing to provide all the input required for augmentation of Tiger population and its habitat, while also assuring economic security to the people within the habitat and outside. Earnest efforts are on to enhance the forest cover through due process of forest settlement. Tigers within PA and outside will continue to get the attention as it occupies a place of glory in the rich culture and tradition of the State. The State of Tamil Nadu is committed to enhance the Tiger Reserves to provide contiguous habitat for tigers to maintain the genetic flow and the population viability.

CHAPTER-X

WILDLIFE PROTECTION SCENARIO

I) Historical perspective and process culminating to the present state of working

1. History of protection initiatives in Tamil Nadu

Historically, many of the wild animals have been hunted by the human communities for various reasons, food being an important one. It was only in those belts in India where the human communities were strictly vegetarian that this practice was not common. Wildlife meat has been part of the diet of most of the forest fringe and tribal communities in Tamil Nadu, though opportunistic harvest of meat could have been more common as compared to active hunting.

During the colonial period, the hunting of animals, water birds and fishing was an important past time of the rich. The decline of wild animal population started from about the middle of the 19th century with the increase of sporting weapons and the development in succession of the large bore rifle in 1840 and the express rifle in 1860. Apart from the landed gentry, local shikaris had also increased and a very lucrative business of meat supply to market and private employees had developed (FM in TN).

By the late 19th century, considering the rapidly dwindling elephant population, the Madras Wild Elephants Preservation Act, 1873 was enacted and was the first legislation of the State and perhaps in the entire country for offering protection to a single species (FM in TN). Simultaneously, recognizing the rapid decline of game in the Nilgiris due to rampant hunting, the Nilgiri Game Association was formed and the first ever game law 'Nilgiri Fish and Game Preservation Act of 1879' in the country, came into being.

The Nilgiri Game association at one point in time had 17 watchers to control poaching and apprehend offenders and the watchers worked in tandem with the regular forest beat establishment. For its own endeavor, game management played such an influential role that in order to protect game animals like the deer, practice was prevalent around 1930s that authorized the DFOs to grant rewards of Rs.10/- per animal for the destruction of wild dogs.

The Wild Birds and Animals Protection Act of 1912 aimed at providing protection to wild birds and animals. The Vedanthangal tank was officially recognized as a sanctuary in 1936 and a part of the Mudumalai range was constituted into Mudumalai Wildlife Sanctuary in the year 1940.

Some of the early protection measures taken up in TN to protect the wild fauna from poaching were:

- In the Tirunelveli district, Papanasam check post was opened in 1957 to check all vehicles for illegal arms to prevent shooting of tiger and deer on the main road.

- A black list of offenders was maintained by the DFO, Tirunelveli district.

- Shooting of black buck and four-horned antelope was prohibited in North Coimbatore Division in 1961.

- Sathyamangalam range area around Bhavanisagar reservoir and Talamalai range were closed for shooting.

- The whole of Tirunelveli North Division was declared closed to shooting from 1.10.1962.

- Subsequent to ban order on tiger and bear shooting in Palacode range and Bevanurmalai forests of Dharmapuri Range of Salem North Division from 1968 to 1970, the Government extended the prohibitory orders against killing of tigers and bears to the whole state. Panther was included in the prohibitory list of shooting in 1971.

2. Developments in wildlife protection issues in recent past

In the recent past, one of the most serious issues faced by the wildlife wing in protection of wild animals related to poaching of elephants. This problem was faced in most of the elephant habitats and more so in the areas of the Nilgiris Biosphere Reserve. Areas like Mudumalai WLS, Nilgiris North Division, Coimbatore Division, Sathyamangalam Forest Division, Erode Forest Division were the prime areas for elephant poachers considering the high density of elephants,

the presence of elephant poachers in the terrain, the proximity of inter-state borders with Kerala and Karnataka and the fertile market for tusks primarily at Sultan Bathery, Kerala. The problem was very serious in the 80s and 90s with the notorious poacher and sandalwood smuggler Veerappan and his gang operating in this terrain.

Post independence, the poaching of other wild animals especially ungulates primarily for meat and skin and poaching for sport was also a problem across the state. Chital, sambar and Gaur were the primary species targeted for this. Poaching of a variety of animals for subsistence especially smaller ones like mouse deer, monitor lizard etc for the purpose of meat by the local people and tribals living within and just outside the forests was also a known phenomenon.

In the recent past, several wild animals have become the target of poaching and trade for a variety of products which fetch high process in the illegal market, both domestic and international. Tusks, bones, skins, hair, teeth, nail, bile and liver, meat etc of different animals are often the reasons for the poaching of animals. Animals like elephant, tigers, deer species, primate species, hare, squirrel, mongoose, snakes, pangolin, several bird species especially water fowl have become the target animals for poachers. Country guns, snares, traps, cages and even electrocution have been used by poachers.

3. Steps taken in recent past for wildlife protection

The practice of tribal watchers for protection was started in the late eighties and early nineties in the Wildlife Sanctuaries, National parks and Reserved forest areas having good wildlife density. These tribal watchers were paid monthly wages under various schemes.

Special anti-poaching efforts to protect elephants were undertaken in the Nilgiris Biosphere Reserve area during the Pongal and Deepavali seasons as it was a common practice for elephant poachers to take advantage of the festival season as well as the migration of elephants through certain corridor areas. It was during these periods that orders would be issued for all staff would be present in the field with no festival leave being granted to them and they would be stationed in special camps for several days. Camps were located at vulnerable locations like Mangalapatti in the Nilgiris-Erode district

border and also close to the interstate border. A team of staff with some tribal watchers would halt for a week during the festival season and the team was equipped with fire weapons and HF wireless sets.

Festival season hunting of small game in various districts like Salem were controlled to a great extent by deployment of staff in the forest areas vulnerable to such practices.

Another important measure taken for wildlife protection was the employment provided to Tribals as Reserve watchers. This practice was started in the Kalakkad Mundanthurai Tiger Reserve as the Reserve watcher posts in the reserve would be largely vacant as the staff from other areas was reluctant to work in the interior and inhospitable terrain of the Reserve. Staff would often seek transfer on various grounds and would move out leaving behind vacancies. In order to solve this problem, the then Chief Wildlife Warden Thiru V.R. Chitrapu sent a proposal to the Government requesting orders for employing the Kani tribals in KMTR as Reserve watchers without considering the age, educational and physical qualifications that were prescribed for Reserve Watchers. The Government accepted the proposal and issued necessary orders and the Forest department employed several Kani tribals as Reserve Watchers. These tribal reserve watchers were very effective in protection of the reserve as they knew the area and terrain well, were very fit physically, understood the behaviour of wild animals and the modus-operandi of the local anti-social elements functioning in the reserve area. Considering the success of this experiment, the Government order was extended to the Anamalai Wildlife sanctuary and Mudumalai WLS as these areas faced similar problems and had several tribal groups living within the protected areas.

4. Present day Anti-poaching Camps – Genesis and development

The Anti-poaching system in Tamil Nadu, with a wide network of anti-poaching camps employing men from the local tribal community developed in the late 1990s and is presently a widely acclaimed model in wildlife protection against poaching in the country.

Anti-poaching camps were started systematically in the Mudumalai wildlife sanctuary and National Park in 1997-98. This originated as the Mudumalai wildlife Sanctuary and National Park sharing borders with both Kerala and Karnataka had several interior

forest beats, at distances of about 15-20 kms from the headquarters of the beat staff. The forest road network was not extensive and the Forest Ranges also did not possess adequate vehicles during that period and as a result, these beats could not be patrolled on a regular basis by the beat staff by moving on foot from their headquarters. Considering the high density of wild animals in Mudumalai and lower levels of protection in many areas, the poachers both for meat as well as elephant tusks took advantage of this and were poaching animals at will.

Considering the above, small buildings/sheds were constructed in interior forest areas of Mudumalai. The location of these sheds was carefully decided taking various factors into account. The vulnerability of the area, availability of water for the camp inmates, vantage locations, accessibility to the road network were some of the factors taken into account while locating the sheds. In fact, some of the sheds were located at the known campsites of the poachers.

With the construction of the sheds, the staff and anti-poaching tribal watchers were made to halt in the camps both day and night. Rations were provided to the camp inmates and the camp inmates used to cook their meals. Full time and night camps were started. The full time anti-poaching camps were usually located in very interior forest areas where daily patrolling by the beat staff from their headquarters was impossible and hence, small sheds were constructed and the group of uniformed staff and tribal watchers started halting in the sheds. A new batch of staff and tribal watchers carrying their rations would relieve the earlier batch every three days. A register was maintained at each camp providing details of the activities of the camp inmates and their findings. For the night camps, in certain vulnerable locations close to the village borders, sheds (some temporary) were set up where the staff and tribal watchers would reach by evening with rations, cook their dinner and halt for the night at the camp and then return back to their head quarters in the morning. The main job of the night camp inmates was to monitor the movement of any suspects into the forests and also be alert to any gunshots in the evening and night and seek help from the main camps and forest campus nearby. All the camps were equipped with wireless base sets or/cum walkie talkies and fire weapons. The camp inmates were instructed to perambulate

all vulnerable areas on a daily basis within a radius of about 10 kms from the campsite.

Subsequent to the setting up of AP camps in Mudumalai, the number of encounters with poachers and other offenders in the interior areas increased drastically and then came down gradually indicating the efficacy of these camps. The anti-poaching camps yielded considerable success and this practice was extended to Anamalai WLS and NP and later to most of the wildlife and territorial divisions supporting large mammals vulnerable to poaching. The anti-poaching camps also yielded considerable success in the control of several other offences like tree felling, forest fires, NTFP collection etc.

II) Future of the Anti-poaching and protection activities in Tamil Nadu

The Anti-poaching and wildlife protection initiatives adopted in Tamil Nadu could be improved with the following initiatives:

- Thorough networking of all the anti-poaching camps amongst themselves and with the master control room in the Range and Division head quarters for effective and instantaneous transmission of audio and video data.

- Use of technology for effective monitoring and utilization of patrolling efforts.

- Use of camera traps and other electronic devices to instantaneously detect the entry and movement of wildlife poachers in vulnerable areas.

- Establishing a intelligence network in the lines of the Police to combat wildlife crime
- Electronic database of forest and wildlife offenders, accessible to all the forest divisions and ranges in the State.

- Training of staff and tribal watchers in jungle warfare and in tackling poachers.

- Training in law for effective processing of wildlife offences

III) Desired policy interventions

- Instead of the present system of a forest guard and Forest watcher for every forest beat, we could have a team of forest Guard assisted by three forest watchers. This would relieve the pressure as the present FG and FW are on continuous duty, 24 hours and 365 days a year and even when one or both of them go on casual leave, the responsibility of protection still lies with them.

- The practice of tribals being engaged as Forest watchers with relaxation in the qualifications could be extended to the entire state as the system has been found to be very effective. This step would also help in winning the confidence and support of the tribals for forest and wildlife protection.

Guidelines for taking non-forestry activities in wildlife habitats

General Policy:

National Parks, Sanctuaries and Conservation Reserve are notified under the Wildlife Protection Act, 1972 as dedicated areas rich in and representing the unique biodiversity of a place. Such protected areas are considered very important for conservation of biodiversity and for ensuring the healthy populations of its floral and faunal components, for the present and future generations alike. However, the rising human population and its growing demands for socio-economic development put increasing trees on forests including protected areas both directly and indirectly. This calls for a balance that has to be struck between development and conservation implying that any activity involving use or diversion of any part of a notified protected area may be considered only under most exceptional circumstances, taking fully into account its impending impact on the biodiversity of the area, and consequently on the management of the Protected Area. A critical part of this balanced approach is to spell out the feasibility of mitigation to address the impacts without compromising the management objectives of the Protected Area. The activities to be taken up in the identified wildlife habitats also need to comply with the orders of the Hon'ble Supreme Court in addition to the statutory requirements as provided in the Wildlife (Protection) Act, 1972.

Scope:

Measures to protect the wildlife and biodiversity in general include inter alia, notification of suitable wildlife habitats as Protected Areas (National Parks, sanctuaries etc.) under the Wild Life (Protection) Act (WLPA), 1972. Recommendations of the National Board for Wildlife (NBWL) are prescribed in the Act for regulating any activity inside such areas. Hon'ble Supreme Court thought a number of order has further made it essential to seek the recommendations of this advisory body for regulating activities in the adjoining areas to the Protected Areas. Protection of other forests is ensured through the Forest (Conservation) Act 1980 wherein, recommendations of the Forest Advisory Committee are prescribed for this purpose. Protected areas cover generally the known habitats of wildlife including important flagship species. Tiger Reserves represent specifically notified areas under the WLPA focusing on conservation of the charismatic big cat under the Project Tiger in view of the specially threatened status of these national animals. With a view to ensuring conservation of elephants, the national heritage animal, 'Project Elephant' is operational. Technical and financial assistance is provided by the Central Government for conservation of elephants in the designated elephant habitats in the country. But presently such habitats are not legal entities. Though many existing elephant habitats are part of the existing Protected Areas, a proposal for enabling notification of such important habitats as elephant reserves under appropriate legal provisions is also under consideration of the Government in the Ministry of Environment and Forests. It is expected that once the legal provisions for declaration of elephant reserves is in place, such areas will also be included under the regulatory regime under Wild Life (Protection) Act 1972 as proper legal entities.

These guidelines prescribe the process of obtaining recommendations of the Standing Committee of NBWL under the Wild Life (Protection) Act 1972 with respect to the areas, for which this process is mandatory under the law, and also in compliance to relevant Hon'ble Supreme Court orders. These guidelines replace the guidelines dated 15.03.2011 issued earlier in this regard, along with all amendments made therein.

Activities inside Protected Areas:

The process of consideration of any proposal for use of areas inside the protected areas, as a mandatory requirement under the present statutes, involves consideration and recommendation of the National Board for Wildlife. However, as the Standing committee of National Board for Wildlife has been delegated the powers of the National Board for Wildlife, such cases are to be referred to the Standing committee of National Board for Wildlife for consideration and recommendation. Details of such situations where such reference is warranted are described below.

Activities inside Wildlife Sanctuaries:

Section 29 of the Wild Life (Protection) Act, 1972 provides for the seeking the recommendation of the State Board for Wildlife (a Board chaired by the State Chief Minister) for any diversion of land or produce including water, etc. from a Sanctuary.

A per the proviso under Section 33 (a), no construction of commercial tourist lodges, hotels, zoos and safari parks can be undertaken inside a sanctuary except with prior approval of the Standing Committee of NBWL.

Further, in view of the directions dated 9th May 2002 of Hon'ble Supreme Court in Writ Petition (Civil) No.337/1995, all such proposals in respect of a Sanctuary or a National Park also require Supreme Court's approval based on the recommendation of the Standing Committee of National Board for Wildlife (a Committee chaired by the Minister in charge of the Ministry of Environment and Forests)

Activities inside National Parks:

Section 35 (6) of the Wild Life (Protection) Act, 1972 provides that the recommendation of the National Board for Wildlife (a Board chaired by the Prime Minister) is essential for any use or diversion of the habitat of any wild animal, or produce including water, etc. in a National Park.

This proviso is also applicable with respect to National Parks in view of Section 35 (8) of the Act.

In the circumstances, any activity proposed within the boundaries of a National Park or Wildlife Sanctuary shall require the recommendation of the Standing Committee of NBWL, and the approval of the Hon'ble Supreme Court.

Section 33 (8) of the Wild Life Protection Act, 1972 provides that no construction of commercial tourist lodges, hotels, zoos and safari parks can be undertaken inside a National Park except with prior approval of the Standing Committee of NBWL.

Activities inside a Tiger Reserve:

A Tiger Reserve notified under the provisions 38V (1) of WLPA may include an existing Protected Area or other forests (as the buffer areas). The Tiger Reserve once notified gets conferred protection on par with a Wildlife Sanctuary under section 38V (2). Further section 38W makes it mandatory to obtain approval of Standing Committee of NBWL for nay activity including alteration of boundaries of Tiger Reserves. Therefore, any proposal involving any area under the notified Tiger Reserve will also be governed by the relevant provisions applicable to the Wildlife Sanctuaries and therefore, will be referred to the Standing Committee of NBWL for consideration.

Activities inside Conservation Reserves:

The Ministry of Law and Justice has opined that activities to be taken up inside a Conservation Reserve can also be dealt with in the Standing Committee of NBWL. Therefore, the procedure indicated under para 4 below needs to be followed for planning and executing any activity inside Conservation Reserve also.

Activities in areas other than Protected Areas:

In addition to the notified protected areas as described above, the consideration of the Standing Committee of NBWL has been prescribed in certain circumstances, which are listed below.

Activities within 10 Kms from boundaries of National Parks and Wildlife Sanctuaries:

In pursuance to the order of Hon'ble Supreme Court dated 4th December 2006 in Writ Petition (Civil) No.460/2004, in case any

project requiring Environmental Clearance, is located within the eco-sensitive zone around a Wildlife Sanctuary or National Park or in absence of delineation of such a zone, within a distance of 10 kms from its boundaries, the User agency / Project Proponent is required to obtain recommendations of the Standing committee of NBWL.

Activities within areas connecting the Tiger Reserves, notified by NTCA for controlling the land use as per section 38 O (g):

Section 38 O (g) of the Wild Life Protection Act, 1972 entrusts the responsibility to NTCA to ensure that areas connecting Tiger habitats are not diverted for ecologically unsustainable habitats except in public interest and with the approval of NBWL. Proposals for any activities in such areas duly notified by NTCA and recommended by it in accordance with these provisions, to be covered under such regulation will be permitted only after seeking recommendations of the Standing Committee of NBWL. Violation of this provision is required to be dealt with by the NTCA.

Procedure to be followed for consideration of proposals by the standing committee of national board for wildlife

The User Agency / Project Proponent is required to submit the proposal in the prescribed proforma that that been prescribed by the Ministry of Environment & Forests and is available on the website of the Ministry (http://moef.nic.in/modules/other to be filled in (Annexure-I)

The prescribed proforma has five parts and each part is required to be filled in by the User Agency; concerned Divisional Forest Officer / Park Manager, concerned Chief Conservator of Forests; concerned Chief Wildlife Warden and Forest Secretary.

The proforma also seeks information in detail on the biodiversity of the area in question; maps of the area, other activities already in place; possible impacts of the proposal etc.

The User agency is required to submit Part-I and Part-II of the proforma duly filled in to the concerned Forest Officer, who in turn, forwards the same to the Chief Wildlife Warden through the Chief Conservator of Forests.

The Chief Wildlife Warden, after giving his specific comments on the pr0oposal, shall forward 15 copies of the same to the Government of India, through the Forest Secretary after obtaining the recommendation of the State Board for Wildlife on the proposal.

The proposal so received from the State Chief Wildlife Warden will be placed before the Standing Committee of NBWL, chaired by Minister of State (i/c.), Environment & Forests. The meaning of the Standing Committee is convened once in 2-3 months.

In cases where the area proposed for diversion is large and / or the impact of the project on wildlife is considered to be serious, site inspections may be conducted by the members of the Committee or further studies / surveys may be conducted by the experts on the instructions of the Standing Committee of NBWL.

The site inspection reports are generally considered in the next meeting of the Standing Committee to enable the Committee to makes recommendation.

After the Standing Committee of NBWL recommends the proposal, the User agency / State Government is required to approach Hon'ble Supreme Court for final clearance in view of the court orders dated 13.11.2000.

In case of border roads, proposals of the Ministry of Defense, a simplified proforma for simultaneous clearance under the Forest (Conservation) Act, 1980 and wildlife clearance is being adopted under "A Single Window System".

Proposals for survey work to be carried out inside National Parks and Wildlife Sanctuaries

In case any kind of survey work and/or Environment Impact Assessment (EIA) studies, that is a prelude to future diversion of land, are to be taken up in areas involving a wildlife habitat, then also the entire procedure, as prescribed in paragraphs 4 above would need to be followed.

CHAPTER-Xi

HUMAN-ANIMAL CONFLICT

The challenges involved in the Wildlife and Biodiversity conservation management are complex and dynamic in nature. One such challenge is effective management of human-wildlife conflicts, which off late is steadily assuming enormous proportions and posing severe threats to conservation of wildlife. The task of wildlife conservation and management cannot be fully accomplished without addressing this problem. Therefore, it is essential that this complex issue is understood in its totality, so that solution may be beneficial to one and all. Human-Wildlife conflict (HWC) is a manifestation of a serious competition between wildlife and humans including livestock for food, water, space or any other resource at spatio-temporal scales leading to varied levels of overlap in their operational areas. Such conflicts results in severe damage to the life and property of man and also irrecoverable damage to the wildlife and its habitat.

Changing landscapes – Rising Conflicts

Tamil Nadu is one among the most urbanized states in the country. The ever increasing demographic profile and the associated demands for resources in pursuit of economic growth is driving many people to involve in many unscientific practices leading to irreparable damage to the natural resources in the form of forest degradation and denudation, fragmentation, encroachments, pollution, over-exploitation and other developmental activities demanding land and other natural resources. As a result, the living environment for both man and wildlife is gradually becoming unhealthy and inhospitable. These rapidly changing and imposed situations, are causing interruptions in the patterns of migration, feeding, hunting, breeding, nesting, etc., With denied access to food, water and shelter in their own habitat, the wildlife is forced to stray into human habitations resulting in human-wildlife conflicts causing loss to human life, physical injuries of varied nature, damage and loss of agriculture/horticulture crops and damage to the physical assets and properties.

Human Wildlife Conflict Zones of Tamil Nadu

A. Nilgiris Eastern Ghats (Nilgiri Elephant Reserve):

1. Mudumalai Tiger Reserve
2. Gudalur Forest Division
3. Nilgiris North Forest Division
4. Sathyamangalam Forest Division
5. Erode Forest Division
6. Dharmapuri Forest Division
7. Hosur Forest Division
8. Nilgiris South Forest Division.

B. Nilambur - Silent Valley Coimbatore (Nilambur Elephant Reserve):

1. Coimbatore Division
2. Mukurthi National Park
3. Nilgiris South Forest Division

C. Periyar (Srivilliputhur Elephant Reserve):

1. Grizzled Giant Squirrel Wildlife Sanctuary
2. Theni Forest Division
3. Tirunelveli Forest Division.

D. Anamalai - Parambikulam (Anamalai Elephant Reserve):

1. Indira Gandhi Wildlife Sanctuary
2. Dindigul Forest Division
3. Kodaikanal Forest Division.

In Tamil Nadu, more commonly involved wild animals in the human-wildlife conflicts, where the damage is caused to man and his property, are - elephants (*Elephas maximus*), tigers (*Panthera tigris*), leopards (*Panthera pardus*), wild boars (*Sus scrofa*), bisons (*Bos gaurus*), bonnet macaques (*Macaca radiata*), marsh crocodiles (*Crocodylus palustris*), peafowl (*Pavo cristatus*) etc., Whereas, on the other side of the human-wildlife conflicts, almost all the wildlife and their habitat is impacted by the human induced interruptions/ interferences.

Causes of Human Wildlife Conflicts

I. Habitat fragmentation and change in land use pattern

Habitat fragmentation coupled with change of land use pattern and landscape is gradually endangering the survival of grass land and swamp eco system. Thus, human population has invaded the natural habitat of wild animals leading to escalation of man animal conflict instances in the region. This opened up floodgate of encroachers even from the neighboring states resulting in severe degradation of private forests. That apart, increased human population mainly by migration, rapid urbanization, and unplanned development activities carried out by line departments in the above areas led to fragmentation of huge habitats.

Thus, in the past few decades, the natural migratory routes have been interrupted in many places by an ever-increasing occupation of land by human beings and an unrelenting abuse of the natural resources found in areas which are yet to be declared as forests and handed over to the Forest Department. Consequently, the wildlife population in general and elephants in particular has been divided physically and genetically into many small, isolated groups, surviving in pocket areas.

Moreover, the land use pattern and cropping pattern in many region have undergone tremendous change in the recent past. It is observed that large area adjoining to forest have been encroached for cultivating seasonal crops like plantain, which entices the wild animals.

II. Degradation of Habitat

Due to initial priority and focus for developmental projects, the degradation and depletion of habitats in forest lands start appearing. The numbers of migratory corridors were affected leading to fragmentation of the habitat especially for landscape species such as the elephants and contributed increasing human-Wildlife conflict in Tamil Nadu like in many other places in the country. Other species such as tiger, leopard, bison, etc., were biologically and ecologically affected due to habitat degradation and shrinkage The other reasons for the loss of habitat quality in Tamil Nadu are grazing, forest fires,

invasion of exotic species, encroachments, quarrying and mining, destruction of the coral reefs and estuarine environments, over and unscientific harvesting of minor forest produce, etc., which unfortunately continue even with the best of the efforts taken by the department.

III. Increasing trend of Wildlife Population (as per census reports)

a) Elephant Census

1998-1999	2481
1999-2000	2844
2000-2001	1863
2002-2003	3052
2003-2004	3049
2004-2005	4015
2006-2007	3867
2010-2011	4812
2011-2012	3987

It is evident from the above figures that the population of elephant from 2001 to 2012 has significantly increased.

b) Tiger Census

The results of nationwide synchronized tiger population estimation to estimate population of tigers, its co-predators and prey organized by NTCA (Government of India) with technical in-puts from Wildlife Institute of India shows steady increase in tiger population from 2005-06 and 2013-14. The median number of tigers in the State was 76 in 2005-06 which has gone up to 229. (NTCA-WII Report, 2014). This in itself speaks volumes about the status of protection provided to tigers, its co-predators and prey in tiger bearing forests in Tamil Nadu.

c) Panther Census

During 1998-99 Census, number of panthers were estimated 101, which have increased to 244 in 2005-06 census..

d) Wild boar abundance

The recent study undertaken by the Forest Department, Divisions like Vellore, Coimbatore, Thiruvanamalai, Hosur, Thirupattur, Hasanur and Madurai have high concentration of Wildlife population of Wild Boar. The Forest Divisions of Attur, Namakal, Salem, Satyamngalam, Kallakurichi, Cuddalore, Nagapattainam, Dindigul, Kodaikanal, Theni, Kalllakadu, Ambasuamudram, Thirunelveli have medium abundance status of Wild Boar. The other Forest Divisions have low to nil status.

IV. Area located within wildlife corridor

The movement of wildlife from one place to another is a natural phenomenon. The seasonal movement of wildlife is a scientifically fact based on the wildlife biology. The areas where there are abundance of wildlife population and are contiguous with the forests in its vicinity, this may be the reason sometimes for the movement in its normal course to adjoining forests. In Tamil Nadu, 12 major elephant corridors have been identified, They are,

S. No	Name of the Elephant Corridor	Length (in Km)	Width (in Km)	Area (in Sq. Km)	Connection
1.	Tali Elephant Corridor	2	1	2	Chattiramdoddi – Hunsamhali
2.	Chamrajnagar – Talamalai at Muddahalli Elephant Corridor	1.5	1	1.5	Talavadi – Muddahali
3.	Talamalai – Guttiyalattur Elephant Corridor	9	5.3	47.7	Sujalkatti – Bannari
4.	Avarahalla – Sigur Elephant Corridor	0.5	1	0.5	Mavinhalla – Chemmanatham
5.	Kalhatti – Sigur at Glencorin Elephant Corridor	0.5-0.7 Average 0.6	0.1	0.06	Glencorin
6.	Moyar – Avarahalla	N/A	6-7 Km	N/A	Masinagudi – Moyar

S. No	Name of the Elephant Corridor	Length (in Km)	Width (in Km)	Area (in Sq. Km)	Connection
	Elephant Corridor				
7.	Kalmalai – Singara and Avarahalla Elephant Corridor	0.2-0.5 Average 0.35	3-4 Average 3.5	1.22	Singara – Masinagudi
8.	Kallar at Gandhapallayam Elephant Corridor	7	0.5-3 Average 1.75	12.25	Kallar
9.	Boolavampatti – Attapadi Elephant Corridor	1.5	0.5	0.75	Anaikatty
10.	Anamalai at Punachi Elephant Corridor	1	0.5	0.5	Attakati – Upper Aliyar
11.	Anamalai at Waterfalls Estate Elephant Corridor	0.5	0.5	0.25	Ayenpadi – Waterfalls Estate
12.	Anamalai Between Siluvaimiedu – Kadamparai Elephant Corridor	1	0.5	0.5	Siluvaimedu – Kadamparai

Human Wildlife Conflict is high in some corridors like in Mudumalai Tiger Reserve which acts as a corridor for wildlife from Western Ghats to Eastern Ghats and vice-versa, at the same time, Mudumalai Tiger Reserve is also surrounded by human habitation along the entire southern boundary from Gudalur to Masinagudi area to a stretch of about 30 km with some patches of forests adjoining it in places. Hence, the movement of wildlife is restricted by the impact of human activities in the corridor and thus the wildlife (especially the elephants and tigers) may stray into the human habitation occasionally. Animal like elephant migrate along their traditional

corridors which have now got fragmented in Gudalur area due to anthropogenic and development.

Gudalur Forest, owing to its geographical location, is merely acting as a passage facilitating migratory movement of elephants between the Mudumalai Wildlife Sanctuary and Silent Valley National Park through Nilambur and New Amarambalam Reserve Forest tracts of Kerala. Thus, Gudalur is just meeting the food, water and migratory requirements of the big herbivores like elephants for a short duration. In the case of tiger, it needs a minimum territory area of ranging from 2 - 5 sq. kms. Since Gudalur Division is in close proximity with Mudumalai Tiger Reserve and Wynad Wildlife Sanctuary, dispersed population of these animals therein, running short of the territorial areas, stray temporarily in search of food to the adjoining Gudalur Division, where intense human habitations exist.

V. Wild animal venturing out of forest in search of food and water

With the improvement in agricultural cultivation technology, most of the areas in the fringes of the Forest area cultivate succulent and sweet crop like sugarcane, Maize, Banana, Cassava and other tuber crops etc. Elephant and wild pig are attracted to such agricultural farm. Carnivores like Tiger and Leopard may also come out in search of easy prey. Eg:- Domestic animal, some time become man eater due to various reasons. It is also observed that wild animal especially carnivores when injured, sick or aged tend to kill easy prey near human habitation.

I. ANTI DEPREDATION ACTIVITIES

Anti-depredation squads involving local tribes have constantly been deployed in all the problematic areas to drive away the elephants straying into human habitation back to available forest area at the disposal of the Forest Department. These teams, including forest staff, are provided with crackers, torch and other necessary equipment. Additional vehicles with fuel are provided to supplement the ongoing anti depredation activities. Round the clock surveillance are being undertaken at vulnerable areas by the team of forest officials involving staff, mahouts, kavadies along with kumkie elephants and during crisis additional staff are deployed by pulling in from adjoining Districts to alert the public in advance. That apart, a Rapid Response

Team (RRT) has been formed, consisting of ten numbers Anti poaching watchers and training has been imparted to them exclusively in the field of combating man animal conflict. Village Elephant Depredation team involving local youth volunteers and forest staff are formed to manage man animal conflict at all village levels. Trainings have been imparted to them under various Schemes

II. HABITAT IMPROVEMENT

Water holes and check dams have been constructed at many places in the reserved forests and dispute-free lands, in order to improve water requirement of animals during summer.

Alien weeds existing in Reserved Forests have been removed. Further, seedlings of fodder like bamboo and other grasses have been planted under TBGP schemes. Several fodder tree species have been planted inside the forests to augment the food resources under the Massive Tree Program over a period time.

III. PHYSICAL BARRIERS

1) Elephant proof trenches, which would prevent entry of elephants into human habitation, have been dug around forest areas Trenches have also been dug around forest fringe villages.

2) **Details of Elephant proof trench dug in Tamil Nadu**

Year	Achievement	
	Km.	Amount (Rs. in lakhs)
2001-02	5.000	5.000
2005-06	10.750	14.250
2006-07	7.420	8.900
2007-08	1.800	2.190
2008-09	11.000	13.200
2009-10	23.889	34.396
2010-11	61.600	115.000
2011-12	388.400	801.700

Year	Achievement	
	Km.	Amount (Rs. in lakhs)
2012-13	484.622	1168.875
2013-14	808.880	3086.881
2014-15	152.140	639.964
TOTAL	**1955.501**	**5890.356**

3) Solar fencing has been provided along the Reserve Forest area to provide protection to the local people.

Year	Achievement	
	Km.	Amount (Rs. in lakhs)
2005-06	62.440	100.000
2006-07	263.200	424.000
2007-08	319.500	511.200
2008-09	331.410	529.000
2009-10	260.800	415.350
2010-11	131.575	226.800
2011-12	54.500	108.000
2015-16	2.500	6.856
TOTAL	**1425.925**	**2321.206**

IV. CREATING AWARENESS AMONG PUBLIC AND OTHER STAKEHOLDERS

1) Awareness camps under various schemes on man animal conflict are organized to enlighten the public on the issue.

2) Publicity Boards indicating the elephant crossing zones with contact phone numbers of the respective Forest Ranges have been erected in all the vulnerable areas over a period of more than 10 years, to alert the passersby.

3) Handbills and posters informing publics about *Dos & Don'ts* have been distributed / pasted in all the public places.

4) The estate authorities in Nilgiris District have been addressed regarding the measures to be undertaken to curb the menace, as most of the wildlife attack victims are labourers under them. They have been requested to provide toilet facilities and other basic amenities to workers, to check movement of drunken labourers especially during night hours, to deploy requisite number of watchers to monitor the movement of animals and alert the labourers. The suggestions also include removal of aromatic fruits like jack which attract elephants.

5) Awareness meetings are conducted at various locations along with the Hon'ble public representatives, officials from different departments, tea estates both private and public. Special Meetings were also convened summoning the estate authorities, non government organizations and staff of various departments, chaired by the Conservator of Forests, and exchanged views and suggestions Similar meeting are being convened at Udhagamandalam under the Chairmanship of the Collector of Nilgiris.

V. PUBLIC ALERT SYSTEM

1) Patrolling teams are alerting the public on possible elephant movement in all vulnerable areas through loudspeakers in their vehicle.

2) Forecast on possible movement of elephants is also telecast through scrolling in local cable TV net work on daily basis to put the public as well as estate managements on alert. That apart, a whatsapp group has been created under the name GUDALUR SAFE WAY to quickly alert and keep the concerned updated on the issue.

3) For the first time in the District, a Trip Wire Early Warning system which would send advance signals in the form of bulk SMS messages to public and selected panchayat members and staff, about elephant movements has been installed in Gudalur Range during 2012-13 itself. This device also sends alarm in the form of sound and light alerting the people in the vicinity.

Further, low cost early warning systems have been installed at at Kunilvayal of Gudalur Range, Kaidhakolly, Genepool ofPandalur Ranges with the help of local NGOs like WCT and WWF.Proximity detector has been installed in Mukkatti, Orkadavu ST colony, Elamanna, Kottappadi Cherangode, and Tantea Mazhuvan Cherambadi areas. Similarly, linear detector has been installed in Mukkatti Godsbrook Reserve Forest and Kolapalli Samiarmalai area of Bitherkad. The steps are being taken to enhance the number of low cost early warning system so as to cover all the vulnerable areas.

VI. COMMUNITY SUPPORT SYSTEM

1) Solar street lights have been installed in villages located within forest areas.

2) Public address system/Rapid Response Unit is in place round-the-clock in all the Range Offices and the Divisional Office to act upon the information received in this regard.

3) Payment of compensation for loss of life/ crop damage/property damage/loss of life stock etc., is being made immediately as far as possible subject to availability of funds.

Details of Relief paid for the damage cause by wildlife: (G.O.MS.No.98 Environment and Forests (FR.5) Department dated 17.08.2011)

Payment of compensation for loss of life/crop damage/property damage/loss of life stock etc., are made immediately as far as possible subject to availability of funds.

1.	Human death or Permanent Incapacitation	Rs. 3,00,000
2.	Major Injury	Rs. 30,000
3.	Crop Damage	Rs. 25,000 per acre or as per actual whichever is less Coconut tree Rs. 500/- per tree
4.	Damage to Tiled / RCC House / Thatched House	**Fully damaged house** Pucca house Rs. 35,000/- per house

		Kucha house Rs. 10,000/- per house **Severely Damaged house** Pucca house Rs. 5,000/- per house Kucha house Rs. 2,500/- per house **Partially damaged house** Rs. 1500/- per house
5.	Damage to Vehicle, loss of cattle or live stock	Milch cattle Rs. 10,000/- Bullock Rs. 10,000/- Goat Rs. 2000/- Sheep Rs. 15000/- Poultry Rs. 100/- per bird Pig Rs. 1000/- or actual value whichever is less
6.	Cloth / House hold articles other house hold	Actual loss or Rs. 2000/- whichever is less
7.	Damage to shop	Rs. 4000/-
8.	Damage to irrigation or drinking water wells, electric motor	Rs. 2000/-
9.	Vehicle compensation	Rs. 2000/-

VII. EVICTION OF ENCROACHMENTS

Efforts are being taken by this Department to evict the encroachers in forest areas. Further, fresh attempts of encroachments are also being prevented. The matter is being reviewed regularly with the District Eviction Cell headed by the Collector of Nilgiris.

VIII. LAST RESORT OF CAPTURING OR SHOOTING DOWN OF MAN EATER TIGER

In the Nilgiris during the last 3 years, orders were issued under sec 11(1)a of Wildlife Protection Act 1972 to shoot three man eater Tiger, one each during 2014, 2015 and 2016 in the interest of public safety. One rogue Elephant was also captured in Gudalur area during April 2016.

Challenges:

1. Reduction of Biotic Pressure from Wildlife Habitat

The main reason for the Man-Wildlife conflict is the dependence of the fringe forest people on forest resources. The overlap in land use for grazing, collection of minor forest produce / fuel wood enhances the chance of conflict. Therefore, it is of utmost necessity that the resource dependency of the people living at least within 5 Kms of vicinity of the forest is reduced. This can be done by forming eco-development committees in the surrounding area of the protected areas. The eco-development committees will identify the genuine needs of the village community and evolve and implement strategies for meeting these needs from outside the forest areas. Poverty is one of the implied reasons for dependence of the villagers on forest. These committees will also develop the models for generating alternate employment opportunities and capacity building to be capable of gradually reducing the dependence on the forests and improving the socio-economic status of the village community. For voluntary relocation of human settlements from inside of protected areas the role of these committees will be of facilitators.

2. Restoration of Wildlife Habitat and it's Corridor

The other main cause for the human-wildlife conflict is the degradation of the habitat resulting in migration of wild animals out of their traditional boundaries and causing damage to the life and property of the human beings. The loss of important migratory corridors and buffer zones has resulted in increased human-wildlife conflict. Therefore, habitat improvement activities will have a great influence in minimizing the conflict by confining the wild animals within the boundaries by meeting their all genuine needs. These activities will include: soil and moisture conservation activities, afforestation and plantation activities with climatic climax species, acquisition of important wildlife corridor, fire prevention and control, weed control and prevention of their spread, arresting the invasion of exotic species, assisting the natural regeneration, providing more protection to unique habitats and keystone species, development and revival of degraded village grazing lands, etc. Timely and suitable pest and disease control measures, providing protection to the migratory

corridors, revival and cleaning of water bodies in the forests will have to be addressed.

3. Mitigation of Human – Wildlife Conflict with in Protected Areas

Apart from strengthening protected area network across the State, number of steps will have to be taken to facilitate the strict protection of wildlife and also to mitigate human-wildlife conflict within protected area networks. Continuous patrols and surprised raids are to be organized by forest staffs in almost all the wildlife rich areas of the State. Permanent Anti-poaching camps need to be established in highly vulnerable places to keep a close watch on movement of poachers, anti-social elements and local villagers in all the protected areas. Local tribal should be engaged as Anti-poaching watchers. These Anti-poaching camps will accommodate the Anti-poaching staff along with facilities of communication, rations, arms and ammunition to run the camps round the clock in most efficient manner. The anti poaching camps will yield excellent results not only in providing effective protection but also to mitigate any chances of human-wildlife conflict in protected areas by minimizing the chance encounter. Watchtowers should be erected at all the strategic locations to keep vigil on forest area and to watch the movements of the antisocial elements and poachers.

4. Management of Conflict Situation outside Protected Areas

While handling the issues of human-wildlife conflict in Tamil Nadu it is experienced that the present practices of rescue and rehabilitation mainly involves driving the animals back into the forest areas by using fire crackers, drum beating, trained elephants, etc. In some cases the wild animals are trapped using nets or chemical tranquilization. But in most of the cases it has been noticed that the staff involved in rescue operation is not sufficiently trained in handling various animals. The delayed response to manage the conflict further aggravates the situation.

There can be one such Special Squads in each Range, positioned at Range head quarters. Each Squad should be headed by a Foresters and include villagers of forest fringes. These Squads can be

administratively controlled by the respective Range Officers. These Squads should be provided with adequate and exclusive financial allocation and be given reasonable freedom to discharge their responsibilities. As and when, the wild animals stray out, these Squads will respond and conduct required counter operation to contain the situation. In case of elephants straying outside, these Squads will stay in village and drive the herds back to forest with the help of farmers. In case of other animals, a standard protocol has to be developed which should be strictly followed by the Squad to trans-locate the animals. The required equipments will have to be procured and skills of the staff in handling the equipments and their operations have to be enhanced to effectively handle the human-wildlife conflict.

5. Landscape Management

In order to have a holistic approach in the management where the management of forest and wildlife associates the management of human dimensions with partnership of people, Landscape Management has to be brought in the operation. This will not only take care of one protected area but the whole stretch of the forest areas along with peripheral villages as one unit and manage all the issues related with that landscape in totality. To involve local people and all other stake holders by fulfilling their genuine requirements, the landscape management concept is under preparation for Agasthiyarmalai landscape which will cover forest areas of Tirunelveli Division, Kalakkad Mundanthurai Tiger Reserve, Kanyakumari Wildlife Sanctuary, Meghamalai Wildlife Sanctuary, Theni Forest Division and Grizzled Squirrel Wildlife Sanctuary. The similar concept could be implemented in all the contiguous protected forest areas such as Anamalai and Mudumalai Tiger Reserve landscapes.

6. Introduction of Tree Culture

The farmers are facing serious loss of crops and life due to the elephant depredation, of commercial crops like banana, sugarcane, coconut which consumes lot of water and attract the elephants as the crops are highly palatable and nutritious compared to forage available in the forest. By introducing the Tree Culture, the farmers would be advised to raise trees of economically important species which will be equally remunerative and at the same time which will not be damaged by the elephants. Trees like teak, casuarinas, Melia, Mahagony, kumil

will be raised and planted by the Department on patta lands along the forest boundary at Government cost of as already being followed in TCPL (Tree Cultivation in Private Lands) scheme under the ongoing JICA funded TBGP in Tamil Nadu.

7. Geo referenced elephant monitoring system

The elephants herd is led by old martriac as a close-nit social group. Number of herds from forest area raids the crops at different point of time in different place. Besides, a solitary tusker also starts raiding the crop in an unpredictable manner. In order to predict their arrival from forest area to patta lands, a device called radio collaring device connected to mobile phone through satellite telemetry. This will forewarn the movement of elephant herd approaching patta land. This particular system will help in alerting the staff to drive back the animals.

8. Establishment of permanent Kumki Elephant camp

This kumki elephant camp also promote eco-tourism besides helping in controlling wildlife depredation of crops and managing problem elephants. Establishment of kumki elephant camp involves recurring costs of feeding and salary of mahout and cavady, maintenance of elephant camp, purchase of chains, medicine, ropes etc.

Way forward

Human-wildlife conflict is a recently developed phenomenon purely due to anthropogenic disturbances caused to the wildlife habitat and their natural routine activities. These conflicts are causing severe damage, not only to the life and property of man, but also cause an irrecoverable damage to the wildlife and its habitat. Almost all instances of human-wildlife conflicts reveal that the root causes for these conflicts are unscientific ways of development around forest areas leading to disturbance to the natural activities of wildlife in their own habitat. The problems of human-wildlife conflict are assuming serious proportions now. These problems are not specific to few areas but are acquiring epidemic proportions and spreading over wide ranges. Conservation of forests, wildlife and associated biodiversity is equally essential for man's own survival.

Keeping these facts in view, the future strategy for preventing human-wildlife conflict should hinge on reducing the human pressure from wildlife habitat by eco-development, providing adequate protection, habitat improvement, prevention of damage, managing the conflict and creating awareness among the people. Wildlife managers will also have to redesign habitat management for retention of wildlife within its environment. Hence, the wildlife and biodiversity conservation efforts have to invariably address the issues and problems related to human-wildlife conflicts in a holistic manner without which the process of conservation would always be incomplete.

CHAPTER-XII

WILDLIFE TOURISM IN TAMIL NADU

Wildlife Conservation and Tourism Development is in separable entity and call for integrated development and augmentation for both the nature and wellbeing of human. Tamil Nadu has a Forest Cover of about 23,625 Sq. Kms. consisting 18.10% of its geographical area.

Status of Tamil Nadu for initiating Eco Tourism

Tamil Nadu comprises of Protected Areas and Reserved Forests with enchanting Eco-Tourism assets like Waterfalls, Rivers, Lakes, Shola Forests, Grasslands, Hill Stations, Western Ghats, Eastern Ghats, Mangrove Forests, Coral Reefs, Sea back waters, etc., The potential areas existing in Tamil Nadu are 15 Birds Sanctuaries, 15 Wildlife Sanctuaries, 5 National Parks, 4 Tiger Reserves, 4 Elephant Reserves, 3 Biosphere Reserves and 2 Conservation Reserves. These areas provide unique opportunities to tourists for a life changing experiences on perception about the need to conserve Forests and Wildlife.

The vision Tamil Nadu – 2023 document targets fast growth in all the sectors including Eco-Tourism. Eco-Tourism is nature based travel, Emphasis on Conservation education while admiring and enjoying serene beauty of wild plant and animals, development and management of sustainable tourism product and activity.

The objective of Eco-Tourism Policy of Tamil Nadu is to secure involvement of local communities and other Stakeholders by way of employment in all tourism related activities.

Eco Tourism Policy envisages the following aspects

Desirable characteristics of Eco-Tourism viz., site development near the destination, to focus on quality of visitors rather than nos. Stipulation of standards in quality and safety, it should be supply driven rather than demand driven etc., Strategies of Eco-Tourism viz to balance between viability and affordability, to focus on carrying capacity, abiding to environmental laws, Economic benefit to local communities to be ensured etc.,

Requirement of Eco-Tourism viz., locating roads, nature trails, reception, interpretation centres, signages etc., to be developed.

National Wildlife Action Plan (2002 & 2016)

Lay emphasis on Tourism Management Plan for each Protected Areas and should be regulated and low impact is vital.

Wildlife (Protection) Act 1972 permits tourism in Protected Areas which should be as per site specific Management Plan approved by the Principal Chief Conservator of Forests and Chief Wildlife Warden. Eco Tourism is promoted in Forest areas in an ecological and environmental friendly manner as per approved Working Plan. Normative standard for tourism activities in Tiger Reserves to be followed as per its Guidelines 2012, viz to prepare site specific tourism plan approved by Local Advisory Committee, State Level Steering Committee (SLSC) and shall review its implementation, the revenue generated is deposited in the Tiger Conservation Foundation for Tiger Reserve Development activities.

Community based Eco-Tourism sites identified and selected in Protected Areas and Reserved Forests by the Forest Department to be promoted and popularized by formulating guidelines for Tamil Nadu State.

Opening up of certain potential Forest areas for future Eco-Tourism development

Certain forest areas which were re-afforested from abandoned mining sites and degraded forest areas should be developed as world class eco-awareness, nature education, interpretation centres. These centre's should be developed near urban areas like in Chennai, Coimbatore, Trichy and Madurai. Forestry Extension Centres can also be upgraded to Eco-Awareness and interpretation centres. These centres should also provide an ambient of relaxation for the tourist and visitor's to de-stress, improve mental health, understand and admire nature. Eg:- Nanmangalam RF (Kanchipuram Division) an abundant mining site comprising mostly vegetation of artificially regenerated is an excellent location for the people of Chennai.

Abandoned or unutilized godown, nursery sites and Forest rest house outside forest areas should be developed as eco-camping site, or nature interpretation and education centre, resting place, accommodation facilities, etc., eg:- Alikulli rest house (Tiruvallur Division) located outside forest area unutilized, should be developed as tourist facilities for eco-camping or camping site for trekkers. Students, eco-clubs, Nature Lovers, etc., The site is adjoining to Poondi reservoir, Alikulli Reserved Forests, successful red sanders plantation (40 years old) and Paleolithic age Giudium caves located in Pulikundrum Reserved Forests. It is an excellent location for the people of Chennai to enjoy and admire nature. Similar potential areas are available in many Forest Divisions in Tamil Nadu.

Opening of Certain areas in Forest Corporations:-

There are three Forest Corporations in Tamil Nadu:-

1) Arasu Rubber Corporation (ARC)
2) Tamil Nadu Tea Plantation Corporation (TANTEA)
3) Tamil Nadu Forest Plantation Corporation (TAFCORN)

These corporations are located near important Eco-Tourism destinations. Hence, potential and vacant forest areas under their control can be developed for Eco-Tourism purpose. In fact Tea gardens, Rubber Plantations, factories and their rest houses are of tourist attractions.

Development and customization of Eco Tourism products viz., different activities to target groups, activities in Forests, Coastal areas, River & Waterfalls, Adventure sports activities, activities in the villages needs to be drafted.

It is suggested to establish Tamil Nadu Eco Tourism Board or Authority under Forest Department to organize, direct and ensure an effective implementation and management of Eco-Tourism objectives and principles in the State.

CHAPTER-XIII

WILDLIFE RESEARCH AND CAPACITY BUILDING

The Forests and Protected Areas of Tamil Nadu have been paradise for research scholars as it is the home of wide array of plants and animals. The Western Ghats, Eastern Ghats and the plains have abundant wealth of wildlife. The wetlands, marine reserves also hold bountiful wildlife resources. The Forest department has had illustrious Foresters who were not only good administrators, but, keen wildlifers and forest scientists. Tamil Nadu has rich tradition of forestry research which started in 1918. Excellent studies in wildlife had been initiated by the department to support wildlife and forest management from time to time. The research findings of the department, universities and institutes have been incorporated in the management and working plans to enable good forestry plans and scheme implementation. Wildlife research in Tamil Nadu has a rich history with many Botanists, Zoologists, Ecologists, Sociologists, Wildlife Biologists and Entomologists and other scholars of science taking up research projects from time to time in Protected Areas. All these are deemed reasons for Tamil Nadu producing some of the best forest and wildlife researchers in the country. The Forest department research wing, SFRI, Kolapakkam and the divisions spread over the State though which focuses on Biodiversity Conservation and Forest Genetic resource research, has been periodically taken up research on wildlife concerns. However, the bulk of wildlife research studies in the State have been initiated by National and International institutes and the State Universities. Many organizations have taken up wildlife research long time in the State. BNHS established the study on migrating birds of Vedaranyam in 1980s. ISC and BNHS set up study stations in MTR and KMTR for ecosystem and wildlife studies way back in the eighties.

Forests have provided a platform for many students to get their PhDs, and served as ground to post-doctoral research scholars. The research in the last two decades has centered round the following broad areas in protected areas particularly KMTR, MTR and ATR which have supported good management decisions. The broad areas include:-

(1) Floristic study and surveys
(2) Research on Pollination and agents

(3) Research on Forest Disturbance and Fragmentation
(4) Project on understanding the studies of large and small mammals
(5) Project on study of ecology behavior and demography of animal species
(6) Project on Inventory, Surveys and Population estimates of wildlife.
(7) Study on insects and other invertebrate species.
(8) Studies on ethno medicinal plants
(9) Bio-prospecting of medicinal plants
(10) Studies on reptiles / amphibians
(11) Studies on endemic flora and fauna
(12) Assessment of habitat quality and connectivity
(13) Studies on forest soils
(14) Studies on population structure and dynamics
(15) Breeding Biology on various invasives
(16) Impact of climate on Biodiversity and wildlife
(17) Mammal counting through camera traps
(18) Fish Diversity etc.

Many research studies also centered round important animals like elephant, tiger, bats, Nilgiri Langur (Primates), loris, bears, deer, Nilgiri Thar tree species, earth worms, reptiles, medicinal plants, aromatic plants, Dhole, Water birds, Owls, Vultures, Butterflies, Beetles, Turtles and Tortoises etc.

Research permissions have been accorded to many organizations like

(1) KFRI, Kerala
(2) Bharathidasan University
(3) Scott Christian College, Nagercoil
(4) Foundation for Ecological Research, Advocacy and Learning (FERAL), Pondicherry
(5) WWF, Ooty
(6) Madras Institute of Developmental Studies, Chennai
(7) TNAU, Coimbatore,
(8) TATA Institute of Fundamental Research, Bengaluru
(9) Sarah Tucker College, Tirunelveli
(10) Manonmaniam Sudnaranar University, Alwarkurichi

(11) Madras Christian College, Chennai
(12) Asoka Trust for Research in Ecology and Environment (ATREE)
(13) Zoological Survey of India
(14) Central Institute of Medicinal and Aromatic Plants, Bengalaru
(15) Madras Veterinary College
(16) Wildlife Trust of India
(17) IFGTB, Coimbatore
(18) National Remote Sensing Centre, Hyderabad
(19) Wildlife Association of South India
(20) Suganthi Devadason Marine Research Institute
(21) Wildlife Information Liaison Development Society, Coimbatore
(22) Arulagam, Coimbatore
(23) Government Arts College, Ooty
(24) Chennai Snake Park Trust
(25) Annamalai University
(26) Indian Institute of Science and Educational Research
(27) Central Soil and Water Conservation Research Institute, Ooty
(28) Centre for Water Resource, Anna University
(29) Goa University
(30) MurugappaChettiyar Research Centre etc.
(31) SACON
(32) ZSI
(33) Madurai Kamarajar University
(34) Department of Wildlife Science, Madras Veterinary College
(35) Bombay Natural History Society, Mumbai
(36) Tropical Botanic Garden and Research Institute, Tiruvananthapuram
(37) Care Earth
(38) Indian Institute of Science, Bengalaru
(39) FRLHT
(40) Nature Conservation Foundation, Mysore
(41) National Chemical Laboratory CSIR, Pune
(42) University of Madras

(43) Department of Zoology / Entomology, St. Xavier College, Palayankottai
(44) Bharathiar University
(45) Pondicherry University
(46) Indian Institute of Science, Bengalaru
(47) Wildlife Institute of India
(48) AVC College, Mayavaram

The research projects, the studies and findings in wildlife covering flora and fauna, critical species have enabled a rich collection of information that has supported wildlife management effectively. The prime areas of research have been Anamalai Tiger Reserve, Pollachi, Mudumalai Tiger Reserve, Ooty, Sathyamangalam Tiger Reserve, Erode, Megamali Tiger Reserve etc. The Gulf of Mannar Biosphere Reserve and Agasthiyarmalai Biosphere Reserve have also provided immense opportunities for marine wildlife science research and other streams of sciences. Off late research on Marine Biosphere Reserves and Wetlands and Seascapes are critical areas of research.

Research has also been conducted on tribes of Tamil Nadu and number of studies have been carried out in zoos, particularly, Arignar Anna Zoological Park to support Ex-situ and In-situ conservation veterinary science. The Tiger Reserves have also supported research work of the students in Japan, USA and other foreign countries. Over 500 studies have been permitted from 2010-11 to 2015-16. Full reports have been recorded for many studies. Many study reports are in the pipeline. For some studies interim reports have been received. Thus, Tiger landscapes have stood ground for excellent projects providing support to enumerable research scholars and institutions. The wildlife research projects from Colleges, Universities, NGOs and individuals have supported and enriched conservation actions. The protected areas, in particular in the State stood ground for excellent research covering various areas of forestry and wildlife biology. Some of the research works have been published in reputed journals. Many research works have also been commissioned by the department with funds obtained under various on-going projects. Thus, the research works permitted to various institutes and individuals besides the department's own research initiative have resulted in a fund of information covering sizeable areas of interest. Even to-day, requests for research are pouring in from young Biologists and students of

forestry and wildlife. This is a healthy sign in support of wildlife research in Tamil Nadu.

Research under Tamil Nadu Biodiversity Greening Project

1. Biodiversity Conservation

   Strategies

   i. Improve critical wetlands by removing invasive and alien species
   ii. Conserve critically endangered species of flora and fauna
   iii. Improve management of water, habitat and herbivores in GNP
   iv. Improve management of water, habitat and herbivores in Vandalur Black Buck Sanctuary
   v. Improve management of water in PAs and RFs.

Research works carried out

Species Conservation Action Plan for Dugong was prepared for Gulf of Mannar & Palk Swait Area under the TBGP through identified resource organization.

Species Conservation Action Plan for sea turtle for the forest division, Chennai (WL), Kancheepuram, Villupuram, Cuddalore, Nagapattinam, Ramnad (WL), Thoothukudi, Tirunelveli and Kanyakumar was carried out by identified resource organization.

Wetland Action Plan was prepared for Vedanthangal, Karikili, Point Calimere, Vaduvoor, Udayamarthandapuram, Vellode, Vettangudi, Chittirangudi, Kanjirankulam, Melselvanur, Kilselvanur and Koonthankulam Bird Sanctuaries.

Water Management Strategy and Action Plan was prepared under TBGP for Mukurthi National Park, Point Calimere, Srivilliputhur, Megamalai, Sathyamangalam, Erode, Coimbatore, Nilgiris North, Nilgiris South, Gudalur, Dharmapuri, Hosur, Dindgul, Kodaikanal, Tiruvnelveli, Thoothukudi and Kanyakumari divisions.

Study on endangered plant taxa (35 species) was carried out by identified experts for Mukurthy National Park, Pt.Calimere,

Srivilliputhur, Megamalai, Sathyamangalam, Erode, Coimbatore, Nilgiris North, Nilgiris South, Gudalur, Dharmapuri, Hosur, Dindigul, Kodaiakanal, Tirunelveli, Thoothukudi and Kanyakumari divisions.

Capacity building

The challenging wildlife conservation scenario today requires committed wildlife managers who possess scientific competence and social awareness aided by communication skills. The Wildlife Managers also need sharp detection and enforcement capabilities against organized criminal elements nursed by big-money illegal trade. Wildlife Management requires good knowledge of current technologies in areas of GIS, GPS and interoperability, knowledge on taxonomy, flora and fauna, habitat understanding and a whole lot of other issues relating to management of hydrology. Therefore in-depth knowledge in the above said areas is not only required for Wildlife Managers but also of frontline staff who have to develop adequate skills and capability at the field level to stay relevant to the present needs. This calls for exposure of wildlife staff to build their capacities in accredited national and international institutes and Universities. Capacity of serving officers is presently being updated through courses in the Wildlife Institute of India, Indira Gandhi National Forest Academy, Indian Council of Forestry Research and Education, Central Academy of State Forest Service Officers, Tamil Nadu Forest Academy, Foresters Training College, Vaigai and also through frequent training and exposure visits to BNHS, SACON, IISC, IRS and other compulsory trainings offered by the Government of India. Capacity building programmes in Wildlife are also important through the various ongoing programmes and projects of the department. Capacity building is a constant need to update the skills in the area of Wildlife management particularly for committed meet the outreach, awareness and extension needs.

CHAPTER-XIV

FUTURE OF WILDLIFE MANAGEMENT IN TAMIL NADU

Considering the present scenario of wildlife conservation and its foreseeable future, the theme of the United Nations 2016 World Wildlife Day was "**The future of wildlife is in our hands**". Though the focus of the World Wildlife Day in 2016 was on African and Asian elephants, the theme applied equally well to all spectrums of wildlife and the message of the role of humanity was appropriate and clear. The message applies equally well to all countries if not more to India, a mega bio-diverse country. As per the International Union for the Conservation of Nature's Red List, India has over 988 threatened species and is 7th on the list of countries with the most threatened species globally. Though India's protected areas comprise just 4% of India's landscape and are virtually islands facing tremendous pressures, the wildlife conservation successes achieved in India is laudable. But at the same time, the fact that the human population in India as well as its aspirations are still growing is a major concern.

Tamil Nadu has range of species and habitat in the Western and Eastern ghats. The species abundance diversity and richness has given it a unique place when compared to other States in the country.

Tamil Nadu has been a pioneering State in Protected Area Management, development of forest resources, wildlife protection and biodiversity conservation. The total protected area is 7,069.72 sq.km, which comes to 30.9% of the State's Forest area. Under the concept of Protected Areas, there are 5 National parks, 15 Wildlife sanctuaries, 14 bird sanctuaries and two conservation reserves besides four Tiger Reserves viz. Kalakkad-Mundanthurai, Anamalai, Mudumalai and Sathyamangalam. These Protected Areas have been established under the Wildlife (Protection) Act, 1972. Tamil Nadu also has the distinction of having 3 Biosphere Reserves viz. Nilgiris, Gulf of Mannar and Agasthiyarmalai, which are known for their richness and unique biodiversity. The Western ghats are one of the 25 global hotspots and one of the 3 mega centers of endemism in India. The forests of Kanniyakumari, Kalakkad-Mundanthurai Tiger Reserve, Anamalai Tiger Reserve, Mudumalai Tiger Reserve, Mukurthi, Srivilliputhur and Megamalai owe their richness in flora and fauna to their location in the Western Ghats. Site specific knowledge on complexities of issues

covering wildlife areas have guided management through the approved management plan prescriptions.

The Protected Areas hold large habitats of viable population of wildlife, endemic species, key-stone species and provide habitat for wildlife besides landscapes and corridors for large mammals. The Protected Areas in the State are mainly managed for conservation of biodiversity, education, recreation, historical significance and unique landscapes and seascapes.

Tamil Nadu not only has taken initiatives for conservation of terrestrial fauna but also initiated action for conservation of marine flora and fauna by declaration of Gulf of Mannar Marine National Park.

Wildlife expert groups have identified 13 Elephant Corridors to enable migration of Elephants, to meet out their food, fodder and biological requirements.

The State's sincere efforts in establishing range of Tiger habitats in Western and Eastern Ghats have resulted in record by raising tiger numbers from 163 in 2011 assessment to 229 in 2014 assessment. Though overall increase at National level comes to 30%, it is 40% in the State of Tamil Nadu since the last estimation in the State. Wildlife management provides attention on conservation of all wildlife within and outside of the Protected Areas.

Ex-situ conservation is a big success in Tamil Nadu. Zoos are recognized by the Central Zoo Authority of India. Arignar Anna Zoological Park recognized by CZA plays an important role in ex-situ conservation. Arignar Anna Zoological Park under its umbrella plays a very important role in the conservation of endangered species, education, research and studies on wildlife health besides entertainment.

While successes in wildlife conservation in Tamil Nadu can be chiefly attributable to the visionary approach in wildlife legislation in India and Tamil Nadu, credit also needs to be given to the fairly rigorous implementation of the policies and laws both in letter and spirit by the Tamil Nadu Government and Forest Department. In fact, some of the steps taken in the direction of wildlife conservation in

Tamil Nadu preceded the developments that took place in the rest of the country.

The crucial question facing the future of wildlife conservation in Tamil Nadu and the country as well is the impact of development. The human population in the landscape is growing along with the aspirations of the population. The human dominated landscapes are increasing in size coupled with new and varied land use patterns in it. Wild landscapes are being reduced, degraded, fragmented and polluted threatening the very survival of the habitat which supports the wildlife.

There are very many challenges for the present day Foresters/ wildlife Managers in the country. They are mainly due to threat to wildlife habitat like fragmentation, encroachment, mining, problem of smuggling of sandal wood, Ganja cultivation, problem of poaching valuable and endangered animals like Tiger, Elephants, etc., There are deliberate killing of wildlife due to poisoning, electrocution in retaliation against crop depredation especially by elephants. The man-animal conflict situation calls for adequate social security measures like insurance, compensation etc.

There are problem like wildlife diseases affecting our endangered fauna, cattle borne diseases like Anthrax, Haemorrahgic Septicaemia, Trypanosomiasis etc.,) account for death of Elephant every year. There are deaths of wildlife like elephants in accidents due to man-made structures like canals and barrages. The poaching of elephants for ivory result in showed sex ratios in many elephants.

While discussing about the future of wildlife of India in general and Tamil Nadu in particular, a few challenges are very prominent and unless effective steps are taken to address them, the future of wildlife conservation would have a very bumpy and uncertain ride ahead. The major challenges of wildlife conservation faced in the Tamil Nadu context are:

- Human-Wildlife Conflicts (HWC)
- Integrity of wildlife habitats
- Corridors, connectivity and contiguity
- Poaching of wildlife
- Stake holder participation

- Capacity development in wildlife management
- Gaps in Wildlife research

1. Human-Wildlife Conflict

HWC manifests as a result of a serious competition between wildlife and humans (including their livestock) for food, water, space or any other resource at spatio-temporal scales leading to varied levels of overlap in their operational areas. Such conflicts often result in severe damage to the life and property of man and irrecoverable damage to the wildlife and its habitat.

The man-animal conflict is an emerging problem. These problems need to be attended to with human face so as to save our wildlife. There are problems like crop depredation by herbivores like Elephant, Sambar, Spotted Deer, Wild boars etc. and cattle lifting due to Tiger, Panther etc., and loss of human live due to killing of animals like elephants, panther or tigers.

Though the people of Tamil Nadu have been extremely tolerant towards wildlife, off late, human-Wildlife Conflicts (HWC) are steadily assuming enormous proportions and posing severe threats to conservation of wildlife. It often dominates the discussion on conservation and consumes considerable resources of the Forest department in tackling it. The wildlife habitats in Tamil Nadu have a sizeable human population living within the boundaries of the habitat as well as adjacent to it and these villages or settlements have strong aspirations for improving their economic status while carrying on agriculture and raising livestock to generate cash incomes.

The increasing human population and related developments have caused interruptions in the patterns of migration, feeding, hunting, breeding, nesting, etc of the wildlife. As a consequence the encounter rate between humans and wild animals has increased significantly resulting in human-wildlife conflicts. These conflicts often end lead to death and injuries among wild animals and also in loss of human life, physical injuries, damage and loss of agriculture / horticulture crops and damage to the assets and properties.

Many a Protected Areas are having innumerable human settlements inside the forest areas. Majority of them are forest

dependent communities. Their needs and aspirations have to be met with. The villages surrounding the Protected Areas/ forests have pressure due to cattle grazing. This needs to be regulated and proper immunisation of cattle for diseases along the belt areas, say about 5 km. distance around the forest boundaries is a must.

As Protected Areas attract tourists, managing the tourists, public relations, interpretational, educational and publicity skills are also essential. Park Management should concentrate on eco-development aspects so as to help long-term conservation.

A holistic approach in tackling this challenge is the key towards the mitigation of these conflicts. A paramount requirement in this effort is to ensure that the existing habitat of the wildlife is made free from human disturbances to the extent possible. Without doubt, the degradation of wildlife habitat in various forms intensify the level and range of conflicts. Biotic pressures like removal of biomass, NTFP, livestock grazing, pollution and reduction of water sources in the habitat, fire need to be reduced to the minimum in order to provide the wildlife a good habitat to survive and thrive. The protection of the connectivity and contiguity between habitats or patches is important to prevent wild animals from straying out of their natural habitats. It is also important that the human landscapes just outside the wildlife habitat are managed in a manner to prevent the straying of wildlife for food, water etc.

While measures mentioned above coupled with effective barriers could lead to a significant decrease in the level of conflicts, the ability to manage the conflicts is also important as and when it happens. Adequate and timely compensation, awareness programmes for the stakeholders to handle responsibilities and roles, early warning systems, effective handling of conflict situations with technically equipped and trained staff would be important steps in reducing the conflicts. The approach of eco-development and management at landscape level will have to be the core of the future strategies for curbing and mitigating human-wildlife conflict. The existing tolerance of the people towards wildlife should not be lost and needs to be built upon to secure the lives of both wildlife as well as the adjacent human populations.

2. Integrity of wildlife habitats

Delineation and securing the boundaries of the wildlife protected areas and reserved forests is a major challenge considering the thirst for ownership of land in the State. It is extremely important to detect and evict existing encroachments in the habitats and prevent future encroachments. It is fairly well accepted that once habitat is lost it is generally lost forever. The use of technology would be an important tool in protecting and preserving the boundaries of habitats. Preparation of digital maps and geo-referencing the boundary stones of protected areas as well as reserved forests would go a long way in this effort.

The voluntary relocation of people living in the critical habitats within protected areas need to be taken up and key priority combined with resources need to be accorded for such steps. This step would be an important positive milestone in the lives of the human communities involved and would be crucial for the long term conservation of wildlife populations and species. The human wildlife conflicts would also be reduced to a great extent with this effort.

3. Corridors, connectivity and contiguity

In the long term conservation of populations and species, single large population has been found to be more effective as against several small populations. Hence large habitats and populations are crucial for the long term conservation of wildlife species. Reduction in the size of the habitat and/or splitting of populations has a serious impact on the viability of populations. Connectivity of habitats is also crucial for the species which display migratory behaviour or require large home ranges.

A landscape approach with considerable emphasis on securing the linkages within and between landscapes would be an important step in securing connectivity. There is a strong need to secure all known corridors without further loss of time in order to ensure that we do not lose them forever. The available existing corridors would also need site specific protocols and management regimes with required regulations/prohibitions /controls.

4. Poaching of wildlife

Poaching is a serious threat to the survival of wild animal populations across the globe. The illegal trade of wildlife and its products has reached alarming proportions and its value in illegal trade is said to be next only to drugs. Poaching is perhaps the most serious threat faced by the fresh water and marine habitats in the state.

Control of poaching is an important step that needs to be taken in the already degraded and fragmented landscapes of the country. Tamil Nadu was one of the pioneer states in evolving effective anti-poaching strategies and the model developed is being emulated in other states. The greatest strength of the model developed in Tamil Nadu has been the participation and involvement of the tribal communities living within the forest areas.

Poaching can assume serious proportions quickly and silently to wipe out populations. The wildlife species targeted as well modus operandi of the mafia in the methods of poaching as well as its transport keeps changing and hence it extremely vigilant that the enforcement agencies play a proactive role in checking this malaise. A Good intelligence network, effective patrolling, diligent follow up on cases filed against offenders, tracking of the illegal chain in both directions, data base on offenders and network and rewards to motivate citizens and staff in the fight against poaching would go a long way in controlling poaching.

Awareness of the people to curb the market for wildlife products is also crucial and it is in this sector that the enforcement agencies and NGOs need to focus significantly.

5. Stake holder participation

The people need to be more aware about their role and responsibility towards wildlife conservation and this can be encouraged by empowering them and also through incentivizing secured social, financial and physical capitals for sustained livelihoods. Changing the way of living of the people, which is compatible to conservation can be effected by facilitating a process of change in attitudes, and motivation. Sincere and genuine implementation of the process of eco-development

which has given positive learning's in some sites across the country will be critical for eliciting local people's participation for wildlife conservation.

The wildlife conservation movement in Tamil Nadu can be proud of the strong involvement of common citizens, wildlife NGOs, media, civil society groups, research organizations, educational institutions and volunteers. Tamil Nadu is one of the few states that have involved the tribal communities living within forests in wildlife conservation in a symbiotic manner.

The population estimation exercises within the protected areas have always been conducted with the help of volunteer groups and individuals and the validity of the results has rarely been questioned. Ecotourism has a great potential in wildlife conservation and Tamil Nadu can make gains on the steps already in this direction.

The main streaming of wildlife conservation in the socio-economic development agenda of the state would necessarily involve all the stakeholders and it is important that considerable attention is paid in this endeavor.

6. Capacity development in wildlife management

The threats to the habitat as well as wildlife keeps changing and the field of wildlife science also continues to evolve and it is in this context that the capacity of the development of the Forest department and its staff needs to keep pace with it. Though considerable resources have been invested in this sector, it is a continuous process and needs constant attention.

7. Gaps in Wildlife research

Though wildlife science is a relatively new subject, it has made major strides and its contribution towards conservation needs no further elaboration. However, the variety of species and its interactions are so huge, intricate and complex that we still have a long way to go before we can effectively manage habitats and populations on a scientific basis. Research on management aspects of species and ecosystems also need further thrust to develop robust models of estimation and management.

Conclusions

Human population trends are on rise. The aspirations, needs and demands of the societies from the natural resources are equally on rise driven by the trajectory of economic growth. Natural resources do provide the basis of growth but within the delivery and carrying capacities of the natural systems. Plundering nature and its resources blindly and mindlessly will not provide a sustainable solution. The very survival of the societies will be endangered if profligacy and not the prudent use of such increasingly scarce resources is not only preached but practiced by all in a society. Wildlife provides a meaning and purpose to the ecosystem by virtue of its living interactions over time and space. Presence of rich wildlife indicates the vibrancy and symbolic to efficient functioning of the system. Removing wildlife from the ecosystem will only make the system non responsive and restricted and will impact the plethora of valuable services to the societal well being.

The increasing instances of human-wildlife conflicts and its fallout are indicative of the fact that everything is not well within an ecosystem containing wildlife. Areas are getting degraded, lost to human use, encroached, extraction of resources continues from such areas and pressures are mounting. Modern growth indicators – roads bisect the areas and impact wildlife movement thus causing conflict. The conventional buffer areas between forest and the villages has shrunk to the extent that in many case now are not available. The wildlife which may be coming out of forest areas now straightaway finds village, people and the agricultural crops. No vacant space to meander and get back to forests. Human prosperity in terms of more lighting, moving vehicles, noise and pollution further annoy wildlife and may irritate them more. The quality of the forest with respect to fodder and water especially during stress periods is another matter of concern. Such a forest limitation will not be supporting the prey base to a desired level and the predators may find their way to human dominated areas in search of some easy prey. A larger picture at landscape level needs to be visualized, and managed in a way where the various components of the larger landscape are managed in such a way that each management is complimenting the natural resource conservation of which wildlife is a component. Modern tools and technologies should make us gaining new skills, methods of enhanced production form land use without being detrimental to conservation.

Corridors are like roads and streets connecting human habitations and wildlife also need them to move from one protected area to other and that alone can ensure the long term sustainability of their populations through genetic flow and mixing. An isolated though healthy wildlife population will not last long due to erosion of genetic base and inbreeding among the individuals of the populations. Therefore, it is required that we allow the 'right of passage' to wildlife their intrinsic and basic right to them to move free from danger and dignity.

Due to increased problems like man-animal conflict and epidemics like Anthrax, Foot and mouth etc., the veterinary support is needed for treatment sick and injured animals, capturing and translocating problem animals like rogues, man-eaters, immunization of livestock on the forest fringe to protect wildlife from communicable diseases, postmortem and forensic support and managing camp elephants and zoo animals including nutrition and health case aspects.

A good working relationship between foresters/ wildlifers and veterinarians is very much essential to face many animal related issues as outlined above so as to save our valuable wildlife and the countrys' biodiversity as a whole for the peace and prosperity in the society. However, human induced pressures and exploitation in the form of habitat destruction, native species exploitation, invasive alien species, climate change, pollution have all put many species under great stress. While on one side conservation initiatives are on, there is also fear of such loss of wildlife due to human intervention and natural calamities. This calls for timely action by way of instituting studies on biodiversity and wildlife, highlighting range of problem for each species and involving stakeholders to assume responsibility for conservation. The management plans, working plans have to play critical role in assessing quantitative criteria for each species identifying them as critical, endangered, vulnerable and taking species relevant action for the threatened species through concerted programmes. The five year plans and annual plans need to work on programmes and projects aimed at conservation of the threatened species and their habitats. It is time that we should also take note of all other species associated with tiger and other large mammals. Fortunately this State has taken all precaution against diversion of forest lands for non-forestry purpose. In the long lasting span of more than 30 years diversion is minimal that is around, 4500 ha. The centrally sponsored schemes,

state schemes and shared schemes have been supporting wildlife conservation in a big way. Such programmes should continue with higher allocations. This is the one State where compensation for damages caused by wildlife is paid promptly and peoples' support evinced in conservation. Yet, man-wildlife conflict is an increasing event almost daily with reports of elephants injuring and damaging agricultural crops and properties and lives. Strategic action is being planned to control such threats from wildlife by creating fodder resources. While there are many programmes for conservation of tiger and its habitat and a host of other mammals, birds and reptiles, Ex-situ conservation programmes are undoubtedly very successful. The biosphere reserve programmes namely Gulf of Mannar Biosphere Reserve, Nilgiris Biosphere Reserve, Agasthiyarmalai Biosphere Reserve are in feather cap of the State. The State has also taken action for conservation of butterfly and other smaller life forms.

With landscape level conservation taking prominence in the State, combined with research coordination, conservation and intensive management the state is poised for bigger gains in wildlife management. The State is doing its best to protect all the wildlife and its habitat. There are pilot plans to contain invasive land species which are considered reasons for habitat degradation. There are specific programmes for conservation of wetlands, marsh lands, mountains and critical ecosystems in the State. Trees outside forest are aimed at conservation of natural resources. Agro forestry, plantation forestry are getting increased attention in the State. This has enabled to reduce the pressure on forests. The State is also lucky to have some keen NGO's who are supporting department in conservation. Sound research awareness has enabled winning people support for conservation. Thus, several promising programmes initiated by the Government and MoEF & CC which have led to habitat improvement, providing enough breeding grounds in protected areas ensuring security of the species. The State also has excellent protection machinery and with legal support have been stringent in dealing with the poachers and smugglers. The rehabilitation of habitats of tigers and forest types on eco system and species levels have assured contiguous habitats for wildlife. The youth have a big role to play in conservation. They have to have a positive attitude towards conservation. The farmers also have to develop a tolerant to attitude towards wildlife.

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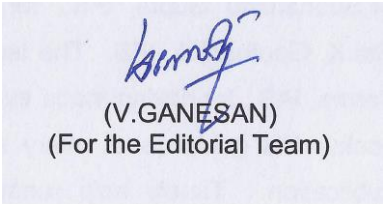

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