TAMILNADU BIODIVERSITY STRATEGY AND ACTION PLAN

CHORDATE DIVERSITY



Edited by

R. Annamalai

TAMILNADU FOREST DEPARTMENT
GOVERNMENT OF TAMILNADU, CHENNAI

2004

Tamil Nadu Biodiversity Strategy and Action Plan

Chordate Diversity

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R. Annamalai

Tamil Nadu Forest Department

Government of Tamil Nadu

Chennai

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FOREWORD

Tamil Nadu has 165 species of fresh water Pisces of which 126 are redlisted; 76 species of amphibians of which 56 are redlisted; 177 species of reptiles of which 77 are redlisted; 454 species of birds of which 32 are redlisted and 187 species of mammals of which 40 are redlisted. There is immediate need to evolve Strategy and Action Plan for Conservation and Recovery of the Redlisted Chordates.

Tamil Nadu Forest Department has constituted 8 Wildlife Sanctuaries, 12 Birds Sanctuaries, 5 National Parks, 1 Tiger Reserve and 3 Biosphere Reserves for *in-situ* conservation of wild animals and wild flora. The protected area covering 3305 sq.kms constitutes about 15% of the Recorded Forest Area and 2.54% of the Geographic area of the State. Wildlife conservation receives equal priority in all the forest areas.

The Strategy and action plan for the chordates have been discussed in a detailed manner in this book.

I congratulate **Dr. R. Annamalai, I.F.S.,** for bringing out this book.

(J. C. KALA)

PREFACE

As part of the National Biodiversity Strategy and Action Plan, Tamil Nadu Biodiversity Strategy and Action Plan have been prepared. This plan has been structured as follows

Tamil Nadu Forest Biodiversity Strategy and Action Plan
Tamil Nadu Invertebrate Biodiversity Strategy and Action Plan
Tamil Nadu Chordate diversity Strategy and Action Plan
Tamil Nadu Wild Plant diversity Strategy and Action Plan
Tamil Nadu Estuarine Biodiversity Strategy and Action Plan
Tamil Nadu Aquatic Biodiversity Strategy and Action Plan
Tamil Nadu Agro Biodiversity Strategy and Action Plan

Strategy and Action Plan for Chordate diversity is discussed in this volume. This has been prepared based on the workshop conducted in Salim Ali Centre for Ornithology and Natural History, Coimbatore. Identified experts prepared the lead paper on each subject and the same was discussed with the invited participants in the workshop.

I thank the Principal Chief Conservator of Forests for entrusting me the entire responsibility of co-ordinating the whole process of preparation of Strategy and Action Plan for Tamil Nadu.

I have been assisted by ***Mr. M. Senthil Kumar***, and ***Mr. K. Muthu Kumar*** in compiling the details for this book and their hard work is duly acknowledged. I have been assisted by ***Mr. N. Kandaraj*** in computerizing the entire information of this book.

The assistance rendered by all the office staff and field staff is gratefully acknowledged.

Last but not the least, my thanks are also due to my wife ***Mrs. Banumathi Annamalai,*** my children ***A. Sathish Kumar, A. Karthik Kumar and A. Prasanna Kumar*** who always take pride in my accomplishments.

I welcome suggestions for the improvement of the future editions.

R. Annamalai

Tamil Nadu Biodiversity Strategy and Action Plan

Chordate Diversity

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1. Zoogeographical Status of Tamil Nadu - An Overview

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1. Zoogeographical Status of Tamilnadu - An Overview

Albert Rajendran

Introduction

The study of the patterns of distribution of organisms in space and time is called *Biogeography*. Biologists are nowadays rarely satisfied with the mere description of these patterns, and the biogeographer usually wants to discover which environmental factors are the ones that determine or limit the distribution of the species he studies. To do this, he must draw on knowledge from the whole spectrum of the sciences of life and the environment, including geology, climatology, systematics and taxonomy, evolution, physiology and ecology. We have realized that the plants and animals that share our environments are not only a source of economic value, but also a resource of interest and beauty which we have a duty to manage and conserve for future generations, just like any other resource, such as food or energy. But the conservation and management of species of animals in natural environments is a complex activity that requires a detailed knowledge of their biology, especially of their geographical distribution, so that we would know in which environments they occur and what conditions they can tolerate. So biogeography is basic to programmes of conservation and management of environments and the organisms within.

For many organisms, distribution can be conveniently considered in terms of units of environment as 'woodland', 'grassland' or 'seashore'. But most species have specific distributions even within such units of environment as the *habitat*. Certain characteristic species of plants and animals are found each of them in smaller *microhabitats*, which have spatial and temporal relationship with that of the broader habitat. So the distribution of these species are considered on a geographical scale, a habitat scale or a microhabitat scale, subjected to physical conditions or food resources or completion, which permit or limit survival. And species constantly seek or develop short-term or long-term compensatory changes (= *adaptations*) to tolerate, disperse and get distributed in different favourable places. This process has been continuously happening from the time of origin of life and is the sole reason for the phenomenon of the present day distributions of organisms in various geographical regions of similar physical, climatic and ecological conditions – in terms of phylogeny and evolution or ecophysiology or minute environmental characteristics.

And that is why some species which disperse too far; have wide geographical distributions and some species are confined in their distribution to the areas in which they evolved – these are said to be *endemic* to that region. Their confinement may be due to physical barriers to dispersion, or they would have recently evolved and have not spread from their centres of origin, or have specific limits of microclimates within regional microhabitats and of food distribution. And so, due to their specific needs, for survival with limited scope for dispersion and with environmental stress (abiotic and biotic) acting on them, these species are restricted to their regional microenvironments, to reach the status of *endemic,* or *endangered*, or *threatened* taxa.

Zoogeography – Global scenario

Zoogeography refers to the distribution of fauna of different taxa in a biome (a broad ecological unit with similar physical and biological factors) with relevance to topography, climate and vegetation (Darlington, 1957). Zoogeography is especially pertinent to vertebrates which have characteristic patterns of distribution depending on land masses or continents. It is much helpful in understanding the phylogenetic and evolutionary relationships of related species of animals within a broad group or between groups of similar adjacent biomes.

Darlington (1957) divided the whole world depending upon the similarity of fauna, into the following regions:

***Realm Megagaea*:** This includes four zoogeographical regions:

Region I: Ethiopian: includes Africa, South of Atlas mountains and southern regions of Arabia.

Region II: Oriental: includes Tropical Asia (e.g. Indian sub-continent) and associated islands.

Region III: Palaearctic: includes Eurasia above tropics and northern portion of Africa, north of Atlas Mountains.

Region IV: Nearctic: includes North America and Mexico, above tropics

***Realm Notogaea*:**

Region V: Neotropical: includes Australia, New Zealand, Tasmania, New Guinea and the Pacific Islands.

This classification was slightly changed by Cox (1974) replacing the name 'African' for 'Ethiopian' region, based on mammalian distribution (see Fig.1).

Oriental Region

Oriental region includes India, Indochina, Sri Lanka, Myanmar, Thailand, Malaysia, Indonesia, Borneo, Taiwan, Philippines and South China. It is bounded by Himalayas in the north, but there is no physical boundary in the south-east corner, up to the island of Borneo, just west of Celebes along the Wallace line, going

southwards between Bali and Lombok bordering the Australian region (see Fig.2).

Oriental region is known for its varied physical features. It presents tropical conditions, except northern part of India which is temperate. Its eastern part including Burma, Indochina and Northeast Asia have rain forests. Western peninsular part is desert and southern portion of Indian sub region has luxuriant tropical forests. Similarly Sri Lanka, Indochina and Malaya contain thick forests.

The fauna of Oriental region exhibits considerable resemblance with that of African region. The resemblances are so marked that some zoogeographers prefer to club these two
regions under a single region. The fauna is neither rich in endemic 'families' nor it includes widespread families. Oriental fauna is characterized by the presence of 153 families of terrestrial vertebrates, but only ten are exclusive (source: Rastogi and Jayaraj, 1979).

The Oriental region is divided into four sub regions:

1. Indian 2. Ceylonese 3. Indo-Chinese 4. Indo-Malayan.

Zoogeography of Indian Sub region

It is first necessary to understand the ways in which today's patterns of Indian geography, climate and distribution of life forms came into existence. Until recently, it seemed as though the geographical ranges of different animals could be explained using only three basic principles – evolution, climatic change and land bridges. Though it was clear that such geological events as the rising of mountain chains (= the Greater Himalayas) must inevitably have affected the climate of surrounding areas, there seemed until recently no reason to search for principles to explain the distribution of animals and plants during the whole of the Cenozoic Era. But studies of the late Paleozoic and early Mesozoic Eras (about 225 – 300 million years ago) provided evidence of a very different scenario (Cox, 1974; Bossuyt and Milinkovitch, 2001).

Cox *et al.* (1977) explains the uniqueness of Indian fauna as follows:

One of the first clues to this was discovery of a group of Permian flora in India, belonging to the genera *Glossopteris* and *Gangamopteris* – usually called the *Glossopteris* flora (Chaloner & Meyen, 1973). Its distribution extended over South America & Central Africa, Australia, Antarctica and India. All these are collectively known as *Gondwanaland*; North America, Greenland and Eurasia, from which the *Glossopteris* flora was absent, are known as *Laurasia*. The presence of this flora in India was unexpected, because on the basis of present-day geography one might expect its flora to be like that of Asia and unlike that of the southern continents. Shortly before the appearance of the *Glossopteris* flora, all the

southern continents had been affected by a giant glaciation. The southern glaciation had affected not only Australia, South America and South Africa, but also India. There is further geological evidence that the glaciers invaded India from the south – that is, from the direction of the present equator.

Bossuyt and Milinkovitch (2001) have proposed a classical hypothesis on amphibian distribution and added a note that the early rapid evolution of fauna in the late Mesozoic era (before 'continental drift' – Wegner, 1929) facilitated the development of separate, distinctive fauna in India by the subsequent emergence of the Greater Himalayas. Because the evolutionary radiation of the mammals did not take place until the break–up of Laurasia and Gondwanaland had commenced, and because today's zoogeographical regions are based upon the distribution of the mammals, it is not surprising to find a number of similarities between African and Oriental faunas (Cox et al., 1977). If India became separate at about the Cretaceous / Coenozoic boundary, it must originally have had a fauna of early mammals and, perhaps, dinosaurs. The late Cretaceous vertebrate fauna of India are still unknown, and its Coenozoic fauna is known only after it became connected with Asia in the middle Eocene and was invaded by the Asian tropical fauna (Cox et al., 1977). So now we know that, early vertebrates migrated from African region to India and also East Asian fauna from Indochinese region through Myanmar/India border into Indian subcontinent.

Gunther (1880)** observed a greater affinity between the fish fauna of the Indian and the African regions. Day (1865)** differed from Gunther saying that many inland fresh water fishes of India have Malayan affinity than Africa. Daniel (1983) states that the reptilian fauna is largely dominated by Indochinese elements and a relict of the fauna of Eastern Himalayas and Assam now occurs in the high rainfall area in the Western Ghats principally below 15Ú N latitude. Blanford (1901), who studied the occurrence and distribution of the vertebrates in general, agreed that the elements of Indo-Malayan fauna are heavily represented in the Eastern Himalayas.

Due to varied climate and geographic conditions, the fauna of Indian sub region is also very heterogenous and further division of this sub region is not an easy task. Its division has been attempted by number of scientists. Jordan (1862)* divided it on the basis of distribution of birds; Gunther (1864) on reptiles; Blanford (1876)* on molluscs; and Mahendra (1942)* tried to subdivide on geographical regions. Rodgers and Panwar (1988) have given a vivid authentic analysis of the major biogeographic zones of India. (See Fig 3.)

Faunal status of Tamil nadu

Many studies have shown that species diversity and richness of fauna in general, are found to be higher in tropics and increasingly higher towards equator (Odum, 1983). Tamil Nadu, with its highly

strategic position being the southernmost state of India and closer to equator (the southern tip, Kanyakumari lies at 7^{U}N lat.), has high faunal species richness, in terms of number of species as well as number of individuals in each species. Presence of three major biogeographic zones in the state, namely the Western Ghats, Deccan plains and the coastal zone (Rodgers and Panwar, 1988) also attribute to this high diversity and richness. According to Mahendra (1942), part of Tamil Nadu fits into the zoogeographical sub division of southern peninsular India below 20^{U} N (mainly the Deccan plains) and other areas in the sub division of Travancore Cochin (the hilly southern Western Ghats, south of lat. 20^{U} N on the west and south of Coleroon river in the east); (see source map Rastogi and Jayaraj, 1979...Fig.3).

Travancore Cochin sub division was based on the studies of the colonial British, when the whole area was under the Madras presidency within which Tamil nadu and Kerala are part, and within the present political boundary of Tamil Nadu lie the eastern side of the southern Ghats upto Niligris(bordering the Kerala state on the west), closely allied Eastern Ghats, such as the Shevaroy hills, Kolli hills, the plains and the part of the Coromandal coast line.

Evolution of the southern Western Ghats has long been of interest to biogeography students (Hora, 1953). The Western Ghats were identified as one among the 18 biodiversity hotspots of the world (Meyers, 1990). Mittermeier *et al.*(1999) recently recognized the Western Ghats along with Sri Lanka as "Hot Spot 25", as the fauna of Western Ghats and Sri Lanka have clear affinities. The Western Ghats constitute five percent of the total land of India but harbour 30% of India's biological species (Rodgers and Panwar, 1988). And so, though we can definitely categorize many faunal species of Tamil Nadu (esp. lower vertebrates) as endemic, many more are wide spread throughout Western Ghats and Sri Lanka. And many lowland fauna occur throughout the Deccan plains. But the recent spurt of taxonomic revision through molecular studies of animals found in different localities (sometimes even within the same biogeographic zone) may add more number to our endemic taxa, exclusive to Tamil Nadu.

How many?

It is estimated that there are about 1.4 million known species of Eukaryotic organisms in the world (Systematic Agenda 2000, 1994), and that 5 million or even 10 to 30 million species remain to be described (Office of the technology Assessment, 1987; Erwin, 1982, 1988). Supposing 5 million is the correct figure, only 30 percent of the existing organisms have been described. Such an estimate holds true with many of the organisms found especially in the Tropics. About 81000 species of animals are found to occur in India (Government of India, 1997). Of the vertebrates, the lower vertebrates are the least studied and understood, and of them amphibians and reptiles are the most neglected.

Myers (1989) indicates that current rate of species loss is the highest in the last 65 million years. This means many of the organisms currently living in our planet would vanish before they are discovered and described. It is of utmost urgency that the faunal wealth of our area has to be monitored, and protected on a holistic approach.

Fishes

Jhingran (1985) does not give an accurate estimate of the fish species of India, and he has not covered all the inland waters, esp. Tamil Nadu riverine drainages, except Cauvery river system. Though a few reports of region wise checklist of fishes are available, a comprehensive study of all the water bodies of Tamil Nadu is lacking. Hence an approximate figure is gathered from a few sources .Of the 2500 species of fresh water as well as coastal fish species in India, inland fresh water fishes account to about 950 species. Of these, in the inland waters of Tamil Nadu (comprising all the riverine systems, ponds and lakes, dams and reservoirs, and hill streams), approximately 400 species may occur (Source: M.Narayanan, Aquatic Biodiversity Centre, St.Xavier's College, Tirunelveli, Tamilnadu). This figure includes both endemics and widespread species. An ongoing ecological study of fishes in the Western Ghats by a group from Manonmaniam Sundaranar University, Tirunelveli might reveal more number of species (Arunachalam, personal communication), probably more endemics, as fish species generally living in rapid hill streams would mostly be found in isolated drainages and most of the Indian lowland species all over the Indian subcontinent (Beavan,1877).

Amphibians

Various studies report different figures of amphibian species accruing in India, but close to about 200. Ravichandran (personal communication) reveals a figure of 201 species in India and 61 species in Tamilnadu. Report of the Conservation Assessment and Management Plan Workshop (CAMP workshop, Molur & Walker, 2001) has analysed the status of 205 species occurring in India and 73 species in Tamil Nadu. Ramasamy (this issue) reports a total of 76 amphibian species in Tamilnadu, and further highlights their endemicity as about one third (32.3%) of the Indian species occurring in Tamilnadu.

However Biju (2001) shows a figure of about 225 species of India. S.D. Biju, on his intensive search for the frogs of Western Ghats, thinks aloud that at least about 100 more species in Western Ghats alone are awaiting scientific identity and most of them are tree frogs of the genus *Philautus*. He further states that that he has collected 96 'species' of *Philautus* from the Western Ghats alone, while total number of Indian species reported in the genus *Philautus* is only 25. While discussing about the present amphibian distribution in Tamilnadu, Biju opines that there are about 80 species, covering the Western Ghats of Tamilnadu

and lowland plains, and that the tree frogs of the hills (esp. high canopy frogs of rainforests), the lowland species such as *Tomopterna*, *Fijervarya* (old name: *Limnonectes*) and overall frog species are to be ascertained in view of their distribution, synonymy problems, ecology and phylogenetic links within and between other zoogeographical regions.

The recent study of Vasudevan *et al.* (2001) reveals that amphibian distribution in the forests floor was found to be largely restricted to the forests of adjoining streams and mountains flaking the valleys may restrict the dispersal of several species of forest floor amphibians across drainages. This study clearly ascertains the need for the protection of each and every hill stream from any disturbances (natural or man-made) for the sustenance of amphibians and to allow them breed in safety.

Reptiles

Bhupathy (this issue) has given a vivid analysis of Reptiles of Tamil Nadu. He has collated all major works done on the Tamil Nadu reptiles and mentions that about 53% of reptile species occurring in Tamil Nadu are endemic to India. Majority of them (90%) are largely endemic to Western Ghats. Of the 484 reptiles species found in India (Das,1997), 177 are found in Tamilnadu.

Only a few intensive reptilian studies are available revealing the distribution of particular group/family, especially of Uropeltid snakes (Rajendran,1985) and Agamid lizards (Bhupathy and Kannan, 1997). CAMP workshop (Molur and Walker, 1998) gave information on the geographical status of each reptilian species of India and presented the conservation status such as 'endemic or endangered or threatened' and certain species as 'data deficient or vulnerable or not evaluated' (see also the tables given by Bhupathy, this issue). I believe that our research in Reptilian taxonomy and systematics are still in infancy and we hastily categorize many reptilian species as 'rare and threatened' without even an intensive survey or classification, and without knowing basic ecology of many species. We still depend on the works of colonial period zoologists and naturalists for distribution and classification as only a few extensive and intensive field surveys have been carried out since more than 60 years. The cryptic reptilian species such as the burrowing 'shield tailed snakes', many rock dwelling agamids and geckos need special priority.

In Tamil Nadu, the area of utmost priority for distributional assessment and conservation of reptiles is the Western Ghats. The other equally important areas are the Eastern Ghats (Shevaroys, Kolli hills, Yelagiris, etc.), the swamp of Vedaranyam and certain other coastal areas (where sea turtles breed), the Gulf of Mannar Marine National Park with coral islands (for sea snakes and turtles), the Kuthiraimoli Theri (with loose red sand) for certain highly adapted reptile species such as *Geochelene elegans* (Star Tortoise), *Sitana ponticeriana*

(Fan throated Lizard), *Echis carinatus* (Saw Scaled Viper). Special mention must be made about the highly localized species in distributon such as the skink *Dasia halianus* (Mundanthurai Plateau where the gallery forest habitat itself is a rarity - Johnsingh and Joshua, 1989), *Uropeltis broughami* and *U. dindigalensis* (Sirumalai Hills – Rajendran, 1985), for priority wise conservation.

Birds

Balasubramaniam and Vijayan (this issue) has given a comprehensive analysis of the status of birds of Tamilnadu with their distribution. He mentions that, of the 1220 species of birds occurring in India (including migratory species), 454 are found to live in Tamil Nadu, which includes 17 endemic species. However, I would like to reiterate Shankar Raman, (2001) that bird communities of the rainforests should be given priority for further research to understand their ecology and distribution.

Mammals

Ajith Kumar (this issue) has mentioned that nearly 150 species of mammals are found in Tamil Nadu. He has stressed the need for research in the least studied taxa such as bats. Mammalian species and their distribution are well documented in Tamil Nadu. However I would like to stress the importance of research in certain elusive small mammals such as Mouse Deer, Leopard Cat, Fishing Cat and the rehabilitation of Nilgiri Tahr into the areas of earlier distribution, especially in Kalakad-Mundanthurai tiger reserve (A.J.T. Johnsingh – frequent personal discussion).

Concluding Remarks

Tamil Nadu includes three major biogeographic zones, within the Indian subregion of the Oriental zoogeographical region. We now know that the glaciation in the late Mesozoic era, the rapid migration of lower vertebrates from African region before the split of Gondwana and Laurasia, and the addition of India to Asian tropics with further rise of the Greater Himalayas have resulted in a heterogeneous varied geography, climate and faunal distribution in India and subsequently in Tamil Nadu.

We have to understand the patterns of faunal distributions, especially lower vertebrates and other myriads of invertebrates, particularly for conservation and sustainable utilization of our biodiversity. It is more than likely that India, esp. Tamil Nadu still harbours many faunal species, particularly of herpetofauna and terrestrial invertebrates, that are not yet known to science. For many species which are in literature only by virtue of their original description, nothing is known of the animal's ecology or even whether it still exists or not. Intensive field oriented research of these less known species should be given priority to really elicit their distribution and conservation status.

Acknowledgements

I express my sincere gratitude to R. Annamalai, Field Director, Kalakad-Mundanthurai Tiger Reserve, for encouraging me to gather information about this topic. I have had many useful long discussions with many persons from whom I have gained knowledge the fauna of Indian subcontinent, and particularly of Tamil Nadu. Special mention must be made of the following persons: A.J.T. Johnsingh – WII, Dehra Dun (esp. on critical habitats and general fauna), S.D. Biju – TBGRI, Thiruvananthapuram and M.S. Ravichandran – ZSI, Kolkota (on amphibian distribution), R. Bhupathy – SACON, Coimbatore (on reptiles). My wife and colleague H.M. Mahilini helped much in gathering materials on Zoogeography in general, literally browsing through many books and journals from the library of our department and other sources.

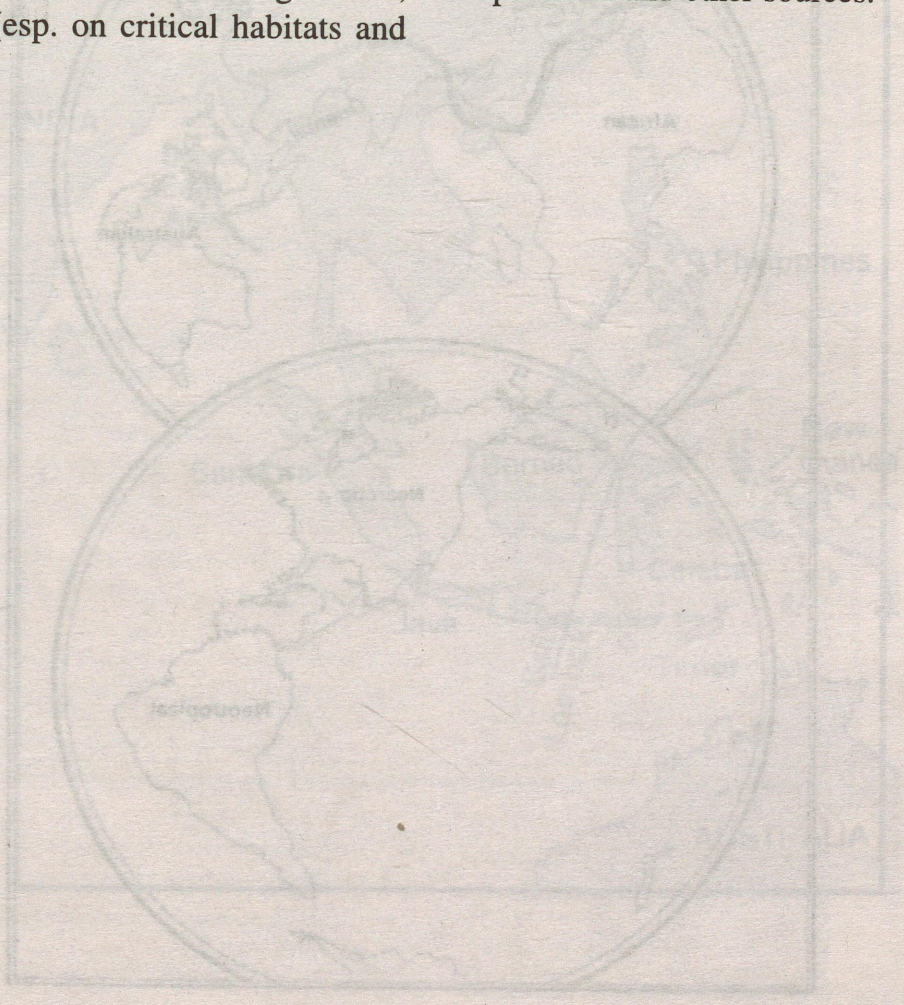
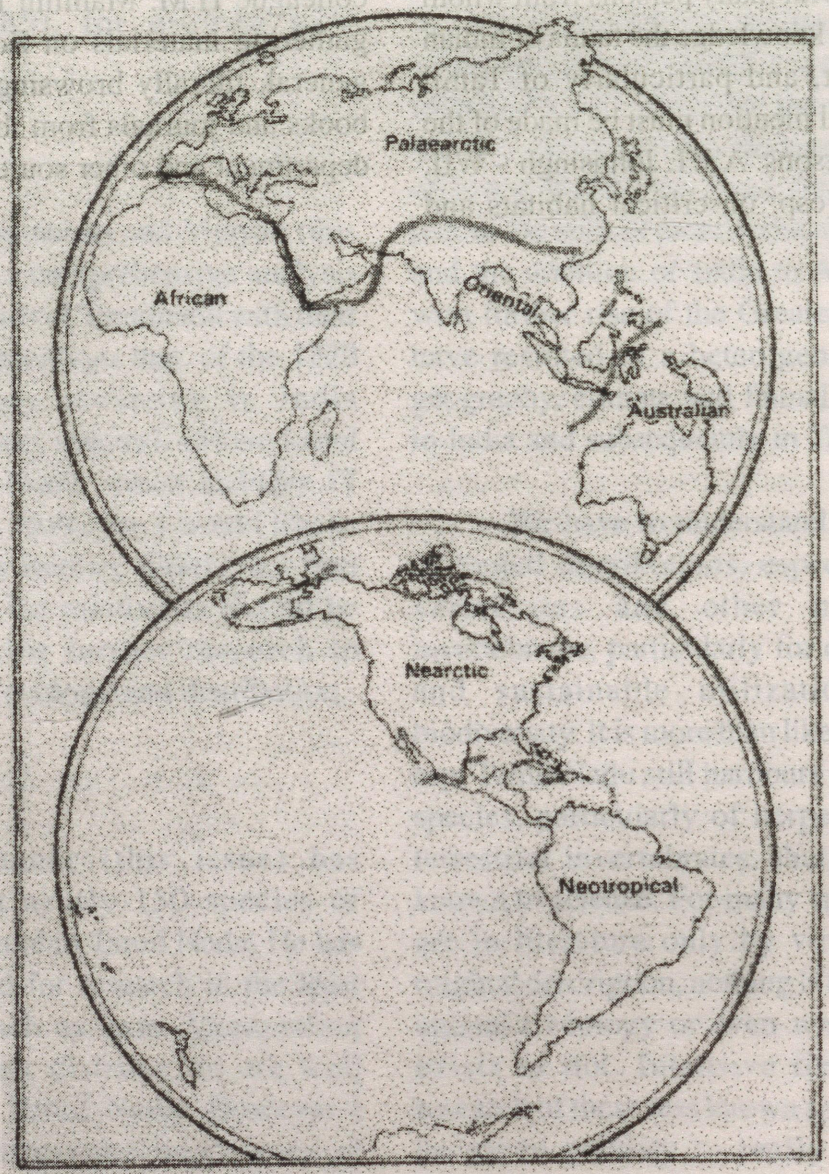


Fig.1.

Zoogeographic regions of the world,
Based on the distribution of mammals

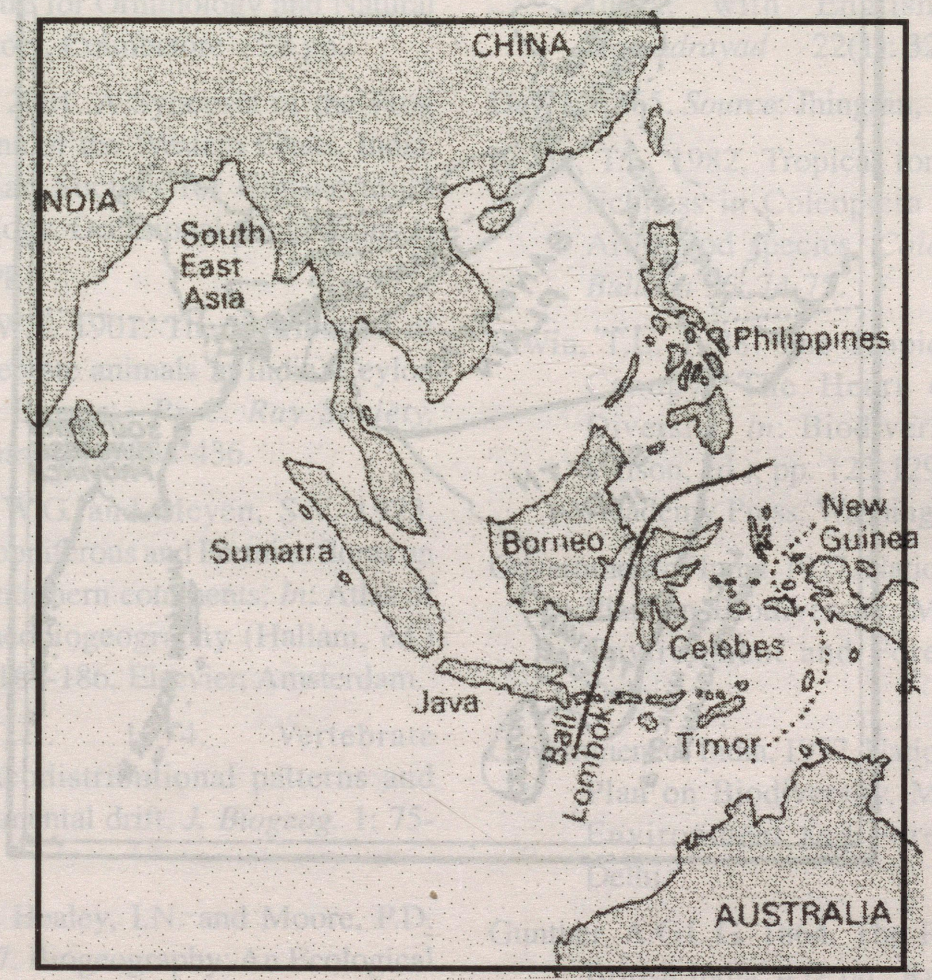


Source : Cox et al. 1977

Fig.2.

A view of the Oriental region

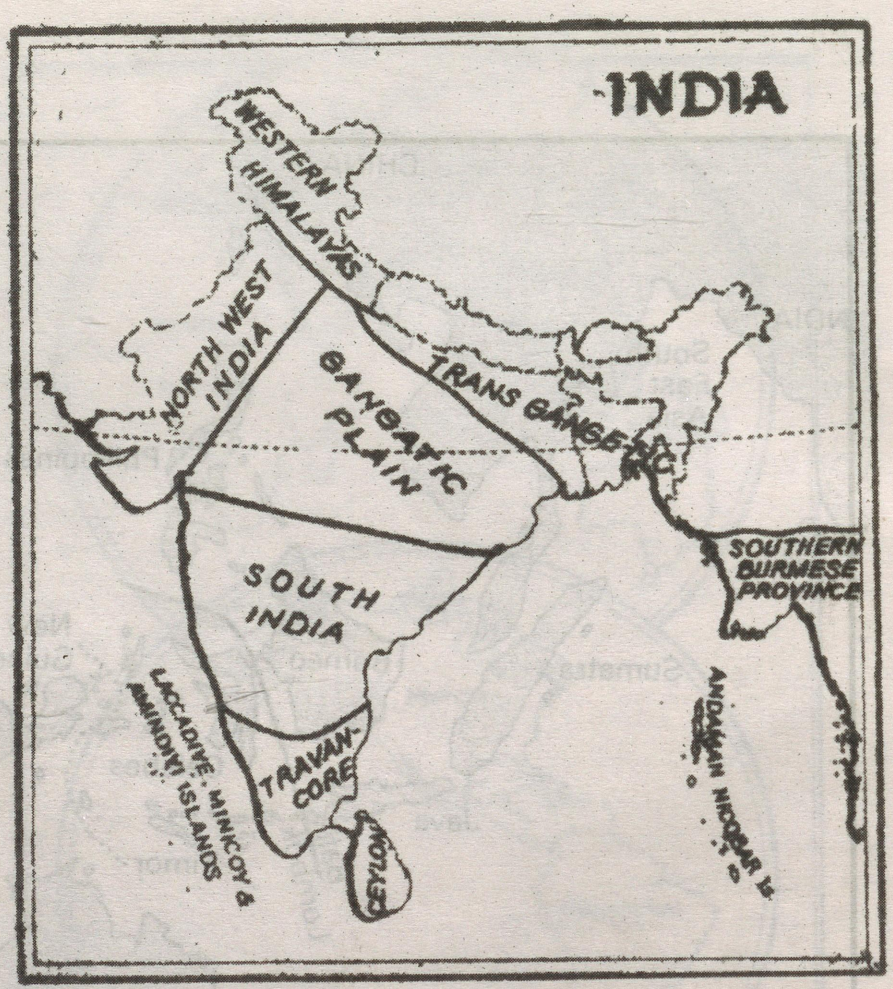
The continuous line marks Wallace's line which runs along the edge of the Australian continental shelf, separates the Oriental and Australian Zoogeographical regions



Source : Cox et al. 1977

Fig.3.

Zoogeographical subdivisions of Indian subregion
(according to Mahendra, 1942)



Source

Rastogi and Jayaraj, 1979

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2. Conservation Strategies and Action Plan for the Prochordates

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2.Conservation Strategies and Action Plan for the Prochordates

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What are ascidians?

Ascidians, commonly called "Sea squirts" are an important group of marine sedentary organisms found distributed from the littoral zone to the deep sea. They are the major components of the fouling community occurring on the hulls of ships, piers, pilings, test panels, buoys, floats, cables and various other harbour installations.

They occur as conspicuous and macroscopic members in many areas along the coast of India. In spite of their visibility and obvious presence in many areas, extremely little quantitative ecological work has been done on this group in India.

Though India is a tropical country with vast stretches of coast line providing favourable features of environment such as suitable substratum for attachment and temperature which can permit continuous breeding, there is a general opinion among the biologists that Indian sea coast is extremely poor with respect to number and variety of ascidians.

One of the possible reasons for the report of a lower number of species of ascidians in India can be attributed mainly to the lack of collecting efforts along the coast. Again the neglect of ecological studies of this conspicuous group is due to the prevailing feeling that small number of species are not enough for adequate quantitative analysis.

Systematic position

Ascidians come under

Phylum: Chordata

Sub Phylum: Urochordata

Class: Ascidiacea

Review of literature

India lags far behind the rest of the world in the taxonomic study of ascidians. From the study of literature it is known that in India random collections have been made and the interval between collections run into several years. The localities of some collections have not been recorded.

The first comprehensive work on the ascidians of the Indian waters was a report upon the Tunicates in the collection of the Indian Museum, presented

by Oka (1915). He described three species *Polycarpa cryptocarpa* Sluiter, 1885; *Microcosmus manaarensis* Herdman, 1906 and *Polycarpa anandalei* Oka, 1915 from the Madras coast, two species *Polycarpa glebosa* Sluiter, 1904 and *Ascidia andamanensis* Oka, 1915 from the Andamans and one species *Monobotryllus violaceus* Oka, 1915 from Orissa coast.

Subsequently Gravely (1927) reported a number of ascidians from Krusadai Islands, Pamban and Rameswaram, the descriptions of which were incomplete, vague and the identification doubtful.

The ascidian fauna of the sea adjoining Tuticorin, Ennur and Bombay was surveyed by Das (1936, 1938, 1940). He reported the occccurence of *Pyura momus* Savigny, 1816 from the sea near Tuticorin. *Ecteinascidia bombayensis* Das, 1938 and *Herdmania ennurensis* Das, 1940 from Bombay and Ennur coasts. Das (1945) also reported the occurrence of *Ascidiella aspersa* Mueller, 1776 and *Styela areolata* Heller, 1878 from Madras coast.

Sebastian (1952, 1954, 1955) described two species of *Polyclinum* – *Polyclinum madrasensis* Sebastian, 1952 and *Polyclinum indicum* Sebastian, 1954 from the Madras coast and reported the occurrence of the colonial ascidian *Perphora listeri indica* Sebastian, 1955. Sebastian (1956) recorded *Symplegma viride* Herdman, 1886 and *Symplegma viride stolonica* Berril, 1931, two fouling ascidians from Indian waters.

After a lull period of twenty five years the availability of ascidians has been reported by Renganathan (1981a, 1981b, 1982a, 1982b, 1983a, 1983b, 1983c, 1984a, 1984b. 1984c, 1984d, 1984e); Renganathan and Monniot (1984); Renganathan (1985); Renganathan and Nelson (1985); Renganathan and Krishnaswamy (1985); Renganathan (1986a, 1986b, 1986c). Of these ten species *Sidnyum pentatrena* Monniot, 1972; *Ascidia zara* Oka, 1935; *Styela canopus* Savigny, 1816; *Polycarpa palkensis* Herdman, 1906; *Polyandrocarpa chendurensis* Renganathan and Krishnaswamy, 1985; *Polyandrocarpa durbanensis* Millar, 1955; *Pyura lanka* Herdman, 1906; *Pyura vittata* Stimpson, 1852; *Microcosmus exasperatus* Heller, 1878; *Molgula martensi* Traustedt, 1885; were collected from the chank beds off Tuticorin coast from a depth of 10- 30 metres and *Ecteinascidia garstangi* Sluiter, 1898 from sponges off Mandapam and Rameswaram coast at a depth of 10 metres.

Two species *Didemnum psammathodes* Sluiter, 1895 and *Lissoclinum fragile* Van Name, 1902 show a wide distribution from Kanyakumari to Rameswaram along the east coast, whereas *Aplidium multiplicatum* Sluiter, 1909 has been reported from Mandapam only. *Eudistoma viride* Tokioka, 1955; *Eudistoma lakshmiani* Renganathan, 1986; *Sidnyum indicum* Renganathan and Monniot, 1984; *Diplosoma swamiensis* Renganathan, 1986; *Perophora formosana* Oka, 1931; *Ecteinascidia krishnani* Renganathan and Krishnaswamy, 1985; *Ecteinascidia imperfecta* Tokioka, 1950; *Styela bicolor* Sluiter, 1887; *Botrylloides chevalense* Herdman, 1906; *Botrylloides magnicoecum* Hartmeyer, 1912; *Symplegma brakenhielmi* Michaelson, 1904; *Microcosmus curvus* Tokioka, 1954 have been reported from the littoral zone of Tuticorin coast. Thus the total

number of ascidians reported from India was raised to 42.

In addition to the above species Krishnan *et al*., (1989) made a brief reference to the ascidian fauna of Royapuram coast of Madras contributing two more species – *Polyclinum constellatum* Savigny, 1816; and *Ascidia gemmata* Sluiter, 1895 to the ascidian fauna of Indian waters.

The author started working on the ascidians of India in the year 1994 and in a short span of three years was able to report as many as forty one species (Meenakshi, 1997, 1998a, 1998b, 2000a, 2000b, 2002; Meenakshi and Renganathan, 1997, 1998, 1999a, 1999b, Meenakshi and Venugopal, 1999) of ascidians from the east coast of India along the Gulf of Mannar thus bringing the total number of ascidians reported from India to 85.

From the review of literature it is evident that adequate information on the occurrence of ascidians is not available in India as the collections from the Indian coasts are too little and made at very wide intervals.

Though we are blessed with a rich marine fauna, it is pitiable to know that we have identified only about 30% of them whereas the remaining 70% still remains untouched. Many animals in the ocean depth lives and vanishes without being noticed by us. Hence they do not enter into the faunistic list of our natural resources.

Status of ascidians in India

	1915 to 92 (77 years)	1994 to 97 (3 years)	Total
No. of families	8	2	10
No. of genera	21	5	26
No. of species	44	41	85
No. of species new to science	—	9	9

Number of families reported from India

S. No.	Family	S. No	Family
01	Polyclinidae	06	Ascidiidae
02	Holozoidae	07	Corellidae
03	Polycitoridae	08	Styelidae
04	Didemnidae	09	Pyuridae
05	Perophoridae	10	Molgulidae

Number of genera reported from India

S. No.	Genera	S. No.	Genera
01	**Aplidium**	14	**Ascidiella**
02	*Sidnyum*	15	*Rhodosoma*
03	*Polyclinum*	16	*Styela*
04	*Distaplia*	17	*Cnemidocarpa*
05	*Eudistoma*	18	*Polycarpa*
06	*Didemnum*	19	*Monobotryllus*
07	*Tridemnum*	20	*Polyandrocarpa*
08	*Diplosoma*	21	*Eusynstyela*
09	*Lissoclinum*	22	*Symplegma*
10	*Perophora*	23	*Botrylloides*
11	*Ecteinascidia*	24	*Pyura*
12	*Phallusia*	25	*Microcosmus*
13	*Ascidia*	26	*Molgula*

List of species reported from India

S. No.	Species
1	*Aplidium multiplicatum* Sluiter, 1909
2	*Sidnyum indicum* Renganathan and Monniot, 1984
3	*Sidnyum pentatrema* Monniot, 1972
4	*Polyclinum constellatum* Savigny, 1816
5	*Polyclinum fungosum* Herdman, 1886
6	*Polyclinum indicum* Sebastian, 1954
7	*Polyclinum madrasensis* Sebastian, 1952
8	*Polyclinum nudum* Kott, 1992
9	*Polyclinum saturnium* Savigny, 1816
10	*Distaplia nathensis* Meenakshi, 1998

S. No.	Species
11	*Eudistoma constrictum* Kott, 1990
12	*Eudistoma kaverium* Meenakshi, 2002
13	*Eudistoma lakshmiani* Renganathan, 1986
14	*Eudistoma laysani* (Sluiter, 1900)
15	*Eudistoma ovatum* (Herdman, 1886)
16	*Eudistoma toealensis* Millar, 1975
17	*Eudistoma viride* Tokioka, 1955
18	*Tridemnum cerebriforme* Hartmeyer, 1913
19	*Didemnum candidum* Savigny, 1816
20	*Didemnum psammathodes* Sluiter, 1895
21	*Diplosoma swamiensis* Renganathan, 1986
22	*Lissoclinum fragile* Van name, 1902
23	*Perophora formosana* Oka, 1931
24	*Perophora listeri indica* Sebastian, 1955
25	*Ecteinascidia bombayensis* Das, 1938
26	*Ecteinascidia diaphanis* Sluiter, 1885
27	*Ecteinascidia diligens* Sluiter, 1900
28	*Ecteinascidia garstangi* Sluiter, 1898
29	*Ecteinascidia imperfecta* Tokioka, 1950
30	*Ecteinascidia koumaci* Monniot, 1987
31	*Ecteinascidia krishnani* Renganathan & Krishnaswamy, 1985
32	*Ecteinascidia nexa* Sluiter, 1904
33	*Ecteinascidia sluiteri* Herdman, 1906
34	*Ecteinascidia styeloides* Traustedt, 1882
35	*Ecteinascidia venui* Meenakshi, 2000
36	*Phallusia caguayensis* Millar and Goodbody, 1974
37	*Phallusia nigra* (Savigny, 1816)
38	*Phallusia polytrema* (Herdman, 1906)
39	*Ascidia andamanensis* Oka, 1915
40	*Ascidia challengeri* Herdman, 1882
41	*Ascidia decepta* Kott, 1985
42	*Ascidia dorsata* Meenakshi, 1999
43	*Ascidia gemmata* Sluiter, 1895
44	*Ascidia glabra* Hartmeyer, 1922
45	*Ascidia indica* Meenakshi, 1997
46	*Ascidia kesevanica* Meenakshi, 1997
47	*Ascidia latesiphonica* Hartmeyer, 1922
48	*Ascidia liberata* Sluiter, 1887

S. No.	Species
49	*Ascidia sydneiensis* Stimpson, 1855
50	*Ascidia tuticoriensis* Meenakshi, 1997
51	*Ascidia zara* Oka, 1935
52	*Ascidiella aspersa* Mueller, 1776
53	*Rhodosoma turcicum* (Savigny, 1816)
54	*Styela bicolor* Sluiter, 1887
55	*Styela canopus* Savigny, 1816
56	*Styela plicata* (Lesueur, 1823)
57	*Cnemidocarpa areolata* Heller, 1878
58	*Polycarpa annandalei* Oka, 1915
59	*Polycarpa aurita* (Sluiter, 1890)
60	*Polycarpa cryptocarpa* Sluiter, 1885
61	*Polycarpa glebosa* Sluiter, 1904
62	*Polycarpa palkensis* Herdman, 1906
63	*Polycarpa maniensis* Meenakshi, 1997
64	*Polycarpa scatterata* Meenakshi, 1997
65	*Monobotryllus violaceus* Oka, 1915
66	*Polyandrocarpa chendurensis* Renganathan & Krishnaswamy, 1985
67	*Polyandrocarpa durbanensis* Millar, 1955
68	*Eusynstyela tincta* Van name, 1902
69	*Symplegma brakenhielmi* Michaelsen,1904
70	*Symplegma viride* Herdman, 1886
71	*Symplegma viride stolonica* Berril, 1931
72	*Botrylloides chevalense* Herdman, 1906
73	*Botrylloides magnicoecum* Hartmeyer, 1912
74	*Pyura ennurensis* Das, 1940
75	*Pyura lanka* (Herdman, 1906)
76	*Pyura momus* Savigny, 1816
77	*Pyura spinosa* (Quoy and Gaimard, 1834)
78	*Pyura vittata* Stimpson, 1852
79	*Microcosmus curvus* Tokioka, 1954
80	*Microcosmus exasperatus* Heller, 1878
81	*Microcosmus manaarensis* Herdman, 1906
82	*Microcosmus pupa* (Savigny, 1816)
83	*Microcosmus squamiger* Hartmeyer and Michaelsen, 1928
84	*Molgula martensii* Traustedt, 1885
85	*Molgula simulans* Oka, 1915

Significance of ascidians

1. Ascidians are producers of amino acid derived secondary metabolites. Investigations of taxonomically diverse ascidians could reveal a variety of pharmacologically potent natural products.
2. Most of the microorganisms which cause infectious diseases in man are rapidly developing resistance towards traditional antibiotics. Screening of Indian ascidians for unprecedented novel natural products which can act as antibiotics could be carried out.
3. Ascidians elsewhere in the world have been proved to contain chemicals with unique antiviral, antitumour, anti-inflammatory, antileukaemic activity. Similar work on Indian ascidians could be taken up.
4. The magnitude of over and ever increasing need for food protein has made it necessary to explore other protein sources, to supplement part of this need ascidians can be exploited.
5. Ascidians are consumed as food in many parts of the world and are sufficiently important to merit an entry in FAO Year Book of Fishery Statistics. Indian ascidians have to be analysed for their nutritive value.
6. Like other marine food products ascidians are delicious, relatively easily digestible and offer minerals, iodine and vitamins.
7. Ascidians have a high breeding capacity and a faster growth rate facilitating their culture in open sea farms.
8. Cultivation of ascidians thus has a great potential for the production of protein rich quality food.
9. Ascidians can replace other animal proteins which are expensive and serve to improve the nutritional status of Indians and help in preventing protein deficiency malnutrition in children.
10. Specialised products and dishes like soups jellies, sausages, jams, pickles and similar ready to eat food materials can increase their market value and earn foreign exchange. When their novel uses are established steps can be taken to conserve and culture them.

Possible user agencies

1. Central Drug Research Institute, Lucknow
2. Indian Institute of Chemical Technology, Hyderabad
3. Captain Srinivasamoorthy Drug Research Institute, Chennai
4. Researchers involved in the preparation of Siddha Medicine
5. Zoological Survey of India
6. Geological Survey of India
7. Department of Science & Technology, Govt. of India
8. Department of Ocean Development, Govt. of India
9. National Institute of Oceanography, Goa
10. Indian Institute of Technology
11. Centre for Advanced Studies in Marine Biology, Porto Novo
12. Fisheries Department
13. Central Electrochemical Research Institute (Corrosion studies)
14. Central Marine Fisheries Research Institute (Mariculture)
15. Centre for Scientific & Industrial Research, Govt. of India
16. Central Food Technology Institute, Govt. of India
17. Atomic Power Plants
18. Pollution control Units
19. Indian Naval Chemistry Division
20. Universities & Colleges
21. Young Researchers
22. Scientists
23. Marine Parks
24. Small scale industry (culture of ascidians)

Self employment units (food products from ascidians)

Problems caused by ascidians

Fouling is one of the serious menaces caused by ascidians, especially to aquaculture in the marine environment. Tuticorin is an important mariculture centre with full fledged year round coastal aquaculture activities like the culture of edible and pearl oysters. The ascidians which grow on the aquaculture cages block the free flow of water into the cages thus reducing the supply of oxygen, nutrients etc., which result in poor growth rate and harvest of pearls.

In addition to a variety of common fouling organisms like barnacles, sea anemones etc., more than 100 species of ascidians in the world have also been

reported to occur on ship bottoms, test panels, buoys, floats, cables, harbour installations and other sites. Their growth on the hulls of ships increases friction, put additional load on the engine and increases fuel consumption, hence they have to be removed periodically.

Threats to ascidian diversity and distribution

1. Anthropogenic activities especially bottom trawling using mechanized vessels has led to the disturbance of the rubbles and dead coral beds on which ascidians settle. A recent survey conducted by the author has shown the presence of more than 50 species of ascidians from the trawl discards.
2. Mining of coral from the coral islands of Gulf of Mannar also pose a serious threat to those animals including ascidians which inhabit the crevices of corals.
3. Pollution of the coastal stretch due to urbanization, tourism, industrial waste, fertilizers, pesticides, untreated sewage etc., result in degradation of the water quality.
4. The most important and serious threat to the ascidians of Tuticorin coast is by thermal pollution and dumping of fly ash by the Tuticorin Thermal Power Plant.
5. Port development activities like deepening by dredging increases turbidity affecting filter feeding animals like ascidians.
6. A recent (unpublished data) survey of the Gulf of Mannar by the author has revealed the occurrence of a rich haul of ascidians belonging to the family Didemnidae which are producers of pharmacologically potent natural products. The implementation of the multi-crore Sethu Samudram Project, providing a navigational route may have its own stress on the sedentary animals inhabiting these areas.

Why is there a need for the conservation of ascidians?

1. Ascidians play a vital role in the ecology of the marine environment . Being filter feeders they are responsible for keeping the turbidity of the water on the ambient level.
2. They are important links in the food chain of the marine ecosystem.
3. They form components of fouling community which respond to pollution parameters and hence could be profitably employed in environmental impact assessment studies.
4. Ascidians are relevant to deal with water pollution studies and environment management as they act as bio-indicators of heavy metal pollution.
5. Ascidians are economically important with good food value.

6. Many species of ascidians are sources of valuable bioactive compounds.
7. A recent report says that ascidians produce chemicals with fouling deterrent activity.

Taking into consideration their novel uses and vast scope for further research on various aspects, conservation of ascidians should be given utmost importance.

Strategic action plan

1. Bottom trawling should be strictly prohibited.
2. Illegal coral and sand mining should be severely punished.
3. Implementation of government policies with emphasis on pollution control.
4. While implementing the Sethu Samudram Project, which is inevitable for the development of the Nation, care should be taken to leave a buffer zone.
5. Monitoring new entrants into the harbour area by way of transport on the hull of ships, ballast water etc., should be carried out.
6. The breeding pattern and the peak period of settlement has to be monitored to decide the appropriate season for aquaculture in the sea farms.

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3. Conservation Strategies and Action plans for the Pisces of Tamil Nadu

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3. Conservation Strategies and Action plans for the Pisces of Tamil Nadu

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Introduction

Fishes constitute approximately half of all the described vertebrates, (24,618 species out of the total of 48,170) and comprise of 482 families with living species. Eight largest families, each with over 400+ species contain approximately 33% of all species (some 8,039), which are in descending order, Cyprinidae, Gobidae, Cichlidae, Characidae, Loricariidae, Labridae, Balitoridae and Serranidae. Approximately 100 new species of freshwater fishes are described each year, compared with two new bird species (Maitland, 1995).

India is endowed with a vast network of rivers, canals, reservoirs, tanks and ponds and backwaters, which harbour a rich and diverse fish fauna with nearly 11% of the total fish species of the world. About 2,200 species are known from the Indian waters of which 73 live in upland coldwater, 544 inhabit warm waters of the plains, 143 live in brackish waters and 1440 in the marine environment.

Tamil Nadu is very rich is fish biodiversity thus we have more than 165+ species of fishes reported from 25 family and 70 genus. This is uncertainty in exact number resulting from taxonomic ambiguities and lack of knowledge on distribution and ecology of fishes. Tamil Nadu has a unique fish fauna partly due to the geology and partly to the behaviour of fishes, as they tend to become isolated within drainage, resulting in distinctive populations and subspecies. Tamil Nadu is remarkable for its rare endangered and threatened species too.

Threats to fishes that can render species vulnerable or endangered can arise in several different ways, most, but not all of them are man-made. Habitat alteration or destruction, pollution, over-exploitation and incidental or intentional introduction of species or genetic strains is the principal threats to rare and sensitive species. The most diverse and complex ecosystems, which are usually those with the richest faunas, are likely to be those that are most sensitive to perturbation (May, 1975). To date, fish conservation has been concerned with endangered and threatened species, but the conservation of communities of fishes, their habitats and the whole of the ecosystems of should be a long-term aim.

The World Conservation Strategy (WCS) was launched in 1980 jointly, by the International Union for the Conservation of Nature, the World Wildlife Fund and the United Nations Environmental Programme.

The main objectives of WCS are a) to maintain essential ecological processes and life-support systems; b) to preserve genetic diversity, which is being dangerously impoverished; and c) to ensure the sustainable use of species and ecosystems by the present and future mankind.

Most governments paid little attention to the WCS, and continued to encourage the creation of wealth in ways, which ignored its damage to the environment. But, several years after the initiatives of scientists worldwide, some serious global environmental problems, several 'environmental movements' of national and international concern have just (in 1990) begun to cause governments to start taking serious political and practical actions.

Conservation of aquatic systems is essential for the maintenance of a global environment suitable for man and the biosphere as it is now (Lovelock, 1987). Fish conservation is essential, as fishes are valuable to mankind in several aspects.

Firstly, fishes provide a significant proportion of the protein in human diets in many parts of the world, but there is still scope for the further development of fisheries based on wild stocks. Increase in sustained yields that would result from applying more scientific, economic and political understanding in long-term management. Moreover, the development of fish culture could provide a larger share of human food in many areas where high-grade protein is in short supply. While many traditional fish-farming practices have, in the past, produced high yields, there is scope for the domestication of new species and strains; the availability of diverse genetic resources from wild populations in a range of habitats is likely to be essential for this.

Sport fishery is an important recreation for 10% or more of the population in many developed countries and also contributes to food and the tourist industry. The keeping and breeding of ornamental fish in aquaria are also important hobbies. Fishes are used as indicators of pollution; the presence of a large number and variety of fishes in a river is a good indication that the water is unpolluted and suitable for extraction and use for humans. Fish in laboratories can be used for bioassay studies and even to set off alarms when water supplies suddenly become polluted. Ecologically, fishes are maintaining the ecological balance in the aquatic system. In many ways fishes provide practical and material benefits to man.

Some disturbing trends in the depletion of native fish populations are already noticeable in certain areas of the Tamil Nadu, which has received little attention. Pollution from human settlements and plantations are affecting the fish community. Introduction of exotic fishes (major carps) in the dams and wetlands also has its impact on the native species. The following conservation strategies may be more appropriate and this may help to

conservation and management of Tamil Nadu fishes.

Conservation Strategies

Legislation

The Indian Fisheries Regulation Act (1897) was framed more than a century ago. These regulations are also not uniformly applied throughout the country. Revision of this Indian Fisheries Act of 1897 should be implemented immediately by the Central Government, and the Acts of different states should also be revised. Powers vested with administrative personnel responsible for enforcing the existing regulations are inadequate, and the penalties prescribed for infringement of the laws are not sufficiently severe to be a deterrent.

1. Provisions for the creation and management of sanctuaries for the viable conservation of threatened species of fishes and the maintenance of genetic resources and biomass.

3. Provisions for adequate magisterial powers for enforcement of the Act to all personnel responsible for ensuring the conservation of the fish fauna, at least in protected areas of the country.

6. If any person is found carrying or transporting threatened fishes within the protected areas or outside their boundaries, he should be imprisoned, with high monetary penalties. This would stop this actniosy both fisherfolk and fish consumers. Researchers could be exempted from this rule if they have prior permission from the concerned authority, but they should also minimize their unnecessary collection.

7. Threatened freshwater fishes should be included under the Wildlife Protection Act, so that greater protection can be given to them.

8. Auctioning of river and reservoir fishery rights should be abolished, because license owners can then kill all of the fishes in the water body, as they hold the fishing rights. There should be a rule to ban the catching of certain important threatened fish species. Also, fish slaughtering in reservoirs during the dry season (maybe once in 3 or 4 years) as now practiced kills all of the brood fish and small sized fishes irrespectively. Small sized fishes are used for cattle feed after drying. This eliminates the total fish fauna in that area and revival takes much time; usually the threatened species present will not revive.

9. The punishments for breaking the rules should be severe enough to deter offenders, as have been attempted in the Wild Life (Protection) Act of India (1972) and the Environment (Protection) Act (1986).

In most of the reservoirs located inside the protected area fishing activities are still going on. But the mesh regulations and the restrictions of fishing to certain periods have not been enforced so far. The mesh size should therefore be uniformly fixed during the post-monsoon period (which most freshwater fishes prefer for breeding) to restrict fishing pressure. By this method the brood fish can

be saved from the effects of excessive fishing pressures.

Usually in reservoirs the fishermen fish beyond the reservoir limits, especially in the inlet channels which fishes use to migrate through for breeding in the natural habitats. This practice can be controlled by the Forest Department, or an appropriate policy made between the Forest Department and the Fishery Department. Also, the practice of introducing alien and exotic carp into these reservoirs should be banned. The Fishery Department should encourage the use of native carps for culture in the area. This will help to conserve the native fish fauna.

Protection of natural habitat

Further construction of dams should be avoided inside the protected areas, because this destroys many natural habitats of fishes. Construction of dams, barrages, canals, etc., for any development should keep in view the potential for requirements of fishery development and maintain adequate flows in the rivers for the breeding and conservation of fish, especially for the indigenous species.

Habitat restoration

Habitat restoration is generally only practiced in western countries the like US and in Europe, mainly for game fish such as trout. In India, habitat restoration has not been given any importance for fishes.

1. Riparian vegetation can be established where ever necessary this will provide good food and habitat resources for fishes.
2. Deep pools can be constructed in the rivers this may save many species during dry season especially threatened and endemic species.

Effects of introduced and invasive species

Negative effects of exotics on native stream fauna have been described in a variety of different geographical settings. An analysis of 31 case studies of fish introductions to stream communities showed that 77% of the studies documented a subsequent decline in the native species present (Ross, 1991) especially in warm temperate streams. Potential mechanisms by which exotics affect native species include predation, habitat alteration, hybridisation and the introduction of diseases or parasites (Taylor *et al.*, 1984). Introduction of the Nile perch in the late 1950s resulted in a successful new fishery that earns much needed foreign currency, but at great ecological and human cost. Many local people have lost their sources of protein and income, and the extinction of some hundreds of native species has occurred (Baskin, 1992; Kaufman, 1992).

It is understood from the Fishery Department once their major catch was indigenous species alone in all the dams. However, today these species are not even seen in a single catch, which could be due to the introduction of predatory fish. Since we have many examples of introduced fish

species, species like *Oreochromis mossambica* should be eliminated at least the dam which are located in the protected areas because there extent of such biological invasions is high.

Monitoring

Assessing and monitoring of the conservation status of fishes at regular intervals would allow new species to be added to the protected lists, or species no longer at risk to be deleted.

Ecology

Ecology of most of the endangered fish species is not known information on ecological based study of endangered species may help to prepare specific conservation strategies.

Fish Sanctuary

In order to conserve fish populations and provide adequate living space, shelter and habitat for valuable threatened fishes, some part of the river starch which passes through the protected areas can be declared as fish sanctuaries, since these rivers are flowing through well protected areas it would be very easy to declare as fish sanctuaries. This would save many threatened fishes which are on the verge of extinction in the area. Some of these areas could also be leased for monitoring by some dedicated local wildlife associations. For instance, the Karnataka Forest Department (Wildlife) has leased out 14 miles of the river Cauveri to the Wildlife Association of South India (WASI), which agency is now protecting the wildlife, including fishes with military discipline by hired guards.

Awareness

Awareness can be raised among local peoples about the introduction of exotic species, impact of using chemicals for mass fish poisoning, using dynamite for catching fish, and the seasons during which they should avoid fishing. Knowledge about the importance of fish conservation, and especially of the larger barbs and threatened fishes like *Tor* and *Hypselobarbus*, is also very important.

Translocation

Translocation can be done with little threat to existing stocks, even for threatened species, but it is importance to maintain the carrying capacity of the specie and specific habitat requirements.

Captive breeding

Captive breeding is not appropriate for many fish species in the long term. However, this can be an important 'last resort' measure for endangered and endemic species, which may otherwise become extinct in the wild (Reid, 1990). *In situ* conservation measures could be initiated for critically endangered species.

Table 1.

The freshwater fishes of Tamil Nadu, their conservation status, and actions required for their conservation.

Name of the species	Common Name	IUCN status 1996	Remarks
NOTOPTERIDAE			
Notopterus notopterus (Pallas)	Grey feather back	LRnt	Commercial fish
ANGUILLIDAE			
Angulla bicolar (McClelland)	Eel	LRnt	Restricted distribution
Anguilla bengalensis bengalensis (Gray)	Indian longfin eel	EN	Common eel and has considerable commercial value
CLUPEIDAE			
Dayella malabarica (*Day*)		CR	Restricted distribution
MEGALOPIDAE			
Megalops cyprinoids (Brousonct)		VU	-
CYPRINIDAE			
Tinca tinca (Linnaeus)	Tench, doctor fish	Exotic	Introduced into India by McIvor along with Tench
Catla catla (Hamilton)	Catla	VU	One of the fastest growing major carps. It is a commercially important fish and has been introduced into almost all the Indian river systems
Cirrhinus cirrhosus (Bloch)	Cauvery white carp	VU	It is a hardy fish, growing upto 30 cm. It forms a major fishery in the Cauvery river
Cirrhinus mrigala (Hamilton)	Mrigal	LRnt	It has spread to almost all peninsular rivers since it was transplanted for aquaculture. It is a bottom feeder
Cirrhinus reba (Hamilton)	Reba carp	VU	It is a planktivorous fish and can be cultivated in ponds. Commonly available in the Cauvery river

Name of the species	Common Name	IUCN status 1996	Remarks
Ctenopharyngodon idellus (Valenciennes)	Grass Carp	Exotic	Introduced into peninsular rivers. It was brought to the CIFRI, Cuttack (Orissa) in 1959 from Hong Kong. It is an herbivore and is extensively used as a biological control of aquatic weeds
Cyprinus carpio communius Linnaeus	Scale carp	Exotic	The mirror carp was brought from Sri lanka in 1939 and stocked in the Ooty lake (Tamil nadu).
Cyprinus carpio specularius Lacapede	Mirror carp	Exotic	,,
Horalobiosa joshuai Silas	Barb	CR	Need Ecological study
Horalabiosa palaniensis Rema Devi & Menon		CR	Status not known. and need monitoring
Labeo ariza (Hamilton)	Ariza labeo	CR	It forms a good fishery in the Cauvery river system, especially in Bhavani river
Labeo bata (Hamilton)	Bata	LRnt	It is also cultivated along with the major carps
Labeo boga (Hamilton)	Boga labeo	LRnt	Common fish
Labeo boggut (Sykes)	Boggut labeo	EN	It was quite common in the Krishna river system, but now there is a steady decline in the catches at Pune and Satara
Labeo calbasu (Hamilton)	Kalbasu	LRnt	It is one of the Indian major carps and forms an important foodfish
Lebeo dero (Ham.)		VU	Need monitoring
Labeo dussumieri (Valenciennes)	Malabar labeo	EN	Commercial fish
Labeo fimbriatus (Bloch)	Peninsular carp	LRnt	A common carp found in Tamil nadu
Labeo kontius (Jerdon)	Pigmouth carp	EN	cultivable fish in Tamil Nadu
Labeo potail (Sykes)	Dotondi	VU	-
Labeo pangusia (Ham.)		LRnt	-

Name of the species	Common Name	IUCN status 1996	Remarks
Labeo rohita (Hamilton)	Rohu	LRnt	This is one of the major Indian carps and has been transplanted into most of the peninsular rivers
Osteobrama cotio peninsularis Silas		EN	Not seen in the type locality. Needs further study.
Osteobrama neilli (Day)		EN	-
Osteochilus (Osteochilichys) brevidorsalis (Day)	Kantaka barb	EN	Ecology is not known
Barbodes bovanicus (Day)	Bovany barb	CR	A rare barb with restricted distribution need monitoring. Endemic
Barbodes carnaticus (Jerdon)	Carnatic Carp	LRnt	It forms a minor fishery in Mettur reservoir but the catch has declined in recent years
Barbodes sarana sarana (Hamilton)	Olive barb	VU	
Barbodes sarana subnasutus (Valenciennes)	Peninsular Olive-barb	VU	It is found in ponds, lakes and rivers
Puntius amphibious (Valencienes)		VU	It is a common species in South India and is an potential larvicide fish
Puntius arenatus	Kulla Kendai	LRnt	Rare. Needs monitoring
Puntius arulius arulius (Jerdon)	Arenatus barb	EN	Restricted distribution need monitoring
Puntius arulius tambraparniei Silas	Longfin barb	CR	Endemic Needs monitoring
Puntius bimaculatus (Bleeker)	Tambraparniei barb	LRnt	Needs further checking
Puntius cauveriensis (Hora)	Cauvery barb	DD	It is of no fishery interest
Puntius chola (Hamilton)	Chola barb	VU	Fairly common in coastal areas of Tamil nadu and Kerala
Puntius conchonius (Hamilton)	Rosy barb	VU	It is one of the most beautiful of Puntius species and is in great demand by aquarists
Puntius dorsalis (Jerdon)	Long-snouted barb	EN	Good aquarium fish

Name of the species	Common Name	IUCN status 1996	Remarks
Puntius fasciatus fasciatus (Jerdon)	Melan barb	EN	Commonly found in the shallow and detritus region. It breeds easily in ponds and tanks
Puntius filamentosus (Valenciennes)	Tiger barb	LRlc	A popular aquarium fish
Puntius melanostigma (Day)	Wynaad barb	EN	Good aquarium fish
Puntius mudumaliensis Rema Devi & Menon		CR	Endemic to Mudumalai wildlife sanctuary need monitoring
Puntius ophicephalus (Raj)	Channa barb	EN	A rare barb no ecological information available
Puntius parrah Day	Parrah barb	VU	Common fish
Puntius punctatus Day		VU	Ornamental fish
Puntius santhamparaiensis Arunachalam & Jhonson		CR	Endemic and Ornamental fish
Puntius sophore (Hamilton)	Spotfin swamp barb	LRnt	-
Puntius ticto (Hamilton)	Ticto barb	LRnt	Ornamental fish
Puntius vittatus Day	Kooli barb	VU	-
Hypselobarbus curmuca Hamilton	Curmuca barb	EN	It prefers deep pools of hill streams
Hypselobarbus dobsoni (Day)		CR	Need taxonomic clarification
Hypselobarbus dubius Day	Nilgiri barb	EN	It is found more commonly in hilly regions than in the plains
Hypselobarbus jerdoni (Day)	Jerdon's Crap	EN	The catch has declined in recent years. Needs monitoring
Hypselobarbus kurali Menon & Rema Devi	Atthumullan	EN	It is found in small number in the fast flowing hill streams in forested area in the west flowing of the Western Ghats
Hypselobarbus kolus (Sykes)	Kolus	EN	Less population needs monitoring

Name of the species	Common Name	IUCN status 1996	Remarks
Hyselobarbus micropogon micropogon	Korhi barb	CR	Ecology is not known need monitoring
Tor mussullah (Sykes)	High-backed Mahseer	CR	It grows to 1500 mm. (weight upto 90kg). It a very good sports fish. Need ecology study
Tor khudree (Sykes)	Deccan Mahseer	VU	It grows to 450mm and about 22 kg in weight. It is a good game and food fish
Neolissochilus wynaadensis (Day)		CR	Rare fish need monitoring
Schismatorhynchus (nukta) nukta (Sykes)	Nukta	EN	Ecology is not known
Chela cachius Ham.	Silver hatchet chela	EN	It is found in flowing waters. It grows to 60 mm. It is a good aquarium fish due to its colouration and ability to breed in tanks. It can be used as a larvicidal fish
Chela fasciata Silas	Hatchet chela	EN	Restricted. Western Ghats - Annamalai hills
Chela laubuca (Hamilton)	Glass barb, hatchet fish	LRlc	It is a good aquarium fish and can breed in tanks and ponds. It grows to 50 mm. in length.
Salmostoma acinaces (Valenciennes)	Silver razonbelly minnor	EN	It grows to 150 mm. and is of no fishery interest
Salmostoma boopis (Day)	Boopis razorbelly minnow	EN	Common, tt grows to 120 mm.
Salmostoma clupeoides (Bloch)	Razorbelly minnow	LRlc	Common fish, found in streams and rivers
Salmostoma novacula (Valenciennes)	Novacula razorbelly minnow	LRnt	Grows upto 200 mm. It is of no fishery interest. Ecology is not known.
Amblypharyngodon melettinus (Valenciennes)	Attentive carplet	Exotic	Ghats-Tamil Nadu, common
Amblypharyngodon microlepis (Bleeker)	Indian carplet	Exotic	Common, tt grows upto 100 mm. in length

Name of the species	Common Name	IUCN status 1996	Remarks
Barilius bendelisis (Hamilton)	Vennathi kendai	LRnt	Grows to about 110 mm. Prefers hill stream habitats.
Barilius canarensis (Jerdon)	Jerdon's baril	DD	Restricted, hills stream fish found fast flowing water.
Barilius gatensis (Valenciennes)	River carp	CR	Western Ghats - Maharashtra, Karnataka , Tamil Nadu and Kerala, common, hill stream fish
Danio aequipinnatus (McClelland)	Giant danio	LRnt	It is widely distributed throughout India and forms an excellent aquarium fish. It grows to 150 mm. in length and prefers hill streams
Danio (Brachydanio) rerio (Ham.)	Zebra fish	EN	It is one of the most popular aquarium fishes. It grows to a length of 40 mm. It is a hardy fish and easy to maintain in tanks
Danio neilgherriensis (Day)	Kowlei	CR	Restricted to Nilgiri, need monitoring
Esomus danricus (Hamilton)	Messai paravai	LRlc	Common, grows to a length of about 120 mm. It prefers ponds with weeds
Esomous thermoicus (Val.)	Flying barb	VU	
Horadandia atukorali brittani Rema Devi and Menon		CR	Rare fish, it grows to about 30 mm. in length. It is found among weeds in the ponds. No commercial fishery value
Parluciosoma daniconius (Hamilton)	Rasbora	LRnt	It grows to 100 mm. in length and is quite commonly found in almost all the aquatic habitats.
Rasbora caverii (Jerdon)		EN	Found in river Cauvery basin, grows to 70 mm. in length, need monitoring.

Name of the species	Common Name	IUCN status 1996	Remarks
Crossocheilus latius latius (Hamilton)	Latia	DD	Common, Grows to 120 mm. in length. No fishery interest
Garra gotyla stenorhynchus (Jerdon)	Ghor poia	EN	Very primitive fish found in the hill stream in the Nilgiri area.
Garra hughi Silas		EN	Restricted to Anamalai, Palani and Cardamon hills
Garra kalakadensis Rema Devi		CR	Endemic to Kalakad hill ranges, found in hill stream
Garra mcclellandi (Jerdon)	Stone carp	CR	Found in the hill stream of Western Ghats regain, ecology is not known.
Garra mullya (Sykes)	Stone carp	LRnt	Due to its wide distribution the specimens from different river systems it shows morphological variations in size of mental disc, shape, colouration, etc.
BALITORIDAE			
Bhavania australis (Jerdon)	Western Ghat loach	EN	Extreme south of the Western Ghats (Karnataka, Nilgiris (Tamil Nadu) and Kerala.
Homaloptera montana Herre	Anamalai loach	CR	Found in mountain streams, endemic.
Travancoria jonesi Hora	Travancore loach	EN	Found in high range mountain streams in Kerala and Anamalai hills
Noemacheilus denisoni denisoni Day		LRnt	Grows upto maximum length of 5 cm. Not important as commercial fishery, but commonly caught by tribals using traditional methods.

Name of the species	Common Name	IUCN status 1996	Remarks
Noemacheilus nilgiriensis Menon	Nilgiri loach	EN	Endemic to Nilgiris
Noemacheilus pulchellus Day		DD	Endemic to Bhavani river. Needs monitoring
Noemacheilus t. tambraparniiensis Menon	Tamraparni loach	CR	Restricted to Tambraparni river system needmoniroring
Noemacheilus semiarmatus Day		VU	Common in hill streams of the Western Ghats
Noemacheilus triangularis triangularis Day		LRlc	Endemic to the Western Ghats
Hypopththalmichthys molitrix (Nal.)	Grass carp	Exotic	Introduced in the wetlands for cultural purpose.
COBITIDAE			
Enobarbichthys maculates Day	Whitley loach	EN	This species was described based on one known specimen fromMadrass
Lepidocephalus thermalis (Valenciennes)	Lesser loach	LRlc	Grows upto 80 mm. It is of no fishery interest
Botia striata Rao	Tiger loach	EN	Grows upto a length of 90 mm. It is a good aquarium fish
BAGRIDAE			
Aorichthys aor (Hamilton)	Long whiskered catfish	VU	It is a common fish found in major rivers of the Krishna drainage and introduced in all the dams for its important fishery value. It grows to a length of 1.5 m.
Aorichthys seenghala (Sykes)	Giant river catfish	EN	It grows upto 1.5 m. and is of fishery value. It also forms a good sport fish.
Mystus armatus (Day)	Cat fish	VU	Restricted to Wynaad and Anamalai hill ranges, ecology is not known, need monitoring.
Mystus bleekeri (Day)	Mystus	VU	It grows to a length of 130 mm. It is quite common in rivers, tanks and lakes.
Mystus cavasius (Hamilton)	Solai kelunthi	LRnt	It grows to about 500 mm. in length and forms a major fishery in certain areas.

Name of the species	Common Name	IUCN status 1996	Remarks
Mystus gulio (Ham.)	At fish	VU	Found in the tanks of Kaniyakumari region wetlands.
Mystus keletius (Valenciennes)	Keletius	VU	It is common in rivers and ponds.
Mystus malabaricus (Jerdon)	Jerdon's mystus	EN	It grows to a length of about 150 mm. It forms a minor fishery in the states of Karnataka, Kerala and some part of Tamil Nadu.
Mystus montanus (Jerdon)	Kellete	VU	Western Ghats - Ecology is not known.
Mystus oculatus (Valenciennes)	Theyidoo	EN	Western Ghats: Tamil Nadu and Kerala, need monitoring.
Mystus punctatus (Jerdon)	Sholang kellete	EN	Restricted distribution to Western Ghats - Nilgiri hills, need monitoring.
Mystus vittatus (Bloch)	Striped dwarf catfish	VU	A common species growing to a length of 210 mm. found in the wet lands and streams.
SILURIDAE			
Ompok bimaculatus (Bloch)	Indian butter-catfish	EN	Found almost all the dams. It grows to a length of about 500 mm. forms good fishery value.
Silurus wynaadensis Day		CR	Found in the hill streams of Kerala and TamilNadu part of Nilgiries.
Wallago attu (Schneider)	Boal	LRnt	Highly carnivore fish, inhabits rivers, tanks and lakes and is one of the largest and most predatory catfishes in Indian waters. It can grow to a length of 2 m., weighing over 40 kg.
SCHILBEIDAE			
Pseudeutropius atherinoides (Bloch)		EN	Very common in the Krishna river system distributed in Tamil part of Western Ghats also, the distribution and ecology is not known much.
Silonia childreni (Sykes)	Kelletii	EN	Found Western Ghats - Cauvery river systemsc (Tamil Nadu) no study were available on the species, need monitoring.

Name of the species	Common Name	IUCN status 1996	Remarks
PANGASIIDAE			
Pangasius pangasius (Hamilton)	Koolakelette	CR	It grows to a length of 1.4 m. and prefers large rivers and estuaries. It is not relished as a food fish as it feeds on decaying matter.
SISORIDAE			
Glyptothorax anamalaiensis Silas		CR	Western Ghats - Anamalai hills. Endemic to Anamalai hill ranges. Need monitoring.
Glyptothorax annandalei Hora		EN	Western Ghats & Vindhyas. Found only high ranges of hill stream.
Glyptothorax madraspatanum (Day)	Kal kovitte	VU	Western Ghats - Anamalai and Nilgiri hills. Found in the fast flowing rivers and streasm.
CLARIIDAE			
Clarias batrachus (Linnaeus)	Magur	VU	It grows to about 40 mm. length and can live in any type of habitat (rivers, ponds, swamps, derelict waters, etc.). It is cultured in ponds or by using cages.
Clarias dussumieri Valenciennes	Air-breathing cat-fish	VU	Found in the wetland and dams. It grows to about 230 mm. and forms a minor fihsery.
Clarias dayi Day	Magur	EN	Found in the Wynaad and Mudumalai hill ranges.Once it was thought that this species was extinct and the recent report says the availability and distribution of the species.
HETEROPNEUSTIDAE			
Heteropneustes fossilis (Bloch)	Stinging catfish	VU	It grows to a alength of about 300 m. and is a very hardy fish. It has air breathing apparatus which enables it to survive the dry season when the water in the ponds and lakes dry out. It is an aggresive fish and can inflict cuts with its strong pectoral spine.

Name of the species	Common Name	IUCN status 1996	Remarks
SALMONIDAE			
Salmo gairdenerii gairdnerii (Richardson)	Rainbow trout	Exotic	Introduced in the Nilgiri and Anamalai grass hills. Much impacts were noticed on the native fish fauna. This may be eradicated from the natural habitat.
BELONIDAE			
Xenentodon cancila (Hamilton)	Freshwater Garfish	LRnt	It is commonly found in rivers and streams. It grows to about 400 mm. in length.
Oryzias melastigma (McClelland)	Rice fish	VU	Found streams flowing near the rice field
APLOCHEILIDAE			
Aplocheilus blocki (Arnold)	Malabar Killie	LRlc	Found the polluted water this is a indicator species for pollution and this species also found in the hill stream were no flow.
Aplocheilus lineatus (Val.)	Malabar Killie	LRlc	-do-
CICHLIDAE			
Etroplus canarensis Day		DD	Found in the streams and dam, it forms good aquarium fish.
Etroplus maculates (Bloch)		EN	-do-
Etroplus suratensis (Bloch)	Banded pearlspot	VU	It found in the streams and dam and also estuaries. Forms good fisheries value.
Oreochromis mossambica (Peters)	Tilapia	Exotic	It was introduced into the country in 1952 and and now spread at a alarming rate in almost all the major river systems. This is a matter of concern, specially in the Ujni reservoir (Krishna river basin), Maharashtra, where the fish catches show a predominence of this fish. This was not the case 5 years ago.
Oreochromis niloticus Hasselquist	Tilapia	Exotic	-do-
Anabas testudineus (Bloch)		VU	Found in the wetlands

Name of the species	Common Name	IUCN status 1996	Remarks
POECILIDAE			
Gambusia affinis (Baird & Girard)		LRlc	It was introduced into Indian waters in 1928 from Italy under the antimalarial programme. It grows to about 60 mm. length, is a very hardy fish and can survive in diverse habitats.
Poecilia (lebistes) reticulata Peters		LRlc	It was introduced from South America in 1908 for mosquito control. Due to its hardy nature, being a live-bearer and beautiful colour, it is a common aquarium fish. It has been hybridized into numerous combinations.
AMBASSIDAE			
Chanda nama Hamilton	Glass perchlet	LRlc	Found in the wetlands and hill streams. It grows to a length of about 100mm and forms a major food item for the under privileged.
Pseudambassis ranga Hamilton		LRlc	-do-
Ambassis commersoni Cuvier		VU	Much information is not known about this species.
MUGILIDAE			
Liza parsia (Ham.)		EN	-
Liza subviridis (Val.)		EN	-
Liza tade (Forskal)		EN	-
Mugil cephalus (Linnaeus)		EN	
Rhinomugil corsula (Hamilton)	Mullet	EN	It is quite common now in the Cauvery river where it was accidentally introduced (Menon & Jayaram, 1977). Another such case is in the Ujni reservoir (Pradhan & Singh, 1984). The fish swims at the subsurface level, keeping its eyes above the water surface. This aerial vision helps it to jump over the nets. It prefers to swim in shoals.

Name of the species	Common Name	IUCN status 1996	Remarks
GOBIIDAE			
Awaous grammepomus (Bleeker)		VU	-
Glossogobius giuris (Hamilton)	Gobi fish	LRnt	It grows to about 250 mm. and is fairly common in the rivers of the Western Ghats. It prefers deeper waters.
CHANNIDAE			
Channa marulius (Hamilton)	Giant snakehead murrel	LRnt	A good sports fish, growing upto 1220 mm length. It prefers large lakes and rivers with sandy to rocky bottom. It is highly aggressive carnivorous in nature.
Channa orientalis Bloch & Schneider	Brown snake-head	VU	Fairly common species in the Western Ghats. It is of some fishery value in Maharashtra.
Channa punctatus (Bloch)	Spotted snakehead	LRnt	It grows upto 310 mm. in length. It prefers large ponds and tanks.
Channa striatus (Bloch)	Striped snakehead murrel	LRlc	-do-
Psedosphromemum cupanus (Val.)		EN	-
BELONTIDAE			
Colisa fasciata (Schneider)		LRnt	-
Macropodus cupanus (Valenciennes)		LRlc	It is an excellent larvicidal fish. It is also kept in aquariums.
MASTACEMBELIDAE			
Macrognathus aral (Bloch & Schneider)	Spiny eel	LRnt	Uncommon. Needs monitoring
Macrognathus guentheri Day		VU	-
Macrognathus pancalus (Hamilton)	Spiny eel	LRnt	-
Mastacembelus armatus (Lacepede)	Tire track spiny eel	LRlc	It grows to a length of 500 mm. and is one of the largest spinyells in India. It is commonly caught by gill nets and even with lines in the Krishna river

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4. Conservation Strategies and Action Plan for Amphibians of Tamil Nadu

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Status of Amphibians in Tamil Nadu

According to the CAMP draft proposal the status of amphibians of Tamil Nadu is

LRlc	LRnt	DD	VU	CR	TOTAL
13	23	12	28	0	76

TAXONOMIC REPRESENTATION OF THE AMPHIBIANS OF TAMIL NADU

S.No.	Family	Numbers	%	Endemics	%
1.	*Bufonidae*	6	8	2	33
2.	*Microhylidae*	9	12	3	33
3.	*Ranidae*	36	47	16	44
4.	*Rachophoridae*	18	24	9	50
5.	*Ichthyophidae*	7	9	6	86

1. STATEMENT OF THE ISSUES: (Problems, Threats, Management concerns)

I. Natural Threats

1. Insufficient rain and scarcity of water
2. Natural predation

II. Man Made Threats

1. Habitat destruction, degradation, deforestation, clearing for human settlements, urbanization and industrialization.
2. Unchecked usage of Chemical Fertilizers and Chemical pesticides and usage of detergents.
3. Hunting/Capturing for dissections to Schools and Colleges.
4. Burning of grass lands and bush cover.
5. Hunting for food and medicine.

Problems

1. No clear cut protection to amphibians under the Indian Wildlife (Protection) Act, 1972, 1991.
2. Lack of knowledge about the systematics and species identification
3. Unaware of the role of amphibians in the agro eco systems as pest controllers
4. Lack of knowledge of the species availability, Richness, Diversity and life-history.

Measures (Short term and Long term) and Actions

1. JWPA (1972) should ensure the protection of all the amphibians categorically.
2. Ban should be imposed on the dissection of Frogs and Toads in Schools and Colleges.
3. The National Wildlife Action Plan, National Biodiversity Strategy and other similar policies, plans and strategies should give higher priority to amphibians especially the endemic species.
4. Legislation should be made to control the indiscriminate use of chemical fertilizer and pesticides.
5. As like fish aquariums, Zoos should take up the exhibition of amphibians insisting on their ecological values.

STRATEGIES AND ACTIONS FOR THE CONSERVATION OF AMPHIBIANS:

1. Awareness Creation:

    1. Amphibians role in the agro-eco systems to be taught in the schools as like that of earthworms.
    2. Public and the students are to be given hands-on training in the identification of the species and should be educated about the benefits of amphibians.
    3. Awareness can be created both by the electronic media and the print media.

2. Collecting the baseline data about amphibians

    1. A check list of amphibian species present in all the protected areas of Tamil Nadu is to be prepared immediately as like that of the check list of birds and mammals.
    2. Photo-documentation of the species, their microhabitat and life history are to be prepared based on field studies and not on Museum specimens.
    3. Amphibian field studies can be encouraged.
    4. Amphibian data base can be maintained and updated by the Government or Institutions or by ENVIS.
    5. Amphibians are highly localized and are good indicators of the environment quality, hence they are to be considered and incorporated in the Conservation and Management Plans of the Protected Areas as like the Mega species.

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Appendix –1.

Check List of Amphibians in Tamil Nadu

Sl. No.	Species Name	Common Name	Family	Endemic Status	IUCN Status	Legal Status	Remarks
1	*Bufo fergusonii* Boulenger, 1892	Ferguson's toad	Bufonidae	--	LRIC/ N	--	--
2	*Bufo microtympanum* Boulenger, 1892	Southern hill toad	"	--	VU/n	--	--
3	*Bufo parietalis* Boulenger, 1892	Ridged toad	"	Endemic	LRnt/N	--	--
4	*Bufo melanostictus* Schneider 1799	Common Indian toad	"	--	Vu	--	--
5	*Bufo beddomi* Gunther, 1875	Beddom's toad	"	Endemic	LRIC	--	--
6	*Bufo stomaticus* Lutken, 1862	Marbled toad	"	--	DD	--	--
7	*Ramanella anamalaiensis* Rao, 1937	Anamalai narrow mouthed frog	Microhylidae	Endemic	DD	--	--
8	*Ramanella triangularis* Gunther 1875	Malabar narrow mouthed frog	"	Endemic	VU	--	--
9	*Ramanella variegata* Stoliczka	Marbled narrow mouthed frog	"	--	LRnt/N	--	--
10	*Ramanella montana* Jerdon 1854	Jerdon's narrow mouthed frog	"	Endemic	LRnt	--	--
11	*Malanobatrachus indicus* Beddome 1878	Black narrow mouthed frog	"	--	VU	--	--
12	Microhyla ornata *Dumeril Bibron, 1841*	Ornata narrow mouthed frog	"	--	LRnt	--	--
13	*Microhyla rubra* Jerdon 1854	Red narrow mouthed frog	"	--	LRnt	--	--
14	*Uperodon systoma* Schneider 1799	Marbled ballon frog	"	-	LRnt/N	--	--

Sl. No.	Species Name	Common Name	Family	Endemic Status	IUCN Status	Legal Status	Remarks
15	*Kaloula pulchra taprobanica* Parker 1934	Indian painted frog	"	--	LRnt	--	--
16	*Micrixalus fuscus* Boulenger 1882	Dusky torrent frog	Ranidae	--	VU	--	--
17	*Micrixalus opisthorodus*	Pink-thighed torrent frog	"	--	VU	--	--
18	*Micrixalus sylvaticus* Boulenger 1882	Forest torrent frog	"	--	VU	--	--
19	*Micrixalus nudis* Pillai 1978	Pillai's torrent frog	"	-	VU	--	--
20	*Micrixalus gadgili* **Pillai & Pattabiraman, 1990**	Sabarigiri torrent frog	"	--	EN	--	--
21	*Nycti batrachus beddomi* Boulenger, 1882	Beddom's dwarf frog	"	Endemic	LRnt	--	--
22	*Nyctibatrachus aliciae* **Inger, Shaffer, Koshy & Bakde 1984**	Alice's wrinkled frog	"	Endemic	VU	--	--
23	*Nyctibatrachus deccanensis* Dubois 1984	Pygmy wrinkled frog	"	Endemic	VU	--	--
24	*Nyctibatrachus major* Boulenger, 1882	Large wrinkled frog	"	Endemic	LRnt	--	--
25	*Rana diplosticta* Gunther 1875	Spotted leaping frog	"	Endemic	VU	--	--
26	*Rana leptodactyla* Boulenger, 1882	Thin legged leaping frog	"	Endemic	VU	--	--

Sl. No.	Species Name	Common Name	Family	Endemic Status	IUCN Status	Legal Status	Remarks
27	*Rana semipalmata* Boulenger, 1882	Brown leaping frog	"	Endemic	VU	--	--
28	*Rana brevipalmata* Peters 1871	Short webbed frog	"	Endemic	LRnt	--	--
29	*Rana crassa*	Jerdon's bull frog	"	--	LRnt/N	--	--
30	*Rana keralensis* Pubois 1980	Verrucose frog	"	Endemic	LRnt	--	--
31	*Rana limnocharis*	Streaked frog	"	--	VU/N	--	--
32	*Rana murthii* Pillai 1979	Murthy's frog	"	--	EN	--	--
33	*Rana nilagirica* Jerdon 1953	Nilgiri cricket frog	"	--	EN	--	--
34	*Rana tigrina*	Indian bull frog	"	--	VU/N	--	--
35	*Rana cyanophlyctis* Schncider, 1799	Skipper frog	"	--	LRnt	--	--
36	*Rana hexadactyla* Lesson 1834	Indian pond frog	"	--	DD	--	--
37	*Rana curtipes* Jerdon 1853	Bi-coloured frog	"	Endemic	LRnt	--	--
38	*Rana travancorica* Annandale 1910	Travancore frog	"	Endemic	DD	--	--
39	*Rana dobsoni*	Burrowing frog	"	--	--	--	--
40	*Rana rolandae*	Southern burrowing frog	"	--	--	--	--
41	*Rana aurantiaca* Boulenger, 1904	Golden frog	"	Endemic	LRnt	--	--
42	*Rana beddomi*	Beddomi's leaping frog	"	Endemic	VU	--	--
43	*Rana brachytarsus*	Short legged leaping frog	"	--	--	--	--

Sl. No.	Species Name	Common Name	Family	Endemic Status	IUCN Status	Legal Status	Remarks
44	*Rana leithii*	Leith's leaping frog	"	Endemic	VU	--	--
45	*Rana malabarica* Tschudi 1838	Fungeid frog	"	Endemic	LRnt	--	--
46	*Rana temporalis*	Bronzed frog	"	--	--	--	--
47	*Rana phrynoderma*	Rough-skinned leaping frog	"	--	--	--	--
48	*Tomopterna breviceps*	Indian burrowing frog	"	--	DD	--	--
49	*Tomopterna dobsonii*	Dobson's burrowing frog	"	--	DD	--	--
50	*Tomopterna rolandae* Dubois, 1983	Southern burrowing frog	"	--	LRnt/N	--	--
51	*Tomopterna rufescens*	--	"	Endemic	LRnt	--	--
52	*Philautus beddomi* Gunther, 1875	Green bush frog	Rhacophoridae	--	VU	--	--
53	*Philautus charius* Rao, 1937	Bush frog	"	--	LRnt	--	--
54	*Philautus glandolosus* Jerdon 1953	Rough skined bush frog	"	--	VU	--	--
55	*Philautus variabilis* Gunther 1858	Tinkling frog	"	Endemic	LRnt	--	--
56	*Philautus chalazodus* Gunther 1875	White-spotted green bush frog	"	--	VU	--	--
57	*Philautus femoralis*	Plain green bush frog	"	--	DD	--	--
58	*Philautus leucorhinus* **Lichtenstein & Martens, 1856**	White n osed bush frog	"	Endemic	LRnt	--	--
59	*Philautus pulcherrimus* Ahl 1927	Pretty bush frog	"	Endemic	VU	--	--

Sl. No.	Species Name	Common Name	Family	Endemic Status	IUCN Status	Legal Status	Remarks
60	*Philautus signatus* Boulenger 1882	Castanet bush frog	"	Endemic	VU	--	--
61	*Philautus nasutus*	Sharp nosed bush frog	"	--	LRnt	--	--
62	*Philautus temporalis* Gunther, 1864	Plain coloured bush frog	"	Endemic	EN	--	--
63	*Polypedatus maculatus* Gray 1834	Common tree frog	"	--	LRic	--	--
64	*Polypedatus pleurostictus*	Spotted green tree frog	"	--	--	--	--
65	*Polypedatus pseudocruciger* Blyth 1852	--	"	Endemic	DD	--	--
66	*Polypedatus leucomystix* Gravenhorst, 1829	Bamboo tree frog	"	--	--	--	--
67	*Rhacophorus calcadensis* Ahl, 1927	Kalakad gliding frog	"	Endemic	DD	--	--
68	*Rhacophorus malabaricus* Jerdon 1870	Malabar flying frog	"	Endemic	LRnt	--	--
69	*Rhacophorus pleurostictus* Gunther, 1864	Spotted Green tree frog	"	Endemic	VU	--	--
70	*Ichthyophis beddomi* Peters 1879	Beddome's caecilian	Ichthyophis	--	VU	--	--
71	*Ichthyophis longicephalus* Pillai 1986	Long headed caecilian	"	Endemic	VU	--	--
72	*Ichthyophis peninsularis* Taylor 1960	Kerala caecilian	"	Endemic	VU	--	--
73	*Ichthyophis tricolor* Taylor 1960	Three coloured caecilian	"	Endemic	EN	--	--

Sl. No.	Species Name	Common Name	Family	Endemic Status	IUCN Status	Legal Status	Remarks
74	*Ichthyophis subterrestris* Taylor 1960	Semi terrestrial caecilian	"	Endemic	VU	--	--
75	*Uraeotyphlus malabaricus* Beddome, 1820	Malabar caecilian	"	Endemic	EN	--	--
76	*Uraeotyphlus oxyurus* **Dumeril & Bibron 1841**	Sharp tooled caecilian	"	Endemic	VU	--	--

5. Conservation Strategies and Action Plan for Reptiles of Tamil Nadu

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5. Conservation Strategies and Action Plan for Reptiles of Tamil Nadu

S.Bhupathy

Tamil Nadu, the southernmost state of India is blessed with high biological diversity. Of the 484 reptile species reported to occur in India (Das 1997), 177 are found in this state. This is mainly due to the strategic location of the state, closer to the equator, and the contiguous mountain range, the Western Ghats. Presence of three major biogeographic zones in the state, namely the Western Ghats, Deccan plains and the Coastal zone (Rodgers and Panwar 1988) also attribute for this high diversity. The present paper is an attempt to collate all major works done on the reptiles of Tamil Nadu (Smith 1931, 1935, 1943, Murthy 1977, Daniel 1983, Rajendran 1985, Groombridge 1990, Malhotra and Davis 1991, Daniels and Ishwar 1994, Bhupathy and Kannan 1997, Daniels 2001, Ishwar et al 2001), and report the status of reptiles found within the political boundary of Tamil Nadu in terms of their distribution and population levels. Information provided in the report of the Conservation Assessment and Management Plan workshop (CAMP workshop, Molur and Walker 1998) on the population and geographical status of the species was extensively used. In the present paper, conservation action plans related to management and research priorities are discussed. The nomenclature followed herein is largely of Das (1997).

Species richness

Compilation from various available information shows that 177reptiles species belonging to 78 Genera and 20 Families are found in Tamil Nadu (Table 1, Appendix 1). The snakes represent the highest with 46 genera and 111 species followed by lizards (19 genera and 54 species). The colubrid snakes contributed the highest at species level (44 species) followed by shieldtail snakes (29 species). Among lizards, the skinks have higher number of species.

Endemicity

About 53% of reptile species found in Tamil Nadu are endemic to India. Majority (90%) of them are largely endemic to the Western Ghats. Fourteen species are reported only from Tamil Nadu, and they appear endemic to this state (Table 2). All but one are found exclusively in the Western Ghats. Also, these species are known from a fewer records (from
one or two localities) . Species belonging to shieldtail snakes (100%), agamid lizards (79%)
and viperine snakes (63%) show high endemicity (Table 3).

Table 1.
Taxonomic representation of the reptiles of Tamil Nadu

Group	Family	Genus	Species	Endemic	
				Species	%
Crocodile	1	1	1	0	0
Turtle	5	12	12	3	25
Lizard	6	19	54	32	59
Snake	8	46	111	59	54
	20	78	178	94	53

Table 2.
Endemic reptiles of Tamil Nadu

S.No	Family	Species status	Common name	Survival
1	Gekkonidae	*Hemiphyllodactylus typus*	Common worm gecko	Vulnerable
2	Agamidae	*Calotes andamanensis*	Green crestless forest lizard	Vulnerable
3	Scincidae	*Dasia subcaeruleum*	Blue-bellied tree skink	Data Deficient
4	Scincidae	*Mabuya gansi*	Gans' grass skink	Vulnerable
5	Typhlopidae	*Typhlops beddomei*	Beddome's worm snake	Vulnerable
6	Uropeltidae	*Uropeltis broughami*	Sirumalai shieldtail	Data Deficient
7	Uropeltidae	*Uropeltis dindigalensis*	Dindigul shieldtail	Critical
8	Uropeltidae	*Uropeltis liura*	Ashambu shieldtail	Endangered
9	Uropeltidae	*Uropeltis macrorhynchus*	Anaimalai shieldtail	Data Deficient
10	Uropeltidae	*Uropeltis nitidus*	Cochin shieldtail	Data Deficient
11	Uropeltidae	*Uropeltis petersi*	Peter's shieldtail	Data Deficient
12	Uropeltidae	*Uropeltis smithii*	Violet shieldtail	Data Deficient
13	Colubridae	*Oligodon nikhili*	Palni hills kukri snake	Critical
14	Viperidae	*Trimeresurus huttoni*	Hutton's pit viper	Critical

Table 3.
Endemic species distribution among various reptile families found in Tamil Nadu

S.No	Family	*Genus*	Species	Endemic to India	
				Species	%
1	Crocodylidae	*1*	*1*	0	0
2	Dermochelidae	*1*	*1*	0	0
3	Cheloniidae	*4*	*4*	0	0
4	Testudinidae	*2*	*2*	1	50
5	Bataguridae	*2*	*2*	1	50
6	Trionychidae	*3*	*3*	1	33
7	Gekkonidae	*4*	*20*	10	50
8	Agamidae	*6*	*14*	11	79
9	Chamaeleonidae	*1*	*1*	0	0
10	Scincidae	*6*	*17*	10	59
11	Lacertidae	*1*	*1*	1	100
12	Varanidae	*1*	*1*	0	0
13	Typhlopidae	*2*	*6*	3	50
14	Uropeltidae	*7*	*29*	29	100
15	Boidae	*2*	*3*	0	0
16	Acrochordidae	*1*	*1*	0	0
17	Colubridae	*19*	*44*	19	43
18	Elapidae	*4*	*7*	3	43
19	Hydrophidae	*6*	*12*	0	0
20	Viperidae	*4*	*8*	5	63
	Total	*78*	*178*	94	53

Reptile Conservation in Tamil Nadu
Status

The Conservation Assessment and Management Plan workshop (Molur and Walker 1998) reveals that of the 177 species of reptiles found in Tamil Nadu, 35 were not assessed due to various reasons such as inadequate data. Among 141 species assessed, about 42% are having some sort of extinction threat (4 species Critical and 24 Endangered, *Appendix* – 1). Three out of four Critically endangered species are endemic, and restricted to the Western Ghats. Similarly, 17 out of 24 endangered reptiles are endemic species largely found in the Western Ghats. Among the 14 endemic reptiles of Tamil Nadu, four species

are with high risk of extinction (3- critical and 1- endangered), and another four are vulnerable due to various threats. The remaining six species come under the category of Data Deficient as virutally nothing is known about them.

Conservation Area

Undoubtedly, the Western Ghats is an important conservation area for reptiles in Tamil Nadu. This hill range is the habitat for about 89.2% of the reptiles species found within the political boundary of Tamil Nadu. The Protected Areas present along this range, the Mundanthurai-Kalakad Tiger Reserve, Srivilliputtur Grizzled Giant Squirrel Sanctuary, Indira Gandhi Wildlife Sanctuary, Mudumalai Wildlife Sanctuary and Mukuruthi National Park give considerable protection to these little known species. The Gulf of Mannar with vast stretches of sea grass is ideal habitat for foraging sea turtles. This is also an important area for sea snake conservation. Sea snakes are one of the poorly known reptile taxa.

Research Priorities

(i) Critically Endangered (4) and Endangered (24) species should be given top priorities in our conservation, management and research. Baseline information pertaining to the endangered species and that come under the Data Decifient category (+25 species) should be gathered at the earliest. Status and range limits of endemic reptiles of the state (Table 2) should be worked out at the earliest. Lack of information prevents decision makers from taking appropriate steps for conserving them. (ii) Species groups/guilds (eg. subterranean snake guild such as the shield tail or rough tail snakes) that require similar resource requirements should be identified for research. This kind of broad spectrum approach would help conserving many species as well as landscapes.

Management Priorities

Reptiles and amphibians are highly localised, and are good indicators of local environment. However, in the prevailing wildlife management plans, only mega and charismatic species such as the Tiger and Elephants have greater emphasis. It is suggested that species with localised distribution such as the endemic reptiles should be considered and incorporated in the conservation and management plans.

Many species of reptiles such as tortoises, snakes and crocodiles are affected by commercial exploitation. This is evident from the large scale confiscation of tortoises and snake skin in many parts of Tamil Nadu by the officials of the State Forest Department and Wildlife Preservation Regional directorate, Chennai. Often the legal procedures take years together to punish the offenders. Hence, it is suggested that modalities for finalising these cases fast may be worked out in consultation with departments involved.

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Appendix I.
Checklist of the Reptiles of Tamil Nadu.

S. No.	Family	Species	Common name	Status	
				Endemicity	Threat category
1	Crocodylidae	*Crocodylus palustris*	Mugger		EN
2	Dermochelidae	*Dermochelys coriacea*	Leatherback sea turtle		EN
3	Cheloniidae	*Caretta caretta*	Loggerhead sea turtle		LR
4		*Chelonia mydas*	Green turtle		EN
5		*Eretmochelys imbricata*	Hawksbill sea turtle		EN
6		*Lepidochelys olivacea*	Olive ridley sea turtle		EN
7	Testudinidae	*Geochelene elegans*	Indian star tortoise		VU
8		*Indotestudo travancorica*	Travancore tortoise	E	LR
9	Bataguridae	*Geoemyda silvatica*	Cochin forest cane turtle	E	VU
10		*Melanochelys trijuga*	Indian black turtle		LR
11	Trionychidae	*Lissemys punctata*	Indian flapshell turtle		LR
12		*Aspideretes leithii*	Leith's softshell turtle	E	VU
13		*Pelochelys canotrii*	Asian giant softshell turtle		LR
14	Gekkonidae	*Cnemaspis beddomei*	Beddome's day gecko	E	VU
15		*Cnemaspis gracilis*	Slender day gecko		NoE
16		*Cnemaspis indica*	Indian day gecko	E	VU
17		*Cnemaspis jerdonii*	Jerdon's day gecko		VU
18		*Cnemaspis kandianus*	Kandy day gecko		LR
19		*Cnemaspis littoralis*	Coastal day gecko	E	LR
20		*Cnemaspis mysoriensis*	Mysore day gecko	E	DD
21		*Cnemaspis ornatus*	Ornate day gecko	E	VU
22		*Cnemaspis sisparensis*	Sispara day gecko	E	EN

S. No.	Family	Species	Common name	Status	
				Endemicity	Threat category
23		*Geckoella collegalensis*	Kollegal ground gecko		DD
24		*Hemidactylus anamallensis*	Anaimalalai gecko	E	VU
25		*Hemidactylus brookii*	Brook's house gecko		LR
26		*Hemidactylus frenatus*	Asian house gecko		LR
27		*Hemidactylus leschenaulti*	Bark gecko		LR
28		*Hemidactylus maculatus*	Spotted house gecko		LR
29		*Hemidactylus reticulatus*	Reticulated gecko	E	LR
30		*Hemidactylus scabriceps*	Scaly gecko		VU
31		*Hemidactylus subtriedrus*	Jerdon's gecko	E	EN
32		*Hemidactylus triedrus*	Termite hill gecko		LR
33		*Hemiphyllodactylus typus*	Common worm gecko	E	VU
34	Agamidae	*Sitana ponticeriana*	Fan-throated lizard		LR
35		*Otocryptis beddomii*	Indian kangaroo lizard	E	VU
36		*Draco dussumieri*	Western Ghats flying lizard	E	LR
37		*Salea horsfieldi*	Horsfield's spiny lizard	E	EN
38		*S.anamallayana*	Anamalai spiny lizard	E	EN
39		*Calotes versicolor*	Indian garden lizard		LR
40		*Calotes nemoricola*	Nilgiri forest lizard	E	VU
41		*C. grandisquamis*	Large scaled forest lizard	E	LR
42		*Calotes calotes*	Common green calotes		LR
43		*Calotes andamanensis*	Green crestless forest lizard	E	VU
44		*Calotes rouxii*	Roux's forest lizard	E	LR
45		*Calotes elliotti*	Elliot's forest lizard	E	LR

S. No.	Family	Species	Common name	Status	
				Endemicity	Threat category
46		*Psammophilus blanfordanus*	Blanford's rock agama	E	NoE
47		*Psammophilus dorsalis*	South Indian rock agama	E	LR
48	Chamaeleonidae	*Chamaeleo zeylanicus*	Indian chameleon		VU
49	Scincidae	*Dasia halianus*	Haly's tree skink		CR
50		*Dasia subcaeruleum*	Blue-bellied tree skink	E	DD
51		*Lygosoma punctatus*	Spotted supple skink		LR
52		*Mabuya beddomei*	Beddome's grass skink		LR
53		*Mabuya bibronii*	Bibron's seashore skink		LR
54		*Mabuya carinata*	Keeled grass skink		LR
55		*Mabuya gansi*	Gans' grass skink	E	VU
56		*Mabuya macularius*	Bronze grass skink		LR
57		*Mabuya trivittata*	Three-lined grassskink	E	LR
58		*Ristella beddomii*	Beddome's cat skink	E	VU
59		*Ristella guentheri*	Gunther's cat skink	E	VU
60		*Ristella rurkii*	Rurk's cat skink	E	VU
61		*Ristella travancoricus*	Travancore cat skink,	E	VU
62		*Scincella bilineatum*	Two-lined ground skink	E	DD
63		*Scincella travancoricum*	Travancore ground skink	E	VU
64		*Scincella laterimaculatum*	Travancore groundskink	E	NoE
65		*Sphenomorphous dussumieri*	Dussumier's litter skink		LR
66	Lacertidae	*Ophisops leschenaultii*	Leschenault's lacerta	E	LR
67	Varanidae	*Varanus bengalensis*	Bengal monitor		VU

S. No.	Family	Species	Common name	Status	
				Endemicity	Threat category
68	Typhlopidae	*Ramphotyphlops braminus*	Brahminy worm snake		LR
69		*Rhinotyphlops acutus*	Beaked worm		LR
70		*Typhlops beddomei*	Beddome's worm snake	E	VU
71		*Typhlops porrectus*	Slender blind snake		LR
72		*Typhlops thurstoni*	Thurston's worm snake	E	DD
73		*Typhlops tindali*	Tindall's worm snake	E	DD
74	Uropeltidae	*Brachipodium rhodogaster*	Red-bellied shieldtail	E	EN
75		*Melanophidium punctatum*	Pied-belly shieldtail	E	VU
76		*Platyplectrurus madurensis*	Madurai shieldtail	E	EN
77		*Platyplectrurus trilineatus*	Three-lined shieldtail	E	VU
78		*Plectrurus perroteti*	Perrotet shieldtail	E	LR
79		*Plectrurus guentheri*	Purple shieldtail	E	VU
80		*Rhinophis fergusonianus*	Cardamom shieldtail	E	DD
81		*Rhinophis sanguineus*	Red-bellied shieldtail	E	DD
82		*Rhinophis travancoricus*	Travancore shieldtail	E	DD
83		*Teretrurus sanguineus*	Western shieldtail	E	DD
84		*Uropeltis arcticeps*	Tirulveli shieldtail	E	LR
85		*Uropeltis beddomii*	Beddome's shieldtail	E	DD
86		*Uropeltis broughami*	Sirumalai shieldtail	E	DD
87		*Uropeltis ceylanicus*	Kerala shieldtail	E	LR
88		*Uropeltis dindigalensis*	Dindigul shieldtail	E	CR
89		*Uropeltis ellioti*	Elliot's shieldtail	E	LR
90		*Uropeltis liura*	Ashambu shieldtail	E	EN
91		*Uropeltis macrorhynchus*	Anaimalai shieldtail	E	DD
92		*Uropeltis maculatus*	Red-sided shieldtail	E	EN

S. No.	Family	Species	Common name	Status	
				Endemicity	Threat category
93		*Uropeltis myhendrae*	Barred shieldtail	E	DD
94		*Uropeltis nitidus*	Cochin shieldtail	E	DD
95		*Uropeltis ocellatus*	Nilgiri shieldtail	E	LR
96		*Uropeltis petersi*	Peterr's shieldtail	E	DD
97		*Uropeltis phipsoni*	Phipson's shieldtail	E	LR
98		*Uropeltis pulneyensis*	Palni shieldtail	E	EN
99		*Uropeltis rubrolineatus*	Red-lined shieldtail	E	LR
100		*Uropeltis rubromaculatus*	Red-spotted shieldtail	E	EN
101		*Uropeltis smithii*	Violet shieldtail	E	DD
102		*Uropeltis woodmasoni*	Black-bellied shieldtail	E	EN
103	Boidae	*Eryx conica*	Common sand boa		LR
104		*Eryx johnii*	Red sand boa		LR
105		*Python molurus*	Indian rock python		LR
106	Acrochordidae	*Acrochordus granulatus*	Western wart snake		LR
107	Colubridae	*Ahaetulla dispar*	Gunther's vine snake	E	LR
108		*Ahaetulla nasutus*	Common vine snake		LR
109		*Ahaetulla perroteti*	Bronze-headed vine snake	E	EN
110		*Ahaetulla pulverulenta*	Brown vine snake	E	LR
111		*Amphiesma beddomii*	Beddome's keelback	E	LR
112		*Amphiesma monticola*	Monta keelback	E	VU
113		*Amphiesma stolata*	Buff-striped keelback		LR
114		*Atretium schistosum*	Olive keelback water snake		LR
115		*Boiga beddomei*	Beddome's cat snake		DD
116		*Boiga ceylonensis*	Sri Lankan cat snake		NoE

S. No.	Family	Species	Common name	Status	
				Endemicity	Threat category
117		*Boiga dightoni*	Travancore cat snake	E	EN
118		*Boiga forsteni*	Forstein's cat snake		LR
119		*Boiga nuchalis*	Collared cat snake		LR
120		*Boiga trigonatus*	Common Indian cat snake		LR
121		*Cerberus rynchops*	Dog-faced water snake		LR
122		*Chrysopelea ornata*	Ornate flying snake	E	LR
123		*Dendrelaphis bifrenalis*	Bronzeback tree snake		EN
124		*Denrelaphis caudolineolatus*	Bronzeback tree snake		EN
125		*Dendrelaphis grandoculis*	Large-eyed bronzeback tree snake	E	VU
126		*Dendrelaphis tristis*	Common bronzeback tree snake		LR
127		*Dryocalamus gracilis*	Slender bridal snake		DD
128		*Dryocalamus nympha*	Common bridal snake		VU
129		*Elaphe helena*	Indian trinket snake		LR
130		*Enhydris dussumierii*	Dussumier's smooth water snake	E	EN
131		*Enhydris sieboldii*	Siebold's smooth water snake	E	LR
132		*Argyrogena fasciolatus*	Banded racer		LR
133		*Liopeltis calamaria*	Reed-like snake		LR
134		*Lycodon aulicus*	Common wolf snake		LR
135		*Lycodon flavomaculatus*	Yellow-spotted wolf snake	E	VU
136		*Lycodon striatus*	Barred wolf snake		LR

S. No.	Family	Species	Common name	Status	
				Endemicity	Threat category
137		*Lycodon travancoricus*	Travancore wolf snake	E	LR
138		*Macropisthodon plumbicolor*	Green keelback		LR
139		*Oligodon affinis*	Western kukri snake	E	LR
140		*Oligodon arnensis*	Banded kukri snake		LR
141		*Oligodon brevicaudus*	Striped kukri snake	E	LR
142		*Oligodon nikhili*	Palni Hills kukri snake	E	CR
143		*Oligodon taeniolatus*	Streaked kukri snake		LR
144		*Oligodon travancoricum*	Travancore kukri snake	E	EN
145		*Oligodon venusutum*	Black-spotted kukri snake	E	LR
146		*Ptyas mucosus*	Western rat snake		LR
147		*Sibinophis subpunctatus*	Black-headed snake		LR
148		*Xenochropis piscator*	Checkered keelback		LR
149		*Xylophis perroteti*	Striped narrow-headed snake	E	VU
150		*Xylophis stenorhynchus*	Gunther's narrow-headed snake	E	EN
151	Elapidae	*Bungarus caeruleus*	Common Indian krait		LR
152		*Calliophis beddomei*	Beddome's coral snake	E	VU
153		*Calliophis bibroni*	Bibron's coral snake	E	EN
154		*Calliophis melanurus*	Slender coral snake		LR
155		*Calliophis nigrescens*	Black slender coral snake	E	LR
156		*Naja naja*	Spectacled cobra		LR
157		*Ophiophagus hannah*	King cobra		LR
158	Hydrophidae	*Enhydrina schistosus*	Hook -nosed sea snake		DD
159		*Hydrophis caerulescens*	Many-toothed sea snake		DD

S. No.	Family	Species	Common name	Status	
				Endemicity	Threat category
160		*Hydrophis cyanocinctus*	Annualted sea snake		DD
161		*Hydrophis fasciatus*	Banded sea krait		NoE
162		*Hydrophis gracilis*	Common small-headed sea snake		DD
163		*Hydrophis obscurus*	Estuarine sea snake		NoE
164		*Hydrophis ornatus*	Ornate sea snake		NoE
165		*Hydrophis spiralis*	Yellow sea snake		DD
166		*Keralia jerdonii*	Jerdon's sea snake		DD
167		*Lapemis curtus*	Short sea snake		NoE
168		*Pelamis platurus*	Pelagic sea snake		NoE
169		*Thalassophis viperina*	Viperine sea snake		NoE
170	Viperidae	*Daboia russelli*	Russel's viper		LR
171		*Echis carinata*	Indian saw-scaled viper		LR
172		*Hypnale hypnale*	Indian hump-nosed pit viper		LR
173		*Trimeresurus gramineus*	Bamboo pit viper	E	LR
174		*Trimeresurus huttoni*	Hutton's pit viper	E	CR
175		*Trimeresurus macrolepis*	Large -scaled pit viper	E	LR
176		*Trimeresurus malabaricus*	Malabar pit viper	E	LR
177		*Trimeresurus strigatus*	Horse-shoe pit viper	E	LR

E- Endemic; CR-Critical, EN- Endangered, VU- Vulnerable, LR- Lower Risk, NoE- Not Evaluated, DD- Data Deficient.

6. Conservation Strategies and Action Plans for the Avifauna of Tamil Nadu

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6. Conservation Strategies and Action Plans for the Avifauna of Tamil Nadu

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Of the 1220 bird species reported to occur in India (Jhunjhunwala *et al.,* 2001), 454 are found in Tamil Nadu (Table 1-Appendix- I). Bird names in Table 1 follow the official checklist published by Manakadan and Pittie (2001). Among the 454 species, 136 (30%) species are water birds-herons, ducks and allied species, sea birds and shore birds and 318 (70%) are terrestrial birds. The occurrence of 70% terrestrial birds in Tamil Nadu is almost equal to the figure (72%) reported for southwestern India by Daniels (1997).

Endemic Birds

A total of 17 endemic bird species occur in Tamil Nadu (Table 2 -Appendix-II). None of them are exclusive endemics to Tamil Nadu, though the major population of Nilgiri Laghingthrush is reported from Nilgiris. Of the 17 endemic species, while 16 are endemics to Western Ghats, one species, the Yellow-throated Bulbul is endemic to Eastern Ghats.

Threatened Birds

Among the 454 bird species occurring in Tamil Nadu, 32 species are included under various categories of threats (BirdLife International 2001) (Table 3-Appendix- III). Among the 32 birds, while 13 are water birds, remaining 19 are terrestrial birds. Number of species under each threat category is furnished below:

Critical	=	2
Endangered	=	2
Vulnerable	=	11
Near-threatened	=	17

Important Bird Areas

The Bombay Natural History Society in collaboration with the BirdLife International, organized a statewide meeting of ornithologists and forest managers and prioritized 25 sites as Important Bird Areas (IBAs) in Tamil Nadu (Appendix IV). IBAs are identified using four standard global criteria, which cover sites that regularly hold significant populations of threatened birds listed as red data book (RDB) species; endemic birds i.e. birds with restricted ranges; bird communities consisting of species of birds that are more or less typical to certain biomes and sites where large congregations of birds gather (Jhunjhunwala *et al.,* 2001). The 25 IBA sites in Tamil Nadu include six water bird areas and 19 forested areas. Among the 19 forested areas, thorn scrub and dry

deciduous forests in Tamil Nadu Eastern Ghats is important as they harbor the rare, endemic Yellow-throated Bulbul. The sites in Western Ghats are important because of the presence of several endemic bird species. While Nilgiri Laughingthrush is mainly confined to the shola forests of upper Nilgiris, Nilgiri Pipit occurs in the shola grasslands. Nilgiri Wood Pigeon and Malabar Grey Hornbill inhabits moist forests of Tamil Nadu Western Ghats.

Major Threats to Avifauna

1. Habitat Loss

i. Habitat alteration

In the Western and Eastern Ghats, increasing agricultural and plantation activities along the fringes of reserve forests lead to the conversion of potential bird habitats into crop fields and plantations (Tea-Coffee.)

ii. Habitat destruction

In the hill areas, deforestation activities such as lopping and cutting of trees, forest fires and developmental activities such as construction of roads, dams and small industries lead to the loss of important bird habitats.

2. Bird Trade

i. Hunting for Food and Medicine

Meat of several bird species is considered delicious and also said to contain medicinal properties. Hence, local inhabitants of the forests involve in the killing of birds. From the wetlands, large number of migratory birds are trapped for meat during the migratory season. Bird trapping is the primary livelihood for some communities of the coastal regions. Pelicans, sandpipers, plovers. ducks, coots, moorhens, egrets, herons, pigeons, partridges, koel and cuckoos are some of the important birds trapped for meat

ii. Capturing for Pet Trade

As birds form good pets, several species of birds are trapped and sold for pet keeping. Mynas, parakeets, doves, pigeons, munias, sparrows, partridges, larks and quails are sold as pet birds.

Conservation Strategies and Action Plans for the birds of Tamil Nadu

Implement Recommendations suggested in Scientific Reports: Implementation of various recommendations proposed by the scientific studies of Bombay Natural History Society and Salim Ali Centre for Ornithology and Natural History could be tried out in some of the important bird areas. The after-effect of those recommendations in the bird-

habitat could be monitored as part of management research.

Conduct Avifaunal Surveys and Ecological Studies on Birds: Conduct avifaunal surveys and thorough ecological studies in Important Bird Areas (IBAs) listed by the Bombay Natural History Society and BirdLife International. The proposed studies should cover inventory of avifauna, population status and ecology of endemic and threatened species. As part of National Wetland Project, Salim Ali Centre for Ornithology and Natural History has identified the wetlands of conservation value for Tamil Nadu. A network of such important wetlands may be formed and a scientific management plan could be implemented to offer effective protection of bird species and habitats.

Create Public Awareness: Creating public awareness regarding bird conservation and providing alternate revenue for traditional bird trappers need to be done immediately. Mobile squads should be formed to track the illegal bird catchers and prevent their poaching activities. Public awareness campaign as a module should be prepared as separate packages for each of the important bird areas, as the habitat features, and bird biology differ from one area\bird to another. NGOs and other interested agencies may be entrusted with the job of creating conservation awareness among the public.

Prepare Specific Action Plan for Bird areas/Bird species: Specific action plan should be developed to protect the habitat of threatened bird species. For example, the protection of vegetation fringing river Bhavani in Coimbatore Forest Division would conserve the near-threatened Malabar Pied Hornbill (Balasubramanian & Maheswaran, 2002). It is suggested that the contiguity of vegetation along river Bhavani should be restored and human interferences such as exploitation of forest produces and expansion of agricultural activities should be controlled to protect this bird-habitat. Shola forests in the upper reaches of Nilgiris have been identified as the prime habitat for the endemic and endangered Nilgiri Laughingthrush (Vijayan and Gokula, 2001). They have further suggested that the shola forest patches of upper Nilgiris that harbour the Nilgiri Laughingthrush population should be included in the Mukurthi National Park and the Park could be renamed as "Mukurthi National Park and Laughingthrush Sanctuary" for the effective protection of this species.

The effective protection and management of mangrove forests in Pitchavaram and Muthupet would offer a very good wintering ground for certain habitat specific water bird species. Reducing human interferences and industrial activities in and around Point Calimere and Pulicat lake would attract a lot more migratory birds to these precious wetlands. Increasing the vegetal cover and water management in

the inland wetlands such as Udayamarthandapuram Eri (Muthupet), Vellode Eri (Erode), Big Tank (Ramanathapuram) and similar other sites in Tamil Nadu would attract more water bird population to the heronries.

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APPENDIX- I

Table 1.
List of birds of Tamil Nadu

S. No.	Family	Common Name	Scientific Name	Endemic status	Threat status	Legal status
1	Podicipedidae	Little Grebe	*Tachybaptus ruficollis*			S-IV
2	Hydrobatidae	Wilson's Storm-Petrel	*Oceanites oceanicus*			S-IV
3	Phaethontidae	Yellow-billed Tropicbird	*Phaethon lepturus*			S-IV
4	Pelecanidae	Spotbilled Pelican	*Pelecanus philippensis*		VU	S-IV
5	Phalacrocoracidae	Indian Shag	*Phalacrocorax fuscicollis*			S-IV
6	Phalacrocoracidae	Great Cormorant	*Phalacrocorax carbo*			S-IV
7	Phalacrocoracidae	Little Cormorant	*Phalacrocorax niger*			S-IV
8	Anhingidae	Darter	*Anhinga melanogaster*		NT	S-IV
9	Ardeidae	White-bellied Heron	*Ardea insignis*		EN	S-IV
10	Ardeidae	Grey Heron	*Ardea cinerea*			S-IV
11	Ardeidae	Purple Heron	*Ardea purpurea*			S-IV
12	Ardeidae	Little Green Heron	*Butorides striatus*			S-IV
13	Ardeidae	Indian Pond Heron	*Ardeola grayii*			S-IV
14	Ardeidae	Cattle Egret	*Bubulcus ibis*			S-IV
15	Ardeidae	Large Egret	*Casmerodius albus*			S-IV
16	Ardeidae	Median Egret	*Mesophoyx intermedia*			S-IV
17	Ardeidae	Little Egret	*Egretta garzetta*			S-IV
18	Ardeidae	Western Reef Egret	*Egretta gularis*			S-IV
19	Ardeidae	Black-crowned Night Heron	*Nycticorax nycticorax*			S-IV
20	Ardeidae	Malayan Night-Heron	*Gorsachius melanolophus*			S-IV
21	Ardeidae	Chestnut Bittern	*Ixobrychus cinnamomeus*			S-IV
22	Ardeidae	Yellow Bittern	*Ixobrychus sinensis*			S-IV
23	Ardeidae	Black Bittern	*Dupetor flavicollis*			S-IV
24	Ardeidae	Great Bittern	*Botaurus stellaris*			S-IV
25	Ciconiidae	Painted Stork	*Mycteria leucocephala*		NT	S-IV
26	Ciconiidae	White-necked Stork	*Ciconia episcopus*			S-IV
27	Ciconiidae	Asian Openbill Stork	*Anastomus oscitans*			S-IV
28	Ciconiidae	Black-necked Stork	*Ephippiorhynchus asiaticus*		NT	S-IV
29	Ciconiidae	Lesser Adjutant Stork	*Leptoptilos javanicus*		VU	S-IV
30	Ciconiidae	European White Stork	*Ciconia ciconia*			S-IV
31	Ciconiidae	Black Stork	*Ciconia nigra*			S-IV
32	Threskiornithidae	Oriental White Ibis	*Threskiornis melanocephalus*		NT	S-IV
33	Threskiornithidae	Black Ibis	*Pseudibis papillosa*			S-IV
34	Threskiornithidae	Eurasian Spoonbill	*Platalea leucorodia*			S-I
35	Phoenicopteridae	Greater Flamingo	*Phoenicopterus ruber*			S-IV
36	Phoenicopteridae	Lesser Flamingo	*Phoenicopterus minor*		NT	S-IV
37	Anatidae	Bar-headed Goose	*Anser indicus*			S-IV
38	Anatidae	Lesser Whistling-Duck	*Dendrocygna javanica*			S-IV
39	Anatidae	Large Whistling-Duck	*Dendrocygna bicolor*			S-I

S. No.	Family	Common Name	Scientific Name	Endemic status	Threat status	Legal status
40	Anatidae	Brahminy Shelduck	*Tadorna ferruginea*			S-IV
41	Anatidae	Ferruginous Pochard	*Anas acuta*			S-IV
42	Anatidae	Common Teal	*Anas crecca*			S-IV
43	Anatidae	Comb Duck	*Sarkidiornis melanotos*			S-IV
44	Anatidae	Ferruginous Pochard	*Aythya nyroca*		NT	S-IV
45	Anatidae	Common Pochard	*Aythya ferina*			S-IV
46	Anatidae	Spot-billed Duck	*Anas poecilorhyncha*			S-IV
47	Anatidae	Mallard	*Anas platyrhynchos*			S-IV
48	Anatidae	Gadwall	*Anas strepera*			S-IV
49	Anatidae	Eurasian Wigeon	*Anas penelope*			S-IV
50	Anatidae	Garganey	*Anas querquedula*			S-IV
51	Anatidae	Northern Shoveller	*Anas clypeata*			S-IV
52	Anatidae	Cotton Teal	*Nettapus coromandelianus*			S-IV
53	Accipitridae	Black-shouldered Kite	*Elanus caeruleus*			S-I
54	Accipitridae	Jerdon's Baza	*Aviceda jerdoni*			S-I
55	Accipitridae	Black Baza	*Aviceda leuphotes*			S-I
56	Accipitridae	Oriental Honey-Buzzard	*Pernis ptilorhynchus*			S-I
57	Accipitridae	Black Kite	*Milvus migrans*			S-I
58	Accipitridae	Brahminy Kite	*Haliastur indus*			S-I
59	Accipitridae	Shikra	*Accipiter badius*			S-I
60	Accipitridae	Crested Goshawk	*Accipiter trivirgatus*			S-I
61	Accipitridae	Eurasian Sparrow-hawk	*Accipiter nisus*			S-I
62	Accipitridae	Besra Sparrow-hawk	*Accipiter virgatus*			S-I
63	Accipitridae	Long-legged Buzzard	*Buteo rufinus*			S-I
64	Accipitridae	Common Buzzard	*Buteo buteo*			S-I
65	Accipitridae	White-eyed Buzzard	*Butastur teesa*			S-I
66	Accipitridae	Mountain Hawk-Eagle	*Spizaetus nipalensis*			S-I
67	Accipitridae	Changeable Hawk-Eagle	*Spizaetus cirrhatus*			S-I
68	Accipitridae	Bonelli's Eagle	*Hieraaetus fasciatus*			S-I
69	Accipitridae	Booted Eagle	*Hieraaetus pennatus*			S-I
70	Accipitridae	Rofous-bellied Eagle	*Hieraaetus kienerii*			S-I
71	Accipitridae	Greater Spotted Eagle	*Aquila clanga*		VU	S-I
72	Accipitridae	Tawny Eagle	*Aquila rapax*			S-I
73	Accipitridae	Steppe Eagle	*Agulia nipalensis*			S-I
74	Accipitridae	Black Eagle	*Ictinaetus malayensis*			S-I
75	Accipitridae	Greater Grey-headed Fish Eagle	*Icthyophaga ichthyaetus*		NT	S-I
76	Accipitridae	White-bellied Sea-Eagle	*Halyaeetus leucogaster*			S-I
77	Accipitridae	Red-headed Vulture	*Sacrogyps calvus*		NT	S-IV
78	Accipitridae	Long-billed Vulture	*Gyps indicus*		CR	S-IV
79	Accipitridae	Indian White-backed Vulture	*Gyps bengalensis*		CR	S-IV
80	Accipitridae	Egyptian Vulture	*Neophron percnopterus*			S-IV
81	Accipitridae	Pallid Harrier	*Circus macrourus*		NT	S-I
82	Accipitridae	Hen Harrier	*Circus cyaneus*			S-I
83	Accipitridae	Montagu's Harrier	*Circus pygargus*			S-I

S. No.	Family	Common Name	Scientific Name	Endemic status	Threat status	Legal status
84	Accipitridae	Pied Harrier	*Circus melanoleucos*			S-I
85	Accipitridae	Western Marsh Harrier	*Circus aeruginosus*			S-I
86	Accipitridae	Short-toed Snake Eagle	*Circaetus gallicus*			S-I
87	Accipitridae	Crested Serpent Eagle	*Spilornis cheela*			S-I
88	Pandionidae	Osprey	*Pandion haliaetus*			S-I
89	Falconidae	Peregrine Falcon	*Falco peregrinus*			S-I
90	Falconidae	Oriental Hobby	*Falco severus*			S-IV
91	Falconidae	Red-headed Falcon	*Falco chicquera*			S-I
92	Falconidae	Common Kestrel	*Falco tinnunculus*			S-IV
93	Falconidae	Lesser Kestrel	*Falco naumanni*		VU	S-IV
94	Phasianidae	Grey Francolin	*Francolinus pondicerianus*			S-IV
95	Phasianidae	Jungle Bush-Quail	*Perdicula asiatica*			S-IV
96	Phasianidae	Painted Bush-Quail	*Perdicula erythrorhyncha*			S-IV
97	Phasianidae	Red Spurfowl	*Galloperdix spadicea*			S-IV
98	Phasianidae	Grey Junglefowl	*Gallus sonneratii*			S-IV
99	Phasianidae	Indian Peafowl	*Pavo cristatus*			S-I
100	Turnicidae	Yellow-legged Buttonquail	*Turnix tanki*			S-IV
101	Turnicidae	Common Buttonquail	*Turnix suscitator*			S-IV
102	Rallidae	Blue-breasted Rail	*Gallirallus striatus*			S-IV
103	Rallidae	Slaty-legged Crake	*Rallina eurizonoides*			S-IV
104	Rallidae	Baillon's Crake	*Prozana pusilla*			S-IV
105	Rallidae	Ruddy-breasted Crake	*Porzana fusca*			S-IV
106	Rallidae	White-breasted Waterhen	*Amaurornis phoenicurus*			S-IV
107	Rallidae	Watercock	*Gallicrex cinerea*			S-IV
108	Rallidae	Common Moorhen	*Gallinula chloropus*			S-IV
109	Rallidae	Purple Moorhen	*Prophyrio prophyrio*			S-IV
110	Rallidae	Common Coot	*Fulica atra*			S-IV
111	Jacanidae	Pheasant-tailed Jacana	*Hydrophasianus chirurgus*			S-IV
112	Jacanidae	Bronze-winged Jacana	*Metopidius indicus*			S-IV
113	Rostratulidae	Greater Painted-Snipe	*Rostratula benghalensis*			S-IV
114	Haematopodidae	Eurasian Oystercatcher	*Haematopus ostralegus*			S-IV
115	Charadriidae	Red-wattled Lapwing	*Vanellus indicus*			S-IV
116	Charadriidae	Yellow-wattled Lapwing	*Vanellus malabaricus*			S-IV
117	Charadriidae	Grey Plover	*Pluvialis squatarola*			S-IV
118	Charadriidae	European Golden Plover	*Pluvialis apricaria*			S-IV
119	Charadriidae	Greater Sand Plover	*Charadrius leshenaultii*			S-IV
120	Charadriidae	Common Ringed Plover	*Charadrius hiaticula*			S-IV
121	Charadriidae	Little-ringed Plover	*Charadrius dubius*			S-IV
122	Charadriidae	Kentish Plover	*Charadrius alexandrinus*			S-IV
123	Charadriidae	Lesser Sand Plover	*Charadrius mongolus*			S-IV
124	Scolopacidae	Whimbrel	*Numenius phaeopus*			S-IV
125	Scolopacidae	Eurasian Curlew	*Numenius arquata*			S-IV
126	Scolopacidae	Blacktailed Godwit	*Limosa limosa*			S-IV

S. No.	Family	Common Name	Scientific Name	Endemic status	Threat status	Legal status
127	Scolopacidae	Bartailed Godwit	*Limosa lapponica*			S-IV
128	Scolopacidae	Spotted Redshank	*Tringa erythropus*			S-IV
129	Scolopacidae	Common Redshank	*Tringa totanus*			S-IV
130	Scolopacidae	Marsh Sandpiper	*Tringa stagnatalis*			S-IV
131	Scolopacidae	Common Green Shank	*Tringa nebularia*			S-IV
132	Scolopacidae	Green Sandpiper	*Tringa ochropus*			S-IV
133	Scolopacidae	Wood Sandpiper	*Tringa glareola*			S-IV
134	Scolopacidae	Terek Sandpiper	*Xenus cinereus*			S-IV
135	Scolopacidae	Common Sandpiper	*Actitis hypoleucos*			S-IV
136	Scolopacidae	Ruddy Turnstone	*Arenaria interpres*			S-IV
137	Scolopacidae	Asian Dowitcher	*Limnodromus semipalmatus*		NT	S-IV
138	Scolopacidae	Pintail Snipe	*Gallinago stenura*			S-IV
139	Scolopacidae	Swinhoe's Snipe	*Gallinago megala*			S-IV
140	Scolopacidae	Common Snipe	*Gallinago gallinago*			S-IV
141	Scolopacidae	Wood Snipe	*Gallinago nemoricola*		VU	S-IV
142	Scolopacidae	Jack Snipe	*Lymnocryptes minimus*			S-IV
143	Scolopacidae	Eurasian Woodcock	*Scolopax rusticola*			S-IV
144	Scolopacidae	Red Knot	*Calidris canutus*			S-IV
145	Scolopacidae	Great Knot	*Calidris tenuirostris*			S-IV
146	Scolopacidae	Sanderling	*Calidris alba*			S-IV
147	Scolopacidae	Little Stint	*Calidris minuta*			S-IV
148	Scolopacidae	Temminck's Stint	*Calidris temmincki*			S-IV
149	Scolopacidae	Long-toed Stint	*Calidris subminuta*			S-IV
150	Scolopacidae	Dunlin	*Calidris alpina*			S-IV
151	Scolopacidae	Curlew Sandpiper	*Calidris ferruginea*			S-IV
152	Scolopacidae	Spoonbill Sandpiper	*Calidris pygmeus*		VU	S-IV
153	Scolopacidae	Red-necked Stint	*Calidris ruficollis*			S-IV
154	Scolopacidae	Broad-billed Sandpiper	*Limicola falcinellus*			S-IV
155	Scolopacidae	Ruff	*Philomachus pugnax*			S-IV
156	Recurvirostridae	Blackwinged Stilt	*Himantopus himantopus*			S-IV
157	Recurvirostridae	Pied Avocet	*Recurvirostra avosetta*			S-IV
158	Phalaropopidae	Red-necked Phalarope	*Phalaropus lobatus*			
159	Dromadidae	Crab-Plover	*Dromas ardeola*			
160	Burhinidae	Stone-Curlew	*Burhinus oedicnemus*			S-IV
161	Burhinidae	Great Stone Plover	*Esacus recurvirostris*			S-IV
162	Glareolidae	Indian Courser	*Cursorius coromandelicus*			
163	Glareolidae	Small Pratincole	*Glareola lactea*			
164	Stercorariidae	Brown Squa	*Catharacta antartica*			S-IV
165	Laridae	Yellow-legged Gull	*Larus cachinnans*			S-IV
166	Laridae	Lesser Black-backed Gull	*Larus fuscus*			S-IV
167	Laridae	Palla's Gull	*Larus ichthyaetus*			S-IV
168	Laridae	Brown-headed Gull	*Larus brunnicephalus*			S-IV
169	Laridae	Black-headed Gull	*Larus ridibundus*			S-IV
170	Laridae	Slender-billed Gull	*Larus genei*			S-IV
171	Laridae	Whiskered Tern	*Chlidonias hybridus*			S-IV

S. No.	Family	Common Name	Scientific Name	Endemic status	Threat status	Legal status
172	Laridae	White-winged Black Tern	*Chlidonias leucopterus*			S-IV
173	Laridae	Black Tern	*Chlidonias niger*			S-IV
174	Laridae	Brown Noddy Tern	*Anous stolidus*			S-IV
175	Laridae	Gulbilled Tern	*Gelochelidon nilotica*			S-IV
176	Laridae	Caspian Tern	*Sterna caspia*			S-IV
177	Laridae	Common Tern	*Sterna hirundo*			S-IV
178	Laridae	Roseate Tern	*Sterna dougallii*			S-IV
179	Laridae	Black-bellied Tern	*Sterna acuticauda*		NT	S-IV
180	Laridae	Bridled Tern	*Sterna anaethetus*			S-IV
181	Laridae	Little Tern	*Sterna albifrons*			S-IV
182	Laridae	Large-crested Tern	*Sterna bergii*			S-IV
183	Laridae	Lesser-crested Tern	*Sterna bengalensis*			S-IV
184	Laridae	Sooty Tern	*Sterna fuscata*			S-IV
185	Laridae	Sandwich Tern	*Sterna sandvicensis*			S-IV
186	Laridae	River Tern	*Sterna aurantia*			S-IV
187	Pteroclididae	Chestnut-bellied Sandgrouse	*Pterocles exustus*			S-IV
188	Columbidae	Pompadour Green Pigeon	*Treron pomapadora*			S-IV
189	Columbidae	Orange-breasted Green Pigeon	*Treron bicincta*			S-IV
190	Columbidae	Yellow-legged Green Pigeon	*Treron phoenicoptera*			S-IV
191	Columbidae	Green Imperial Pigeon	*Ducula aenea*			S-IV
192	Columbidae	Mountain Imperial Pigeon	*Ducula badia*			S-IV
193	Columbidae	Blue Rock Pigeon	*Columba livia*			S-IV
194	Columbidae	Nilgiri Wood Pigeon	*Columba elphinstonii*	E	VU	S-IV
195	Columbidae	Oriental Turtle Dove	*Streptopelia orientalis*			S-IV
196	Columbidae	Red Collared Dove	*Streptopelia tranquebarica*			S-IV
197	Columbidae	Eurasian Collared Dove	*Streptopelia decaocto*			S-IV
198	Columbidae	Spotted Dove	*Streptopelia chinensis*			S-IV
199	Columbidae	Little Brown Dove	*Streptopelia senegalensis*			S-IV
200	Columbidae	Emerald Dove	*Chalcophaps indica*			S-IV
201	Psittacidae	Alexandrine Parakeet	*Psittacula eupatria*			S-IV
202	Psittacidae	Roseringed Parakeet	*Psittacula krameri*			S-IV
203	Psittacidae	Plum-headed Parakeet	*Psittacula cyanocephala*			S-IV
204	Psittacidae	Blue-winged Parakeet	*Psittacula columboides*	E		S-IV
205	Psittacidae	Indian Hanging Parrot	*Loriculus vernalis*			S-IV
206	Cuculidae	Red-winged Crested Cuckoo	*Clamator coramandus*			S-IV
207	Cuculidae	Pied Crested Cuckoo	*Clamator jacobinus*			S-IV
208	Cuculidae	Large Hawk-Cuckoo	*Hierococcyx sparverioides*			S-IV
209	Cuculidae	Brainfever Bird	*Hierococcyx varius*			S-IV
210	Cuculidae	Indian Cuckoo	*Cuculus micropterus*			S-IV
211	Cuculidae	Common Cuckoo	*Cuculus canorus*			S-IV
212	Cuculidae	Lesser Cuckoo	*Cuculus poliocephalus*			S-IV

S. No.	Family	Common Name	Scientific Name	Endemic status	Threat status	Legal status
213	Cuculidae	Banded Bay Cuckoo	*Cacomantis sonneratii*			S-IV
214	Cuculidae	Indian Plaintive Cuckoo	*Cacomantis passerinus*			S-IV
215	Cuculidae	Drongo Cuckoo	*Surniculus lugubris*			S-IV
216	Cuculidae	Asian Koel	*Eudynamys scolopacea*			S-IV
217	Cuculidae	Small Green-billed Malkoha	*Phaenicophaeus viridirostris*			S-IV
218	Cuculidae	Greater Coucal	*Centropus sinensis*			S-IV
219	Cuculidae	Lesser Coucal	*Centropus bengalensis*			S-IV
220	Tytonidae	Barn Owl	*Tyto alba*			S-IV
221	Tytonidae	Oriental Bay Owl	*Phodilus badius*			S-IV
222	Tytonidae	Grass Owl	*Tyto capensis*			S-IV
223	Strigidae	Eurasian Scops Owl	*Otus scops*			S-IV
224	Strigidae	Collared Scops Owl	*Otus bakkamoena*			S-IV
225	Strigidae	Eurasian EagleOwl	*Bubo bubo*			S-IV
226	Strigidae	Forest EagleOwl	*Bubo nipalensis*			S-IV
227	Strigidae	Dusky Eagle Owl	*Bubo coromandus*			S-IV
228	Strigidae	Brown Fish-Owl	*Ketupa zeylonensis*			S-IV
229	Strigidae	Jungle Owlet	*Glaucidium radiatum*			S-IV
230	Strigidae	Brown Hawk-Owl	*Ninox scutulata*			S-IV
231	Strigidae	Spotted Owlet	*Athene brama*			S-IV
232	Strigidae	Brown Wood-Owl	*Strix leptogrammica*			S-IV
233	Strigidae	Long-eared Owl	*Asio otus*			S-IV
234	Strigidae	Short-eared Owl	*Asio flammeus*			S-IV
235	Podargidae	Ceylon Frogmouth	*Batrachostomus moniliger*			S-I
236	Caprimulgidae	Great-eared Nightjar	*Eurostopodus macrotis*			S-IV
237	Caprimulgidae	Indian Jungle Nightjar	*Caprimulgus indicus*			S-IV
238	Caprimulgidae	European Nightjar	*Caprimulgus europaeus*			S-IV
239	Caprimulgidae	Large-tailed Nightjar	*Caprimulgus macrurus*			S-IV
240	Caprimulgidae	Common Indian Nightjar	*Caprimulgus asiaticus*			S-IV
241	Caprimulgidae	Franklin's Nightjar	*Caprimulgus affinis*			S-IV
242	Apodidae	Indian Edible-nest Swiftlet	*Collocalia unicolor*			
243	Apodidae	Brown-backed needle tail-Swift	*Hirundapus giganteus*			
244	Apodidae	White-rumped needle tail-Swift	*Zoonavena sylvatica*			
245	Apodidae	Alpine Swift	*Tachymarptis melba*			
246	Apodidae	House Swift	*Apus affinis*			
247	Apodidae	Asian Palm-Swift	*Cypsiurus balasiensis*			
248	Hemiprocnidae	Crested Tree Swift	*Hemiprocne coronata*			
249	Trogonidae	Malabar Trogon	*Harpactes fasciatus*			
250	Alcedinidae	Lesser Pied Kingfisher	*Ceryle rudis*			S-IV
251	Alcedinidae	Small Blue Kingfisher	*Alcedo atthis*			S-IV
252	Alcedinidae	Blue-eared Kingfisher	*Alcedo meninting*			S-IV
253	Alcedinidae	Oriental Dwarf Kingfisher	*Ceyx erithaca*			S-IV
254	Alcedinidae	Stork-billed Kingfisher	*Halcyon capensis*			S-IV
255	Alcedinidae	White-breasted Kingfisher	*Halcyon smyrnensis*			S-IV

S. No.	Family	Common Name	Scientific Name	Endemic status	Threat status	Legal status
256	Alcedinidae	Black-capped Kingfisher	*Halcyon pileata*			S-IV
257	Meropidae	Chestnut-headed Bee-eater	*Merops leschenaulti*			
258	Meropidae	European Bee-eater	*Merops apiaster*			
259	Meropidae	Blue-tailed Bee-eater	*Merops philippinus*			
260	Meropidae	Small Bee-eater	*Merops orientalis*			
261	Coraciidae	Indian Roller	*Coracias benghalensis*			S-IV
262	Coraciidae	Oriental Broad-billed Roller	*Eurystomus orientalis*			S-IV
263	Upupidae	Common Hoopoe	*Upupa epops*			
264	Bucerotidae	Malabar Grey Hornbill	*Ocyceros griseus*	E		S-I
265	Bucerotidae	Malabar Pied Hornbill	*Anthracoceros coronatus*		NT	S-I
266	Bucerotidae	Great Pied Hornbill	*Buceros bicornis*		NT	S-I
267	Bucerotidae	Indian Grey Hornbill	*Ocyceros birostris*			S-I
268	Capitonidae	White-cheecked Barbet	*Megalaima viridis*			S-IV
269	Capitonidae	Crimson-throated Barbet	*Megalaima rubricapillus*			S-IV
270	Capitonidae	Coppersmith Barbet	*Megalaima haemacephala*			S-IV
271	Capitonidae	Great Barbet	*Megalaima virens*			S-IV
272	Picidae	Eurasian Wryneck	*Jynx torquilla*			
273	Picidae	Speckled Piculet	*Picumnus innominatus*			
274	Picidae	Rufous Woodpecker	*Celeus brachyurus*			S-IV
275	Picidae	Little Scaly-bellied Green Woodpecker	*Picus xanthopygaeus*			S-IV
276	Picidae	Small Yellow-naped Woodpecker	*Picus chlorolophus*			S-IV
277	Picidae	Lesser Golden-backed Woodpecker	*Dinopium benghalense*			S-IV
278	Picidae	Common Golden-backed Woodpecker	*Dinopium javanense*			S-IV
279	Picidae	Great Black Woodpecker	*Dryocopus javensis*			S-IV
280	Picidae	Yellow-fronted Pied Woodpecker	*Dendrocopus mahrattensis*			S-IV
281	Picidae	Brown-capped Pygmy Woodpecker	*Dendrocopus nanus*			S-IV
282	Picidae	Heart-spotted Woodpecker	*Hemicircus canente*			S-IV
283	Picidae	Black-shouldered Woodpecker	*Chrysocolaptes festivus*			S-IV
284	Picidae	Greater Golden-backed Woodpecker	*Chrysocolaptes lucidus*			S-IV
285	Pittidae	Indian Pitta	*Pitta brachyura*			S-IV
286	Alaudidae	Bengal Bush Lark	*Mirafra assamica*			S-IV
287	Alaudidae	Singing Bush Lark	*Mirafra cantillans*			S-IV
288	Alaudidae	Red-winged Bush Lark	*Mirafra erythroptera*			S-IV
289	Alaudidae	Ashy-crowned Sparrow-Lark	*Eremopterix grisea*			S-IV
290	Alaudidae	Rufus-tailed Finch Lark	*Ammomanes phoenicurus*			S-IV

S. No.	Family	Common Name	Scientific Name	Endemic status	Threat status	Legal status
291	Alaudidae	Greater Short-toed Lark	*Calandrella brachydactyla*			S-IV
292	Alaudidae	Malabar Crested Lark	*Galerida malabarica*			S-IV
293	Alaudidae	Common Crested Lark	*Galerida cristata*			S-IV
294	Alaudidae	Eastern Skylark	*Alauda gulgula*			S-IV
295	Hirundinidae	Sand Martin	*Riparia riparia*			
296	Hirundinidae	Eurasian Crag Martin	*Hirundo rupestris*			
297	Hirundinidae	Dusky Crag Martin	*Hirundo concolor*			
298	Hirundinidae	Common Swallow	*Hirundo rustica*			
299	Hirundinidae	House Swallow	*Hirundo tahitica*			
300	Hirundinidae	Wire-tailed Swallow	*Hirundo smithii*			
301	Hirundinidae	Streak-throated Swallow	*Hirundo fluvicola*			
302	Hirundinidae	Red-rumped Swallow	*Hirundo daurica*			
303	Hirundinidae	Northern House Martin	*Delichon urbica*			
304	Motacillidae	Eurasian Tree Pipit	*Anthus trivialis*			S-IV
305	Motacillidae	Oriental Tree Pipit	*Anthus hodgsoni*			S-IV
306	Motacillidae	Richard's Pipit	*Anthus richardi*			S-IV
307	Motacillidae	Paddyfield Pipit	*Anthus rufulus*			S-IV
308	Motacillidae	Tawny Pipit	*Anthus campestris*			S-IV
309	Motacillidae	Brown Rock Pipit	*Anthus similis*			S-IV
310	Motacillidae	Nilgiri Pipit	*Anthus nilghiriensis*	E	NT	S-IV
311	Motacillidae	Forest Wagtail	*Dendronanthus indicus*			S-IV
312	Motacillidae	Yellow Wagtail	*Motacilla flava*			S-IV
313	Motacillidae	Citrine Wagtail	*Motacilla citreola*			S-IV
314	Motacillidae	Grey Wagtail	*Motacilla cinerea*			S-IV
315	Motacillidae	White Wagtail	*Motacilla alba*			S-IV
316	Motacillidae	Large Pied Wagtail	*Motacilla maderaspatensis*			S-IV
317	Campephagidae	Pied Flycatcher-Shrike	*Hemipus picatus*			S-IV
318	Campephagidae	Large Wood Shrike	*Tephrodornis gularis*			S-IV
319	Campephagidae	Common Wood Shrike	*Tephrodornis pondicerianus*			S-IV
320	Campephagidae	Large Cuckoo-Shrike	*Coracina macei*			S-IV
321	Campephagidae	Black-headed Cuckoo-Shrike	*Coracina melanoptera*			S-IV
322	Campephagidae	Scarlet Minivet	*Pericrocotus flammeus*			S-IV
323	Campephagidae	Small Minivet	*Pericrocotus cinnamomeus*			S-IV
324	Pycnonotidae	Grey-headed Bulbul	*Pyconotus priocephalus*	E		S-IV
325	Pycnonotidae	Black-crested Bulbul	*Pyconotus melanicterus*			S-IV
326	Pycnonotidae	Red-whiskered Bulbul	*Pycnonotus jocosus*			S-IV
327	Pycnonotidae	Red-vented Bulbul	*Pycnonotus cafer*			S-IV
328	Pycnonotidae	White-browed Bulbul	*Pycnonotus luteolus*			S-IV
329	Pycnonotidae	Yellow-throated Bulbul	*Pycnonotus xantholaernus*	E	VU	S-IV
330	Pycnonotidae	Yellow-browed Bulbul	*Iole indica*			S-IV

S. No.	Family	Common Name	Scientific Name	Endemic status	Threat status	Legal status
331	Pycnonotidae	Black Bulbul	*Hypsipetes leucocephalus*			S-IV
332	Irenidae	Common Iora	*Aegithina tiphia*			S-IV
333	Irenidae	Gold-fronted Chloropsis	*Chloropsis aurifrons*			S-IV
334	Irenidae	Jerdon's Chloropsis	*Chloropsis cochinchinensis*			S-IV
335	Irenidae	Asian Fairy-Bluebird	*Irena puella*			S-IV
336	Laniidae	Great Grey Shrike	*Lanius excubitor*			
337	Laniidae	Bay-backed Shrike	*Lanius vittatus*			
338	Laniidae	Grey-backed Shrike	*Lanius tephronotus*			
339	Laniidae	Brown Shrike	*Lanius cristatus*			
340	Muscicapidae	White-bellied Shortwing	*Brachypteryx major*	E	VU	
341	Muscicapidae	Bluethroat	*Luscinia svecica*			S-IV
342	Muscicapidae	Indian Blue Robin	*Luscinia brunnea*			
343	Muscicapidae	Oriental Magpie-Robin	*Copsychus saularis*			S-IV
344	Muscicapidae	White-rumped Shama	*Copsychus malabaricus*			
345	Muscicapidae	Black Redstart	*Phoenicurus ochruros*			S-IV
346	Muscicapidae	Pied Bushchat	*Saxicola caprata*			S-IV
347	Muscicapidae	Common Stonechat	*Saxicola torquata*			
348	Muscicapidae	Indian Robin	*Saxicoloides fulicata*			S-IV
349	Muscicapidae	Blue-headed Rock Thrush	*Monticola cinclorhynchus*			S-IV
350	Muscicapidae	Blue Rock Thrush	*Monticola solitarius*			S-IV
351	Muscicapidae	Malabar Whistling Thrush	*Myiophonus horsfieldii*			S-IV
352	Muscicapidae	Pied Thrush	*Zoothera wardii*			S-IV
353	Muscicapidae	Orange-headed Thrush	*Zoothera citrina*			S-IV
354	Muscicapidae	Scaly Thrush	*Zoothera dauma*			S-IV
355	Muscicapidae	Eurasian Blackbird	*Turdus merula*			
356	Muscicapidae	Spotted Babbler	*Pellorneum ruficeps*			S-IV
357	Muscicapidae	Large Scimitar Babbler	*Pomatorhinus hypoleucos*			S-IV
358	Muscicapidae	Rufous-bellied Babbler	*Dumetia hyperythra*			S-IV
359	Muscicapidae	Black-headed Babbler	*Rhopocichla atriceps*			S-IV
360	Muscicapidae	Yellow-eyed Babbler	*Chrysomma sinense*			S-IV
361	Muscicapidae	Common Babbler	*Turdoides caudatus*			S-IV
362	Muscicapidae	Large Grey Babbler	*Turdoides malcolmi*			S-IV
363	Muscicapidae	Indian Rufous Babbler	*Turdoides subrufus*	E		S-IV
364	Muscicapidae	Jungle Babbler	*Turdoides striatus*			S-IV
365	Muscicapidae	White-headed Babbler	*Turdoides affinis*			S-IV
366	Muscicapidae	Wynaad Laughingthrush	*Garrulax delesserti*	E		S-IV
367	Muscicapidae	Nilgiri Laughingthrush	*Garrulax cachinnans*	E	EN	S-IV
368	Muscicapidae	Grey-breasted Laughingthrush	*Garrulax jerdoni*	E	NT	S-IV
369	Muscicapidae	Quaker tit-babbler	*Alcippe poioicephala*			S-IV
370	Muscicapidae	Streaked Fantail Warbler	*Cisticola juncidis*			S-IV
371	Muscicapidae	Franklin's Prinia	*Prinia hodgsonii*			S-IV
372	Muscicapidae	Plain Prinia	*Prinia inornata*			S-IV

S. No.	Family	Common Name	Scientific Name	Endemic status	Threat status	Legal status
373	Muscicapidae	Ashy Prinia	*Prinia socialis*			S-IV
374	Muscicapidae	Jungle Prinia	*Prinia sylvatica*			S-IV
375	Muscicapidae	Common Tailor Bird	*Orthotomus sutorius*			S-IV
376	Muscicapidae	Broad-tailed Grass Warbler	*Shoenicola platyura*	E	VU	S-IV
377	Muscicapidae	Thick-billed Warbler	*Acrocephalus aedon*			S-IV
378	Muscicapidae	Indian Great Reed-Warbler	*Acrocephalus stentoreus*			S-IV
379	Muscicapidae	Blyth's Reed-Warbler	*Acrocephalus dumetorum*			S-IV
380	Muscicapidae	Paddyfield Warbler	*Acrocephalus agricola*			S-IV
381	Muscicapidae	Booted Warbler	*Hippolais caligata*			S-IV
382	Muscicapidae	Orphean Warbler	*Sylvia hortensis*			S-IV
383	Muscicapidae	Common Lesser Whitethroat	*Sylvia curruca*			S-IV
384	Muscicapidae	Tytler's Leaf-Warbler	*Phylloscopus tytleri*			S-IV
385	Muscicapidae	Tickell's Warbler	*Phylloscopus affinis*			S-IV
386	Muscicapidae	Common ChiffChaff	*Phylloscopus collybita*			S-IV
387	Muscicapidae	Large-billed Leaf-Warbler	*Phylloscopus magnirostris*			S-IV
388	Muscicapidae	Greenish Leaf-Warbler	*Phylloscopus trochiloides*			S-IV
389	Muscicapidae	Western Crowned Warbler	*Phylloscopus occipitalis*			S-IV
390	Muscicapidae	Blyth's Leaf- Warbler	*Phylloscopus reguloides*			S-IV
391	Muscicapidae	Brown-breasted Flycatcher	*Muscicapa muttui*			S-IV
392	Muscicapidae	Rusty-tailed Flycatcher	*Muscicapa ruficauda*			S-IV
393	Muscicapidae	Red-throated Flycatcher	*Ficedula parva*			S-IV
394	Muscicapinae	Kashmir Flycatcher	*Ficedula subrubra*		VU	S-IV
395	Muscicapidae	Black and Orange Flycatcher	*Ficedula nigrorufa*	E	NT	S-IV
396	Muscicapidae	White-bellied Blue Flycatcher	*Cyornis pallipes*	E		S-IV
397	Muscicapidae	Blue-throated flycatcher	*Cyornis rubeculoides*			S-IV
398	Muscicapidae	Tickell's Blue Flycatcher	*Cyornis tickelliae*			S-IV
399	Muscicapidae	Little Pied Flycatcher	*Ficedula westermanni*			S-IV
400	Muscicapidae	Verditer Flycatcher	*Eumyias thalassina*			S-IV
401	Muscicapidae	Nilgiri Flycatcher	*Eumyias albicaudata*	E	NT	S-IV
402	Muscicapidae	Grey-headed Flycatcher	*Culicicapa ceylonensis*			S-IV
403	Muscicapidae	Black-naped Monarch-Flycatcher	*Hypothymis azurea*			S-IV
404	Muscicapidae	Asian Paradise Flycatcher	*Terpsiphone paradisi*			S-IV
405	Muscicapidae	White-browed Fantail Flycatcher	*Rhipidura aureola*			S-IV
406	Muscicapidae	Whitethroated Fantail Flycatcher	*Rhipidura albicollis*			S-IV
407	Paridae	Great Tit	*Parus major*			S-IV
408	Paridae	Black-lored Yellow Tit	*Parus xanthogenys*			S-IV
409	Sittidae	Chestnut-bellied Nuthatch	*Sitta castanea*			

S. No.	Family	Common Name	Scientific Name	Endemic status	Threat status	Legal status
410	Sittidae	Velvet-fronted Nuthatch	*Sitta frontalis*			
411	Dicaeidae	Thick-billed Flowerpecker	*Dicaeum agile*			S-IV
412	Dicaeidae	Tickell's Flowerpecker	*Dicaeum erythrorhynchos*			S-IV
413	Dicaeidae	Plain Flowerpecker	*Dicaeum concolor*			S-IV
414	Nectariniidae	Purple-rumped Sunbird	*Nectarinia zeylonica*			S-IV
415	Nectariniidae	Small Sunbird	*Nectarinia minima*	E		S-IV
416	Nectariniidae	Loten's Sunbird	*Nectarinia lotenia*			S-IV
417	Nectariniidae	Purple Sunbird	*Nectarinia asiatica*			S-IV
418	Nectariniidae	Crimson Sunbird	*Aethopyga siparaja*			S-IV
419	Nectariniidae	Little Spiderhunter	*Arachnothera longirosta*			S-IV
420	Zosteropidae	Oriental Whiteeye	*Zosterops palpebrosus*			
421	Emberizidae	Black-headed Bunting	*Emberiza melanocephala*			S-IV
422	Emberizidae	Crested Bunting	*Melophus lathami*			S-IV
423	Fringillidae	Common Rosefinch	*Carpodacus erythrinus*			S-IV
424	Estrildidae	Red Munia	*Amandava amandava*			S-IV
425	Estrildidae	White-throated Munia	*Lonchura malabarica*			S-IV
426	Estrildidae	White-rumped Munia	*Lonchura striata*			S-IV
427	Estrildidae	Black-throated Munia	*Lonchura kelaarti*			S-IV
428	Estrildidae	Spotted Munia	*Lonchura punctulata*			S-IV
429	Estrildidae	Black-headed Munia	*Lonchura malacca*			S-IV
430	Passeridae	House Sparrow	*Passer domesticus*			S-IV
431	Passeridae	Yellow-throated Sparrow	*Pertronia xanthocollis*			S-IV
432	Passeridae	Baya Weaver	*Ploceus philippinus*			S-IV
433	Passeridae	Streaked Weaver	*Ploceus manyar*			S-IV
434	Sturnidae	Grey-headed Starling	*Sturnus malabaricus*			S-IV
435	Sturnidae	White-headed Starling	*Sturnus erythropygius*			S-IV
436	Sturnidae	Brahminy Starling	*Sturnus pagodarum*			S-IV
437	Sturnidae	Rosy Starling	*Sturnus roseus*			S-IV
438	Sturnidae	Common Myna	*Acridotheres tristis*			S-IV
439	Sturnidae	Jungle Myna	*Acridotheres fuscus*			S-IV
440	Sturnidae	Southern Hill Myna	*Gracula indica*			S-IV
441	Oriolidae	Eurasian Golden Oriole	*Oriolus oriolus*			S-IV
442	Oriolidae	Black-naped Oriole	*Oriolus chinensis*			S-IV
443	Oriolidae	Black-headed Oriole	*Oriolus xanthornus*			S-IV
444	Dicruridae	Black Drongo	*Dicrurus macrocercus*			S-IV
445	Dicruridae	Ashy Drongo	*Dicrurus leucophaeus*			S-IV
446	Dicruridae	White-bellied Drongo	*Dicrurus caerulescens*			S-IV
447	Dicruridae	Bronzed Drongo	*Dicrurus aeneus*			S-IV
448	Dicruridae	Spangled Drongo	*Dicrurus hottentottus*			S-IV
449	Dicruridae	Greater Racket-tailed Drongo	*Dicrurus paradiseus*			S-IV
450	Artamidae	Ashy Wood Swallow	*Artamus fuscus*			
451	Corvidae	Indian Treepie	*Dendrocitta vagabunda*			S-IV
452	Corvidae	White-bellied Treepie	*Dendrocitta leucogastra*	E		S-IV
453	Corvidae	House Crow	*Corvus splendens*			S-V
454	Corvidae	Jungle Crow	*Corvus macrorhynchos*			S-IV

Endemic Status: **E=Species endemic to Western or Eastern Ghats, occurring in Tamil Nadu**

Threat Status: **CR=Critical;EN=Endangered;VU=Vulnerable;CD=Conservation Dependent;NT=Near Threatened**

Legal Staus: **S-I=Schedule I; S-IV-Schedule IV; S-V=Schedule V, wildlife(Protection)Act 1972**

APPENDIX- II

Table 2.

Endemic birds reported in Tamil Nadu

Sl. No.	Common Name	Scientific Name	Locations
	Endemic to Western Ghats		
1	Nilgiri Wood Pigeon	*Columba elphinstonii*	Nilgiris; Palni hills; Kalakkad-Mundanthurai & Anamalais
2	Blue-winged Parakeet	*Psittacula columboides*	Western Ghats
3	Malabar Grey Hornbill	*Ocyceros griseus*	Nilgiris; Anamalai;Kalakkad-Mundanthurai
4	Nilgiri Pipit	*Anthus nilghiriensis*	Nilgiris; Anamalais
5	Grey-headed Bulbul	*Pycnonotus priocephalus*	Siruvani hills
6	Black and Orange Flycatcher	*Ficedula nigrorufa*	Nilgiris
7	Broad-tailed Grass Warbler	*Schoenicola platyura*	Anamalais; Nilgiris
8	Small Sunbird	*Nectarinia minima*	Nilgiris
9	Grey-breasted Laughing Thrush	*Garrulax jerdoni*	Nilgiris
10	Nilgiri Flycatcher	*Eumyias albicaudata*	Nilgiris
11	Indian Rufous Babbler	*Turdoides subrufus*	Western Ghats
12	Nilgiri Laughingthrush	*Garrulax cachinnans*	Nilgiris
13	White-bellied Blue Flycatcher	*Cyornis pallipes*	Nilgiris
14	White-bellied Shortwing	*Brachypteryx major*	Nilgiris
15	White-bellied Treepie	*Dendrocitta leucogastra*	Western Ghats
16	Wynaad Laughing Thrush	*Garrulax delesserti*	Nilgiris
	Endemic to Eastern Ghats		
17	Yellow-throated Bulbul	*Pycnonotus xantholaemus*	Eastern Ghats

APPENDIX- III

Table 3.

Threatened birds reported in Tamil Nadu

S. No.	Common name	Species name	Red Data Book status	Resident/ Migrant
1	Spot-billed Pelican	Pelicanus philippensis	VU	R
2	Darter	*Anhinga melanogaster*	NT	R
3	White-bellied Heron	*Ardea insignis*	EN	R
4	Painted Stork	*Mycteria leucocephala*	NT	R
5	Black-necked Stork	*Ephippiorthynchus asiaticus*	NT	R
6	Lesser Adjutant Stork	*Leptoptilos javanicus*	VU	R
7	Oriental White Ibis	*Threskiornis melanocephala*	NT	R
8	Lesser Flamingo	*Phoenicopterus minor*	NT	M
9	Ferruginous Pochard	*Aythya myroca*	NT	M
10	Greater Spotted Eagle	*Aquila clanga*	VU	M
11	Greater Grey-headed Fish Eagle	*Icthyophaga icthyaetus*	NT	R
12	Red-headed Vulture	*Sacrogyps calvus*	NT	R
13	Long-billed Vulture	*Gyps indicus*	CR	R
14	Indian White-backed Vulture	*Gyps benghalensis*	CR	R
15	Pallid Harrier	*Circus macrourus*	NT	M
16	Lesser Kestrel	*Falco naumanni*	VU	M
17	Asian Dowitcher	*Limnodromus semipalmatus*	NT	M
18	Wood Snipe	*Gallinago nemoricola*	VU	M
19	Spoonbill Sandpiper	*Calidris pygmeus*	VU	M
20	Black-bellied tern	*Sterna acuticauda*	NT	M
21	Nilgiri Wood Pigeon*	*Columba elphinstonii*	VU	R
22	Malabar Pied Hornbill	*Anthracoceros coronatus*	NT	R
23	Great Pied Hornbill	*Buceros bicornis*	NT	R
24	Yellow-throated Bulbul*	*Pycnonotus xantholaemus*	VU	R
25	Nilgiri Laughingthrush*	*Garrulax cachinnans*	EN	R
26	Grey-breasted Laughingthrush*	*Garrulax jerdoni*	NT	R
27	Broad-tailed Grass Warbler*	*Schoenicola platyura*	VU	R
28	White-bellied Shortwing*	*Brachyopteryx major*	VU	R
29	Nilgiri Pipit*	*Anthus nilghiriensis*	NT	R
30	Kashmir Flycatcher	*Ficedula subrubra*	VU	R
31	Black and Orange Flycatcher*	*Ficedula nigrorufa*	NT	R
32	Nilgiri Flycatcher*	*Eumiyas albicaudata*	NT	R

CR=Critical; EN=Endangered; NT=Near Threatened; VU=Vulnerable;
*=Endemic

APPENDIX- IV
Important Bird Areas of Tamil Nadu
Courtesy: BNHS & BirdLife International

NILGIRIS DISTRICT

1. Avalanche

Habitat:: Shola Forests
Bird Species:

(A1): *Garrulax cachinnans, Columba elphinstonii, Brachypteryx major, Schoenicola platyura*

(A2): *Columba elphinstonii, Anthus nilghiriensis, Pycnonotus priocephalus, Brachypterx major, Garrulax delesserti, Anthus nilghiriensis*

2. Bison swamp

Habitat:: Shola Forests
Bird Species:

(A1): *Garrulax cachinnans, Columba elphinstonii, Brachypteryx major*

(A2): *Columba elphinstonii, Brachypteryx major, Garrulax delesserti, Garrulax cachinnans*

3. Cairnhill Reserve Forest

Habitat:: Shola Forests
Bird Species:

(A1): *Brachypteryx major, Columba elphinstonii, Garrulax cachinnans*

(A2): *Columba elphinstonii, Brachypterx major, Garrulax delesserti, Garrulax cachinnans, Eumyias albicaudata, Columba elphinstonii, Ocyceros griseus*

4. Coonoor

Habitat:: Shola Forests
Bird Species:

(A1): *Garrulax cachinnans, Columba elphinstonii*

(A2): *Anthus nilghiriensis, Garrulax delesserti, Garrulax cachinnans, Nectarina minima*

5. Governor's shola

Habitat:: Shola Forests
Bird Species:

(A1): *Garrulax cachinnans, Columba elphinstonii*

(A2): *Columba elphinstonii, Ocyceros griseus, Anthus nilghiriensis, Garrulax delesserti, Garrulax cachinnans, Nectarina minima*

6. Kodanad

Habitat:: Shola Forests
Bird Species:
(A1): *Columba elphinstonii, Garrulax cachinnans*
(A2): *Columba elphinstonii, Ocyceros griseus, Anthus nilghiriensis, Garrulax delesserti, Garrulax cachinnans, Nectarina minima, Columba elphinstonii, Psittacula columboides*

7. Kothagiri, Longwood shola

Habitat: Shola Forests
Bird Species:
(A1): *Garrulax cachinnans, Gallinago nemoricola, Brachypteryx major, Columba elphinstonii*
(A2): *Columba elphinstonii, Ocyceros griseus, Anthus nilghiriensis, Garrulax delesserti, Garrulax cachinnans, Nectarina minima*

8. Mudumalai Wildlife Sanctuary

Habitat: Tropical semi evergreen, Tropical moist deciduous
Bird Species:
(A1): *Leptoptilos javanicus, Aquila clanga, Schoenicola platyura, Columba elphinstonii*

9. Naduvattam

Habitat: Shola Forests
Bird Species:
(A1): *Garrulax sp.*
(A2): *Garrulax sp.*

10. Thalakundah

Habitat: Shola Forests
Bird Species:
(A1): *Garrulax cachinnans, Columba elphinstonii, Brachypteryx major*
(A2): *Columba elphinstonii, Psittacula columboides, Ocyceros griseus, Anthus nighiriensis, Pycnonotus priocephalus, Brachypterx major, Garrulax delesserti, Garrulax jerdoni, Turdoides subrufus, Schoenicola platyura, Ficedula nigrorufa, Eumyias albicaudata, Cyomis pallipes, Nectarina minima, Dendrocitta leucogastra*

COIMBATORE DISTRICT

11. Siruvani foothills

Habitat: Wet Evergreen, Moist Deciduous
Bird Species:

(A1): *Columba elphinstonii, Garrulax cachinnans*

12. Grass hills-Anamalai

Habitat:Grasslands
Bird Species:
(A1): *Schoenicola platyura, Columba elphinstonii, Aquila clanga, Falco naumanni, Brachypteryx major, Garrulax cachinnans*
(A2): *Columba elphinstonii, Anthus nilghiriensis, Garrulax delesserti, Garrulax cachinnans, Garrulax jerdoni, Ficedula nigrorufa*

DINDIGUL DISTRICT

13. Berijam (Kodaikanal)

Habitat: Evergreen, Moist Deciduous Forest
Bird Species:
(A1): *Falco naumanni, Schoericola platyura*
(A2): *Pycnonotus priocephalus*

14. Kodaikanal, Palni hills + Kukal (Kodaikanal)

Habitat: Moist Deciduous Forest, Grasslands
Bird Species:
(A1): *Brachypteryx major, Schoenicola platyura*
(A2): *Columba elphinstonii, Anthus nilghiriensis, Pycnonotus priocephalus, Brachypterx major, Garrulax delesserti, Garrulax jerdoni, Turdoides subrufus, Schoenicola platyura*

15. Moir point

Habitat: Wet Evergreen, Moist Deciduous Forest
Bird Species
(A1): *Brachypteryx major, Columba elphinstonii*
(A2): *Columba elphinstonii, Anthus nighiriensis, Pycnonotus pricephalus, Brachypterx major, Garrulax delesserti, Garrulax jerdoni, Turdoides subrufus, Cyomis pallipes, Nectarina minima, Dendrocitta leucogastra*

16. Poomparai [Kodaikanal]

Habitat: Wet Evergreen, Moist Deciduous Forest
Bird Species:
(A1): *Brachypterx major, Garrulax cachinnans*
(A2): *Ocyceros grisseus, Pycnonotus priocephalus, Garrulax delesserti, Garrulax cachinnans, Garrulax jerdoni, Brachypterx major*

TIRUNELVELI DISTRICT

17. Kalakkad Wildlife Sanctuary

Habitat: Tropical wet evergreen, Tropical semi evergreen, Grasslands
Bird Species:

(A1): Brachypteryx major, *Schoenicola platyura*

RAMANATHAPURAM DISTRICT

23. Gulf of Mannar (Mandapam & group of Islands)

Habitat: Wetland
Bird Species:
(A1): *Pelecanus philippensis*

24. Big tank

Habitat: Wetland
Bird Species:

(A1): *Pelecanus philippensis*

NAMAKKAL DISTRICT

25. Kolli hills (Eastern Ghats)

Habitat: Wet Evergreen Forest, Semi-evergreen Forest & Scrub Forests
Bird Species:

(A1): *Columba elphinstonii, Pycnonotus xantholaemus*
(A2): *Turdoides subrufus, Pycnonotus xantholaemus*

(A1) = Red Data Book Species
(A2) = Restricted Range Species

7. Conservation Strategies and Action Plan for the Mammals of Tamil Nadu

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7. Conservation Strategies and Action Plan for the Mammals of Tamil Nadu

Ajith Kumar

Introduction

Tamil Nadu has nearly 150 species of mammals, the uncertainty in exact number resulting from taxonomic ambiguities and imperfect knowledge on distribution. Taxonomic ambiguities are due to the validity of some species (primarily rodents) and recent revisions in taxonomy as in the case of primates. Imperfect knowledge on distribution hounds conservation attempts in the case of bats and marine mammals. In this scenario, the identification of strategies and action plans for the conservation of mammals in Tamil Nadu, at the species level, is based on terrestrial non-volant mammals *i.e.* excluding bats and marine mammals. For these two groups we need to base our attempts at conservation on gathering the most basic information on their occurrence, distribution, and threats in the State. Species wise conservation status and important actions that need to be taken are listed in Table 1.

Conservation strategies

1. *Implement various recommendations made by expert committees in recent years*: Several recommendations have been made by some expert committees set up to examine specific issues in conservation of wild fauna. The most important of these are the Subramaniam Committee Report, Project Tiger Steering Committee, Project Elephant Steering Committee, and National Wildlife Action Plan. These recommendations address issues in the conservation of single species or wild fauna in general. However, even after several years the most important recommendations still remain to be implemented.

2. *Conduct ecological surveys*: For several taxa, our knowledge is limited to their occurrence in Tamil Nadu. Many of these are small mammals (rodents and small carnivores), and a few are endemic. A basic understanding of their distribution, abundance and human impacts on them is essential to ensure their representation in protected areas and to develop threat reduction plans. Thus, conducting ecological surveys (on distribution, abundance, habitat preference, and threats) on small mammals is a priority.

3. *Conduct surveys of bats*: Nearly 110 species of bats occur in India, and about 120 in South Asia (Molur *et*

al. 2002). Endemism is relatively low with 17 being endemic to South Asia. About 45 species of bats occur in the Western Ghats and peninsular India, and most of these are likely to occur in Tamil Nadu. However, due to methodological problems, virtually nothing is known about the occurrence of bats in Tamil Nadu except for short term studies in a few localities. *It is necessary therefore that a rapid survey of bats is carried out in order to assess their species richness and representation in protected areas.*

A recent assessment of the conservation status of South Asian bats (Molur *et al.* 2002), identified habitat loss as a threat to 34% of the species. However, unlike most other free ranging animals, several other factors such as loss of roosting trees, hunting, renovation of building, application of insecticides etc. were also identified as equally important threats. The importance of bats in the functioning of natural as well as agricultural ecosystems, as an insectivore and seed disperser, remains unappreciated.

1. *Conduct surveys of marine mammals:* Similarly, nearly 35 species of marine mammals are reported to occur in the Indian waters and most of these are likely to occur along the coast of Tamil Nadu. A systematic compilation of incidental catches and deaths, and surveys are necessary to assess species occurrence and distribution.

2. *Develop species action plans:* Although many of the conservation actions for wild mammals can be taken at the habitat level, some require species based approach. Tiger and elephant are typical examples. The conservation needs of these species have been assessed in recent years, and projects have been launched for the conservation of these two species. However, there are some other species which are perhaps in much greater attention. An example is the dugong. Tamil Nadu presently has the largest population in India, in the Gulf of Mannar. This population has been adversely affected by poaching in the last 3 decades. There has been no population surveys of the species either. In fact, India is the only country which has not carried out an aerial survey of the species. The survival of dugong also depends on prevention of poaching, conservation of sea grass beds, and long term monitoring. Species like this require a project based approach as in the case of tiger and elephant.

3. *Conservation opportunities in areas outside forest areas:* The area under formal protection with the Forest Department is very limited. It is but natural that populations of many

species, sometimes their only populations, are restricted to areas outside the control of the Forest Department, either permanently (*e.g.* the lion-tailed macaque) or temporarily (*e.g.* elephants during local or seasonal movement). In recent several species have been described primarily from private lands. Conservation such lands therefore is critical to the conservation of animal fauna. Such major opportunities for conservation occur in privately held estates of tea, coffee and cardamom in the Western Ghats. Although the total area of these estates in Tamil Nadu is not known, they cover nearly 4000 sq.km in the Western Ghats. Such estates are even otherwise important since these occur either inside or around most protected areas. Inland wetlands, with highly complex ownership, is another example.

Both these habitats are currently under immense pressure for conversion to other uses due to various reasons.

Table 1.

The inland non-volant mammals in Tamil Nadu, their conservation status, and actions required for their conservation.

Sl No.	Species	Common name	Endemic status	IUCN status 1996	Legal status	Remarks (threats/strategies)
ORDER: ARTIODACTYLA						
Family: Bovidae						
1	*Antilope cervicapra*	Blackbuck	No	LR/Lc	I	Population in Tamil Nadu heavily fragmented, and some populations reportedly declining over the last several years; in some cases due to changes in habitat due to protection from grazing, and population fragmentation due to construction of barriers such as fences and walls • Active management of habitat, rather than mere protection.
2	*Bos gaurus*	Gaur	No	VU	I	
3	*Hemitragus hylocrius*	Nigiri tahr	To montane grasslands in the Western Ghats, in Kerala and Tamil Nadu	LR/Nt	I	The Nilgiri hill population, one of the two viable populations in Tamil Nadu has sharply declined in the last 2-3 decades (from 400 to <100), due to poaching and unknown reasons. Small isolated populations in other areas have not been monitored. • Scientific research on population dynamics including dispersal and genetics of small populations • Long term habitat monitoring
4	*Tetracerus quadricornis*	Four-horned antelope	No	LR/Lc	I	Nothing much known about the population in Tamil Nadu. • Ecological surveys on the species
Family: Cervidae						
5	*Axis axis*	Chital	No	LR/Lc	IV	Widely distributed
6	*Cervus unicolor*	Sambar	No	LR/Lc	III	Widely distributed

Sl No.	Species	Common name	Endemic status	IUCN status 1996	Legal status	Remarks (threats/strategies)
7	*Muntiacus muntjak*	Barking deer	No	LR/Lc	III	Widely distributed
Family: Suidae						
8	*Sus scrofa*	Wild pig	No	LR/Lc	III	Widely distributed
Family: Tragulidae						
9	*Moschiola meminna*	Mouse deer	No	LR/Lc	III	
ORDER: CARNIVORA						
Family: Canidae						
10	*Canis aureus*	Jackal	No	LR/Lc	II	
11	*Canis lupus*	Wolf	No	DD	I	The population in Tamil Nadu has not been confirmed, and very poorly known. • Ecological survey
12	*Cuon alpinus dekhanensis*	Indian wild dog	To India	LR/nt	I	The population in Tamil Nadu is poorly known. Known to range over large distances. Major threats include disruption of ranging routes, and stealing of kills by local people. • Long term monitoring at landscape level
13	*Vulpes bengalensis*	Bengal (Indian) fox	No	LR/nt	II	The population in Tamil Nadu is poorly known. Subject to poaching for fur. • Ecological survey of the species
Family: Felidae						
14	*Panthera pardus*	Leopard	No	VU	I	Increasing lifting of livestock and people is a major reason for man-wildlife conflict. • Systematic recording of lifting livestock and people, and periodic analysis of the data

Sl No.	Species	Common name	Endemic status	IUCN status 1996	Legal status	Remarks (threats/strategies)
15	*Panthera tigris*	Tiger	No	EN	I	Increasing incidence of poaching in south India to be viewed seriously as it could spread to Tamil Nadu. Poaching of prey, cattle grazing, and habitat degradation are other major threats. • Important recommend-ations of several committees and meeting regarding conservation of tiger remain to be acted up on (see general strategies)
16	*Prionailurus bengalensis*	Leopard cat	No	LR/Nt	I	Nothing much is known about its distribution, densities and habitat requirements. Poaching for fur is widespread.
17	*Prionailurus rubiginosus*	Rusty spotted cat	No	LR/Nt	I	Nothing much is known about its distribution, densities and habitat requirements. Poaching for fur is widespread.
18	*Prionailurus viverrinus*	Fishing cat (???)	No	VU		Nothing much is known about its distribution, densities and habitat requirements. Poaching for fur is widespread.
Family: Herpestidae						
19	*Herpestes edwardsii*	Common mongoose	No	LR/Lc	IV	Poaching for fur, pets, and hair is widespread
20	*Herpestes fuscus*	Brown mongoose	No (in Sri Lanka also; wet forests in Western Ghats	VU	IV	Nothing is known about its ecology and habitat requirements.
21	*Herpestes smithii*	Ruddy mongoose	No (also in Sri Lanka)	LR/Lc	IV	Nothing is known about its ecology and habitat requirements.
22	*Herpestes vitticollis*	Stripe-necked mongoose	No (also in Sri Lanka)	LR/Nt	IV	Nothing is known about its ecology and habitat requirements.

Sl No.	Species	Common name	Endemic status	IUCN status 1996	Legal status	Remarks (threats/strategies)
Family: Hyaenidae						
23	*Hyaena hyaena*	Striped hyena	No	LR/Nt	III	Very little is known about the Tamil Nadu population, except for an ongoing study. • Ecological survey
Fammily: Mustelidae						
24	*Amblonyx cinereus*	Clawless otter	No	DD	???	Very little is known about the Tamil Nadu population. Dams are a major threat to the species since it prefers low order rivers. Poaching for pelt has been reported • Ecological survey
25	*Lutra lutra*	Common otter	No	DD	I	Very little is known about the Tamil Nadu population. Dams are a major threat to the species since it prefers low order rivers. Poaching for pelt has been reported. • Ecological survey
26	*Lutrogale perspicillata*	Smooth-coated otter	No	DD	II	Very little is known about the Tamil Nadu population, except for few studies in the mangrove areas. Poaching for pelt has been reported. • Ecological survey
27	*Martes gwatkinsi*	Nilgiri marten	To higher elevation forests in Tamil Nadu, and Kerala	DD	I	Very little is known about the Tamil Nadu population. • Ecological survey
28	*Mellivora capensis*	Ratel or honey badger	No	LR/Nt	I	In the drier forests, but little else is known. • Ecological survey
Family: Ursidae						
29	*Melursus ursinus*	Sloth bear	No	VU	I	
Family: viverridae						
30	*Paradoxurus hermaphroditus*	Common palm civet	No	LR/Lc	II	Very widely distributed.
31	*Paradoxurus jerdoni*	Brown palm civet	To the rainforest in the Western Ghats south of Goa	VU	II	Good information is available from recent studies. These show important role in seed dispersal, and susceptibility to habitat fragmentation.
32	*Viverricula indica*	Small Indian civet	No	LR/Nt	II	Widely distributed. Used for harvesting civet secretion. Poaching reported for trade.

Sl No.	Species	Common name	Endemic status	IUCN status 1996	Legal status	Remarks (threats/strategies)
ORDER INSECTIVORA						
Family: Erinaceidae						
33	*Paraechinus micropus nudiventris=hypomelas*	Short-eared hedgehog	To dry areas of peninsular India	VU	???	Taxonomy uncertain??? Nothing known about the Tamil Nadu population. • Ecological survey
Family: Soricidae						
34	*Crocidura horsfieldi*	Sri Lankan white-toothed shrew	No	DD	???	Nothing is known about the species. • Ecological survey
35	*Suncus dayi*		To the higher elevation forests of Western Ghats	VU	???	Reported from Nilgiri, Palni, and Anamalai Hills in Tamil Nadu. Nothing much else is known. • Ecological survey
36	*Suncus etruscus*	Pygmy white-toothed shrew	No	LR/Lc	???	Through most of India, except the dry areas. But nothing much is known about the species
37	*Suncus murinus*	House shrew	No	LR/Lc	???	Very common species
38	*Suncus stoliczkanus*	Anderson's shrew	No	LR/Lc	???	Through south India, in scrub and grasslands in the plains.
ORDER: LAGOMORPHA						
Family: Leporidae						
39	*Lepus nigricollis*	Black-naped hare	No	LR/Lc	???	Very widely distributed
ORDER:						
Family: Manidae						
40	*Manis crassicaudata*	Indian pangolin	No	LR/Nt	I	Widely distributed, but nothing much is known about the Tamil Nadu population
ORDER: PRIMATES						
Family: Cercopithecidae						
41	*Macaca radiata*	Bonnet macaque	To south India		II	Common in villages, and forests. But the southern subspecies, *M.r.diluta* is confined to southern Tamil Nadu and southern Kerala. • Ecological survey of the southern sub-species

Sl No.	Species	Common name	Endemic status	IUCN status 1996	Legal status	Remarks (threats/strategies)
42	*Macaca silenus*	Lion-tailed macaque	To rainforest in Kerala, Tamil Nadu, and Karnataka	EN	I	One of the best studied species in India. Population highly fragmented. The largest contiguous population occurs in KMTR. So also the largest fragmented population in the Anamalai Hills. • Prevent all forms of threat which can fragment the population in KMTR. • Management of fragmented population in the Anamalai Hills, including those in private forests.
43	*Semnopithecus entellus*	Common langur	No	LR/Nt	???	There is considerable taxonomic ambiguity due to two recent taxonomic revisions (Groves 2001; Bradon-Jones et al. in prep.). According to Groves (2001) one of the revised species, *S.priam*, might be primarily confined to Tamil Nadu. • Ecological surveys in the light of recent taxonomic revision.
44	*Semnopithecus johnii*	Nilgiri langur	Primarily to rainforest of Kerala, Tamil Nadu and Coorg district of Karnataka	VU	I	Although it has recovered substantially following the WLPA (1972), increased poaching in recent years has been reported.

Sl No.	Species	Common name	Endemic status	IUCN status 1996	Legal status	Remarks (threats/strategies)
Family: Loridae						
45	*Loris tardigradus*	Slender loris	No (in Sri Lanka also)	LR/Nt	I	Recent taxonomic revisions (Groves 2001; Brandon-Jones et al. in prep.) list the Indian species as *Loris lydekkarianus* with two subspecies. *L.l.lydekkarianus* occurs in the dry scrub forests in the plains of Tamil Nadu (and other south Indian states) and *L.l.malabaricus* occurs in the moist forests, including in Tamil Nadu (*e.g.* Anamalai Hills). • Ecological survey in the light of revised taxonomy, to assess the distribution of subspecies.
ORDER: PROBOSCIDEA						
Family: Elephantidae						
46	*Elephas maximus*	Asian elephant	No	EN	I	Has been the subject of considerable conservation attention. Major threats are poaching for ivory and due to crop raiding (which has skewed adult sex rations in many places) and loss of habitat connectivity. • Implement recommendations of several committees and meetings which have examined elephant conservation problems. • Preservation of habitat corridors
ORDER: RODENTIA						
Family: Hystricidae						
47	*Hystrix indica*	Indian porcupine	No	LR/Nt	IV	Very widely distributed

Sl No.	Species	Common name	Endemic status	IUCN status 1996	Legal status	Remarks (threats/strategies)
Family: Muridae						
48	*Bandicota bengalensis*	Lesser bandicoot rat	No	LR/Lc	V	Very widely distributed
49	*Bandicota indica*	Bandicoot rat	No	LR/Lc	V	Very widely distributed
50	*Cremnomys blanfordi*	Long-tailed wood rat	No	LR/Lc	V	Very widely distributed
51	*Cremnomys elvira*	???	To thorny scrub forest of Tamil Nadu	VU	V	Reported only from Kurumbapatti in Salem district. • Ecological survey
52	*Golunda ellioti*	Indian bush rat	No	LR/Lc	V	Very widely distributed. Intruder into disturbed wet forests.
53	*Millardia meltada*	Soft-furred field rat	No	LR/Lc	V	Very widely distributed
54	*Mus booduga*	Indian field mouse	No	LR/Lc	V	Very widely distributed; intruder into disturbed wet forests.
55	*Mus dunni*	???	???	????	????	Taxonomic uncertainty.
56	*Mus famulus*	???	To southern India & Andaman & Nicobar Islands	EN	V	Reported from the high elevation grasslands in Upper Bhavani and KMTR. Otherwise nothing much is known about the species. • Taxonomic confirmation • Ecological survey
57	*Mus musculus*	House mouse	No	LR/Lc	V	Very widely distributed; intruder into disturbed wet forests.
58	*Mus phillipsi*	????	To southern, central and western India	LR/Lc	V	Reported to occur in the dry scrub forests; otherwise nothing known, and rarely reported. • Taxonomic confirmation • Ecological survey
59	*Mus platythrix*	Spiny field mouse	To peninsular India, but introduced in other areas.	LR/Lc	V	Very widely distributed. Intruder into disturbed wet forests.
60	*Mus saxicola*	?????	No (in Pakisthan)	LR/Lc	V	Widely distributed in the scrub forests in hilly terrain, but rarely reported.

Sl No.	Species	Common name	Endemic status	IUCN status 1996	Legal status	Remarks (threats/strategies)
61	*Platacanthomys lasiurus*	Malabar spiny dormouse	To wet forests in Kerala and Tamil Nadu (especially rainforest of the lower elevation)	LR/Lc	IV	Recent studies show it to be highly sensitive to logging and other forms of habitat disturbance in rainforest.
62	*Rattus norvegicus*	Brown rat	No	LR/Lc	V	Very widely distributed
63	*Rattus ranjiniae*	???	To one location near Trivandrum	VU	V	Likely to occur in Tamil Nadu
64	*Rattus rattus*	Black rat	No	LR/Lc	V	Very widely distributed
65	*Tatera indica*	Indian gerbil	No	LR/Lc	V	Very widely distributed
66	*Vandeleuria nilagirica*	???	To Nilgiri hills?	DD	V	Nothing known after its description. Not reported from a subsequent study in the area.
67	*Vandeleuria oleracea*	Tree mouse	No	LR/Lc	V	Widely distributed. Intruder into disturbed wet forests.
Family: Pteromyidae						
68	*Petaurista philippensis*	Large brown flying squirrel	No	LR/Nt	II	Widely distributed
69	*Petinomys fuscocapillus*	Travancore flying squirrel	No (also in Sri Lanka)	VU	I	Recent studies show it to be limited to lower altitudes, rainforest, and to be sensitive to logging.
Family: Sciuridae						
70	*Funambulus layardi*	Layardi's striped squirrel	No (also in Sri Lanka)	DD	???	Nothing is known about the current status of the species. There has been no reports of its occurrence by any study. • Taxonomic confirmation • Ecological survey
71	*Funambulus palmarum*	Three-striped palm squirrel	No (also in Sri Lanka)	LR/Lc	???	Very common
72	*Funambulus sublineatus*	Dusky striped squirrel	No (also in Sri Lanka)	DD	???	Common in rainforest, but no reports on its ecology. • Ecological survey

Sl No.	Species	Common name	Endemic status	IUCN status 1996	Legal status	Remarks (threats/strategies)
73	*Funambulus tristriatus*	Western Ghats squirrel	To Western Ghats	LR/Nt	???	Common in the Western Ghats, but no reports on its ecology. • Ecological survey
74	*Ratufa indica*	Malabar giant squirrel	To peninsular India	LR/Nt	I	Fairly common in the Western Ghats.
75	*Ratufa macroura*	Grizzled giant squirrel	No (also in Sri Lanka0	EN	I	Restricted and fragmented distribution mostly in Tamil Nadu. No ecological information other than one study. • Ecological survey
ORDER: SCANDENTIA						
Family: Tupaiidae						
76	*Anathana ellioti*	Indian tree shrew	To southern India	LR/Nt	???	Widely distributed in scrub forests as well as shoal forests in some parts of the peninsular India. No ecological information is available. • Taxonomic studies on populations in scrub forests in the plains and high elevation forests in Shevroy hills. Might be different species. • Ecological surveys.

8. Conservation Strategies and Action Plan for Bats of Tamil Nadu

by

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Latidens salimalii


Rhinolophus lepidus


Hipposideros speoris


Megaderma spasma

8. Conservation Strategies and Action Plan for Bats of Tamil Nadu

Juliet Vanitharani

Introduction

Bats are instantly recognised yet poorly known! The hours of twilight followed by darkness is the best feeding time for these animals. The night is really alive with such nocturnal creatures. More than 21% of all mammal species are bats. Bats are unique elegant and fascinating. They are the only mammals who mastered true, sustained flight much before man's own lineage began. They 'See' with their ears, hang upside down to sleep by day and can catch insects while flying even in the darkest of nights

Global Status Of Bats

They inhabit almost every corner of the globe. They are not known from Antarctica, Arctic tundra and few remote oceanic islands. Of all known species of mammals one in five is bat. Yet remain creatures of mystery, subject of more prejudice and lots of misinformation than any other group of animals. The news media, legends, folklore, television, movies and storybooks perpetuate myths. Still it is a fact 'Fears about bats' exist and a surprising number of people believe!

Systamatics Of Bats

'Hand wing' forms a basis for classifying bats as separate order of Mammals. The order Chiroptera (Greek Cheiros-hand, Pteros-wing), includes 1242 species (Hutson et al., 2001, Micklebrugh et al., 2002). Their dietary variation classified them into two sub orders the Megachiroptera (Fruit bats) and Microchiroptera (insectivores).

The sub order Megachiroptera consists of only one family (*Pteropodidae*) with 167 species of bats found in the old world tropics and subtropics feed on fruits nectar and Pollen. They roost mainly on trees.

The second sub order Microchiroptera includes 17 families consisting 1075 species. These bats have small eyes and can echolocate. Wide variety of species-specific food specialization is a remarkable character. Which includes insects and flesh (fish, frog, lizards, birds other mammals).

Status Of Bats In India

According to IUCN Criteria Version 3.1 India has 114 bat species. Out

of which 13 species are Megachiropterans and the rest are Microchiropterans. 28 of them come under the IUCN red list and 9 of them are Endemic.

In India bats have a bad reputation. They have very poor recognition under Indian Government legislations and policies. Which is largely undeserved. Indian Government needs sufficient justification to upgrade the fruit bats from schedule V Indian Wildl Life Act

India being a tropical country, our ecosystem immensely depends on this group of mammals for land (vegetation) management, pest management, and bio-diversity and to the general well being of mankind, plant and animal kingdom. The agroecosystem analysis indicates bats are the real agents, who do pest monitoring in free of cost both in tropical plains and the rain forest of our country.

Status Of Bats In Tamil Nadu

Tamil Nadu has a report of 37 bat species representing 8 families out of total 18 families under order Chiroptera (Table 1-Appentix -I). Four Microchiropteran bats (*Rhinolophus beddomei*, *Hipposideros cineraceus, Harpiocephalus harpia* and *Kerivoula papillosa)* reached the NT (Near Threatened) state. The four endemic bat species of South Asia (Magachiropteran *Latidens salimalii* (Endangered) and the 3 Microchiropterans *Rhinolophus beddomei* (Near Threatened*), Hipposideros speoris* (Least Concerned) and *Pipistrellus dormeri* (Least Concerned) are the note worthy representatives. According to IUCN 2001. Version 3.1 *Latidens salimalii* is endemic to Tamil Nadu that too reached the endangered state of survival.

Habits and Habitats of Bats

Bats are vulnerable, sensitive and nocturnal mammals. Their physiological and behavioural modifications, their skills of flight and echolocation are rivaled by a few other animals and surpassed by none. Their role in the ecology of certain habitats and in the affairs of man is often a paramount importance.

Bats play a tremendous role in bringing sustainable, balanced ecosystem and also in the Indian economy. The Megachiropteran bats are viable plant pollinators and seed dispersers while the Microchiropterans are the only predators of the night swarming insects, efficient pest control agents and keep the insect population under check. The dietary composition of each species is selectively species specific. Carnivorous bats as a rodent controller act as a good friend of farmers.

Bats prefer to roost during daytime in diversified roosting patterns (Table2-Appentix-II). They are vulnerable to disturbance. Roost serves as community hall for social promotion, refuge from adverse weather, a spot for mating, and venue for rearing young ones. The bat species prefers roosts in accordance to their sensitivity, population size, and risks of predation, food

resource availability, body size and physical environment. (Fenton. 1992, Kunz. 1982).

Some fruit and carnivorous bats use secondary roost in their foraging areas, which they use as night, halt to consume their food at leisure. These secondary roosts promote quick digestion, help to conserve energy during long intermittent flight, it also act as a retreat from night flying predators, center to facilitate social interaction by sharing information about the location of feeding grounds etc

Reason For The Decline In Bat Population

The major reason for the decline in bat population is due to the problems and threats caused to the habit and habitats of various bat species (Figure 1-Appentix-I) (South Asian Chiroptera CAMP (Conservation Assessment and Management Plan) Report 2002).

The bats as a vulnerable mammal have low fecundity They produce one offspring per year. Slight disturbance during reproduction period causes high rate of extinction. The other natural threats are competition for space with other species, predation by other species and natural calamities like strong wind, flood, forest fire, etc.

The threats to Indian bats are man made. Habitat loss is the major threat to almost all the bat species in India. Changes in habitat, habitat destruction, deforestation, looping of trees, construction of dams, human settlements, urbanization and break down of old buildings are the major calamities faced by bats.

Threats To Roosting Sites Cause Server Effect On The Bat Population

Threats to roosting sites cause server effect on the population size of these vulnerable creatures. For many bat species the caves constitute a calm, cozy roosting place with large spacious chambers. They are typically more stable when compared to other roosting sites. But still the bats face the problems of human interferences like caves as a recreation and tourism spot eg. The Guna Caves at Kodaikanal, Mining activities and stone quarrying in the hillocks eg. hillocks around Tirunelveli, Madurai etc. Sealing and fumigation of caves by the village children just for fun. In forest area the intruders like poachers use the caves as night halts (Jeyapraba and Vanitharani, 2003).

Plants form a basic raw material for roost construction to some gregarious fruit bat colonies choose tall trees as diurnal roost; even the cavity of tree trunks offer favored shelter for some of the Microchiropterans. Removal of older trees as management techniques, change in the plantation of crops, disturbance to tree hole species during honey collection by traders, harvest of bamboos are the major threats (Jeyapraba and Vanitharani, 2003).

Increased human activities due to over population , intensive agricultural practices by using various pesticides are the main human interferences to the bats in the agroecosystem.

Bat being sensitive creatures they prefer to stay away from human disturbances. Abandoned buildings, crevices of the domes of the old archeological monuments are the favorite roosting sites. The mass killing of temple bats during renovation of temples and buildings is the major threat for Tamil Nadu bats. The incidental or deliberate disturbances to their roosting sites causes the animals to abandon their roosts. Legislations are needed to protect the roosting sites due to the bat's diverse ecological and economic role in the ecosystem.(South Asian Chiroptera CAMP Report 2002)

Hunting And Trading Of Bats

Bats are hunted for food. In Tamil Nadu many fruit bat colonies (***Pteropus giganteus***) occupy trees are under this threat. They are hunted for medicine to treat, Asthma , Back-aches, Chronic pains etc. Oil extraction from bat flesh is believed to cure Arthritis. Tribals relish bat flesh (***Latidens salimalii,*** and ***Pteropus giganteus***) (Vanitharani *et al* 2004 (in press)

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Bats Have No Protection Under Indian Wildlife (Protection) Act.

Schedule V of the Indian Wildlife Protection Act 1972 treats fruit bats as VERMIN. They can be hunted, captured, killed and even exported.

Problems Due To The Lack Of Information- Myths, Legends And Folklore

Myths about bats are found in many human cultures. India is not an exception to this. Human misunderstanding made the following persecutions on bats as they attack people, drink blood, agents evil, portrayed symbol of bad luck, inauspicious bad omen, indicator of death, carriers of Rabies etc. This problem is due to the lack of information about the ecology of bats (their role in ecosystem as pest controllers, pollinators and seed dispersers), reproductive behaviour (like gestation, parental care, infant mortality, sex ratio, segregation during reproduction etc), migration, hibernation, roosting behaviour and species availability and population size.

The only way to bring conservation of bats is to list out the measures and action plans (short and long term) needed to implement in terms of importance and immediacy. Strategies and Action Plan can be brought through legislations, policies, awareness, publications, researches and projects.

Conservation Through Legislation And Policy

Revision in the Indian Wildlife (Protection) Act1972, 1991 should be ensured to remove fruit bats from Schedule V (vermin category). Legislations should be formulated to protect the key roosting sites of endemic species, trees and caves in which large number of bats are roosting.

Vulnerable and primary bat roosting sites should be identified and declared as bat reserves or bat protected areas. With reference to migratory bat species, they should be identified and the development of international agreement for their conservation through the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention) should be investigated. Law should be extended to prevent trading and hunting of bats for food, medicine and sports. Engineers should consult the bat conservation specialists before venture into the renovation of old buildings and temples to prevent the indiscriminate mass killing of bats. NGOs involved in Wildlife conservation activities should coordinate with the Chiroptera specialists to discuss and formulate various broad conservation issues. Strict legislation should be implemented to control the indiscriminate use of pesticides. This harms the food animals (insects) of bats and affects human through biological magnification. Educational materials should be made and prescribed in school curriculum to remove misconceptions about bats. This will ensure the youngsters to grow up with appreciation of bats. The National Wildlife Action Plan, Forest Management Plans, National Biodiversity Strategy, Environmental Impact Assessment (EIA) and other similar policies, plans and strategies should be incorporated on the interests of Chiroptera

Strategies And Actions For Conservation Of Bats

Action Plans For Awareness

Public awareness is a crucial component action that must be implemented as a holistic conservation action plan for bats in India. This can be achieved by making education materials for schools and graduate students, writing articles in newspapers, erecting posters in temple localities and near the major bat roosting sites, formation of bat clubs in schools, colleges, villages and cities involving locals. Make special reading materials about bat's beneficial role in the ecosystem for policy makers (Ministry both Central and State, Forest and Environment Officials, Village and Panchayat Officials), temple authorities and zoo directors.

Recommendation Through Researches And Projects

Bats are one of the least studied mammalian groups in India. Steps should be taken to motivate more people to study bats in association with wildlife monitoring. The results of the researches and projects are crucial information to promote bat conservation. Ecological studies will be of immense help for better understanding the status of bat species. Documentation of the ecological value of bats is very much needed. Even bat biologists admit that they know very little about South Asian bats especially Indian bats. It is crucial that the monitoring of priority species of Chiroptera

in their habitats should be undertaken so that population trends can be ascertained. Every species considered a status assessment Unknown and un-surveyed localities should be surveyed. The species, which is centauries as DD EN, NT, should be surveyed and re-surveyed on priority basis. The science of population dynamics in the study of Chiroptera should be emphasized. The study of pollination and seed dispersal by Chiroptera in different ecosystems is extremely important and would help improve image of this neglected and misunderstood taxon group The effect of pesticides and their impacts on bats should be studied in detail. Migratory bat species should be identified and there is a need for drafting of appropriate international agreements. The current information from active field workers should provide a compass by which the direction of a viable conservation action plan has to be practiced

Conclusion

The fate of man's quality of life depends to a great extent on his capacity to reverse some current trends in management, legislation and even science, which are based on subjective impressions and unpractical policies. It also is the case with Indian bats. Knowledge about bats in India is staggering. Legislation in India is still based on false economic principles and political salvation without sufficient attention to genuine scientific information from active field biologists. It is also clear that there is a crying need for more active, full time field biologists working on bats, to deal with 114 species of this large, neglected and complex group of mammals.

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Table –1 :
Status of Bats in Tamil Nadu

Order: Chiroptera
Sub order: Megachiroptera
Family: Pteropodidae (Old World Fruit Bat)

S. No.	Name of species	IUCN status	Locality
1.	***Rousettus leschenaulti*** Fulvous fruit bat	Least Concern (LC)	**Vannathiparai** (USNM), **Zakampatti** (Sinha, 1980), **Madras** (Rookmaaker and Bergmans, 1981), **Temple of Tirunelveli, Cheranmahadevi, Nanguneri, Srivaikundam, Vitillapuram** (Vanitharani, 1998)
2.	***Pteropus giganteus*** Indian flying fox	Least Concern (LC)	**Point Calimere** (BNHS), **Salem** (Sinha, 1980), **Madras** (BMHN), **Keelarajakularaman, Srivaikundam, Ramanathapuram** (Marimuth, 1988), ***Terminalia arjuna*** **Trees of the river line area Srivaikundam, Tirunelveli** (Kurukkuthurai), **Thirupadaimaruthur, Karaikal**, (Vanitharani, 2003), **Sathiyamangalam Timber Depot, Thanjavore** (Annamalai Pers. Comm.)
3.	***Cynopterus sphinx*** Short nosed fruit bat	Least Concern (LC)	**Cubum** (Wroughton, 1921), **Karapar, Cotengady** (Lindsay, 1927), **Madurai** (Sinha, 1980, Marimuthu *et.al*, 1998), **Point Calimere** (Balasubramanian, 1988), **Upper Manalaar, Vannathiparai, Coimbatore** (USNM), **Dharmapuri** (FMNH), **Tirunelveli** (Balasingh *et.al,* 1993), **Located in almost all the villages in around Tiruneveli. Forms tent in palm trees and creepers** (Vanitharani, 2003)
4.	***Cynopterus brachyotis*** Lesser dog faced fruit bat	Least Concern (LC)	**Centre Camp** (near Chinnamanur) (HZM), **Common fruit bat of forest area above 700 m altitude, Courtallam, Kalakad, Kothiyar hill ranges** (Vanitharani, 2003)
5.	***Latidens salimalii*** Salim Ali's fruit bat **Endemic to South India**	**Endangered (EN)**	**Kardana Coffee Estate** (Bates *et.al*, 1994), **High Wavy mountains Theni district** (Singaravelan *et.al,*), **Fruit bat of rain forest area above1000 m altitude Kalakad Mundanthurai Tiger Reserve in Nagapothigai, Senkaltheri, Servalar hill range, Courtallam hills** (Vanitharani *et.a,* 2003).
6	***Eonycteris spelaea*** Dawn bat	Least Concern (LC)	**Kalakad Mundanthurai Tiger Reserve** – (Balasingh – Pers.Comm0.

Order: Chiroptera
Sub order: Microchiroptera
Family: Rhinopomatidae (Mouse-tailed bats)

Sl. No	Name of bat species	IUCN status	Locality
1.	***Rhinopoma microphyllum*** Greater mouse tailed bat	Least Concern (LC)	**Near Madras** (Cakenberghe and Vree, 1994)
2.	***Rhinopoma hardwickii*** Lesser mouse tailed bat	Least Concern (LC)	**Madras** (BNHS), **Madurai** (Ko ck and Felten, 1980), **Dharmapuri** (BNHS), **Palani hills** (Lindsay, 1927i), **Pannian** (HNHM), **Sivanthipatti hillock** (Vanitharani, 2003)

Order: Chiroptera
Sub order: Microchiroptera
Family: Emballonuridae (Sheath-tailed bats)

Sl. No	Name of bat species	IUCN status	Locality
1.	***Taphozous longimanus*** Long-winged tomb bat	Least Concern (LC)	**Madras** (D obson, 1878), **Cumbum** (Wroughton, 1921), **Murrappanadu** (Vanitharani, 2003)
2.	***Taphozous melanopogon*** Black-bearded tomb bat	Least Concern (LC)	**Nagarcoil** (Wroughton, 1921), **Keela Kuyil Kudu** (Usman, 1988), **Temples of Tirunelveli, Krishnapuram, Nanguneri, Srivaikundam** (Vanitharani, 1998, 2003, Lilly *et.al,* 2003, Addline *et.al*, 2003)
3.	***Taphozous nudiventris*** Naked-rumped Tomb bat	Least Concern (LC)	**Madurai** (Marimuthu and Chandrashekaran, 1983)
4.	***Taphozous saccolaimus*** Pouch bearing bat	Least Concern (LC)	**Madras** (Blyth, 1844)

Order: Chiroptera
Sub order: Microchiroptera
Family: Megadermatidae (False Vampire bats)

Sl. No	Name of bat species	IUCN status	Locality
1.	***Megaderma lyra*** Indian false vampire	Least Concern (LC)	**Vannathiparai** (USN M), **Palani** (Lindsay, 1927), **Salem, Coimbatore** (Sinha, 1980), **Tirunelveli, Madurai** (Chandrashekaran *et.al,* 1988), **Keela Kuyil Kudi, Pannian Malai, Seelayampatti** (Usman, 1988), **Madras, Tirthamalai** (BMNH), **Idachivillai** (Thoothukudi District) 1998, **Murrappanadu, Krishnapuram, Tirunelveli, Cheranmahadevi, Thirupadaimaruthur, Nanguneri** (Vanitharani, 2003, Addline, 2003)
2.	**Megaderma spasma** Lesser false vampire	Least Concern (LC)	**Vannathiparai** (USNM), **Chettiri Range, near Cumbum** (Wroughton, 1921), **High Wavy Moun tains** (BMNH), **Courtallam, Servalar hill range** (Vanitharani, 2003)

Order: Chiroptera
Sub order: Microchiroptera
Family: Rhinolophidae (Horseshoe bats)

Sl. No	Name of bat species	IUCN status	Locality
1.	**Rhinolophus affinis** Intermediate Horseshoe bat	Least Concern (LC)	Das *et.al,* 1995.
2.	***Rhinolophus rouxii*** Rufous Horseshoe bat	Least Concern (LC)	**Pondicherry, Coonoor** (Blanford, 1888 - 91), **Palani Hills** (L indsay 1927i), **Shevaroy Hills** (Sinha, 1973), **Kalakad hill range** (Vanitharani, 2003)
3.	***Rhinolophus lepidus*** Blyth's Horseshoe bat	Least Concern (LC)	**Salem** (Das, 1986), **Agasthiyer and Kalakad hill range** (Vanitharani, 2003)
4.	**Rhinolophus beddomei** Lesser Woolly Horseshoe bat **Endemic to South India**	**Near Threatened (NT)**	**Kalakad and Kothiyar hill range** (Vanitharani, 2003)

Order: Chiroptera
Sub order: Microchiroptera
Family: Hipposideridae (Leaf-nosed bats)

Sl. No	Name of bat species	IUCN status	Locality
1.	**Hipposideros ater** Dusky Leaf-nosed bat	Least Concern (LC)	**Cumbum** (Wroughton, 1921), **Kurumbapatti, Tirthamalai** (BMNH), **near Madras** (HZM), **near Madurai** (Jones *et.al,* 1994), **Abandoned buildings in and around Tirunelveli** (Vanitharani, 1998, Ezhilmathi and Vanitharani, 2003)
2.	***Hipposideros cineraceus*** Least Leaf-nosed bat	**Near Threatened (NT)**	**Kurumbapatti, Tirthamalai** (BMNH)
3.	***Hipposideros fulvus*** Fulvous Leaf-nosed bat	Least Concern (LC)	**Keela Kuyil Kudi** (Usman, 1988), **Sivanthipatti hillock** (Vanitharani, 2003)
4.	***Hipposideros Pomona*** Andersen's Leaf-nosed bat	Least Concern (LC)	**Madhavoram** (FMNH)
5.	***Hipposideros speoris*** Schneider's Leaf-nosed bat Endemic to South Asia	Least Concern (LC)	**Nagarcoil, Aram bol** (Wroughton, 1927), **Kurumbapatti, Tirthamalai** (BMNH), **Salem, Madras** (Jerdon, 1874), **Trichinopoly, Travancore** (Blanford, 1888-91), **Keela Kuyil Kudi, Kanavai Katha Bootham, Pannian Malai** (Usman, 1988), **Madurai** (Marimuthu and Selvanayagam, 1981), **Madras** (HNHM), **Temples and abandoned buildings in and around Tirunelveli** (Vanitharani, 1998, Lilly and Vanitharani, 2003, Adline *et.al*, 2003, Rajkumar *et.al*, 2003)

Order: Chiroptera
Sub order: Microchiroptera
Family: Molossidae (Free-tailed bats)

Sl. No	Name of bat species	IUCN status	Locality
1.	***Tadarida aegyptiaca*** Egyptian free failed bat	Least Concern (LC)	**Madurai** (Marimuth pers. comm.), **Krishnapuram** (Vanitharani, 2003)
2.	***Tadarida plicata*** Wrinkle – lipped Free-tailed bat	Least Concern (LC)	**Near Madras** (Jerdon, 1874)

Order: Chiroptera
Sub order: Microchiroptera
Family: Vespertilionidae (Evening bats)

Sl. No	Name of bat species	IUCN status	Locality
1.	***Myotis horsfieldii*** Horsfields mouse eared bat	Least Concern (LC)	**Venniar Estate** (HZM)
2.	***Scotophilus heathii*** Asiatic greater yellow House bat	Least Concern (LC)	**Madras, near Pondicherry, Nilgiri Hills, Shevaroy Hills, Trichinopoly** (BMNH), **Salem** (HZM), **Coimbato** (HNHM), **Murappanadu** (Vanithara 2003)
3.	***Scotophilus kuhlii*** Asiatic lesser yellow house bat	Least Concern (LC)	**Kotagiri** (Wroughton and Davidson, 1920), **High Wavy Mountain** (Hutton, 1949), **Murappanadu** (Vanitharani, 2003)
4.	***Pipistrellus coromandra*** Indian pipistrella	Least Concern (LC)	**Pondicherry, Samaya Malai** (HZM), **Upper Manalaar** (USNM)
5.	***Pipistrellus tenuis*** Least pipistrella Indian pigmy bat	Least Concern (LC)	**Samaya Malai** (HZM), **Tirthamalai Chettiri Range, Tirthamalai** (BMNH), **Madurai** (pers. obser), **Crevices of buildings in around Tirunelveli, Courtallam hills** (Vanitharani, 2003)
6.	***Pipistrellus ceylonicus*** Kelaart's pipistrelle	Least Concern (LC)	**Nilgiri Hills** (BMNH), **Mukkudal** (Vanitharani, 2003)
7.	***Pipistrellus dormeri*** Dormer's bat Endemic to South Asia	Least Concern (LC)	**Salem** (HZM), **Murappanadu** (Vanitharani, 2003)

Sl. No	Name of bat species	IUCN status	Locality
8.	**Hesperotenus tickelli** Tickell's bat	Least Concern (LC)	**Madras** (Wroughton, 1918)
9.	***Miniopterus schreibersii*** Schreiber's long fingered bat	Least Concern (LC)	**St. Thome Island** (USNM)
10.	**Miniopterus pusillus** Nicobar Long-fingered bat	**Vulnerable VU**	**Madras** (BMNH)
11.	***Harpiocephalus harpia*** Hairy winged bat	**Near Threatened (NT)**	**Perumal** (Thomas, 1923)
12.	***Kerivoula picta*** Painted bat	Least Concern (LC)	**Madras** (Blanford, 1888 -91), **High Wavy Mountain** (Hutt on, 1949), **Nagercoil** (Vanitharani, 2003)
13.	***Kerivoula papillosa*** Papilose bat	**Near Threatened (NT)**	**Courtallam hills** (Vanitharani *et.al,* 2003)

Table – 2
Diverse bat roosting sites in Tamil Nadu

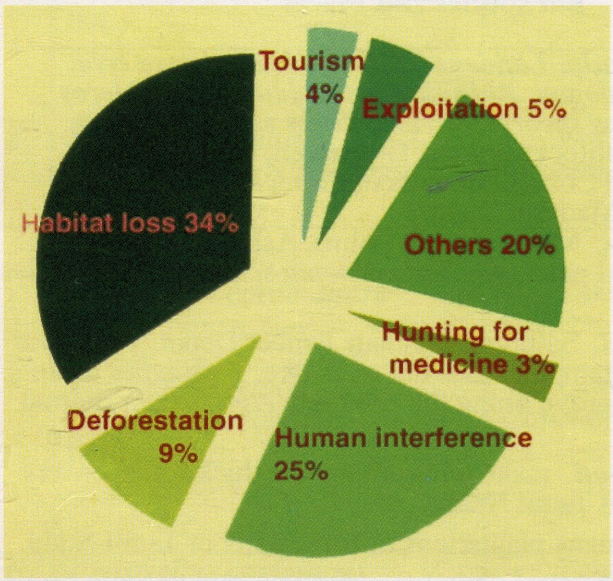
Sl. No	Bat Roosts	Bat species and Places
1.	Caves	***Rousettus leschenaulti, Latidens salimalii, Megaderma lyra, Taphozous melanopogon, Rhinolophus lepidus,Hipposideros fulvus, Hipposidesos speoris*** etc. uses caves as roosting sites. example. Caves at hillocks around Tirunelveli, caves of Agesthiyar hills and Courtallam hills in Tirunelveli District. Nagamalai hills of Madurai District.
2.	Trees	***Cynopterus sphinx ,*** Make tents in palms, Ashoka trees, flower / fruit strings of kitul palm, vines of *vernonia scanders* of the cities and villages. ***Pteropus giganteus,*** Sathiyamangalam Timber Depot, Thanjavur Division, Srivaikuntam, Chooses tall trees like *Terminalia arjuna, Aegle marmelos* in grove lining the river line area as their diurnal roost. ***Cynopterus brachyoti*** make tents among the thick forest covers of Western Ghats of Tamil Nadu. ***Kerivoula picta*** banana plantations of some parts of Tamil Nadu. ***Megaderma spasma, Kerivoula lenis*** roost in tree holes in forest area
3.	Abandoned buildings, houses, Godowns	***Hipposideros ater, Megaderma lyra, Pipistrellus tenuis, Pipistrellus dormeri*** of almost in many village of Tamil Nadu.

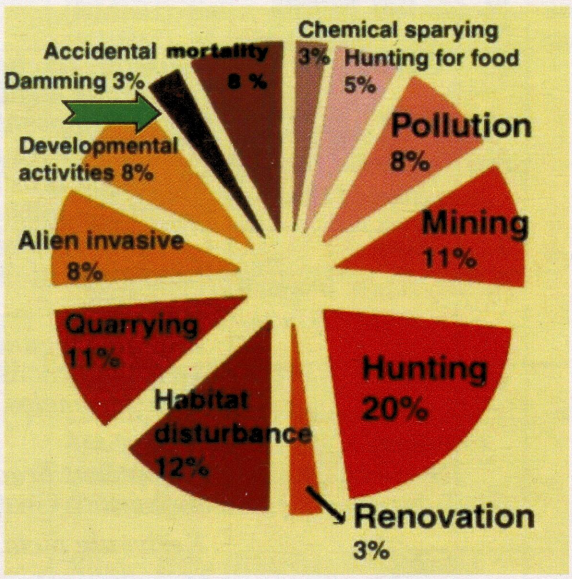
Sl. No	Bat Roosts	Bat species and Places
4.	Underground storerooms	***Hipposideros ater, Hipposidesos speoris, Megaderma lyra.***
5.	Temples and Temple Towers	In every village and city of Tamil nadu ***.Rousettus leschenaulti, Megaderma lyra, Hipposidesos s peoris. Taphozous melanopogon, Pipistrellus tenuis, Pipistrellus ceylonicus*** etc.
6.	Crevices in old buildings, Under Bridges, Temple Towers etc.	In every village and city of Tamil Nadu ***Tadarida aegyptiaca, Pipistrellus ceylonicus, Pipistrellus dormeri, Pipistrellus tenuis, Pipistrellus pipistrellus.***
7.	Crevices and cavities of rocks	***Tadarida aegyptiaca, Tadarida plicata, Rhinolophus luctus, Scotophilus heathii, Scotophilus kuhlii*** old buildings in remote areas , In the forest areas of Western Ghats of Tamil Nadu,

Figure I :

Problems And Threats Caused To The Habit And Habitats Of Various Bat Species

(South Asian Chiroptera CAMP (Conservation Assessment and Management Plan)Report 2002)





9. Ex-situ conservation of Wild Animals in Tamil Nadu - Past Learning and Future Challenges

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9. Ex-situ conservation of Wild Animals in Tamil Nadu - Past Learning and Future Challenges

N. KRISHNAKUMAR

I Captive Conservation success in Tamil Nadu

Tamil Nadu has been one amongst the pioneering States involved in the Ex-situ conservation and captive-breeding programme of Marsh Crocodiles (Crocodylus porosus). The State can boast of a fair degree of success in the venture. As part of the Wildlife youth club member run by Tamil Nadu Forest Department Wildlife wing for students, I have had the opportunity to witness the captive breeding attempts in Amaravathi Crocodile Park during 1976-77. The Forest Department established Crocodile captive breeding centres in Hogenekkal, Sathanur and Amaravathi and also attempted reintroduction programmes. However this programme came to a halt due to lack of reintroduction sites, opposition from Tamil Nadu Electricity Board (TNEB), Public Works Department (PWD), Fisheries and other user Department of the dam sites. Today as a result of the successful attempts we have a captive stock of over 2000 Crocodiles put together in the four captive breeding centres namely Amaravathi, Sathanur, Arignar Anna Zoological Park and Hogenekkal. Thus the first Ex-situ conservation programme of Crocodile remained merely a captive breeding success story. Scientific reintroduction, evaluation monitoring of released stock has not been completely under taken. Apart from Crocodiles not many Ex-situ conservation efforts have been attempted, by Forest Department nor any other agency in the State, for any other Wild animal. Ex-situ conservation is just one of the many options open to Wildlife managers, but often represents the only hope for species near extinction in Wild.

The State Forest Department has vast experience in In-situ conservation attempts and have been a pioneer in many areas of Wildlife management in the Country with many field Research activities. The State has produced some of the best Wildlife managers and Scientists in the Country and the best managed protected areas. Probably this is one reason why even today the Department has not realized the need for Ex-situ conservation for endangered species. There could be other reasons too. Although the Department runs 8 captive breeding facilities and zoos, these centres have remained only as entertainment and Wildlife education centre rather than transacting scientific business of Conservation.

List of Mini, Medium and Large Zoos in Tamil Nadu

1	Arignar Anna Zoological Park, Vandalur	Large Zoo	Zoos run by Forest Department
2	Children's Park, Guindy	Medium Zoo	
3	Amirdhi Zoo, Vellore	Mini Zoo	
4	Crocodile Rearing Centre Amaravathi Nagar	Mini Zoo	
5	Deer Park, Udhagai, Nilgiris Dist	Mini Zoo	
6	Gangaikondan Deer Park, Neliai, Kattabomman	MiniZoo	
7	Hogainakkal Mini Zoo	Mini Zoo	
8	Kurumbapatti Zoological Park, Salem	Mini Zoo	
9	Mini Zoo, Courtallam	Mini Zoo	Zoos run by other agencies
10	Montfort School Mini Zoo	Mini Zoo	
11	Shivganga Garden Mini Zoo	Mini Zoo	
12	V.O.C. Park Mini Zoo, Erode	Mini Zoo	
14	Madras Crocodile Bank Trust, Mamallapuram	Medium Zoo	
15	V.O.C. Park Mini Zoo, Coimbatore	Medium Zoo	

II Planning for Ex-situ Conservation:-

The reduction and fragmentation of Wildlife population in the Western and Eastern Ghats are assuming at a rapid and accelerating rates. Isolated populations are at great risk of extinction. For such populations intensive management may become necessary for their survival and recovery. To a great extend this intensive management includes captive breeding. Today even Bio materials derived from both live and dead animals play a vital role in conservation, Bio-technology, reproduction etc., Biological Resource Banking (Bio Banks), Genome Resource Banking (GRB) perform a vital function by assisting In-situ conservation and Ex-situ conservation. The State is no where near such ventures. Ex-situ conservation for Wildlife animals has just taken a beginning in zoos. The greatest need of the hour is for co-ordination between In-situ and Ex-situ managers, field Scientists, Veterinarians and others to sit and prioritize those species that need Ex-situ conservation attempts. Zoos in the State

should co-ordinate amidst themselves and plan for a scientific animal collection policy through scientific animal exchanges and Co-operative captive-breeding programme. Arignar Anna Zoological Park the largest zoo, can act as an umbrella organization co-ordinating the captive breeding programmes. Ex-situ conservation is costly and therefore requires meticulous planning, co-ordination and involvement of all those involved. The business of zoo management in the State should become scientific and each zoo should plan for conservation of 4 to 5 critically endangered species. The Ex-situ centres can also play an excellent role in Wildlife education and awareness as zoos are visited by more number of people than protected areas. Hence, zoos should also have a Wildlife Education plan and interpretation plan.

Despite the best attempt of conservationists, planners and all involved, the State of Wildlife in Reserve Forests and Protected Areas, where they are best conserved, is becoming worse due to various pressures. In the days to come with man Wildlife conflicts on the increase zoos are also turning out to be Rescue and Rehabilitation centres for animals which stray out of the Forests. Hence, the role of captive breeding centres cannot be done away with. The State should have a Ex-situ conservation plan and also co-ordinate with other zoos in the Country to co-operatively manage endangered species of this region. Zoos in the State have to work with Scientific institutes like SACON, Wildlife Institute of India and other supporting organizations like IUCN/ Species Survival Commission (SSC), CBSG and plan for long term Ex-situ conservation programmes, if not they have no reason to remain.

The zoos have a big challenge in conservation of Bio-diversity of the State, as captive propagation potentially constitutes one of the best tools in conservation of Bio-diversity. The end point of the captive breeding is reintroduction (Colin Tudge 1991). The art and Science of reintroduction have to be understand intimately for each endangered species by all of us involved in the conservation programmes. Zoos are faced with many problems like animal exchange, space, expertise and finance. The functioning of Ex-situ centres have to reoriented and reorganized in the State. Zoos in the State remain just as animal exhibit centres and project animals in very bad shape. The State of affairs have to change immediately. Zoos in the State are faced with tremendous responsibility to maintain high standards of animal welfare and care. Zoos need to have to clear-cut policy for surplus animals. The resource of zoos should be earmarked for those species at risk. This requires many scientific activities like stud book keeping, continuous training for zoo educators, managers, keepers providing special equipments, expertise and funds. It is time that zoos change roles from an animal exhibit centre and visitor attraction centre to conservation centre and also as demonstration centre to expose to people the problem faced by Wildlife.

III Ex-situ Conservation priorities:-

As In-situ conservation effort increasingly focuses on area of species, Captive breeding should be planned for the most critically endangered taxa of the locality. Captive breeding programmes have saved some valuable species in the World, though the concentration has been on charismatic declining mega fauna. In our State we now need to expand the programme to include the multitude of small Mammals, Carnivores, Reptiles and Birds. Captive breeding priorities in the State can be determined with reference to Zoological Survey of India reports, Red list of IUCN and reports of the Wildlife Research centres like Wildlife Institute of India, Zoo Outreach Organization etc., The most urgent need is to identify the threatened species of Western and Eastern Ghats (i.e.) Prioritize of species with reference to current status, threats and risks and then plan for a scientific breeding and reintroduction programme.

IV Animal Collection Plan for Zoos

Analysis of threatened species held in captivity by Forest Department zoos in the State reveal that most of them hold Mammals of which only a handful of them are critically endangered and endemic. Small Mammals, Amphibians, Reptiles, Birds, Bats and Insects have been left out. A few Primates, Artrodactyla, Carnivores, Proboscidae are the only species held in the zoos. In contrast insectivores, Rodents, Chiroptera, Logomorph species are left out. Surprisly we hold species which have public appeal and fascination. The zoos in Tamil Nadu should concentrate more in conservation of critically endangered small Mammals. Zoos hold more of less vulnerable and less risk groups in large numbers. Zoos therefore need to have a concrete conservation programme and animal collection policy.

Some of the Mammals that may require immediate attention and Ex-situ conservation plan by the zoos run by the Forest Department are:-

Sl.No	Common Name	Scientific Name
1	Indian Gaur	Bos gaurus (Smith)
2	Ellerman rat	Cremonomys clyira (Ellerman)
3	Kelaart's long clawed shrew	Feroculus feroculus (Kelaart)
4	Nilgiri Tahr	Hemitragus hylocrius (ogilby)
5	Brown Mongoose	Herpestes fuscus fuscus (Water house)
6	Leafnosed Bat	Hipposideros lankadiva (Kelaart)
7	Salim Alis Fruit Bat	Latidens Salimalii (Thonglongya)
8	Lion – tailed macaque	Macaca silenus (Linnacus)
9	Sloth Bear	Melursus ursinus (Shaw)
10	Yellow threated Martens	Mertes gwatkinsi (Horse field)
11	Wroughton's free tailed bat	Otomops wroughtoni (Thomes)
12	Brown Palm Civet cat	Paradoxurus jerdoni (Blanford)
13	Hedgehogs	Paracehinus micropus nudiventris (Horse field)
14	Small travancore flying Squirrel	Petinomys fuscocapillus fuscocappilus (Jerdon)
15	Fishing cat	Prionailurus viverrinus (bennett)
16	Indian giant squirrel	Ratufa indica indica (Erxleben)
17	Indian giant squirrel	Ratufa indica maxima (Erxleben)
18	Grizzled giant Squirrel	Ratufa maeroura dandolena (Pennant)
19	Musk Rat	Suncus dayi (Dobson)
20	Shrews	Suneus dayi (Kelaart)
21	Nilgiri langur	Trachypithecus johnii (J.Fisheher)
22	Malabar civet	Viverra civettina (Blyth)
23	Tiger	Panthera tigris (Linnacus)

Similarly the list of Birds, Reptiles, Amphibians and other life forms that need attention, can also be prioritized, after discussions with Scientists and field conservationists and zoos in collaboration can decide on appropriate conservation plans.

V Arignar Anna Zoological Park – A modern Wild Animal conservation centre:-

Arignar Anna Zoological Park with an area of 510 hec (602 hec presently) is the largest Ex-situ facility in South Asia and India with a wide collection of endangered and threatened animal species. This zoo remains even today a generalized zoo, involved in conservation of endangered

species from many habitats including exotic species. The zoo is also involved in Wildlife Education and awareness specializing in Ex-situ Research in the fields of breeding, nutrition, ecology study of animal health and diseases. With the release of the National Zoo Policy'1998 by Central Zoo Authority. Arignar Anna Zoological Park has now visualized a new conservation action plan. To set the conservation trend Arignar Anna Zoological Park has recently set a new mission statement " The Mission of Arignar Anna Zoological Park is to encourage people to develop a caring attitude towards flora and fauna; to serve as a dynamic nature conservation centre, by promoting breeding programmes for rare and endangered species of the Western Ghats and the Eastern Ghats, and to offer excellent public service, recreation, Eco-awareness and education"

It is time that the mini and medium zoos in the State reorient their objectives, have an meaningful master plan, management plan with a vision.

VI Development of Co-ordinated genetic and breeding programme

Arignar Anna Zoological Park is the largest and most modern zoo, with scientific infrastructure and personals. Along with other mini and medium Zoo in the State it should provide the support for the survival of species, sub-species and animal population of the Western Ghats under threat. Arignar Anna Zoological Park with other zoos should reorient its strategies to propagate and manage Ex-situ population of local and regional endangered animals to prevent their immediate extinction and also develop stable captive population and also have solid Education programmes for them to sensitize visitors. For conservation success zoos should strictly avoid collection of species from Wild except founder stock for captive breeding programmes with due permission of the Central Zoo Authority and the Chief Wildlife Warden. The zoos through improved zoo sanitation, hygiene and Veterinary protocols strive to focus on species at levels of individuals and assure sufficient longevity of physical and psychological well being of them. Zoos should ensure sufficient reproduction (i.e.) Scientific controlled and planned reproduction for continuity of the generation, taking care to maintain the genetic diversity and avoiding inbreeding and subject the population to visits of unnatural, artificial selection. The key words for Ex-situ success remains in intensive management and Co-operation amidst zoos. Much has to be done in the field of Ex-situ conservation in the State. The real works still remains. The zoo community has a great role to play in the conservation of Bio-diversity and all this is possible only by effective net working of Foresters, conservationists, Zoo Biologists, Veterinarians and field Scientists. The real work of Ex-situ conservation still remains to be started in the State and has to commence immediately with a lot of commitment from all concerned.

10. Policy and Law on Wild Animal Diversity of Tamil Nadu

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10. Policy and Law on Wild Animal Diversity of Tamil Nadu

K. P. M. Perumahl

1. Policy on Conservation of Wild Animal Diversity:

At present there is no separate policy on Conservation of Wild Animal Diversity. Infact there is no need to have a separate policy since the existing "National Forest Policy 1988" takes care of this. One of the basic objectives of the National Forest Policy 1988 reads as follows:

"Conserving the natural heritage of the Country by preserving the remaining natural forests with the vast variety of flora and fauna, which represents the remarkable biological diversity and genetic resource of the Country".

One of the strategies of Forest Management enumerated in the National Forest Policy 1988 speaks about Wildlife Conservation as follows:

"Forest Management should take special care of the need of the Wildlife Conservation and Forest Management Plans should include prescriptions for this purpose. It is especially essential to provide for "Corridors" linking the protected areas in order to maintain genetic continuity between artificially separated sub-sections of migrant Wildlife".

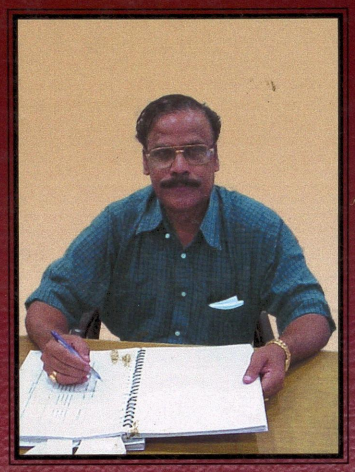
The phrase "Wildlife" mentioned in the National Forest Policy actually refers to wild animals.

Though as stated above, the National Forest Policy speaks about conserving wild animal diversity, it mainly refers to conserving wild animals in the context of Forest Management i.e. conservation of wild animals in the forests. The policy should be amended in such a way that it takes care of conserving wild animal diversity outside the forest area also. The State Forest Policy which is yet to be declared may include this aspect. The objectives and strategies of State Forest Policy should provide for conserving wild animal diversity in the entire geographical area of the State. The Forest education, forestry research and personnel management should be reoriented and restructured to enhance the professional competence in this field.

2. Law and Regulations for Conservation of Wild Animal Diversity:

At present the major law in operation to conserve and protect the wild animals is the "Indian Wildlife Protection Act 1972". This law is not sufficient to conserve the entire wild animal diversity since the act provides protection to only those wild animals included in the schedule I to IV. The "Bio-diversity Act" recently passed by the Parliament has to be studied in relation with the Indian Wildlife Protection Act 1972 and the adequacy of the Act and the bio-diversity act has to be examined. Need to include wild animal species which are endemic to this State and which require the legal protection is to be examined and acted upon. The need to bring state amendments to the Wildlife Protection Act which will not be in conflict with the provisions of the main act and which will take care of the specific needs of the state has to be studied and wherever it is felt necessary it should be done. An expert committee consisting of Zoologists, Wildlife and Forest Managers etc. may be constituted to study these aspects and to suggest necessary legal provisions. These recommendations may be referred to legal experts to examine the feasibility of incorporating them into the act by way of state amendments.

About the Editor



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His publications in the past includes Joint Forest Management Concepts, Policies and Guidelines, Joint Forest Management in Tamilnadu, Status Report - 2003, Participatory Learning and Action for Joint Forest Management, Eco Development in Kalakad Mundanthurai Tiger Reserve: Status Report - 2003 and more than 50 Research papers. Seven books authored/edited by him are being published along with this publication. The titles of the books are Tamilnadu Biodiversity Strategy and Action Plan - Forest Biodiversity, Tamilnadu Biodiversity Strategy and Action Plan - Chordate diversity, Tamilnadu Biodiversity Strategy and Action Plan - Wild Plant diversity, Tamilnadu Biodiversity Strategy and Action Plan - Estuarine Biodiversity, Bibliography of Angiosperms of Tamilnadu, Biodiversity of Kalakad Mundanthurai Tiger Reserve and Eco Development in Kalakad Mundanthurai Tiger Reserve, Status Report - 2004.



Conserve Biodiversity