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Database on Biodiversity of Tamil Nadu

Biodiversity Profile of Tamil Nadu

I. The Convention on Biological Diversity:

The Convention on Biological Diversity (CBD) is a landmark in the environment and development field, as it takes for the first time a comprehensive rather than a sectoral approach to the conservation of Earth's biodiversity and sustainable use of biological resources. It was in the year 1984 that the need to have in places a global convention on biological diversity started gaining momentum. In response, the United Nations Environment Programme (UNEP) in the year 1987 recognised the need to streamline international efforts to protect biodiversity. The Convention on Biological Diversity (CBD) was negotiated and signed by nations at the UNCED Earth Summit at Rio de Janeiro in Brazil in June 1992. The Convention came into force on December 29,1993. India became a Party to the Convention in 1994. At present, there are 175 Parties to this Convention. The main objectives of the Convention are:

- Conservation of biological diversity;
- Sustainable use of the components of biodiversity;
- Fair and equitable sharing of benefits arising out of the utilisation of genetic resources.

II. Biodiversity Authority:

In India a National Biodiversity Authority (NBA) has been set up at Chennai, under the Biological Diversity Act 2002. The Act provides for establishment of State level Boards and local level bio-diversity management committees to deal with any matter concerning conservation of biological diversity, its sustainable use and fair and equitable sharing of benefits arising out of the use of Biological resources and associated knowledge.

III. Biological Diversity Act, 2002:

1. To regulate access to biological resources of the country with the purpose of securing equitable share in benefits arising out of the use of biological resources; and associated knowledge relating to biological resources;

2. To conserve and sustainably use biological diversity;

3. To respect and protect knowledge of local communities related to biodiversity;

4. To secure sharing of benefits with local people as conservers of biological resources and holders of knowledge and information relating to the use of biological resources;

5. Conservation and development of areas of importance from the standpoint of biological diversity by declaring them as biological diversity heritage sites;

6. Protection and rehabilitation of threatened species;

7. Involvement of institutions of state Governments in the broad scheme of the implementation of the Biological Diversity Act through constitution of committees.

IV. Tamil Nadu's Biodiversity:

Tamil Nadu is endowed with a rich biodiversity. The angiosperm diversity of India includes 17,672 species, with 5,640 species, Tamil Nadu ranks 1st among all the States in the country (Annamalai, TNBSAP 2004). In Tamil Nadu the main natural habitat types are forest, mountains, rivers, wetlands, mangroves and beaches. Tamil

Nadu has a geographical area of 1,30,058 km^2, which constitutes about 4 per cent of the country's total area. Tamil Nadu shares the Western Ghats (one of the 25 biodiversity hotspots) with the states of Kerala, Karnataka, Goa, Maharashtra and Gujarat. It shares the Eastern Ghats with the States of Andhra Pradesh and Orissa. Tamil Nadu accounts for nearly $1/3^{rd}$ of the total flora of India. Species and Generic diversity of flora of Tamil Nadu is comparatively richer than the neighbourhood states (Draft Tamil Nadu State Action Programme,1999).

V. Biodiversity database:

Tamil Nadu has a long history of taxonomical surveys and ecological research; but available information on its biodiversity is rather scattered. Hence ENVIS Center, Department of Environment, has developed a check list database on algae, fungi, bryophyte, lichens, pteridophyta, gymnosperms, angiosperms flowering plants and faunal diversity with the help of taxonomists.

A. Algal diversity:

Algae are both microscopic and macroscopic. They are present in both fresh and marine waters and in air and soil. They are also found growing on other plants (epiphytic), animals (epizoic), within the cavities of animals (endozoic), growing on rocks (epipelic, (on ice), floating planaktonic attached (benthic). Algae range in form from unicellular through colonial, filamentous, siphonaceous to complex parenchymatous thalli of larger seaweeds (Sridharan, 2004).

The algal flora of Tamil Nadu is dominated by the members of the Chlorophyceae represented by 419 taxa, followed by the members of the Rhodophyceae (267), Cyanophyceae (235), Bacillariophycee (233), Phaeophyceae (68) and Charophyceae. A total number of 1263 taxa belonging to 8 classes is reported to occur in Tamil Nadu, of these 1119 taxa are species of algae belonging to different groups and the rest are sub species (2), varieties (100) and forms (42). These algae are distributed under 432 genera belonging to 115 families under 38 orders. It is also reported that there are 668 taxa of fresh water algae and 625 taxa of marine algae were distributed in Tamil Nadu (Baluswamy, 2006).

B. Fungal diversity:

Fungi are a group of organisms and micro-organisms that are classified within their own kingdom, the fungal kingdom, as they are neither plant nor animal. Fungi draw their nutrition from decaying organic matter, living plants and even animals. They do not photosynthesis as they totally lack the green pigment chlorophyll, present in green plants. Many play an important role in the natural cycle as decomposers and return nutrients to the soil. Fungi are even used for medical purposes, such as species within the penicillium genus, which provide antibiotics.

In Tamil Nadu a total number of 1077 species in 370 genera have been recorded and it is widely distributed in Nilgiris, Palani hills and Anamalai hills. The first Indian fungus to be recorded was from Tranqeubar, in the erstwhile Madras State.

Fig.1 *Gracilaria textorii*

Fig.2 *Amanita aureoflocossa*

With the appointment of E. J. Butler as Cryptogamic Botanist to the Government of India more systematic surveys of Indian fungal floras were initated. However, large scale collections of fungi in Tamil Nadu were made only after the establishment of the Mycology section at the Agricultural college and Research Institute, Coimbatore (Natarajan, 2006).

C. Lichen diversity:

Lichens are fungi that live in a symbiotic association with a green alga or a cyanobacterium or both to fulfill its nutritional requirements. In the lichen association the fungal partner is known as the mycobiont and the green alga or a cyanobacterium is known as the photosynthetic partner or the photobiont. In India, around 2000 to 2200 species are known to occur and in Tamil Nadu there are about 555 lichen species were recorded (Hariharan, 2007).

The algal or cyanobacterial partner (photobiont) has a different binomial. Lichen symbiosis is one of the most successful symbioses known in nature.This relationship enables lichens to colonies a vast spectrum of habitats and climates all over the world including extreme environment from the polar regions to the equator and inter-tidal zones to mountain peaks. Lichens colonize natural substrata such as tree bark, wood, rock, soil, leaf surfaces, and shells / hard surfaces of living animals like carapaces, weevils and man-made substrates like walls, mortar, asbestos, glass, iron poles, plastics etc. Lichens are part of vital components of ecosystem functions in food web and food chain, nutrient cycling and are used by many animal groups as brooding/nest building spaces (Hariharan, 2007).

Fig. 3 *Parmelia grayanam*

D. Bryophyte diversity:

Fig. 4 *Cyathodium smaragdinum*

Bryophytes occupy an important place in the plant kingdom. They are the simplest and the most primitive of the land plants. They are the pioneers to colonies terrestrial habitat from aquatic environment. Their adaptation to a terrestrial mode of life is partial as water is indispensable in one stage or another in their life cycle. Hence, they are also known as the amphibians of the plant kingdom. Bryophytes are useful to human beings as well as to other organisms. They are the secondary colonisers on barren rocks next to lichens in plant succession in xerosere. Thus they help in weathering of soil. They are extremely good soil binders as they form large mats on forest floors and roadside cuts, thus controls soil erosion.

In India, there are about 850 species of liverworts belonging to 140 genera and 52 families and 2000 species of mosses belonging to 342 genera and 54 families were reported. From the West Coast and the Western Ghats 121 species of liverworts with 10 endemic and 682 species of mosses with 190 endemic have been identified (Dulip Daniels, 2006).

E. Pteridophyte diversity:

The Pteridophytes formed a dominant part of earth's vegetation. Pteridophytes lend a distinct charm to the landscape. The elegant tree ferns of the warm humid forest of eastern Himalayas, Pachmahri and Nilgiri hills, the epiphytic ferns and the hanging club mosses of the tropical forests attract one's attention. The lithophytic and terrestrial forms that grow in comparatively larger numbers are also a source of great attraction because of their beautiful

foliage. Some of them grow in water and form a luxuriant hydrophytic component of the lakes (Salvia), ponds and pools (Azolla, Marsilea). In India about 1300 specis of Pteridophyts have been reported, promote the flow of water and nutrients (Manickam, 2007). The ecological classification of Pteridophytes is given in Table1.

Table 1 : Ecological classification of Pteridophytes of the Tamil Nadu

S.N	Habitat	Number of species
1.	Terrestrial	90
2	Lithophytes	67
3.	Epiphytes	42
4.	Aquatic	5
5.	Epiphytes/Lithophytes	44
6	Epiphytes/Terrestrial	16
7	Terrestrial/Lithophytes	15
Total		**279**

Fig.5 *Tectaria coadunata*

F. Gymnosperm diversity:

The Gymnosperm diversity of the country is 64 species of which Tamil Nadu has 4 species of indigenous Gymnosperms and about 60 introduced species. (Sreedharan & Annamalai,2007) *Cycas circinalis* L. (Cycadaceae), *Nageia wallichiana* (Presl.) O.Kuntze (Podocarpaceae) and *Gnetum edule* (Willd.) Blume (Gnetaceae) are widely distributed. While *Gnetum contractum* Markgr. Is confined to the Nilgiris. The distribution of all the 4 indigenous species is given in Table 2.

Table 2. Distribution of Gymnosperms in Tamil Nadu

Name of the Species	Habit	Distribution in Tamil Nadu
Cycas circinalis L. (Cycadaceae)	Tree	Chennai, Coimbatore, Madurai, Tirunelveli, Kanniyakumari
Nageia wallichiana (Presl.) O.Kuntze (Podocarpaceae)	Tree	Coimbatore, Nilgiris, Tirunelveli, Kanniyakumari
Gnetum edule (Willd.) Blume (Gnetaceae)	Liana	Coimbatore, Nilgiris, Madurai, Tirunelveli, Tiruchirappalli, Salem, Kanniyakumari
Gnetum contractum Markgr. (Gnetaceae)	Liana	Nilgiris

Source: Murugan, 2004

Fig.6 *Cycas circinalis*

G. Angiosperm diversity:

The Angiosperm diversity of India includes 17,672 species. With 5674 species, Tamil Nadu ranks 1st among all the states in the Country. This includes 533 endemic species, 230 red listed species, 1559 species of medicinal plants and 260 species of wild relatives of cultivated plant (Annamalai, TNBSAP 2004).

Out of about 17,500 species of flowering plants described from India subcontinent about 4,000 are reported from Western Ghats (Nair & Daniel,1986). Out of about 315 flowering plants families in India about 230 families are represented in Tamil Nadu. The Nilgiri Biosphere Reserve situated on the southern Western Ghats harbours 3,379 species of flowering plants (Balakrishnan & Ansari, 1990). Similarly, Agasthyamalai come under

Kalakad-Mundanthurai Tiger Reserve situated on the Tirunelveli-Travangore hills at southern end is recorded to have about 2,000 species of flowering plants in an area of about 2000 km^2 (Henry & al., 1984). Tamil Nadu ranks first in species richness. (Dhar, 2002), and also ranks first in the combined score of species richness, use value, rarity and endemicity (Annamalai, TNBSAP 2004).

Fig.7 *Calliandra haematocephala*

H. Faunal diversity

The faunal diversity of Tamil Nadu includes 165 species of fresh water pisces, 76 species of amphibians, 177 species of reptiles, 454 species of birds and 187 species of mammals. According to the CAMP reports the red-listed species include 126 species of Pisces, 56 species of amphibians, 77 species of reptiles, 32 species of birds and 40 species of mammals. The endemic fauna includes 36 species of amphibians, 63 species of reptiles, 17 species of birds and 24 species of mammals.

As per the Wildlife Protection Act 1972, Schedule I animals include 22 species of mammals, 42 species of birds and 9 species of reptiles. Schedule II animals include 13 species of mammals. Schedule III animals include 5 species of mammals. Schedule IV animals include 5 species of mammals, 367 species of birds, 109 species of reptiles and 23 species of amphibians. Schedule V animals include 13 species of mammals and 1 species of birds (www.forests.tn.nic.in).

Antilope cervicapra

I. Marine diversity

The Gulf of Mannar region in the Indian coast between Rameswaram to Kanyakumari is among world's richest region from marine bio-diversity perspectives. Considering the biological and ecological richness of the area the Government of Tamil Nadu has bought the 21 in un-inhabited islands and their shallow waters around along the coast in Ramanathapuram and Thoothukudi district as the first marine National Park of the country. The Gulf of Mannar Biosphere Reserve (GOMBR) extending over 10,500 sqkm and includes 21 islands of the National Park (560 sqkm) is the first marine Biosphere Reserve in the Country. The GOMBR is rich both in species and habitat bio-diversity. This richness also makes the reserve a high productive area for marine resources of fisheries. The reserve has a status of a particular concern because of its diversity and special multiple use management status

Major ecosystem types available in GOMBR are Coral reefs, mudflats, beach, island, shallow water, and mangrove. Sea grass beds dominated by family like Hydrocharitaceae and Potamogetonaceae and species *Halodule uninervis*, *Cymodocea rotunds*, *C.Serulata* ; Coral reefs; mangroves including *Rhizophora muctonata, Avicennia alba, Bruguiera gymnorrhiza, Ceriops tagal, Lumnitzera racemosa* are also common in the stretch. This area has all the mangrove species available in India with *Pemphis acidula* being endemic and all the 11 sea-grasses of India occur here with *Enhalus acoroides* being endemic. This area supports 147 species of sea-weeds, abundance of sea-weeds and sea-grasses in grazing ground attract Sea cow (*Dugong dugon*). The other marine creatures like Dolphins, Sea-horse, Sea-cucumber, and Sea-anemone are common, peculiar animal like Balanoglosses are also endemic to GOMBR. Sandy shores of islands is feeding ground for five endangered marine turtles, they are Green turtle, Olive ridley turtle, Hawksbill turtle, Leatherback turtle and Loggerhead turtle. The islands form a good habitat and a stop over between Chilka lake, Point Calimore and Sri Lanka for migratary birds. Nearly 180 birds are found here and waders and sea-birds being the most common.

Impact of climate change on corals in the Gulf of Mannar

Fig 8. Bleached *Acropora cytherea*

Fig 9. Bleached massive coral

Coral bleaching is the loss of color of corals, due to stress-induced expulsion of symbiotic unicellular algae or due to the loss of pigmentation within the algae. The corals that form the structure of the great reef ecosystems depend on a symbiotic relationship with photosynthesizing unicellular algae called *zooxanthellae* that live within their tissues. Zooxanthellae give coral its particular coloration, depending on the clade living within the coral. Under stress or increase in temperature, corals may expel their *zooxantheallae*, which leads to a lighter or completely white appearance, hence the term "bleached". In Gulf of Mannar (GoM) a significant rise in the surface water temperature and subsequent coral bleaching was observed during the summer since 2005. The study carried out by Suganthi Devadason Marine Research Institute, Tuticorin from 2005 to 2008 reveals that the temperature varied between 31.0º C and 33.5ºC during summer. The average percentage of bleached corals were recorded during the years 2005 (14.6%), 2006(15.6%) 2007(12.9%) and 2008(10.5%) respectively. Massive corals especially *Porites* sp. are the first to be affected and the other dominant coral species bleached are *Acropora cytherea, A. formosa, A. intermedia, A. nobilis, M. foliosa, M. digitata* and *Pocillopora damicornis* (Patterson Edward, 2008).

Tamil Nadu State Animal

Nilgiri Tahr (*Hemitragus hylocrius)* is endemic to the Western Ghats mountain range in India, straddling the border between the states of Kerala and Tamil Nadu. The IUCN Caprinae Specialist Group classifies the Nilgiri tahr as endangered.As an endemic species, *H. hylocrius* receives full (legal) protection under the Indian Wildlife Act of 1972.

Tamil Nadu State Bird

Emerald Dove (*Chalcophaps indica*) is a very secretive and shy bird. The Emerald Dove is a stocky, medium-sized pigeon, typically 23 to 28 cm in length. The back and wings are bright emerald green. The flight feathers and tail are blackish. Because of their beautiful colouration and soothing call they are trapped and sold as cage birds.

Tamil Nadu State Flower

Flame Lily *(Gloriosa superba)* is a striking tuberous climbing plant with brilliant wavy-edged yellow and red flowers. The name *Gloriosa* comes from the word *gloriosus*, which means handsome and *superba* form the word superb clearly alluding to the beautiful flowers. The tuberous roots are useful in curing inflammations, ulcers, skin disease, leprosy, indigestion, helminthiasis, snake bites.

Tamil Nadu State Tree

Palmyrah (*Borassus flabelifer)* is capable of growing up to 30 m high. Palmyra Palms are economically useful, and widely cultivated in tropical regions.The leaves are used for thatching, mats, baskets, fans, hats, umbrellas, and as writing material. The riped fibrous outer layer of the palm fruits are also boiled/ heated in fire and eaten.

Links:	
National Biodiversity Authority	www.nbaindia.org/
Convention on Biodiversity	www.cbd.int/
Eastern Ghats	http://envis-eptri.ap.nic.in/
Western Ghats	www.westernghats.org/
Gulf of Mannar	http://www.gombrtrust.org/
Botanical Survey of India	www.envfor.nic.in/bsi/
Tamil Nadu Forest department	www.forests.tn.nic.in
Marine biodiversity	http://www.casmbenvis.nic.in/

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