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RESEARCH ARTICLE

DISTRIBUTION AND CONSERVATION OF ENDEMIC AND THREATENED PLANTS FROM TUTICORIN COAST, INDIA.

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Abstract

Documenting the list of endemic and threatened plants is important for prioritizing conservation efforts along Tuticorin coast. A study was conducted to compile the list of endemic and threatened plants enlisted in the IUCN Red list of Threatened Species for the Tuticorin coast. According to the present study there are 38 plants among which 8 are least concern, 8 “endangered”, 3 “vulnerable” and 18 endemic plants. Field observations showed that, endemic and threatened species were influenced by various factors like habit, habitat, climatic factor and poor germination. Many of these plant species require immediate attention for their conservation. This study also envisages recommendations for conserving the endemic and threatened plants, along the Tuticorin coast. These include effective protected area management, ex-situ conservation, community-based natural resources management and evaluation of other suspected “endangered” plants in Tuticorin. This paper thus holistically discusses the status, distribution and threats faced and the conservation implications at border regions of some of the endemic and threatened plants of the Tuticorin coast.

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Introduction:-

Biodiversity or Biological diversity refers to the wide variety of ecosystems and living organisms i.e. plants, animals, their habitats and their genes. Biodiversity is the foundation of life on the earth. In general biodiversity is a complex and balanced network of different species, which are mutually dependent on each other. Floral and faunal diversities are two major components of biodiversity which covers the variety and variability of species. Biodiversity hotspots are areas that support natural ecosystems that are largely intact and where native species and communities associated with these ecosystems are well represented. They are also areas with a high diversity of locally endemic species, which are species that are not found or are rarely found outside the hotspot. Emphasis was given mainly on the plants that are endemic to India and/or in the rare, endangered and threatened category according to IUCN (International Union for Conservation of nature and Natural Resources). A rare species is one with small population that is not presently endangered but is at risk, an endangered species is one, which is in danger of extinction throughout all or of a significant portion of its range and a threatened species is one, which is likely to become endangered in foreseeable future (Bryde, 1979; Smith 1980; Nayar and Sastry, 1990). These rare and threatened plants species has to be highlighted for their conservation. According to IUCN an endangered species is a population of organisms which is at risk of becoming extinct because it is either few in numbers. “Threatened species” is a related term, referring to a species likely to become endangered within the foreseeable future. The Species Survival Commission of the IUCN published information online about approximately 41,500 endangered

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species worldwide as the Red List of Threatened Species. In India the work on threatened plants was first published in 1980 by the Botanical survey of India (BSI). Jain and Sastry, 1980 published a small booklet entitled "Threatened plants of India". Later a comprehensive work on rare and threatened plants of India was also published by BSI in the form of a book in three volumes entitled "Red Data Book of Indian Plants" (Nayar and Sastry, 1987, 1988, 1990). And also there are references in the website: <http://www.iucnredlist.org>, or www.iucn.org. IUCN's important and detailed overview of the status of the Indian flora, with special studies of a number of key-areas of biodiversity in India and adjacent Countries has been presented by Davis et.al., (1994, 1995 and 1995a).

An endemic species, however, is the one that grows naturally only in a single geographic area, the size of which could be either narrow or relatively large. A species may be both rare and endemic if it lives in a narrow geographical area (Primack, 2006). The concept of endemism has a long history in biology, dating back to Candolle (1820). In 1882, Engler gave a preliminary idea of endemism and provided one of the first classifications of endemics according to their evolutionary age. This classification has been greatly extended and widely used by many botanists (Willis 1922; Cain 1944; Favarger and Contandriopoulos 1961; Stebbin and Major 1965; Hopper 1979). Early research on endemism pertained to vascular plants in temperate areas, for which several reviews have appeared in the past few decades (Prentice 1976; Krukeberg and Robinwitz 1985; Gentry 1986; Major 1988). In India, several authors used the term endemic in their flora while giving the distributional data of different taxa. Cooke (1958) in his 'Flora of Bombay Presidency' used the term endemic for several taxa. As far as endemic flowering plants of the Tamil Nadu are concerned, the detailed inventory has to be undertaken in the future; hence it has become necessary to assess the current position of endemic plants of the Tuticorin coastal environment of Tamil Nadu. The present study is also important due to the fact that endemism is one of the most important factors for determining the status of threatened plants. It is noted during the present study that anthropogenic activities are the main contributor in the unsustainable utilization of the plant natural resources growing in the area. The conservation and management of endemic and threatened species have become an important issue in the present study area. Therefore, in line with studies regarding the conservation status, it is an attempt to study the documentation and conservation assessment of rare, endemic and threatened species of the Tuticorin coastal environment.

Materials and Methods:-

The study area (Fig. 1) Vembar to Manapadu covering seven locations (S1, S2, S3, S4, S5, S6 and S7) of coastal villages of Tuticorin coastal was surveyed. Tuticorin coastal region was preliminary surveyed for its RET and endemic plant diversity during the period of 3 years (2013-2015). During this period regular field visits were made to survey and documentation RET & endemic plant of Tuticorin coastal environment. The field data such as distribution, number of individuals, habit and habitat was recorded and documented as photographs also. The collected specimens were identified by referring to various floras, monographs and literature like: Flora of the Presidency of Madras (Gamble and Fisher, 1915-1936), Flora of the Tamil Nadu Carnatic (Matthew, 1983), The flora of Tamil Nadu (Nair and Henry, 1983; Hentry *et al.*, 1987; 1989), The flora of Coimbatore (Chandrabose and Nair, 1988), The flora of the Gulf of Mannar (Daniel and Umamaheswari, 2001). The nomenclature and IUCN category of plant has been adapted and updated applying, IUCN red list website (www.iucnredlist.org; Nayar and. Sastry, 1987-1990; Nayar, 1996 and C.A.M.P report 1998). Extensive surveys of the study area were conducted to prepare a list of plant species occurring in different seasons.

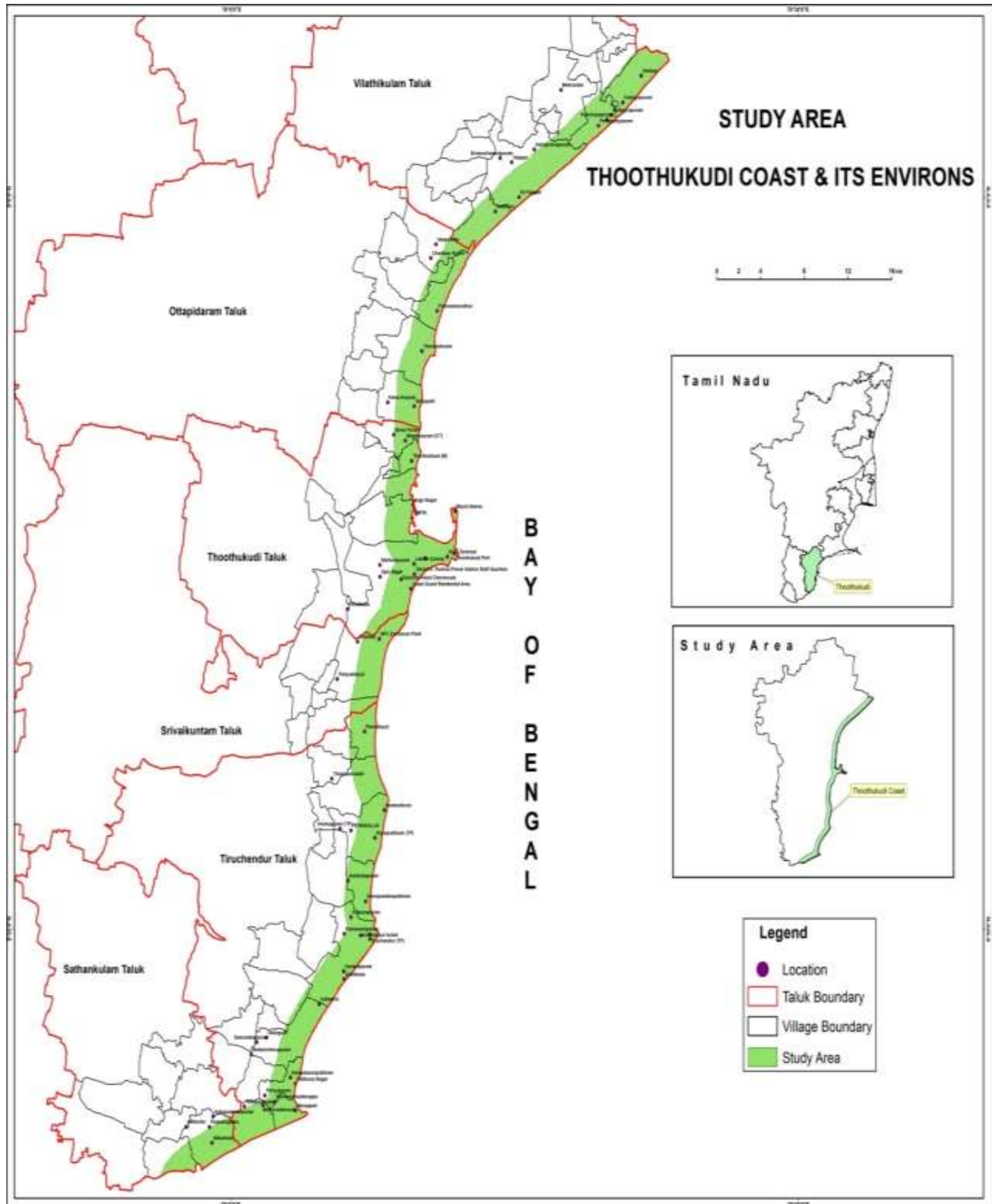


Fig.1:- Map showing on the study area.

Results and Discussion:-

A total of 38 species were recorded and their distribution with status of endemic and threatened species were tabulated (Table.1), among this, 18 species are endemic to Tuticorin coastal environment in Tamil Nadu. Many of them are restricted to small geographical area and facing high-risk of extinction. Only one endemic species have

already been declared as Threatened status. 6 endemic species are observed in only one locality. One endemic species fall into endangered category, are known from only one locality with limited number of individuals and they are on the verge of extinction. Similar studies on endemism in India and Western Ghats has been conducted by Chatterjee (1939), Blasco (1970), Jain & Sastry (1984), Ahemdulla & Nayar (1987), Nayar (1996), Nayar & Sastry (1987, 1988, 1990), Ramesh & Pascal (1997), Gopalan & Henry (2000), Mishra & Singh (2001), Joshi & Janarthanam (2004) and Irwin & Narasimhan (2011).

A total of 38 species belonging to 32 genera were collected and evaluated which include 3 vulnerable, 8 endangered and 8 least concern species (Table1). Among these 8 species are declared in IUCN Red List of Threatened Species of Version 2015.2 (www.iucnredlist.org.) and 12 species are declared in CAMP report-1988 (Table1). Based on the present study and information provided by the inhabitants of the area, the decline in population size and extent of occupancy of these species is a continuous practice. It is concluded that 25 species are suffering due to over exploitation, 7 species each are suffering due to fuel wood and habitat loss, 22 species are suffering from over grazing problems, and 11 species are suffering due to fodder collection species. Tuticorin coastal environment is naturally gifted with tremendous floral diversity, therefore, conservation and sustainable utilization of the endemic and threatened plants is mandatory. Certain factors are severely affecting plant natural resources and traditional knowledge associated with them. Haq (2011) carried out conservation studies of threatened plants in NandiarKhuwar catchment District Battagram, Pakistan. He opined that over exploitation, loss of habitat, invasive species and climate change are the main reasons of threatening these species. According to Haq (2011) and Major (1988) extensive grazing, deforestation, forest fragmentation and habitat loss are causing species extinction in the wild along with that timber use, fuel wood, fodder, medicinal uses, cutting, overgrazing, habitat loss and climatic factor are the main reasons for elimination of endemic and threatened plants. It has been concluded that the main reasons for reduction of population of these plants are over exploitation, fuel wood habitat loss, grazing, fodder etc. Similarly, the unsustainable utilization of plant natural resources, unscientific agricultural practices and terrace farming; these plant species are turning into threatened flora.

The coastal communities are completely dependent upon plants and rely upon plants and plants products for their livelihood and curing different ailments. Conservation of these precious plants and the local knowledge associated with them are extremely important for the future planning, sustainable utilization and exploitation of these species. It is important to carry out concrete steps for the conservation of this natural wealth and to protect the genetic erosion of the threatened plants growing in the coastal environment. Therefore, proper documentation, training of local inhabitants, controlling over exploitation, overgrazing, habitat loss and deforestation will be helping in conserving these resources. Further, *in-situ* conservation in the wild and *ex-situ* conservation in botanical gardens will help in conserving these threatened plants. For sustainability of such activities, legislation and monitoring will be of immense importance to conserve the endemic and threatened plants growing in the study area. Most of these endemic species are restricted to small biogeographically areas and are rare in occurrence; their populations have been declining rapidly due to habitat modifications and anthropogenic pressures.

Table 1:- Endemic and Threatened Plants of Tuticorin Coastal Environment. [kindly change in scientific name cps and space etc)

Sl. No	Name of the plants	S1	S2	S3	S4	S5	S6	S7	Endemic status	Threatened plants
1.	<i>Acrachne henrardiana</i> (Bor) S.M.Phillips	-	-	-	-	-	+	+	X(GM)	-
2.	<i>AELUROPUS LAGOPOIDES</i> (L.)THWAITES	-	+	+	-	-	-	-	-	EN(B1,2b)*
3.	<i>Arthrocnemum macrostachyum</i> (Moric.) K.Koch.	-	-	+	+	+	-	-	-	VU(A1ab)*
4.	<i>Avicennia marina</i> (Forssk.) Vierh.	+	+	+	+	+	+	+	-	LC**
5.	<i>Avicennia officinalis</i> L.	+	+	+	+	+	+	+	-	LC**
6.	<i>Chloris wightiana</i> Nees ex Steud.	-	-	-	-	-	+	+	X(GM)	-
7.	<i>CLERODENDRUM INERME</i> (L.) GAERTN	-	-	-	-	+	-	-	-	EN(B1,2c)*
8.	<i>Commiphora berryi</i> (Arn.) Engl.	-	-	-	-	+	+	-	X(PI)	-
9.	<i>Crotalaria globosa</i> Wight &Arn.	-	-	-	-	-	+	+	X(PI)	-

10.	<i>Cyanoti sarcotensis</i> R.S.Rao	-	-	-	-	-	+	+	X(PI)	LC**
11.	<i>Dalbergia horrida</i> (Dennst.) Mabb.	-	-	-	-	+	+	+	X(PI)	-
12.	<i>Derris trifoliata</i> Lour	-	-	-	-	+	-	-	-	EN(B1,2c)*
13.	<i>Dipcadimontanum</i> var. <i>madrasicum</i> (E.Barnes&C.E.C.Fisch.) Deb &S.Dasgupta	-	-	-	-	+	-	-	X(PI)	-
14.	<i>GLORIOSA SUPERBA</i> L.	+	+	-	-	-	+	-	-	LC **
15.	<i>Halophila beccarii</i> Asch.	-	-	-	-	+	-	+	-	VU(B2ab3c2,3)**
16.	<i>Halosarcia indica</i> (Willd.) Paul G.Wilson	-	+	+	+	-	-	-	-	VU(A1ab)*
17.	<i>Jatropha maheshwarii</i> Subram. &Nayar	-	+	-	-	-	+	-	X(TN)	-
18.	<i>Lepidagathis pungens</i> Nees	+	-	-	-	-	+	-	X(PI)	-
19.	<i>Lepidagathis spinosa</i> Wight ex Nees.	-	-	+	-	-	-	-	X(PI)	-
20.	<i>Leucas anandaraoana</i> Umam.Rao & P.Daniel	+	-	-	-	-	-	-	X(GM)	-
21.	<i>Leucas diffusa</i> Benth.	-	-	-	-	-	+	-	X(PI)	-
22.	<i>Manisuris myurus</i> L.	-	-	-	-	-	+	-	X(PI)	-
23.	<i>Melhania cannabina</i> Wight ex Mast.	-	-	-	-	-	+	-	X(PI)	-
24.	<i>PEMPHISACIDULA</i> J.R. FORST	-	-	-	+	+	-	-	-	LC**
25.	<i>Polycarpha diffusa</i> Wight ex Arn.	-	-	-	-	-	+	-	X(TN)	-
26.	<i>Rhizophora apiculata</i> Blume	-	-	-	-	+	-	-	-	LC **
27.	<i>Rhizophora mucronata</i> L.	-	-	-	-	+	-	-	-	LC **
28.	<i>Salicornia brachiata</i> Miq.	-	-	+	+	+	-	-	-	LC*
29.	<i>Salvadora persica</i> L.	-	-	-	-	+	-	-	-	EN***
30.	<i>Sesbania procumbens</i> (Roxb.)Wight &Arn.	-	-	-	-	+	+	-	X(PI)	-
31.	<i>Sesuvium portulacastrum</i> (L.) L.	-	+	+	+	+	-	-	-	EN(B1,2c)*
32.	<i>Sporobolus virginicus</i> (L.) Kunth	-	-	+	-	-	-	+	-	EN(B1,2c)*
33.	<i>Suaeda maritima</i> (L.) Dumort.	-	-	-	-	-	+	+	-	EN(B1,2bc)*
34.	<i>Suaeda monoica</i> Forsk. ex. J.F.Gmel	-	-	-	-	-	+	+	-	EN(B1,2abc)*
35.	<i>Suaeda nudiflora</i> (Willd.) Moq.	-	-	-	-	-	+	+	-	EN(B1,2ac)*
36.	<i>Tamarix indica</i> Willd.	-	-	-	+	-	-	-	-	EN(B1,2bcd)*
37.	<i>Tephrosia barberi</i> J.R.Drumm	-	-	-	+	+	+	+	X(PI)	-
38.	<i>THERIOPHONUMINFAUSTUM</i> N.E.BR CHANGE IN SMMAL LETTER	-	-	-	+	-	-	+	X(PI)	-

Note: X (GM) - Species endemic to Gulf of Mannar, X (TN) - Species to endemic to Tamil Nadu, X (PI) -Species to endemic to Peninsular India, EN- Endangered, VU-Vulnerable, CR-Critically Endangered, LC-Least Concern. * C.A.M.P.Report-1988 ** IUCN. The IUCN Red List of Threatened Species. Version 2015.2 www.iucnredlist.org *** Sulekha Joshi and S.K. Shringi.2014 – Observed in only one site.



Fig.2:- Threatened Plants of Tuticorin Coastal Environment

Conclusion:-

Tuticorin coastal environment is one of the most diverse floristic areas of Tamil Nadu with a mixture of both exotic and native species. Some of the threatened factors such as over-exploitation of natural resources and other anthropogenic activities adversely affect the existing ecosystem and it may lead to the rarity of many species in future. Most of these endemic species are restricted to small biogeographically areas and are rare in occurrence; their population has been declining rapidly due to habitat modifications and anthropogenic pressures. The species

that are endemic and at the same time threatened are thus important species from conservation point of view. Therefore, strict and priority measures are necessary for their effective conservation. Consequently the large scale cultivation of endemic and threatened species is necessary for their conservation. Such efforts would also lessen the pressure on these species in the natural habitats. Therefore, mass awareness creation among coastal communities is also the need of the hour. There is an urgent need for developing pragmatic conservation strategies for endemic and threatened plants in the Tuticorin coastal environment, which may lead to their effective protection.

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