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ECOLOGICAL SIGNIFICANCE AND HABITAT DISTRIBUTION OF EUPHORBIACEAE FAMILY IN POINT CALIMERE WILDLIFE SANCTUARY, TAMIL NADU

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Abstract

The Euphorbiaceae family is comprised of over 8000 species of flowering plants distributed worldwide, including woody trees, shrubs, cacti-like shrubs, and herbs. The family has great economic importance and has been utilized for medicinal purposes by local populations in various countries. The aim of this study was to document and enumerate Euphorbian plants in Point Calimere Wildlife and Bird Sanctuary in Tamil Nadu, India. A total of 15 genera and 29 species were recorded, with 24 species currently used in disease treatment. The study area was found to have 15 herbs, 12 shrubs, and 2 trees, and the common xerophytic species included Euphorbia antiquorum and Securinega leucopyrus. This study provides a key to identifying different genera in the Euphorbiaceae family. The study also reveals the loss of native plants due to the massive spreading of Prosopis chilensis and its impact on the tropical dry evergreen forest habitat in the area. The present study contributes to increased knowledge of biodiversity in a protected area that has important biological richness.

I. Introduction

Family Euphorbiaceae (spurge) is one of the largest families of flowering plants. According to Hutchinson this is the thirty fifth order of the phylum Angiospermae, the sub-phylum Dicotyledones and division Lignosae. The order consists of a single family, i.e., the Euphorbiaceae. Bentham and Hooker have included the Euphorbiaceae along with other eight families including Urticaceae and Casuarinaceae in their seventh series—the Unisexuales of class Dicotyledones. Engler and Prantl have included the family Euphorbiaceae along with another nineteen families, including, Linaceae, Rutaceae and Meliaceae in their twenty third order—the Geraniales of class Dicotyledoneae and sub-class Archichlamydeae. Euphorbiaceae is one of the complex diversified families of Angiosperms (Wurdack *et al*. 2004) with 334 genera (Webster, 1994) and over 8000 species in the world (Radcliff-Smith, 2001). The species are widely distributed in the tropical countries and occupy several types of vegetation

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and habitats (Albuquerque *et al*., 2014). The species of this family are often cited as pioneers and frequently occupy rocky outcrops, ruderal environments, disturbed areas, and forest and road edges (Lucena and Alves, 2010, Alves, 1999, Santos and Sales, 2009, Silva *et al*., 2010, Araújo *et al*., 2010).

The family Euphorbiaceae is characterized by the presence of milky latex, cyathium inflorescence and hypogynous, actinomorphic, unisexual flowers. It includes great variation in habits ranging from woody trees, shrubs, cacti like shrubs and herbs. The plants may be perennials or annuals. A number of plants of the spurge family are of considerable economic importance. In medicine, some species of Euphorbiaceae have proved effective against many diseases. The main objectives of this work were to do a detailed study of the taxonomic and medicinal aspects of the family Euphorbiaceae occurring in Point Calimere Wildlife and Bird Sanctuary, Tamil Nadu, India.

II. Materials and Methods

Point Calimere Wildlife and Bird Sanctuary (PCWBS) is a protected area in Tamil Nadu, South India along the Palk Strait where it meets the Bay of Bengal at Point Calimere. The windswept and thinly visited landscape of coastal plains, sand dunes (the highest of them 23 ft tall), tidal mud-flats and shallow seasonal ponds is captivating. Point Calimere is also the spectacular site of the second-largest congregation of migratory waterbirds in India, including rare and threatened species like the Spot-billed Pelican and Spoon-billed Sandpiper. The Point Calimere Wildlife Sanctuary is a compact spread—just 21.47 sq km of island formed by the Bay of Bengal, the Palk Strait and swampy backwaters at the southeastern tip of Nagapattinam district in Tamil Nadu. The two villages in the area of study, Kodikkadu in the north and Kodikkarai near angular extreme of Point Calimere are connected by road. It is observed that there are large water bodies along the coast from Kodikkarai to Muthupet.

The source of materials for this work was the extensive and intensive field collections of specimens made from the study area during the period from October 2005 and September 2008. For preparing an account of the different vegetation types and seasonal changes in vegetation, field trips were made thrice a month during the study period. Efforts were made to collect specimens with flowers, fruits as far as possible. A detailed survey was made to gather and document information regarding use of the plants as medicine. Usually, the survey in each locality started with the interview of elderly and experienced members. Information on nomenclature was taken from Gamble and Fischer (1915 -1936), Mathew (1981 – 1988) and Daniel and Umamaheswari (2001).

III. Results and Discussion

During the present field collection trips that the Point Calimere Wildlife and Bird Sanctuary recorded with abound in the members of Euphorbiaceae, to as many as 15 genera and 29 species. The genera *Phyllanthus* and *Euphorbia* were represented by six species. The most distinctive members in the study area are *Acalypha indica, Croton bonplandianus, Euphorbia hirta, Excoecaria agallocha, Securinega leucopyrus and Phyllanthus amarus.* The most representative genus are Tragia (1), *Securinega (1), Sauropus (1), Ricinus (1), Phyllanthus (6), Micrococca (1), Jatropha (3), Excoecaria (1), Euphorbia (6), Dryptes (1), Croton (1), Chrozophora (1), Breynia (1) and Acalypha (3).* Based on life forms classification, the present study observed 15 herbs, 12 shrubs and 2 trees in the study area. The following key showed the identification of genera.

1. Inflorescence - cyathium. Leaves caducous ….. *Euphorbia*
1. Inflorescence other than cyathium. Leaves not caducous
2. Branchlets ending in spines …. *Securinega*
2. Branchlets not ending in spines
3. Leaves 3-5 lobed, palminerved

4. Inflorescence raceme ….. *Jatropha*

4. Inflorescence spike ….. *Ricinus*

3. Leaves distinct, penninerved

5. Perianth biseriate. Stamens (10-20) many

6. Capsule warted …..*Croton*

6. Capsule not warted ….. *Chrozophora*

5. Perianth 1-seriate. Stamens limited, less than 10

7. Stamens - 8 ….. *Acalypha*

7. Stamens less than 8

8. Style connate ….. *Tragia*

8. Styles not united

9. Seeds arillate or carunculate

10. Perianth lobes 3 in male and female. Seeds arillate….. *Micrococca*

10. Perianth lobes 5 in male and 3 in female,

Seeds carunculate ….. *Sebastiania*

9. Seeds not arillate or carunculate

11. Perianth not turbinate, fruits not red

12. Leaves serrulate ….. *Dryptes* 12.

Leaves entire, not serrulate ….. *Phyllanthus*

11. Perianth turbinate, fruits red ….. *Breynia*

13. Mangrove shrub. Leaves elliptic obovate ….. *Excoecaria*

13. Non-mangrove herb. Leaves ovate-lanceolate... *Sauropus*

Topographically the Point Calimere is divided into three forest reaches, such as Coastal vegetation, Saline marshy vegetation and Tropical Dry Evergreen Forest. The vegetation varies with different habitats such as foreshore sandy, inland sandy, salt marsh, mangrove, sand dune and woody scrub jungles. *Phyllanthus amarus, Phyllanthus virgatus* and *Euphorbia rosea* are the hygroscopic herbaceous species which prefer the soil with mild moisture in and around the lake. Many species such as *Acalypha indica, Acalypha fruticosa Croton bonplandianus Euphorbia hirta Jatropha glandulifera Jatropha gossypifolia Phyllanthus amarus Phyllanthus maderaspatensis* and *Phyllanthus reticulatus* occur in different habitats. Mangroves are represented by *Excoecaria agallocha.* The study reported

Breynia vitis-idaea, is exclusively insular, based on the literature available in Flora of Gulf of

Mannar (Daniel and Umamaheshwari, 2001). *Sebastiania chamaelea, Micrococca mercurialis, Euphorbia thymifolia and Acalypha ciliata* are epimerals, which were more common in the rainy season, ENVIS Centre on Floral Diversity, hosted by Botanical Survey of India, Kolkata, West Bengal, listed *Jatropha tanjorensis* Ellis et Saroja under endemic plant to Tamil Nadu (http://bsienvis.nic.in/Database/E_3942.aspx),

The soil is deep and its exterior is sandy in general. Deposited alluvial and sporadic occurrence of boggy areas and quicksand are characteristic in saline habits. The presence of clay in the soil, the saline efflorescence at the surface favour the presence of halophytes and the upper reaches becomes the discontinuous grass lands. The dune is composed of fine sand, yellowish white in colour and the plant cover is rich. The dune is inhabited by evergreen vegetation and wherever the cover is removed, wind erodes the dune. The presence of luxurious

mangrove vegetation in the locality called Muniappan Lake on the western side of the road. On the halomorphic soils of the tidal inlets and creeks, almost a continuous herbaceous cover precedes the woody species. There appears quick growing *Excoecaria agallocha* is capable of forming a thick bush within 5 – 6 years. The soil in the railway tract area, near old light house, Theertharpallam and Light house is strongly calcareous. The soil contains high amount of calcium carbonate and calcium oxide. Humus and nutrient content are poor but water holding capacity is moderate. The plants grow in this calcareous soil exhibit a number of xerophytic characters. The xerophytic species such as *Euphorbia antiquorum, Euphorbia tortilis, Dryptes sepiaria* and *Securinega leucopyrus* are found common.

Majority of the ephemerals are flower towards the end of the rainy season, continuing until early winter eg. *Euphobia rosea*, *Acalypha ciliata, Euphorbia thymifolia, Phyllanthus virgatus, Micrococca mercurialis.* Summer flowering species such as *Jatropha gossypifolia, Securinega leucopyrus Breynia vitis-idaea* and *Chrozophora rottleri* are initiate flower buds in hot dry season (March and April). *Phyllanthus reticulates, Jatropha tanjorensis and Dryptes sepiaria* flowering initiated after the significant rain during the summer.

Euphorbiaceae produces variety of medicinally important secondary metabolites. Hence, many tropical species of Euphorbiaceae are used in traditional system of medicine to treat many diseases. In this study, 24 angiosperm plants species, which currently practiced ethnomedicinal value, are listed (Table 1). They are most often used to treat digestive disorders, skin diseases, inflammation and disorders of the respiratory system. *Excoecaria agallocha, Euphorbia tortilis, Euphorbia antiquorum* and *Croton bonplandianus* are used as purgative, which is in accordance with the earlier report stated that *Euphorbia* species are commonly have purgative and emetic effect (Hoang *et al*., 2008). The milky sap or latex of spurges is used to have a protective and defensive role in helping heal wounds. Numerous scientific records bring up to the use of *Euphorbia* to treat wounds and hemorrhages. The treatment of abscesses, blisters, burns and injuries were also recorded (Olounlade *et al*., 2017), similarly in the present study reveals *Euphorbia tirucalli, Acalypha indica* and *Breynia vitis-idaea* also have same properties. Most of the members are poisonous; it may be due to the presence of wide range of unusual secondary metabolite (Seigler, 1994). Melten *et al*. (2009) confirm that the production of secondary metabolites in leaves in response to insect/microbial attack. Many species in this family are not eaten by cattle. Zhang *et al*. (2000) reported manufacture of different lectins due to different environmental stress factors that occur in varying habitats. Lectins constitute part of a plant's defense system against herbivores (Van Damme, 2008). The people who dwell in Point Calimere jungles are presently called "Seenthil Valayars". These forest dwellers are depending on the forest for their livelihood. Anthropic areas usually provide several useful species, including many species of Euphorbiaceae (Santos *et al*., 2009; Voeks, 1996). These tribal people collect medicinal and economically important plants from the forest area. The massive spreading of *Prosopis chilensis* lead to the fragmentation of the tropical dry evergreen forest habitat of this area. So the invasion of this alien species should be prevented. The current overall biodiversity status of Point Calimere is under unprecedented pressure from various factors, especially from humans whose ever increasing numbers will need and demand more plant resources. Human interference should be regulated to conserve this productive ecosystem.

IV. Conclusion

This study found a representative richness of Euphorbiaceae that contributed to increased knowledge of the biodiversity of a protected area that has important biological richness in the Point Calimere Wildlife and Bird Sanctuary. Of the available Euphorbiaceae species, 76% are widely used for medicinal purpose, which indicates the importance of species of this family. This study focused on one botanical family of emphasis in the literature

and showed the possibility of uniting distinct research objectives by strengthening the relationship between botanical knowledge and traditional knowledge and enhancing the relationship between man and biodiversity.

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Phyllanthus reticulatus

Phyllanthua rotundifolius

Euphorbia antiquorum

Acalypha indica

Euphorbia hirta

Phyllanthus amarus

	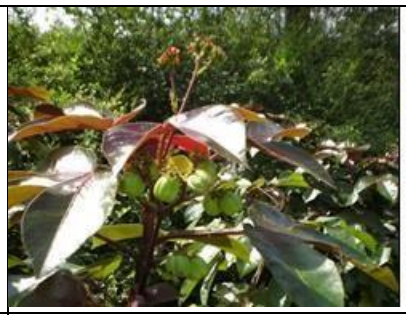	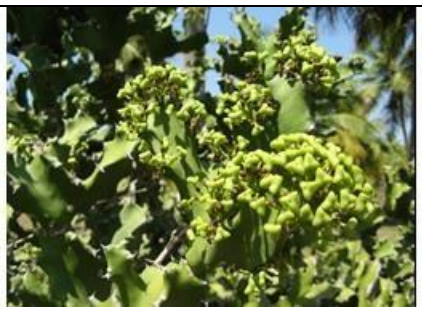	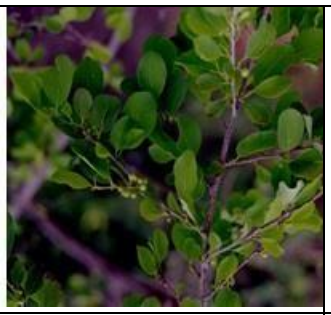	
Jatropha gossypifolia	***Euphorbia tortilis***			***Securinega leucopyrus***

Table 1: List of Euphorbias in Point Calimere Wildlife Sanctuary

Botanical Name	Habit	Medicinal use	Tamil Name	Distribution
Acalypha ciliata Forssk.	Herb	Plant used as vermifuge	-	Less common
Acalypha fruticosa Forssk.	Shrub	Leaves prescribed in digestive troubles and their infusion used as a vulnery. Leaf juice used in ophthalmia.	*Chinni*	Common
Acalypha indica L.	Herb	Plant used as laxative and vermifuge and for cutaneous affections.	Kuppaimeni	Common
Breynia vitis-idaea (Burm.f.) C.E	Shrub	Leaves applied as a poultice to hasten suppuration	Chempoola	Common along railway tracts.
Chrozophora rottleri (Geiseler) A.Juss	Herb	Seeds used as cathartic	**Purapirakkai**	Less common along railway tracts
Croton bonplandianus Baillon	Herb	Used as purgative	Railadipoondu, Mannennei chedi	Common
Dryptes sepiaria (Wight & Arn.) Pax & Hoffm.	Shrub	-	-	Common in scrub jungles
Euphorbia antiquorum L.	Small tree	Plant is considered as purgative and digestive	Chathurakkalli	Common in the scrub jungle.
Euphorbia hirta L.	Herb	Plant used as galactagogue, also used in colic and dysentry	Ammanpatcharisi	Common
Euphorbia rosea Retz.	Herb	Plant used as galactagogue and vermifuge.	Sivappu chitrapaladai	Common
Euphorbia thymifolia L.	Herb	Plant considered as stimulant, anthelmintic and laxative	Chinna Ammanpacharisi	Common in sandy soils.
Euphorbia tortilis Rottl. ex Ainslie,	Shrub	Plant is considered as purgative and digestive	Thirugukalli	Common in the scrub jungle.
Euphorbia tirucalli	Shrub	Useful in the application for warts	Tirukalli	Biofence in home garden
Excoecaria agallocha L.	Shrub	Roots used in swellings, bark emetic and purgative.	Thillai	Common in the marshy

				lands
Jatropha glandulifera Roxb.	Shrub	Flowers and leaves used in eczema.	Kattamanakku	Common
Jatropha gossypifolia L.	Shrub	Roots used in leprosy	Athalai	Common
Jatropha tanjorensis Ellis & Saroja	Shrub	-	Kattamanaku	Common as hedge plant
Micrococca mercurialis (L.) Benth.	Herb	-	Kunukkuth thukki	Common along railway tracts
Phyllanthus amarus Schum. & Thonn.	Herb	Plant used in stomach troubles, jaundice and in urinogenital diseases.	Kizkainelli.	Common
Phyllanthus emblica L.,	Tree	Fruits edible a rich source of vitamin C. Fruit sour, astringent, diuretic and laxative.	Nelli.	Home gardens

Phyllanthus maderaspatensis L.	Herb	Seeds laxative, diuretic and carminative.	Melkainelli.	Common.
Phyllanthus reticulatus Poiret	straggling shrub	Bark used in rheumatism, dysentry and venereal diseases.	Karumpoolathi	Common.
Phyllanthua rotundifolius Klein ex Willd	Herb	-	Thengaipoo	Common.
Phyllanthus virgatus G.Forst.,	Herb	Leaf juice in eye diseases and dysentery, itch and gonorrhea. Roots used in mammary abscess	Patarnelli	Common in Nandupallam tank borders
Ricinus communis L.,	Shrub	Seed oil is used in the manufacture of lubricants, soaps and also used as a laxative.	Amanakku	Cultivated.
Sauropus bacciformis (L.) Airy Shaw	Herb	-	-	Common in Ramarpadam
Sebastiania chamaelea (L.) Muell	Herb	Decoction of the plant given with ghee as a tonic and also applied in vertigo.	Pulamanakku	Common.
Securinega leucopyrus (Willd.) Muell	Shrub	Leaves used as analgesic, antipyretic and laxative.	Vellaipoolathi	Common in scrub jungles
Tragia involucrata L.	Herb	Roots useful in fever	Chenthatti	Less Common