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Checklist of plant diversity in Sulur Tank, Coimbatore district, Tamil Nadu: with a note on urbanization induced changes in the floral composition

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Abstract

The human civilization flourished near water bodies as they nurtured all the needs of mankind. The unscrupulous use of water bodies has led to loss of biodiversity and other ecological benefits. The present study was undertaken to record the changes in floral composition in and around Sulur small tank. 74 plant varieties representing 37 families with 66 dicotyledon species and 8 monocotyledon species were recorded during the study. *Prosophis juliflora*, *Parthenium hysterophorus* and *Eichhornia crassipes* were predominant invasive introduced species. Impact on the water bodies by urbanization is reflected by the change in floral structure of the region.

Key words: Flora, Crop pattern change, Sulur tank, River Noyyal, Sewage, wetlands.

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1. Introduction

Wetlands play an essential role in the regulation of river flow, mitigation of flood, filtering of pollutants and fertilizers and are critical for species conservation hence they are often described as "kidneys of the landscape" (Mitsch and Gosselink, 1986). Further they serve as primary resource for many local communities in supporting fishing, agriculture and other human activities like drinking, washing etc. Their service of ground water recharge and retention of diffused pollutants from the river basin combined with the positive effects on the fauna such as providing a specific habitat for fish and birds make these areas very important ecological zones. Recent works focus on reclamation of abandoned wetlands and how to provide high quality habitats in artificial wetlands for aquatic birds and animals through effective management techniques (Ma *et al*., 2010; Niu *et al*., 2013).

Sulur, a small town situated 18 km east of Coimbatore city has two ancient water tanks, constructed during the 9th century, meant for agriculture, irrigation and flood control. Both the wetlands are interconnected and a canal directly connects these water tanks with River Noyyal. Sulur is known for its betel leaves and anthropologists opine that betel leaf cultivation in this area had led to the human migration and settlement of expert planters in and around Sulur from various districts of Tamil Nadu as early as 1930. Development in urban and rural areas has been perceived as the primary cause for the loss of Wetlands. Urbanization and the resultant land use modification in the regions surrounding the tanks of Sulur town have induced a drastic succession process in the aquatic ecosystem (Anand and Gunasekaran, 2003; Pragatheesh and Jain, 2013). At present about 90% of Indian rivers and wetlands are under pressure from anthropogenic activities (Anand *et al.,* 2009).

The River Noyyal which once supported, one of the world's oldest trade centers and rich biodiversity as evident from literature, stands ruined by unprincipled discharge of human and municipal sewage. Nutrient enrichment, resultant of anthropogenic influence, has been a major cause of reduced biodiversity and changes in community structure and composition of wetlands worldwide (Keddy, 2000). Pollution of waterbodies by domestic and industrial waste waters has assumed global dimensions (Anand, 2010), which can be only monitored by change in floral structure and composition, as plants anchored to soil, lack choice to move to less polluted areas unlike land animals and fish.

Enumeration of floral diversity of Coimbatore began during the end of 17th century by Europeans. Later Indian researchers, contributed in documenting the plant diversity Shankaranarayanan and Gupta (1959) recorded the flora of Coimbatore, Sebastine (1959) studied flora of Marudamalai and Vellingiri hills, Subramanyam (1959) recorded plants of Bolambatty area which was followed by Viswanathan (1972). Chandra Bose and Nair (1988) also reported about the diversity of plants in Coimbatore region. Although all survey and documentation were from Coimbatore the floral wealth reported were restricted to the Western Ghats part of Coimbatore. Extensive literature search reveals that the studies on flora in the Sulur wetland systems have not been done. Studies on wetland vegetation community structure and the role of environmental change are fundamental towards sustainable utility of such aquatic ecosystems (Ruto *et al*., 2012). Also a better understanding of wetland benefits is required to prevent further loss and degradation and to support activities that assist in the recovery of their biodiversity and ecosystem functioning (Alexander and McInnes, 2012). Hence, we conducted a comprehensive study on the floral diversity and the changes in crop pattern in the region adjacent to Sulur small tank.

2. Materials and Methods

The study area Sulur small tank is situated on the southern bank of the River Noyyal at N 11° 02 947' Latitude and E 77° 12 228' Longitude. Terrestrial vegetation was studied for the full stretch of length (1100m) by the Belt transects and quadrat method following Curtis and Mcintosh (1950). Plants were identified using the Flora of Presidency of Madras (Gamble, 1915-1936). Scientific names were verified with Flora of Tamil Nadu (Nair and Henry, 1983; Henry *et al*., 1987; 1989). Micro flora from the water samples was done by visual identification (Vashishta *et al*., 2002). Information retrieval (IR) experiments and public opinion rated questionnaire (Kelly *et al.,* 2008) was used to collect data on plant diversity and crop pattern around Sulur small tank area.

3. Results and Discussion

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A survey was undertaken to enumerate plant diversity of the Sulur small tank (Figs. 1 and 2). Vegetation was scattered and comprised of herbs, shrubs and trees. A total of 74 plant species were recorded during the study i.e. 66 Dicotyledon species (34 families) and 8 Monocotyledon species (3 families). Dicotyledons (91.89 %) were dominant over the monocotyledon (8.11%) plants (Table -1).

Table 1: Plants recorded from Sulur small tank

S. No.	Botanical name	Family	Vernacular name	Habit
1	*Abutilon indicum var. guineense*	Malvaceae	Thuthi	Shrub
2	*Acacia nilotica sub sp. indica*	Mimosaceae	Karuvelam	Tree
3	*Achyranthes aspera var. aspera*	Amaranthaceae	Naaiuruvi	Herb
4	*Aerva persica*	Amaranthaceae	Perumpoonai	Shrub
5	*Ailanthus excelsa*	Simaroubaceae	Perumaram	Tree
6	*Albizia lebbeck*	Mimosaceae	Eayal vaagai	Tree
7	*Alternanthera sessilis*	Amaranthaceae	Ponnankanni	Herb
8	*Amaranthus vividis*	Amaranthaceae	Kuppaikeerai	Shrub
9	*Anisomeles indica*	Lamiaceae	-	Shrub
10	*Argemone mexicana*	Papaveraceae	Bramathndu	Herb
11	*Aristida hystrix*	Poaceae	-	Herb
12	*Arundo donax*	Poaceae	Mudaampul	Shrub
13	*Asystasia gangetica*	Acanthaceae	-	Herb
14	*Azadirachta indica*	Meliaceae	Vepamaram	Tree
15	*Azima tetracantha*	Salvadoraceae	Sangamul	Shrub
16	*Barleria buxifolia*	Acanthaceae	Sullimul	Herb
17	*Boerhavia diffusa*	Nyctaginaceae	Mookkeratai	Herb
18	*Borassus flabellifer*	Arecaceae	Panai	Tree
19	*Calotropis gigantea*	Asclepiadaceae	Yerukku	Shrub
20	*Capparis sepiaria*	Capparaceae	Karunsurai	Shrub
21	*Capparis zeylanica*	Capparaceae	Aathondai	Tree
22	*Cardiospermum halicacabum*	Sapindaceae	Mudakkatraan	Climber
23	*Carex baccans*	Cyperaceae	-	Herb
24	*Carica papaya*	Caricaceae	Pappali	Tree
25	*Cascabela thevetia*	Apocynaceae	Ponarali	Tree
26	*Cenchrus biflorus*	Poaceae	Kozhukkattai pul	Herb
27	*Cenchrus ciliaris*	Poaceae	-	Herb
28	*Chloris barbata*	Poaceae	Kodai pul	Herb
29	*Coccinia grandis*	Cucurbitaceae	Kovai	Climber
30	*Coculus hirsutus*	Menispermaceae	-	Climber
31	*Coldenia procumbens*	Boraginaceae	Seduppadai	Herb
32	*Croton bonplandianum*	Euphorbiaceae	Railpoondu	Herb
33	*Cynodon dactylon*	Poaceae	Arugu	Herb

34	*Datura metel*	Solanaceae	Oomathai	Herb
35	*Delonix regia*	Caesalpiniaceae	Patakathimaram	Tree
36	*Eichhornia crassipes*	Pontederiaceae	Agayathamarai	Herb
37	*Eupatorium repandum*	Asteraceae	Communistpachai	Herb
38	*Ficus benghalensis var. benghalensis*	Moraceae	Aalamaram	Tree
39	*Heliotropium curassavicum*	Boraginaceae	-	Herb
40	*Heliotropium supinum*	Boraginaceae	Theelkoduku	Shrub
41	*Hibiscus ovalifolius*	Malvaceae	Chinna sembbaruthi	Shrub
42	*Holoptelea integrifolia*	Ulmaceae	Aaiya	Tree
43	*Ipomea hederifolia*	Convolvulaceae	-	Climber
44	*Ipomeae aquatica*	Convolvulaceae	Sarkaraivalli	Herb
45	*Jatropha curcas*	Euphorbiaceae	Kaatuaamanakku	Shrub
46	*Jatropha glandulifera*	Euphorbiaceae	Aadalai	Shrub
47	*Leucaena latisiliqua*	Mimosaceae	Savundal	Tree
48	*Luffa cylindrica*	Cucurbitaceae	Mozhukupeerkal	Climber
49	*Morinda citrifolia*	Rubiaceae	Manjanandhi	Tree
50	*Mukia maderaspatana*	Cucurbitaceae	Musumusukkai	Climber
51	*Parthenium hysterophorus*	Asteraceae	Parthenium	Shrub
52	*Passiflora foetida*	Passifloraceae	Sirupoonaikaali	Climber
53	*Peltophorum pterocarpum*	Caesalpiniaceae	Vagai	Tree
54	*Pergularia daemia*	Asclepiadaceae	Veelipparuthi	Climber
55	*Peristrophe paniculata*	Acanthaceae	-	Herb
56	*Phyla nodiflora*	Verbenaceae	Poduthalai	Herb
57	*Pithecellobium dulce*	Mimosaceae	Kodukaapuli	Tree
58	*Plumbago zeylanica*	Plumbaginaceae	Chithirai moolam	Shrub
59	*Pongamia pinnata*	Papilionaceae	Pungam	Tree
60	*Prosopis juliflora*	Mimosaceae	Velikaruvai	Tree
61	*Pterolobium hexapetalum*	Caesalpiniaceae	Kaarandai	Shrub
62	*Ricinus communis*	Euphorbiaceae	Aamanakku	Shrub
63	*Samanaea saman*	Mimosaceae	Mazlhimaram	Tree
64	*Securinega virosa*	Euphorbiaceae	Poolankuchi	Herb
65	*Tamarindus indica*	Caesalpiniaceae	Puliya maram	Tree
66	*Tecoma stans*	Apocynaceae	Manjarali	Shrub
67	*Tephrosia purpureae*	Papilionaceae	Kollukaivelai	Herb
68	*Tinospora cordifolia*	Menispermaceae	Senthil	Climber
69	*Tragia involucrata var. involucrata*	Euphorbiaceae	Senthatti	Shrub
70	*Trianthema portulacastrum*	Aizoaceae	-	Herb
71	*Tribulus terrestris*	Zygophyllaceae	Nedunjhi	Herb
72	*Tridax procumbens*	Asteraceae	Vettukkaaiyapoondu	Herb
73	*Xanthium indicum*	Asteraceae	Marlumuttu	Shrub

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74	*Ziziphus mauritiana var mauritiana*	Rhamnaceae	Elanthai	Tree

Prosopis juliflora was abundant among trees and *Calotropis gigantea* dominant than other shrubs. *Ficus benghalensis, Pongamia pinnata, Tamarindus indica* and *Borassus flabellifer* were sparse along the banks. Decline in palm trees was evident by the absence of young trees which is a common feature in undisturbed environments. *Ricinus communis* and *Eupatorium repandum* were common shrubs around the tank. *Parthenium hysterophorus* was dominant among the herb species. Only two micro-floras in the form of alga *Scenedesmus* sp. of Coelestraceae and *Pithophora* sp. of Cladophoraceae were recorded from the water samples of the small tank.

Fig. 1: Sulur small Tank

Fig. 2: Group of Water Birds in Sulur Small Tank

Aquatic plants act as 'nutrient pumps' and 'nutrient dumps' and decrease the contamination by absorbing various nutrients from water and sediments and transferring it to the atmosphere. However, nutrient enrichment results in decreased plant diversity and shifts in community structure and composition (Rickey and Anderson 2004). The disappearance of native species for instance *Nymphaea nouchali, Nymphaea pubescens, Nymphaea rubra, Nelumbo nucifera* and *Pandanus odoratissimus* which previously had been the natural vegetation of River Noyyal, and its associated tanks may be the result of declining quality of water and soil. These human induced physico-chemical and hydrological factors favour the intrusion of alkaline resistant exotic weeds into freshwater ecosystem. Plants like *Parthenium hysterophorus* and *Eupatorium repandum* of Asteraceae, *Prosopis chilensis* of Mimosaceae were the major survivors on the bunds and around the tank. *Eichhornia crassipes,* notorious aquatic invader, was the major aquatic weed in the tank. Plants are the immediate real indicators of the environment impacts and hazards in a particular area. The presence and predominance of plants with xerophytic adaptations (*Acacia nilotica, Prosopis chilensis* and *Tribulus terrestris*) and milkweeds (*Calotropis gigantea*) could also be accounted for the high salinity of the soil and water. *Jatropha curcas* and *Jatropha glandulifera* of the Euphorbiaceae is the major hedge plants recorded. The only two medicinally important species found in the locality are *Plumbago zeylanica* and *Tinospora cordifolia.* Though some species disappear the overall vegetative cover would seem substantially higher due to the entry of non-native species. Human mediated alteration in nutrient status of wetland result in the displacement of native vegetation by fast growing invasive species (Green and Galatowitsch, 2002).

Farmers and cultivators ascertain that due to increasing urban activities around the tank most of the land under cultivation has been left abandoned. Respondents to the questionnaire were also concerned about the dominance of exotics over the native species. This region once had been the largest supplier of Betel leaf (*Piper betel*) to the south Indian market. Given the popularity of this region for the remunerative *farming* enterprise in the past, it is concerning that not even a single betel leaf plantation could be recorded in the vicinity during this study. The cultivation of other cash crop varieties like Cotton, Banana, Sugarcane, Turmeric and vegetables have also declined tremendously since 1970. Water intensive crop like Paddy cultivation has been completely wiped off from this area and are replaced by fodder

crops like Sorghum, Maize and naturalized invasive fuel tree *Prosophis juliflora.* Changes in biological community composition in response to nutrient enrichment can again result in physical and hydrologic changes to wetlands.

4. Conclusion

This study thus reveals the ground reality pathetic condition of once ecologically productive wetland. Based on the declining native plant community we consolidate that unless the human mediated changes are controlled the remaining water bodies would gradually turn into barren land in the near future. The results of this study would serve as base line for the restoration of the environment as well curb further deterioration of the ecosystem.

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