

Inventory of Wetland Plants of Select Freshwater Environs of Kanyakumari District, with Emphasis on their Indigenous use

Floristic studies were carried out for the period of two years (October 2014 and October 2016) in select ponds of Azhagapapuram village in Agastheeswaram taluk of Kanyakumari district, Tamil Nadu. A total of 65 angiosperm taxa belonging to 30 families, 53 genera, and 15 orders under 10 clades/groups were documented. The major clades were commelinids (23 species), lamiids (10 species) and monocots and asterids (7 species), Campanulids, Fabids and Malvids (5 species). Dominant families were Poaceae with 11 species followed by Cyperaceae (7), Fabaceae and Compositae (4 each), Convolvulaceae, Hydrocharitaceae and Amaranthaceae (3 each), Apocynaceae, Araceae, Commelinaceae, Nyctaginaceae, Onagraceae, Polygonaceae and Plantaginaceae were represented by 2 species each and the remaining 16 families by one taxon each. As regards morpho-ecologic characters, 32 taxa were found to be marshy and wetland plants, 16 emergent anchored hydrophytes, 7 floating anchored hydrophytes, 5 free floating hydrophytes and 5 submerged hydrophytes. Of the 65 taxa recorded 37 were found to have utility value. Most of the plants were recorded to have medicinal value, with 37 species being used in traditional system of medicine to treat over 55 ailments.

Key words: Wetland plants, *Nelumbo nucifera*, *Neptunia oleracea*, *Polygonum barbatum*.

Introduction

India has large variety of aquatic habitats due to geo-morphological, climatic, biotic and cultural diversities (Krishnasamy *et al.*, 2014). Aquatic flora is an important source for well functioning of wetland ecosystem, biological productivity and support for other organisms (Shah *et al.*, 2011). Jeppesen *et al.* (1998) and Mitchell and Perrow (1998) reported that aquatic diversity is considered as a key component for the freshwater ecosystem of shallow lakes and ponds, where they form an extensive and diverse littoral zone with numerous associated invertebrates, fish and birds .

Unfortunately, most of the wetlands and water bodies are under increasing threats as they are drying rapidly due to various anthropogenic pressures such as population explosion, transforming it into other land forms (paddy fields, human settlements and sites for developmental projects), and improper use of watersheds, which in turn greatly influence the aquatic biodiversity (Prasad *et al.*, 2002; Taft and Haig, 2005; Singh *et al.*, 2006; Chambers *et al.*, 2008; Rasingam, 2010; Ramachandra, 2010).

Studies on the aquatic and wetland vascular plants of India were done by Agharkar (1923), Biswas and Calder (1936); Bhadri *et al.* (1962); Subramanyam (1962); Deb (1976); Cook (1996); Maliya and Singh (2004); Singh (2006). Some workers have attempted the vegetation analysis of the banks of the river (Ambasht, 1968; Misra, 1944; Uma, 2015). Recently, Lohidas *et al.* (2015) made medico-botanical studies of angiosperms from Anantha Victoria Marthandavarma (AVM) canal

Out of 65 angiosperm taxa, documented in Azhagapapuram village of Kanya Kumari district, Tamil Nadu, 37 taxa were found to have utility value and being used in traditional system of medicine to treat over 55 ailments.

**G. JERLIN DELETTA, S. JEEVA¹,
V. MOHAN² AND B. PARTHIPAN**
*P.G. and Research Department of Botany,
S.T. Hindu College, Nagercoil,
Tamil Nadu, India.
E-mail: parthipillai64@gmail.com*

Received February, 2018
Accepted July, 2018

¹Department of Botany and Research Centre, Scott Christian College (Autonomous), Nagercoil, Tamil Nadu, India.

²Forest Protection Division, Institute of Forest Genetics and Tree Breeding, Coimbatore, Tamil Nadu, India

bank in Kanyakumari district, Tamil Nadu. Past studies revealed that researchers paid more attention to ethno-medicinal uses of the terrestrial plants. However, little attention has been paid to the systematic study on aquatic and wetland plants of Kanyakumari district, Tamil Nadu (Sukumaran and Raj, 2009; Meena *et al.*, 2010; Rekha *et al.*, 2010; Sukumaran *et al.*, 2010; Sukumaran and Jeeva, 2011). In view of this fact, the present study was carried out to document the wetland plant diversity and their indigenous uses of select ponds of Agastheeswaram taluk in Kanyakumari district, Tamil Nadu, India.

Material and Methods

Study area

The present study was carried out in select ponds of Agastheeswaram taluk of Kanyakumari district, Tamil Nadu, India. The district lies between 77°07'- 77°35' E, 08°05'- 08°35' N, and it occupies an area of about 1672 km². (Fig.1). It is blessed with 2633 fresh water ponds (Sathiya Geetha *et al.*, 2010). In Agastheeswaram taluk 183 ponds were located; it gets water mainly from rain and Kothaiyar river canals. These ponds are used for irrigation purposes for local people. It receives rainfall from both the south-west

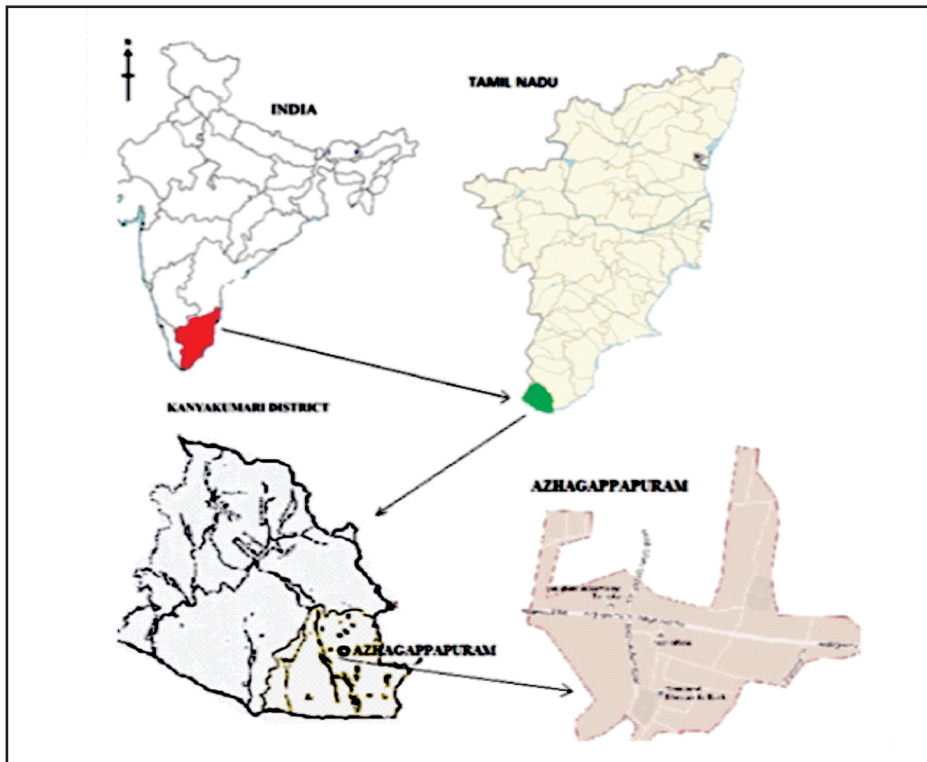


Fig. 1: Map showing the study area.

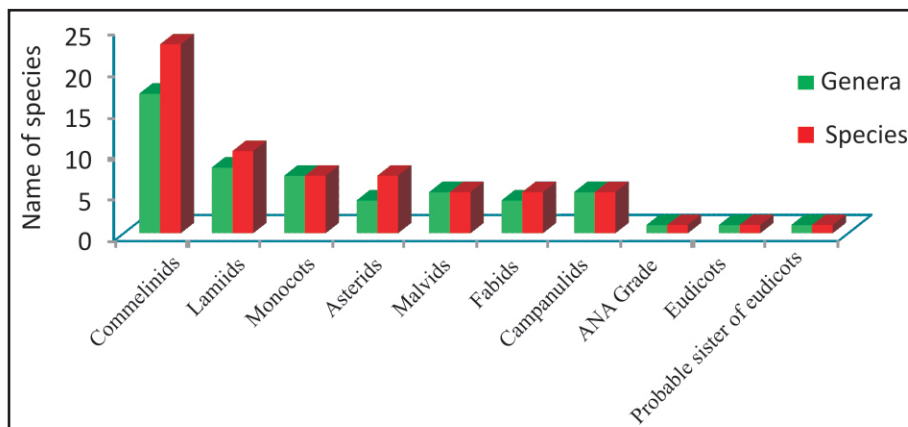


Fig. 2: Distribution species in clades/groups.

and the north-east monsoons. The south-west monsoon starts from June and ends in September months, while the north-east monsoon extends from October to mid – December months. Out of these 183 ponds, only 6 major ponds of Azhagapapuram village in Agastheeswaram taluk were selected for the present study area and details are given in Table 1.

Floristic survey

A systematic field survey of aquatic and wetland plants was conducted for the period of two years from

October, 2014 to October, 2016. The plant specimens were collected at various seasons and at different reproductive stages (flower either fruit or both) from their natural habitats. During the study period, interviews were conducted with local people, traditional health healers and elderly settlers near by the ponds for documenting indigenous knowledge and particularly for knowing local name of the plant species, indigenous medicinal uses of each plant species (Table 2).

The collected specimens are taxonomically identified

Table 1: Details of the study area in Agastheeswaram taluk, Kanyakumari district, Tamil Nadu.

S. No.	Name of the pond	Latitude	Longitude	Area of the pond (Ayacut in ha.)
1	Chenkulam	N8° 8.621'	E77° 34.498	102.21.5
2	Melakarunkulam	N8° 8.197'	E77° 33.095	80.94.0
3	Muthaliyarkulam	N8° 8.804'	E77° 34.104	60.70.0
4	Piranthenerikulam	N8° 9.057'	E77° 34.614	80.94.0
5	Valasoundarikulam	N8° 9.157'	E77° 33.582	64.74.5
6	Varioorputhukulam	N8° 8.422'	E77° 33.003	141.64.0

Table 2: List of wetland angiosperms from select ponds of Agastheeswaram taluk, Kanyakumari district, Tamil Nadu.

Class/ Clade /Order	Family / Species	Habit	Morpho- Ecologic Group	*STHCH No.	Tamil Name	Parts used	Indigenous uses
ANA GRADE							
Nymphaeales	Nymphaeaceae						
	<i>Nymphaea pubescens</i> Willd.	Herb	Floating anchored	4093	Vellambal	Roots and rhizome	Blood dysentery, menorrhagia, piles, and dyspepsia.
MONOCOTS							
Alismatales	Aponogetonaceae						
	<i>Aponogeton natans</i> (L.) Engl.&K.Krause	Herb	Floating anchored	4345	Kottu kizhangu	Seeds, shoot	Food supplement, stomach disorder and reviving digestive system. Young shoot is used as vegetable.
	Araceae						
	<i>Lemna gibba</i> L.	Herb	Free floating	4135			
	<i>Pistia stratiotes</i> L.	Herb	Free floating	4089	Akayathamarai	Whole plant	Goiter, Blood disorder and skin diseases,
	Hydrocharitaceae						
	<i>Hydrilla verticillata</i> (L.f.) Royle	Herb	Submerged	4502	Velampaasi	Whole plant	Abscess of maturity, used as aquarium plant
	<i>Ottelia alismoides</i> (L.) Pers.	Herb	Floating anchored	4016	Nirkkuliri	fruits	Edible
	<i>Vallisneria natans</i> (Lour.)H.Hara	Herb	Submerged	4070		Leaves	Salads. Stomach disorder and lecorrhoea.

Class/ Clade /Order	Family / Species	Habit	Morpho- Ecologic Group	*STHCH No.	Tamil Name	Parts used	Indigenous uses
Potamogetonaceae							
	<i>Potamogeton indicus</i> Roth ex Roem.& Schult.	Herb	Submerged	4353		Tubers	Gonorrhea.
COMMELINDS							
Commelinales	Commelinaceae						
	<i>Commelina</i> <i>benghalensis</i> L.	Herb	Marshy& wetland	4108	Kanangkozai	Leaves	Earache, leprosy and skin inflammations, rheumatic pain.
	<i>C. diffusa</i> Burm.f.	Herb	Marshy& wetland	4231	Kanamvaazhai	Leaves	Piles, urinary diseases, dysentery and fever, stop bleeding.
Pontederiaceae							
	<i>Eichhornia crassipes</i> (Mart.) Solms.	Herb	Free floating	4130	Kaisalai	Leaves	Green Manure, fodder, food for fish and duck
Poales	Cyperaceae						
	<i>Bulbostylis barbata</i> (Rottb.) C.B.Clarke	Herb	Marshy& wetland	4523			
	<i>Cyperus articulatus</i> L.	Herb	Emergent anchored	3966			
	<i>C. laevigatus</i> L.	Herb	Marshy& wetland	4517			
	<i>C. iria</i> L.	Herb	Marshy& wetland	3966			
	<i>C. exaltatus</i> Retz	Herb	Marshy& wetland	4474			
	<i>Eleocharis capitata</i> (L.) R.Br.	Herb	Emergent anchored	4354			
	<i>Kyllinga bulbosa</i> P.Beauv.	Herb	Emergent anchored	4516			
Eriocaulaceae							
	<i>Eriocaulon thwaitesii</i> Korn	Herb	Emergent anchored	4175			
Poaceae							
	<i>Chloris barbata</i> Sw.	Herb	Emergent anchored	3971	Kodaipul	Whole plant	Fodder.
	<i>Cynodon dactylon</i> (L.) Pers.	Herb	Emergent anchored	4001	Arugampul	Leaves	Fever, diarrhoea, Dysentery, Dropsy, Wounds, Catarrhalophthalmia, Haemorrhage, Menorrhagia, Piles, Epilepsy.
	<i>Dactyloctenium</i> <i>aegyptium</i> Willd.	Herb	Emergent anchored	4229			

Class/ Clade /Order	Family / Species	Habit	Morpho- Ecologic Group	*STHCH No.	Tamil Name	Parts used	Indigenous uses
	<i>Echinochloa colona</i> (L.) Link.	Herb	Marshy& wetland	4060			
	<i>E. stagnina</i> (Retz.) P.Beauv.	Herb	Marshy& wetland	4521			
	<i>E. crus - galli</i> (L.)P.Beauv.	Herb	Marshy& wetland	4529			
	<i>Eriochloa procera</i> (Retz.) C.E.Hubb.	Herb	Marshy& wetland	3956			
	<i>Panicum psilopodium</i> Trin.	Herb	Marshy& wetland	4378			
	<i>Paspalum distichum</i> L.	Herb	Marshy& wetland	4535			
	<i>Saccharum spontaneum</i> L.	Herb	Emergent anchored	3962	Pekkarimpu	Leaves	Asthma and cholera, making ropes fodder
	<i>Setaria intermedia</i> Roem.& Schult.	Herb	Marshy& wetland	4540			
Typhaceae							
	<i>Typha angustata</i> Bory&Chaub.	Herb	Marshy& wetland	4205	Sambu	Whole Plant	Making mats, ropes and baskets. Immature inflorescence is used as food
PROBABLE SISTER OF EUDICOTS							
Ceratophyllales	Ceratophyllaceae <i>Ceratophyllum demersum</i> L.	Herb	Submerged	4083	Kombuver	whole plant	Food for fishes and ducks, green manure, insect biting and as cooling agent, vomiting.
EUDICOTS							
Proteales	Nelumbonaceae <i>Nelumbo nucifera</i> Gaertn.	Herb	Free floating	4022	Ven thaamara	Whole plant	Hyperdipsia, cholera, diarrhoea, helminthiasis, vomiting and cardiac debility, cardiotoxic, fever, diseases of liver, piles and its edible.
FABIDS							
Fabales	Fabaceae						
	<i>Aeschynomene aspera</i> L.	Herb	Emergent anchored	4235	Attu netti	Leaves	Cough, cold and fever.
	<i>A. indica</i> L.	Herb	Emergent anchored	4256		Whole plant	Fever and impotency
	<i>Centrosema pubescens</i> Benth	Climber	Marshy& wetland	4182			
	<i>Neptunia oleracea</i> Lour.	Climber	Free floating	4344	Sundaikkirai	Whole plant	Syphilis, dipsia, burning sensation, diarrhoea, strangury and helminthiasis

Class/ Clade /Order	Family / Species	Habit	Morpho- Ecologic Group	*STHCH No.	Tamil Name	Parts used	Indigenous uses
	Polygalaceae						
	<i>Polygala arvensis</i> Willd.	Herb	Emergent anchored	4296			
MALVIDS							
Myrtales	Lytharaceae						
	<i>Triptera natans</i> L.	Herb	Floating anchored	4156	Pani shingori	Seeds and fruit	Seeds edible, burning sensation, dyspepsia
	Onagraceae						
	<i>Jussiaea repens</i> L.	Creeper	Floating anchored	4290		Leaves	Ulcers, skin diseases and coolant.
	<i>Ludwigia perennis</i> L.	Creeper	Emergent anchored	4025			
Malvales	Malvaceae						
	<i>Corchorus olitorius</i> L.	Herb	Marshy & wetland	4174			
	Muntingiaceae						
	<i>Muntingia calabura</i> L.	Tree	Marshy & wetland	4180			
ASTERIDS							
Caryophyllales	Amaranthaceae						
	<i>Alternanthera pungens</i> kunth	Creeper	Emergent anchored	4121			
	<i>A. sessilis</i> (L.) R.Br. ex DC.	Herb	Marshy & wetland	3977	Ponnamkanni keerai	Leaves	Rejuvenator, Night blindness, diarrhoea, Leprosy, Dyspepsia, Splenomegaly, Snakebite, Fever, Skin disease
	<i>Gomphrena celosioides</i> Mart.	Herb	Emergent anchored	3991			
	Nyctaginaceae						
	<i>Boerhavia diffusa</i> L.	Herb	Marshy & wetland	4062	Mukurathai	Whole plant	Kidney disorders
	<i>B. erecta</i> L.	Herb	Marshy & wetland	4527	Chemai mukurathai	Leaves	Asthma, jaundice, diarrhoea, painful urination, cough and cold
	Polygonaceae						
	<i>Polygonum barbatum</i> L.	Herb	Marshy & wetland	4058	Athalaree	Leaves	Ulcers, stomach ache, Diarrhoea and edible.
	<i>P. glabrum</i> Willd.	Herb	Marshy & wetland	3955			
LAMIIDS							
Boraginales	Boraginaceae						
	<i>Heliotropium indicum</i> L.	Herb	Marshy & wetland	4114	Theel kodukey	Whole plant	Scorpion sting, cataract, redness and conjunctivitis.
Gentianales	Apocynaceae						
	<i>Oxystelma esculentum</i> (L.f.) Sm.	Climber	Marshy & wetland	3957	Oosippalai	Roots	Jaundice, liver complaints and ulcer.

Class/ Clade /Order	Family / Species	Habit	Morpho- Ecologic Group	*STHCH No.	Tamil Name	Parts used	Indigenous uses
	<i>Pergularia daemia</i> (Forsk.) Chiov.	Climber	Marshy & wetland	4066	Vaeliparuthi	Leaves	Throat infection and asthma
	Rubiaceae						
	<i>Oldenlandia corymbosa</i> L.	Herb	Marshy & wetland	4004	Kattucayaver	Whole plant	Jaundice and stomach problem.
Lamiales	Lentibulariaceae						
	<i>Utricularia aurea</i> Lour.	Herb	Submerged	4081		Whole plant	Cure cuts and wounds and as green manure
	Plantaginaceae						
	<i>Bacopa monnieri</i> (L.) Wettst.	Creeper	Emergent anchored	4006	Nerbrahmi	Leaves and seeds	Epilepsy, asthma, ulcers, tumours, ascites, enlarged spleen, Indigestion, inflammations, leprosy and anaemia.
	<i>Limnophila heterophylla</i> (Roxb.) Benth	Herb	Emergent anchored	4334			
Solanales	Convolvulaceae						
	<i>Ipomoea carnea</i> Jacq	Shrub	Marshy & wetland	4092	Neyvelikkatta manakku	Leaves	Wounds, sprain, ulcer, mild purgative and blood purifier, reduce high blood pressure.
	<i>I. obscura</i> (L.) Ker Gawl.	Climber	Floating anchored	4161	Nallapachai	Leaves	Septic wounds to cure.
	<i>I. hederifolia</i> L.	Climber	Marshy & wetland	4436			
CAMPANULIDS							
Asterales	Compositae						
	<i>Eclipta prostrata</i> (L.) L.	Herb	Marshy & wetland	3954	Kaisalai	Leaves	Jaundice, skin disease of cattle, headache, bodypain.
	<i>Emilia sonchifolia</i> (L.) DC. ex. DC.	Herb	Marshy & wetland	4505	Muyalchevi	Whole plant	Asthma, reducing inflammation, wounds.
	<i>Cyanthillium cinereum</i> (L.) H.Rob.	Herb	Marshy & wetland	3984	Segadevi	Leaves	Dysentery, bronchial disorders, cuts and wounds
	<i>Synedrella nodiflora</i> (L.) Gaertn.	Herb	Marshy & wetland	3950	Mudiyap achai	Leaves	Rheumatism and laxative
	Meyanthaceae						
	<i>Nymphoides hydrophylla</i> (Lour.) Kuntze	Herb	Floating anchored	4109			
	*S.T. Hindu College Herbarium.						

with the help of various published monographs, taxonomic revisions and floras (Hooker, 1872-1897; Gamble and Fischer, 1915-1935; Henry and Nair, 1983-1989; Mathew, 1993; Mohanan and Henry, 1994; Santapau and Henry, 1994; Kabeer and Nair, 2009) and by using the field keys devised by Subramanyam (1962). Authentication of the identity of plant species were confirmed by specimens deposited in Botanical Survey of India, Southern Circle, Coimbatore, Tamil Nadu, Tropical Botanical Garden and Research Institute, Trivanduram, Kerala and Botany Department, Scott Christian College, Nagercoil, Tamil Nadu. Plants with their correct nomenclature and family name were followed by Angiosperm Phylogeny Group IV (APG IV) classification. It was followed to clarify the species and was verified with IPNI (International Plant Name Index). The voucher specimens were prepared as herbarium and they were deposited in the Herbarium, Department of Botany, S.T. Hindu College, Nagercoil, Kanyakumari district, Tamil Nadu.

Results

A total of 65 species and 53 genera belonging to 30 families, 15 orders and 10 clades/ groups were recorded during the present study from the ponds of

Azhagapapuram village, Agastheeswaram taluk, Kanuyakumari district (Table 2). Among these, dicots contributed 34 species belonging to 28 genera and 19 families under 10 orders. The major clades recorded in the present study were commelinids (23 species), lamiids (10 species) and monocots and asterids (7 species each), Campanulids, Fabids and Malvids (5 species) respectively. While monocots are represented by 30 species belonging to 24 genera and 10 families under 3 orders including Nymphaeales (Fig.3).

The wetland plants contribute 50% (32 species) for marshy plants, 25% (16 species) for emergent anchored hydrophytes, 11% (7 species) for floating anchored hydrophytes, 7% (5 species) for free floating hydrophytes and 7% (5 species) for submerged hydrophytes (Fig. 3). Based on the habitat of this wetland plant species, it was identified that herbs were dominating having (55 species), followed by climbers (6 species), creepers (4 species) and shrubs and trees (1 species) each (Fig.4).

Families with maximum number of species include Poaceae with 11 species, followed by the Cyperaceae family represented by 7 species, Fabaceae and Asteraceae (4 species each), Convolvulaceae,

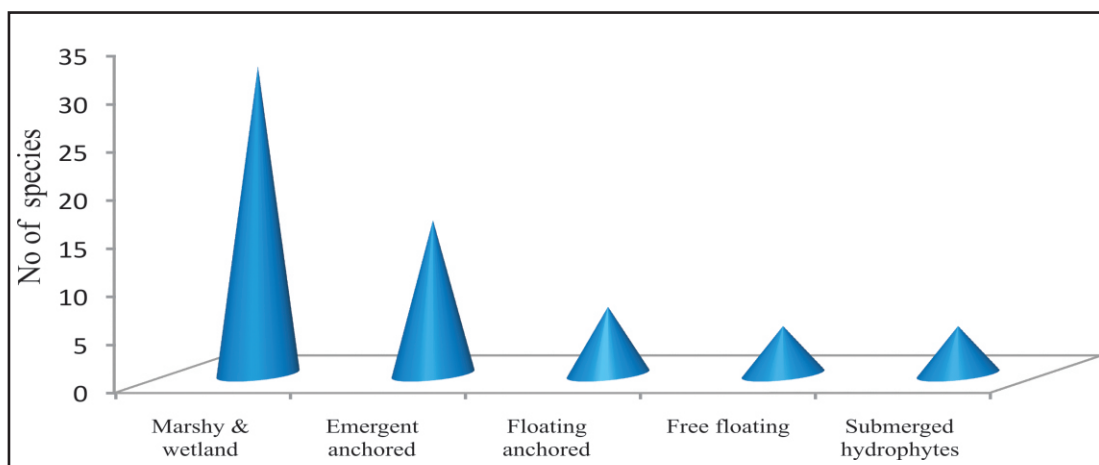


Fig. 3: Habitat wise distribution of plant species in the study area.

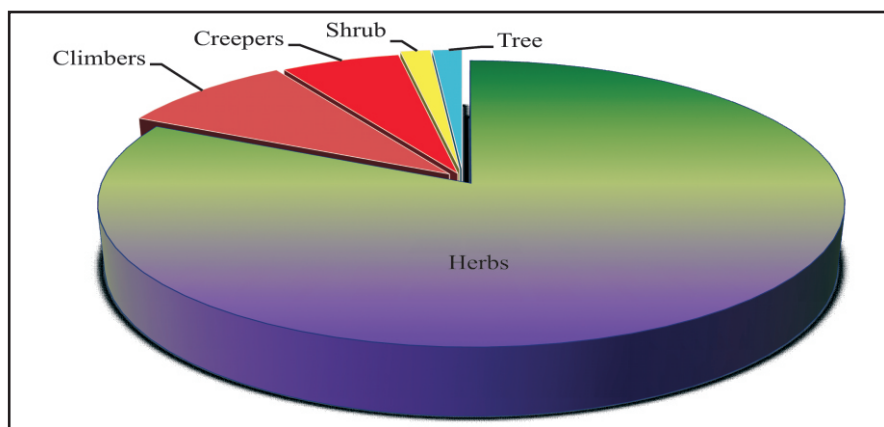


Fig. 4: Habit wise distribution of plant species in the study area.

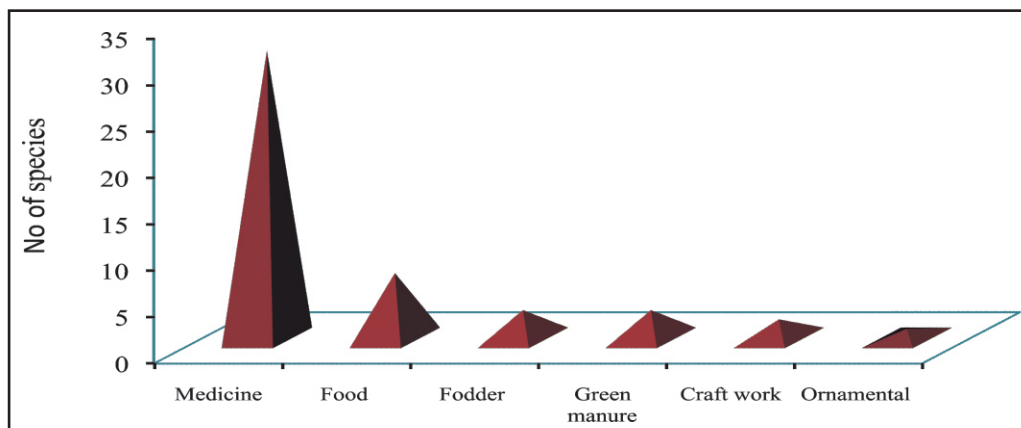


Fig. 5: Indigenous uses of plants collected in the study area.

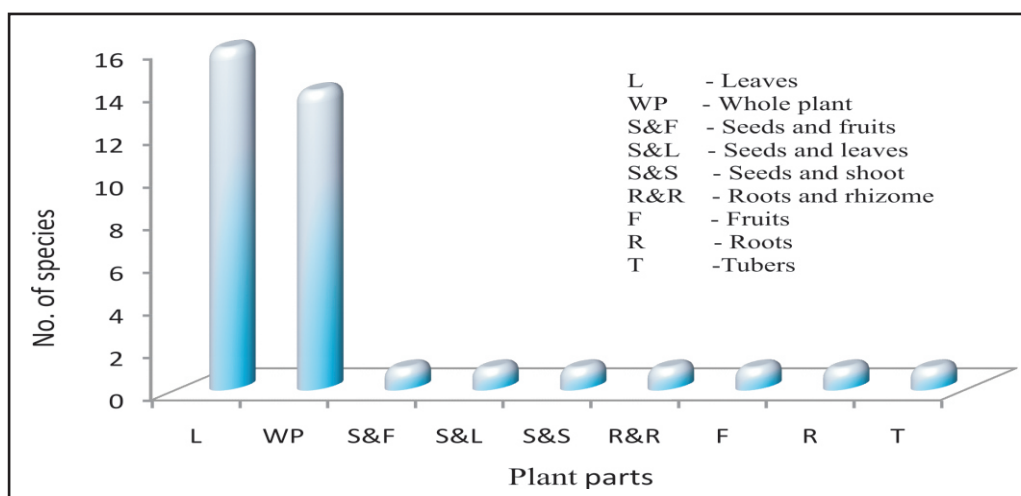


Fig. 6: Indigenous uses of plant parts in the study area

Amaranthaceae and Hydrocharitaceae (3 species each), Nyctaginaceae, Polygonaceae, Apocynaceae, Araceae, Plantaginaceae, Onagraceae and Commelinaceae (2 species each) while remaining 16 families namely, Aponogetaceae, Ceratophyllaceae, Boraginaceae, Eriocaulaceae, Malvaceae, Muntingiaceae, Menyanthaceae, Nelumbonaceae, Nymphaeaceae, Pontederiaceae, Polygalaceae, Potamogetinaceae, Lentibulariaceae, Lythraceae, Rubiaceae and Typhaceae were monospecific (Fig.7).

Of the total of 67 wetland plant species recorded, 39 species are used for medicinal purpose in traditional systems (Table 2). Indigenously used wetland plants were grouped in to medicine (31 species), food (7 species), fodder (3 species), green manure (3 species), graft work (2 species) and ornamental (1 species) (Fig.5). It was interesting to note that these medicinal plant species were used to cure some 55 diseases and ailments (Table 2). Among the most commonly used plant parts for medicinal purposes, the use of the leaves was most common (16 species), which is closely followed by the use of whole plant (14

species), the other plant parts used were fruits (1 species), roots (1 species), tubers (1 species), seeds/fruits (1 species), seeds/leaves (1 species), seeds/shoots (1 species) and roots/rhizome (1 species) (Table 2, Fig.6). The most common practice of the use of these wetland plants for indigenous medicinal purposes was to make paste, powder or to boil or eat raw.

Discussion

The aquatic and marshland vegetation of Kanyakumari district are quite rich because they are situated very near to the tropical equatorial line. The present study area recorded that dicots were dominant (34 species) over the monocots (30 species). Dominance of such dicots over the monocots in aquatic habitats has been emphasized by a number of earlier researchers. In the earlier work of Mishra (2015), dicots were (28 families) dominant over the monocots (14 families). Likewise, dicots were (24 families) dominant over the monocots (6 families) reported by Krishnasamy *et al.* (2014).

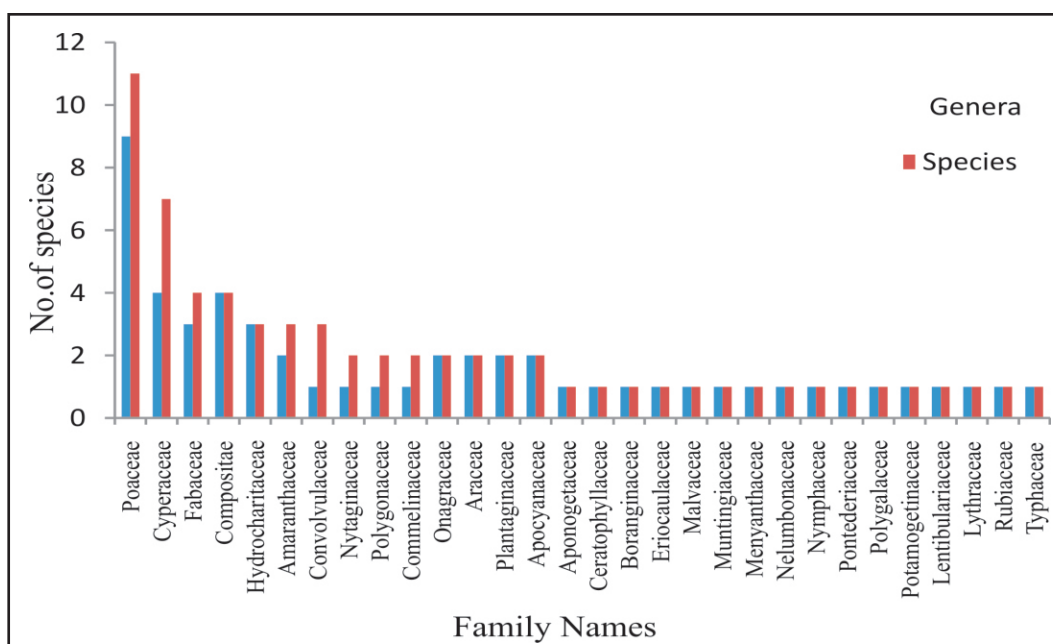


Fig. 7: List of families with number of genera and species.

The maximum species diversity of wetland 50% (32 species) and emergent amphibious hydrophytes 25% (16 species) was due to the availability of both mesic and hydric conditions in their habitats and several ecotone species. Further, this trend was supported by the fact that there is increase in species richness with decrease in water depth (Vander Valk and Davis, 1976; Handoo and Kaul, 1982).

The survey of wetland plants are especially used for the improvement and enhancing the understanding of indigenous knowledge systems (Panda, 2010). In the present study out of 37 wetland plant species, the leaves from 16 species showed high indigenous medicinal values than the other parts of the plants. It was evident in the earlier study of Johnsy *et al.* (2012) and in their studies indigenous medicinal uses are highly reported on leaves (19 species) as compared to other parts of the plants. However, leaves were found most frequently used by part of the local people (Jeeva and Femila, 2012; Jeyakumar *et al.*, 2014;). Generally, the people of the study area still have a strong belief in the efficacy and success of herbal medicine. The results of the present study show the evidence that wetland medicinal plants continue to play an important role in the healthcare system of this local people.

The wetland areas supply a wide variety of edible plants to local people for food and medicinal purposes. In the present study, 7 plant species were reported for used as a food. The edible wetland plants *viz.*, *Nelumbo nucifera*, *Neptunia oleracea* and *Polygonum barbatum* of the present study area are a good source of nutrients in local diets. Likewise, 21 wetland edible plants species were analysed for different nutritional parameters by Jain *et al.* (2011).

The plant species such as *Chloris barbata*, *Cynodon dactylon*, *Dactyloctenium aegyptium*, *Echinochloa colona*, *E. stagnina*, *E. crus-galli*, *Eriochloa procera*, *Panicum psilopodium*, *Pergularia daemia* and *Setaria intermedia* served as fodder grasses for poultry. These species were collected during the growing season, and also grazed by local cattle. Similarly, *Saccharum spontaneum* has been used to reduce the pressure for flood and also prevents soil erosion. *Cynodon dactylon* is used as fresh fodder in the present study area of the tribe Chlorideae. As it is evident in the present study, most grasses are used as fodder, similar uses of these grasses were already reported by Meena *et al.* (2010) and Sukumaran and Jeeva (2011).

Out of 65 plant species, 37 plant species are recorded for the purpose of their indigenous medicinal uses in the present study area and our results coincide with the earlier report of Meena *et al.* (2010) and they recorded that out of 50 wetland plant species, 31 plant species were used as herbal medicine.

In the present study area, 37 plant species are recorded for the purpose of their indigenous uses and they were used to cure 55 different ailments. The findings of our study coincide with the earlier report of Kavya and Jayanthi (2014) and they have reported from their survey that 50 medicinally important plants were found for curing more than 60 types of ailments. In the present study, the wetland plants *viz.*, *Ceratophyllum*, *Eichhornia* and *Potamogeton* are used as good manure for paddy fields, because they serve as indicators of a significant nutrient load. Similar trend was observed by Ahmed Shah and Vyas (2015) and they have reported that *Ceratophyllum demersum*, *Potamogeton crispus* and *Eichhornia crassipes* as

indicators of Eutrophic conditions in river Narmada at Hoshangabad District of Madhya Pradesh.

Twenty one medicinal plants recorded from the present study area are used to cure the common diseases like cough, inflammation, stomach disorders, wounds, fever, headache, Jaundice and skin diseases. The findings of our study coincide with Lohidas *et al.* (2015) and they have reported that 25 different medicinal plants are used to cure the common diseases.

The wetland plants such as *Ipomoea carnea*, *Pistia stratiotes*, and *Eichhornia crassipes* were collected from the study area indicated that a clear sign of invasion of alien species in the present study area and the same has been reported by Udayakumar and Ajithadoss (2010). Among different wetland plants recorded in the study area, *Ipomoea carnea* plant is occupied more in the peripheral part of the pond and it is useful for habitat of many birds too. This is in accordance with the findings already reported in floral diversity of Baanganga wetlands of Uttarakhand, India by Adhikari and Babu (2008).

Another wetland plant, *Nymphaea* species is one of the economically important plant species reported in the present study area. Since the leaves of this plant are used for packing flowers and the flowers have a spiritual importance, the local people are cultivating this plant in large scale in the present study area. Similar trend was already reported by Jain *et al.* (2011) and Ramarajan *et al.* (2015).

Aquatic ecosystems are threatened globally due to their widespread resources which are utilized for human use. The major problems of these ponds are that they are adjacent to building construction, where the people accumulate the garbage and household waste in to these wetlands. Overgrazing and other human activities pose great problems to these wetlands. Abdullah *et al.* (2009) and Jain *et al.* (2011) have suggested that climatic factors influence the distribution of different plant species in certain habitats. The main threat to aquatic ecosystem arises from the cultivation of surrounding land. It is due to the lack of awareness and knowledge regarding the value and importance of aquatic ecosystems among the local population. Hence, detailed knowledge concerning the floristic composition, ecology and environmental factors that influence vegetation type, provide a strong basis to research and helps in improvement of conservation and management practices related to the vegetation and biodiversity of aquatic ecosystem.

Another threatening factor for the wetland species is the use of different parts as medicinal value. There are many plant species and their useful parts are roots and tubers which are highly declining from their natural diversity due to continuous uprooting of the plant species for their medicinal uses (Uma and Parthipan, 2015). The threat to wetland plants are not only for

extensive extraction but also to the construction of ring-bands for fishing, siltation from the surrounding uplands due to overland flow, conversion of marginal wetlands into paddy fields, development projects and urbanization (Jain *et al.*, 2011).

In the present study area, the extent and quality of water bodies are decreasing, accelerating the process of ecological succession, as the terrestrial ecosystem quickly 'invades' the wetland ecosystem. This is not an entirely natural process but anthropogenic factors play a major role. This anthropogenic 'intervention' in the natural scheme of things is wreaking havoc on the water security of the region in the longer term, as wetlands are custodians of this scarce resource.

कन्याकुमारी जिले के चयनित अक्षर जल पर्यावरण के आर्द्र भूमि पादपों की, उनके देशी उपयोग पर जोर देने के साथ, सूची जी.जर्लिन डेलीट्टा, एस.जीवा, वी. मोहन एवं एवं प्रार्थिपन सारांश

कन्याकुमारी जिला, तमिलनाडू के अगस्थीस्वरम तालुक में अझागापापुरम गाँव के चयनित तालाबों में दो साल (अक्टूबर, 2014 और अक्टूबर, 2016) के दौरान पादपी अध्ययन किए गए। 10 क्लेडों/ समूहों के तहत 30 कुलों, 53 वंश और 15 गणों से संबंधित कुल 65 आवृतबीजी टैक्सा को प्रलेखित किया गया। प्रमुख क्लेड कॉमीलिनिड्स (23 प्रजाति), लेमिड्स (10 प्रजाति), और एक बीजपत्री एवं एस्टीरिड्स (7 प्रजाति), कैम्पेनूलिड, फेबिड एवं माल्विड (5 प्रजाति) थे। प्रधान कुल 11 प्रजातियों के साथ पोएसीया इसके बाद साइपीरेसीया (7), फेबेसिया एवं कम्पोजिता (प्रत्येक 4), कान्वोल्यूलेसीया, हाइड्रोकेरिटेसीया और अमरन्थेसीया (प्रत्येक 3) थे, एपोसीनेसीया, एरेसीया, कॉमीलिनेसीया, नीक्टैजिनेसीया, ओनेग्रेसीया, पॉलीगौनसीया और प्लान्टैजिनेसीया का प्रत्येक 2 प्रजातियों द्वारा प्रतिनिधित्व किया गया और शेष 16 कुलों का प्रत्येक एक टैक्सान द्वारा किया गया। आकारिकी-पारिस्थितिकी लक्षणों के संबंध में 32 टैक्सा दलदली एवं आर्द्रभूमि पादप, 16 आपातिक स्थिरक जलोद्भिद्, 7 चलायमान स्थिरक जलोद्भिद्, 5 मुक्त चलायमान जलोद्भिद्, और 5 जलमग्न जलोद्भिद् थे। अभिलिखित 65 टैक्सा में, 37 में उपयोगिता मान पाए गए। 55 से अधिक बीमारियों के उपचार के लिए औषध की पारम्परिक प्रणाली में प्रयोग की जा रही 37 प्रजातियों के साथ अधिकांश पादप औषधीय उपयोगिता के लिए अभिलिखित किए गए।

References

- Abdullah M.B., Sanusi S.S., Abdul S.D. and Sawa F.B.J. (2009). An assessment of the herbaceous species vegetation of Yankari Game Reserve, Bauchi, Nigeria. *American-Eurasian J. Agri. & Envir. Sciences*, 6: 20-25.
- Adhikar S.B and Babu M.M. (2008). Floral diversity of Baanganga Wetland, Uttarakhand, India. *Check List*, 4: 279-290.
- Agharkar S.P. (1923). The present position of our knowledge of the aquatic flora of India.
- Muslim A. S. and Vyas V. (2015). Assessment of macrophytic diversity in selected reaches of river Narmada at Hoshanabad district of Madhya Pradesh. *Inter. J. sci. Engi. and Technology Research*, 4(10): 3338-3344.

- Ambasht R.S. (1968). *Ecology of River Bank*. Proc. Symp. *Recent Advances in Ecobiological Research*. Varanasi: 455-470 pp.
- Bhadri B.B., Singh B. and Desai B.L. (1962). *Water Plants*. New Delhi.
- Biswas K. and Calder C.C. (1936). *Handbook of common Water and Marsh Plants of India and Burma*. New Delhi.
- Chambers P.A., Lacoul P., Murphy K.J. and Thomaz S.M. (2008). Global diversity of aquatic macrophytes in fresh water. *Hydrobiologia*, **595**(1): 9-26.
- Cook C.D.K. (1996). *Aquatic and wetland plants of India*, Oxford: Oxford University Press. 385 pp.
- Deb D.B. (1976). A study on the aquatic vascular plants of India. *Bulletin of the Botanical Society of Bengal*, **29**: 155-170.
- Gamble J.S. and Fischer C.E.C. (1915-1935). *Flora of the Presidency of Madras* (Vol. 1-3), London: Adlard and Sons Ltd. 1389 pp.
- Handoo J.K. and Kaul V. (1982). Phytosociological and crop studies in wetlands of Kashmir. In: *wetlands ecology and management*, (B. Gopal, R.E. Tomer, R.G. Wetzel, R.G. and D.F. Whigham eds.), International scientific publications, Jaipur: 187-195pp.
- Henry A.N. and Nair N.C. (1983-1989). *The Flora of Tamil Nadu* (3 vols.). Coimbatore: Botanical Survey of India. 613 pp.
- Hooker J.D. (1872-1897). *Flora of British India*. (Vol. 1-7), Ashford: Reeve and Company. 5568 pp.
- Jain A., Sundriyal M., Roshnibala S., Kotoky R., Kanjilal P.B., Singh H.B. and Sundariyal R.C. (2011). Dietary use and conservation concern of edible wetland plants at indo-Burma hotspot: A case study from northeast India. *J. Ethnobiology and Ethnomedicine*, **7**: 1-17.
- Jeeva S. and Femila V. (2012). Ethnobotanical investigation of Nadars in Atoor Village, Kanyakumari district, Tamilnadu, India. *Asian Pacific J. Tropical Biomedicine*, **1691**(12): S593-S600.
- Jeppesen E., Lauridsen T.L., Kairesalo T. and Perrow M.R. (1998). Impact of submerged macrophytes on fish-zooplankton interactions in lakes; 91-114 pp., In: *The structuring role of submerged macrophytes in Lakes* (E. Jeppesen, M. Sondergaard, M. Sondergaard and K. Christoffersen eds.) Ecological Studies 131. NewYork: Springer.
- Jeyakumar Jerome J., Kamaraj M., Durairaj P., Prema D. and Anburaja V. (2014). Ethnobotanical studies on Kallanai Thanjavur district. *Pelagia Research Library*, **4**(3): 5-8.
- Johnsy G., Davidson Sargunam S. and Kaviyaran V. (2012). Indigenous knowledge of medicinal plants used for the treatment of skin diseases by the Kanni tribe of Kanyakumari district. *Inter. J. Pharmacy and Pharmaceutical Sciences*, **4**: 309-313.
- Kabeer K.A.A. and Nair V.J. (2009). *Flora of Tamil Nadu-Grasses*. Coimbatore: Botanical Survey of India. 525 pp.
- Kavya A. And Jayanthi G. (2014). Survey of medicinal plants in the coastal areas of Kandallor Panchayat, Alappuzh district. *J. Scientific Transactions in Environment and Technovation*, **7**(3): 121-129.
- Krishnasamy J., Rajendran A. and Sarvalingam A. (2014). Ornamental aquatic and semi-aquatic plants in Coimbatore district. *Biolife*, **2**: 557-571.
- Lohidas J., Parthipan B. and Bency A. (2015). Medico-botanical studies of angiosperms from AVM canal bank in Kanyakumari district, Tamilnadu, India. *Plant archives*, **15**: 93-100.
- Maliya S.D. and Singh S.M. (2004). Diversity of aquatic and wetland macrophytes vegetation of Uttar Pradesh (India). *J. Economic and taxonomic Botany*, **28**: 935-975.
- Matthew K.M. (1993). The flora of Tamilnadu Carnatic. Vol. I-III. The Rapinat Herbarium, Tiruchirappalli, Tamilnadu, India.
- Meena R., Thirumal Thangam R. and Prabavathy H. (2010). Indigenous medicinal usages of some macrophytes of the wetlands in Agasteeswaram, Kanyakumari District, Tamil Nadu. *J. Basic and Applied Sciences*, **4**: 117-122.
- Mohanan M. and Henry A.N. (1994). *Flora of Thiruvananthapuram*, Trivandrum: Botanical Survey of India. 621 pp.
- Misra R. (1944). The Vegetation of Raighat Ravines. *J. Indian Botanical Society*, **23**: 113-121.
- Misra V.K. (2015). Successional pattern and plant species diversity in the aquatic and wetland habitats of north-central Uttar Pradesh, India. *Indian Forester*, **141**(1): 57-67.
- Mitchell S.F. and Perrow M.R. (1998). Interactions between grazing birds and macrophytes; 29-78 pp., In: *Ecology and management of the Aquatic vegetation of the Indian Subcontinent* (E. Gopal ed.). Dordrecht: Kluwer Academy publishers.
- Panda T. (2010). Preliminary study of Ethno-Medicinal plants used to cure different diseases in Coastal district of Orissa, India. *British J. Pharmacology and Toxicology*, **1**: 67-71.
- Prasad S.N., Ramachandra T.V., Ahalya N., Sengupta T., Kumar A., Tiwari A.K., Vijayan V.S. and Vijayan L. (2002). Conservation of wetlands of India - A review. *Tropical Ecology*, **43**: 173-186.
- Ramachandra T.V. (2010). Wetlands: need for appropriate strategies for conservation and sustainable management. *J. Basic and Applied Biology*, **4**(3): 1-17.
- Ramarajan S., Murugesan A.G. and Saravana Gandhi A. (2015). Biodiversity of aquatic macrophytes in Suchinthram Therore birds sanctuary, Kanyakumari District, Tamil Nadu, India. *Indian Forester*, **141**(10): 1046-1049.
- Rasingam L. (2010). Aquatic and wetland plants of Little Andaman Island, India. In: *Proceedings of the National Seminar on Conservation and Management of Wetlands in an Era of Climatic Change*; Organized by Department of Botany, N. M. Christian College, Marthandam, Kanyakumari, Tamil Nadu, India.
- Rekha T., Radha V., Berjini P.B., Jeba Juliet Joy D. and Sheeja B.D. (2010). Hydrophyte diversity of Kanyakulam wetlands ecosystem of Kanyakumari district, Tamil Nadu, India. In: *Proceedings of the National Seminar on Conservation and Management of Wetlands in an Era of Climatic Change*; Organized by Department of Botany, N. M. Christian College, Marthandam, Kanyakumari, Tamil Nadu, India.
- Santapau H. and Henry A.N. (1994). *A dictionary of the flowering plants in India*. New Delhi: CSIR, 198 pp.
- Sathiya Geetha V., Reginald Appavoo M. and Jeeva S. (2010). Ecological status of Vadasery wetland, Kanyakumari district, Tamil Nadu-India. *J. Basic and Applied Biology*, **4**(3): 69-85.

Shah J.P, Dabgar Y.B. and Jain B.K. (2011). Quantitative analysis of aquatic macrophytes in certain wetlands of Kachchh district. *Gujarat J. Pure and Applied Science* **19**: 11-13.

Singh A.K. (2006). A contribution to the aquatic and wetland flora of Varanasi. *J. Economic and Taxonomic Botany*, **30**:6-24.

Singh A.K., Panday R.K. and Singh S. (2006). Understanding wetlands. *Everyman's Science*, XLI: 116-119.

Subramanyam K. (1962). *Aquatic angiosperms*. Council of Scientific and Industrial Research, New Delhi.

Sukumaran S. and Raj A.D.S. (2009). Enumeration of aquatic and semi-aquatic angiosperms in sacred groves of Kanyakumari district, Southern Western Ghats. *J. Economic and Taxonomic Botany*, **33**: 26-31.

Sukumaran S. and Uma Devi and Kingston C. (2010). Wetland medicinal plants of Vilavancode Taluk, Kanyakumari, Tamil Nadu, India. In: *National Seminar on conservation and management of wetlands in an area of climate change* (Paul Raj K. Samuel P.D. and Jeeva, S. eds.). City: Publisher. 23pp.

Selvamony S. and Jeeva S. (2011). Angiosperm flora from wetlands of Kanyakumari district, Tamil Nadu, India. *Check List*, **7**: 486-495.

Taft O.W and Haig S.M. (2005). The value of agricultural wetlands as invertebrate resources for wintering shorebirds. *Agriculture, Ecosystems & Environment*, **110**: 249-256.

Udayakumar M. and Ajithadoss K. (2010). Angiosperms, Hydrophytes of five ephemeral lakes of Thirvallur district, Tamil Nadu, India, *Check List*, **6**: 270-274.

Uma R. and Parthipan R. (2015). Survey on medico-botanical climbers in Pazhayaru river bank of kanyakumari district, Tamil Nadu. *J. Medicinal Plants Studies*, **3**:33-36.

Uma R. (2015). *Angiosperm flora of Pazhayar river basin, Kanyakumari district, Tamil Nadu, India*, Ph.D. thesis, Manonmaniam Sundaranar University, Tirunelveli: 210pp

Vander Valk A.G and Davis C.B. (1976). Changes in the composition, structure and production of plant communities 412 along a perturbed wetlands coenocline. *Vegetatio*, **32**: 87-96.

Acknowledgements

The authors are highly thankful to the College Management, the Principal, S.T. Hindu College and the Principal, Scott Christian College, Nagercoil, Kanyakumari district, Tamil Nadu for granting permission and providing necessary facility to undertake this study.