Inventory On Floristic Diversity Of Thazhayadi Wetland In Arumanalloor Village, Thovalai Taluk, Kanyakumari District, Tamil Nadu, India

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ABSTRACT
An investigation on the floristic diversity of Thazhayadi wetland was conducted in Arumanallor village, Thovalai taluk, Kanyakumari district, Tamil Nadu, India. During 2022 and 2023, a comprehensive floristic survey and regular field visits were conducted. A total of 92 species from 83 genera and 40 families were observed during the field visits. According to the surveys, 32 belong to dicotyledons, and 8 belong to monocotyledons. Among the most dominant plant families were the Poaceae with 11 species, followed by Asteraceae, Euphorbiaceae and Amaranthaceae. Herbs are dominant in the study area. Most of the plants available in the study area are edible and economically important in the surrounding. It is therefore necessary to conduct periodic floristic surveys in order to monitor and preserve the floral diversity in freshwater ecosystems

INTRODUCTION

As one of the most productive ecosystems, freshwater ecosystems include ponds, lakes, springs, streams, rivers, and wetlands. These habitats contain a wide variety of moisture-loving, semi-aquatic, aquatic animals and plants, which make them a rich source of flora and fauna. (Gulia *et al*. 2017). Throughout the world, aquatic and wetlands plants are crucial for a sustainable life support system, but aquatic plants are very difficult to define precisely because aquatic habitats cannot be clearly distinguished from terrestrial habitats (Sculthorpe, 1967). Due to their heterogeneity in hydrology and soil conditions, wetlands support a variety of ecological niches and biodiversity (McCartney & Hera, 2004).

A wetland is defined as an area between terrestrial and aquatic ecosystems that appears along elevational and hydrological gradients (Bardley & Hauer, 2007). Wetlands provide a variety of ecosystem goods, including irrigation, fisheries, non-timber forest products, water supply, recreation, and carbon sequestration, flood control, groundwater recharge, nutrient removal, toxic retention, and biodiversity maintenance (Turner *et al*., 2000). The world's wetlands cover 6% of its land area (seven to eight million km^2) (Erwin, 2009). A wetland has unique ecological features that make them valuable to humanity in a variety of ways (Prasad *et al*., 2002).

Plants in and around freshwater ecosystems play an integral role in the growth and decline of the ecosystem. According to Cook (1996), aquatic plants are vascular plants whose photosynthetically active parts are permanently submerged or partially submerged in water for several months of the year. Approximately 7.5% of vascular aquatic plants more than 100 families are dicotyledonous and 11% are monocotyledonous worldwide (Raja *et al*., 2015). Globally, aquatic plants are abundant, and man's intensive use of natural water bodies has intensified their negative impacts in recent decades (Ramulu & Benarjee, 2016).

The total area of India's wetlands is approximately 7,57.06 hectares, which make up nearly 4.7% of the country's total geographical area. Of this, inland wetlands account for 69%, coastal wetlands for 27%, and other wetlands (smaller than 2.25 ha) for 4% (SAC, 2011). Approximately 8,84,240 hectares of wetlands cover Tamil Nadu, making it one of the states with the greatest number of wetlands. Inland natural wetlands (lakes, ponds, rivers) contribute 62%; coastal artificial wetlands contribute 65%; and inland artificial wetlands contribute 28% (Ravi *et al*., 2020) Kanyakumari district is the southern tip of Indian Peninsula with numerous waterbodies which habitats diverse lifeforms. There are two monsoons in Kanyakumari, a district with unique environment that supports a rich diversity of wetlands (Kiruba *et al*., 2010).

In various aspects, several workers have deliberated the different wetlands in Kanyakumari District (Ahila *et al*., 2010; Balasingh, 2010; Geetha *et al.*, 2010; Kiruba *et al*., 2010; Meena *et al*., 2010; Reginald, 2010; Sukumaran & Jeeva, 2011; Ramarajan *et al*., 2015; Deletta *et al*., 2018; Deletta & Parthipan, 2018). To gain a deeper understanding of

species richness and distribution in wetlands, botanical exploration is needed. Considering this, the present study is meant to explore and document the flora of Thazhayadi wetland Arumanallor village, Thovalai taluk, Kanyakumari district, Tamil Nadu, India.

STUDY AREA

As a flourishing district in Southern India, Kanyakumari is bordered by Tirunelveli district and Kerala state. The district itself is naturally bound by wetlands such as rivers, springs, streams, lakes, ponds etc. It is well known that the wetlands in this district contains a variety of native and exotic plants. In Kanyakumari district, there are 2633 freshwater ponds and over 55,000 hectares of irrigated land, which serve as sources of drinking water, irrigation, and provide habitat for a diverse range of plants and animals (Geetha *et al.*, 2010).

Thazhayadi wetland comes under Arumanalloor village and it is a small wetland of this village, which is used for irrigating nearby banana and paddy fields. Main source of water to this wetland is from nearby hillocks and the water inflow from Ananthanar Channel of Pechiparai and Perunchaani dam. This wetland and its environs were heavily infested with considerable percentage of aquatic macrophytes.

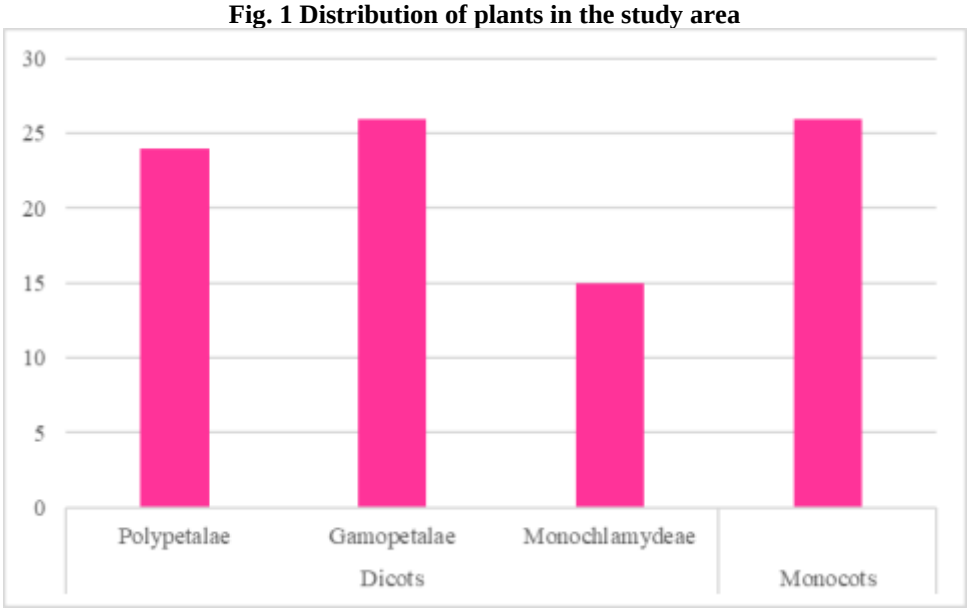
MATERIALS AND METHODS

Over the period 2022-2023, a systematic survey was conducted to determine the floral diversity at Thazhayadi wetland, which included field visits at short intervals to collect plants. Identification of vascular plants from the wetland was carried out by hand-picking the plant specimens, sorting and identifying them in the lab through literature, regional floras such as Flora of the Presidency of Madras (Gamble, 1915-1936), The Flora of Palni Hills, South India (Matthew, 1999), Flora of Tamilnadu Carnatic (Matthew, 1981 - 1983) and Flora of Tirunelveli Hills (Manickam *et al*, 2008), photographs and herbaria of Holy Cross College (Autonomous), Nagercoil. Author citation and binomial of collected species were verified with international plant names index (IPNI, 2022).

RESULTS AND DISCUSSION

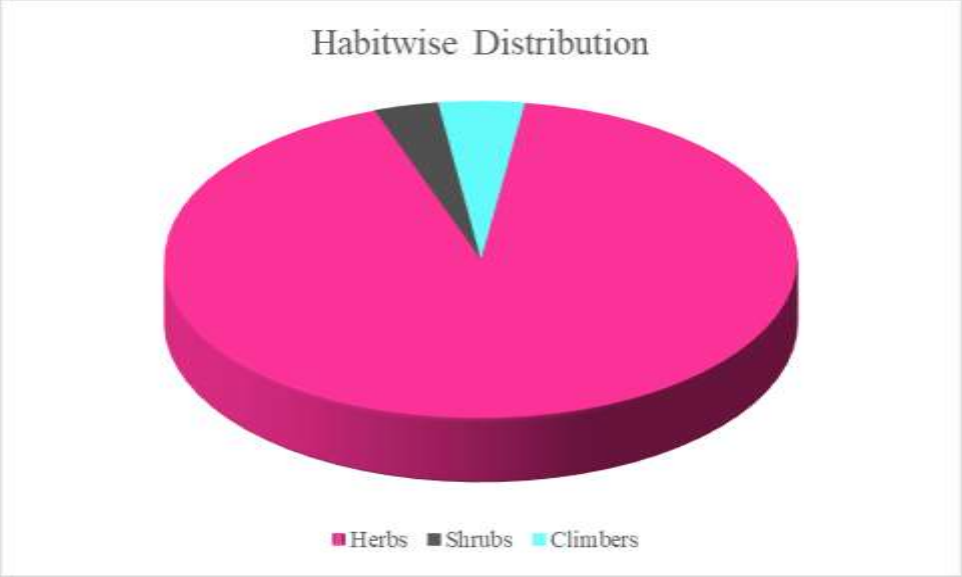
As a result of the survey, 91 species belonging to 83 genera and 40 families were identified. Dicotyledons account for about 32 of the 40 families, whereas monocotyledons account for 8 families of them.

Fig. 1 Distribution of plants in the study area



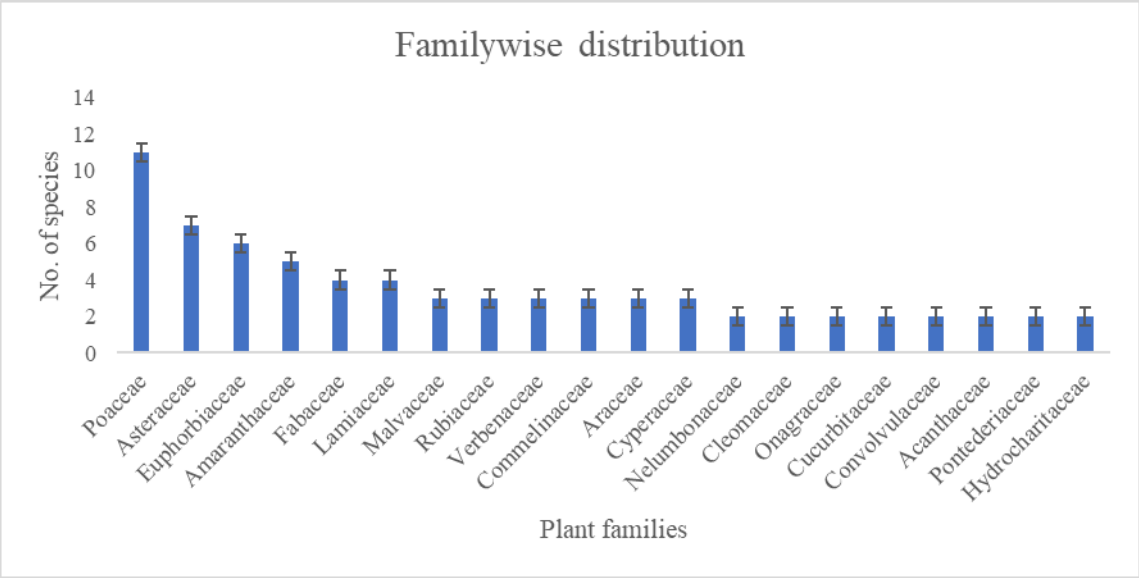
In between the series, Gamopetalae series comprises a greater number of species when compared to other series such as Polypetalae and Monochlamydeae.

Fig. 2 Habitwise distribution of plants in the study area



Nearly 92 % of the plants reported as herbs, followed by 3% climbers and 5% shrubs from the study area. With 11 plant species, Poaceae was the most dominant family, followed by Asteraceae (7), Euphorbiaceae (6), and Amaranthaceae (5). Previous findings of Lakshmanan & Gandhi (2018), Raja *et al*. (2015), Muthulingam *et al*. (2010), Gulia *et al*., (2017) has reported Poaceae as dominant family. About 20 plants were reported as single species each.

Fig. 3 Dominant families recorded in the study area



Such floristic inventories may help boost biodiversity as they reflect the structural and functional complexity of freshwater ecosystems (Sharma, 2008; Heywood, 1999; Webb *et al*., 2010 and Jayakumar *et al*., 2011))
Alternanthera sessilis (L.) R.Br. ex DC. *Amaranthus virdis* Hook. f., *Centella asiatica* (L.)Urban, *Eclipta alba* (L.) Hassk. and *Nelumbo nucifera* Gaertn. are some of the edible wetland plants providing nutritional benefits. Researchers from Madhya Pradesh have also reported that some wetlands plants can be used as food, such as *Amaranthus virdis* Hook., *Chenopodium album* L., *Echinochloa colona* (L.) Link. *Nelumbo nucifera* Gaertrn., *Spirodela polyrhiza* L. and *Trapa natans* var *bispinosa* (Jadhav, 2010, 2016). A majority of the dominant grasses in the pond were fed to cattle, while the leaves of *Nymphea lotus* L. and *Colocasia esculenta* (L.) Schoot were used to package flowers, fruits, fish, and meat, as well as mature stems of *Cyperus pangorei* Rottb.for mat making. Wetlands are not only food sources and breeding grounds for aquatic birds, but also host a wide variety of ecologically and economically valuable organisms.
As reported by Joshi (2018), submerged aquatic plants in ponds produce oxygen through photosynthesis, increase aquatic ecosystem productivity and so maintain ecosystem balance through the process of photosynthesis. *Ceratophyllum demursum* L., *Eichhornia crassipes* (Mart.)solms, *Hydrilla verticillata* (L.f.) Royle, *Lemna minor* L., *Pistia stratiotes* L. and *Vallisaneria spiralis* L, were some of the submerged aquatic plants distributed in the study area.

Table 1- Inventory of plants present in Thazhayadi wetland of Arumanallor village, Thovalai taluk, Kanyakumari district

DICOTS		
POLYPETALAE		
Ranales	Nymphaeaceae	*Nymphea lotus* L.
	Nelumbonaceae	*Nelumbium speciosum* Willd
		Nelumbo nucifera Gaertn.
Parietales	Cleomaceae	*Cleome gynandra* L.
		Cleome viscosa L.
Caryophyllinae	Portulacaceae	*Portulaca oleracea* L.
Malvales	Malvaceae	*Abutilon indicum* (Link)Sweet
		Sida acuta Burm.f.
		Sida cordifolia L.
Sapindales	Sapindaceae	*Cardiospermum halicacabum* L.
Rosales	Fabaceae	*Alysicarpus monilifer* (L) Dc.
		Crotolaria pallida Dryd.
		Desmodium heterophyllum (Wild.)DC.
		Tephrosia purpurea (L.) Pers.
	Mimosaceae	*Mimosa pudica* L.
	Caesalpiniaceae	*Sennna tora* (L.) Roxb.
Myrtales	Onagraceae	*Jussiea repens* L.
		Ludwigia perennis L.
Passiflorales	Passifloraceae	*Passiflora foetida* L.
	Cucurbitaceae	*Coccinia grandis* (L.)Voigh.
		Mukia maderaspatana (L.)M.Roem
Ficoidales	Aizoaceae	*Trianthema portulacastrum* L.
	Molluginaceae	*Mollugo pentaphylla* L.
Umbellales	Apiaceae	*Centella asiatica* (L.)Urban
GAMAOPETALAE		
Rubiales	Rubiaceae	*Oldenlandia corymbosa* L.
		Spermacoce hispida L.
		Spermacoce cymoides L.
Asterales	Asteraceae	*Ageratum conyzoides* L.
		Eclipta alba (L.) Hassk.
		Sphagneticola trilobata (L.)prsk
		Syndrella nodiflora (L)Gaertn
		Tridax procumbens L.
		Vernonia cinerea (L.) Less
		Xanthium indicum Koenig
Gentianales	Menyanthaceae	*Nymphoides cristata* (Lour)
Polemoniales	Convolvulaceae	*Ipomoea aquatica* Forssk.
		Ipomoea carnea Jacq.
	Solanaceae	*Solanum nigrum* L.
Incertae sedis	Plantaginaceae	*Limnophila heterophylla* (Roxb.)Benth.

	Linderniaceae	*Lindernia antipoda* (L.) Alston
Personales	Lentibulariaceae	*Urticularia stellaris* L.f.
	Acanthaceae	*Asystasia gangetica* (L.) T.
		Ruellia tuberosa L.
Lamiales	Verbenaceae	*Clerodendrum infortunatum* L.
		Lantana camera L.
		Stachytarpheta jamaicensis (L.) Vahl.
	Lamiaceae	*Anisomeles malabarica* (L.) R. Br.
		Hyptis suaveolens Poit.
		Leucas aspera (Willd).Link
		Ocimum tenuiflorum L.
MONOCHLAMYDEAE		
Curvembryeae	Nyctaginaceae	*Boerhavia diffusa* L
	Amaranthaceae	*Achyranthes aspera* L.
		Aerva lanata (L.) Juss. ex Schult.
		Alternanthera sessilis (L.) R.Br. ex DC.
		Amaranthus viridis L.
		Gomphrena decumbens Jacq.
	Polygonaceae	*Polygonum glabrum* Willd.
Unisexuales	Euphorbiaceae	*Acalypha indica* L.
		Euphorbia cyathophora Murray.
		Jatropha glandulifera Roxb.
		Phyllanthus amarus Schum & Thonn.
		Phyllanthus maderaspatensis L.
		Phyllanthus niruri Linn.
	Scorphulariaceae	*Scoparia dulcis* L.
Ordines anomali	Ceratophyllacaeae	*Ceratophyllum demersum* L.
MONOCOTS		
Coronarieae	Pontederiaceae	*Eichhornia crassipes* (Mart.)solms
		Monocharia vaginalis (Burm.f) Presl.
	Commelinaceae	*Commelina benghalensis* L.
		Commelina clavata C.B.Clarke
		Cyanotis cristata (L.) D. Don.
Nudiflorae	Pandanaceae	*Pandanus odoratissimus* L.f.
	Typhaceae	*Typha angustifolia* L.
	Araceae	*Colocasia esculenta* (L.)Schoot
		Lemna minor L.
		Pistia stratiotes L.
Apocarpae	Hydrocharitaceae	*Hydrilla verticillata* (Lf.)Royle
		Vallisneria spiralis L.
	Cyperaceae	*Cyperus articulatus* L.
		Cyperus pangorei Rottb.

		Kylinga bulbosa Beavu.
	Poaceae	*Apluda mutica* L.
		Brachiaria distachya (L.) Stapf.
		Chloris barbata Sw.
		Cynodon dactylon (L.)Pers.
		Dactyloctenium aegyptium (L.) Willd.
		Digitaria bicornis (Lam.) Roem. & Schult.
		Eleusine indica (L.)Gaertn
		Eragrostis tenella (L.) Beauv.
		Eriochloa procera (Retz.) CEHubb.
		Oryza perennis Moench
		Saccharum spontaneum L.

Humans rely on the resources in aquatic ecosystems for survival, which threatens their extinction. Mostly anthropogenic activities are responsible for the problems around the wetlands. Conservation of wetlands is necessary in rural areas to reduce the loss of these freshwater bodies as well as the depletion of native plant species for present and future generations.

CONCLUSION

People rely on wetlands for their livelihoods because they provide them with vital ecosystem services. The primary purpose of such wetlands was irrigation and domestic use, and their particular characteristic was maintaining high groundwater levels, Floristic inventories can be very useful for future ecological work, such as rehabilitation and conservation of aquatic ecosystem flora. Protecting such ecosystems is essential for the well-being of humans.

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