WET LAND FLORA OF PULICAT LAKE-SOUTHERN COASTAL WET LAND OF SPSR NELLORE DISTRICT OF ANDHRA PRADESH, INDIA

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Abstract— A mix of estuarine, marine and freshwater ecosystem is observed in Pulicat lake and the lagoon has a long history of sustainable fishing. Aquatic macrophytes are important in the functioning of the water body. They offer food and shelter for many organisms and promote habitat diversity. Wet land plant community wealth varies across the lake from northern to southern region. Low water levels and shore line alternations facilitate non-native plant species invasions that further degrade coastal wetland plant communities. Fish community composition is often related to plant community type and quality. The main aim of this work is to identify aquatic and wet land flora of Pulicat Lake. As a taxonomic floristic work, it will have value to ecologists, taxonomists, research scholars, students etc. A qualitative field study was carried out in the Pulicat Lake of Nellore district, during 2012-2014 to assess the diversity of aquatic macrophytes of the wetlands. A total of 180 species are found in the wetlands, of which 117 species are dicotyledonous plants, 51 species are of monocotyledonous plants and 12 are of mangroves.

Indes Terms : *Pulicat Lake, Fish community, Aquatic macrophytes,Field study, Wet Land Plants, Mangroves, Conservation.*

Introduction

Wet lands are one of the important natural resources and they are the most threatened of all the natural resources The wetlands exhibit rich floral diversity. Wetlands are the transitional zones between permanently aquatic and dry terrestrial ecosystems. Aquatic macrophytes are an important component of the aquatic ecosystems. The macrophytes influence the biomass production of water bodies and serve as indicators for monitoring the degree of damage to the ecosystems. Aquatic and wetland plants are mostly confined to the marshes and wetland habitats. These waterlogged or wet soils form the diverse habitats for specific aquatic plant communities, which in a broader sense are known as wetland. They are ecologically characterized by the presence of water i.e. fresh, brackish, saline or entropic; hydro soil; at least a few hydrophytic vegetation and also by the absence of flood intolerant vegetation. “Wetland” is the collective term for marshes, swamps, bogs and similar areas and is the source of many valuable aquatic flora and fauna and endangered species. Aquatic macrophytes are the important source of food, fodder, herbal medicine and domestic household materials for the people residing in its vicinities. Wetlands that provide benefits are of two categories- ecological and economical. In the ecological terms, wetland plants, both living and their debris are of significance in retaining the requisite carbon and methane balance of our environment and thus maintaining green house equilibrium. Therefore, wetland plants having floating or emergent leaves are considered to be an important tool in reducing global rise in temperature.

The present study aims to explore the we5land flora of the lagoon especially macrophytes of Pulicat Lake which helps to maintain the biodiversity of the lagoon. Pulicat Lake is the second largest in Indiaand unique for its magnificent biological diversity, ecological complexity and sustainability. Lagoons are highly productive and used for raising selected species of prawn and fish species. In general, coastal lagoons trap inorganic sediments and organic matter filters. The understanding of physical dynamics of a lagoon is important for planning and implementation of management strategies. Coastal lakes and lagoons are unique and different from estuaries, bay, tidal rivers and sea straits, thus require separate attention. They are important features of many coastlines and are among the world’s most productive marine environments (Odum, 1971).

MATERIALS AND METHODS:

Study Area :

Pulicat Lake derived its name from a vernacular name ‘Pala-

verkadu' means plants with many number of roots. Those plants are mangroves with aerial roots called Pneumatophores. The word mangrove is considered to be a combination of the Portuguese word "Mangue" and English Word "Grove". These are salt tolerant plants and are rich in this area and might be the reason for that name. The lake harbours rich and valued floristic wealth because of its varied ecological habitat viz., salt marshes, canals, mangroves, islands, low lying areas etc.

The lagoon's boundary limits range between 13.33° to 13.66° N and 80.23° to 80.25°E, with a dried part of the lagoon extending up to 14.0°N.; with about 84% of the lagoon in Andhra Pradesh and 16% in Tamil Nadu. The large spindle-shaped barrier island named Sriharikota separates the lake from the Bay of Bengal. The lake spreads over an area of about 620 km^2 are of numerous islands that lie in it. Out of the total area of the lake, about 360 km^2 in the southern part is active where as the rest of the lake are in its northern part is desiccated and now it appears more or less like a mudflat. It has 20 islands, the largest being Sriharikota island. The other large are Pernadu, Irrakam and Venadu.

Three major Rivers which feed the lagoon are Arani river, Kalangi river and Swarmukhi river. The Buckingham Canal, a navigation Channel is part of the lagoon on its western side.It is connected to the sea through three tidal inlets, one each at Tupilipalem, Rayadoruvu and Pulicat villages respectively, from north to south. The sea mouths are not simply a passage of water into lake but a biocorridor for survival of both aquatic fauna and avian fauna. The annual rain fall is 1200mm and temperature varies from 10^0C to 40^0C. Its soil varies from sandy, clayey to fine alluvial.

Methodology:

The study was carried out during 2012-2014. The specimen was brought to the laboratory and herbarium specimens were prepared by standard herbarium methodology and deposited in the department of Botany, N.B.K.R Research center, Vidyanagar. The plant species were identified with available literature of Suryanarayam.(1962), Gamble (1957), Suryanarayana and Rao (2002), Pullaiah et al. (1997), Banerjee et al (2002) and deposited herbaria at N.B.K.R Research center,Vidyanagar.

Results & Discussions

In the present study a total of 168 angiosperm species belonging to 121 genera and 56 families are documented from Pulicat Lake.

The dicotyledanous flora of Pulicat lake represent 117 species of 81 genera belongs to 41 families (Table :1A). List of dominant families shown in table 1B. Scrophulariaceae is the dominant family with 10 species followed by Asteraceae and Fabaceae. List of dominant genus shown in table 1C. Different life forms of aquatic macrophytes of dicots represent 110 emergent, 3 submerged, 1 rooted floating and 3 are attached floating types. 13 species are present in both post-monsoon and pre-monsoon while 104 are present in only post-monsoon.

Monocotyledanbous flora of Pulicat lake represent 51 species if 40 genera representing 15 families (Table : 2A). List of dominant families shown in (table :2B). Cyperaceae is the most dominant family with 11 species followed by Poaceae with 10 species and Commelinaceae with 8 species etc. Cyperus is the most dominant genus with 4 species and is shown in (Table:2C).Different life forms of aquatic macrophytes of monocots represent 38 emergent, 5 submerged, 5 rooted floating (Floating 1) and 3 attached floating (Floating 2).17 species of them are present in both post- monsoon and pre- monsoon while 34 are present in only post- monsoon.

Common macrophytic plant species like *Nymphea species., Lemna species., Azolla , Eichhornia, Pistia, Hydrilla sp., Ceratophyllum sp., Cyperus sp., Typha sp., and Meremmia,Lippia, Lippia sp., Phyla nodiflora, Oxalis, Hydrocotyl vulgaris* are identified in and around the lake. *Suaeda nudiflora, suaeda monoica and a few Macroptilum lathyroides* plants were found along the road side in Pulicat Lake reported by Basha and Rajyalakshmi (2012).

Submerged macrophytes improve water quality in shallow eutrophic lakes through various mechanisms (Scheffer et al., 1993). They also greatly increase the colonization area in lakes for bacteria, cyanobacteria, algae and invertebrates. Epiphytes compete with macrophytes mainly for light and carbon, sometimes also for nutrients. Rooted submerged macrophytes retrieve nutrients mainly from the sediment (Best and Mantai, 1978; Carignan and Kalff, 1980), although significant uptake can also occur via shoots under eutrophic conditions (Ozimek et al., 1993). Generally, however, nutrient uptake of epiphytes is faster than that of macrophytes (Pelton et al., 1998). Light is generally considered to be the major limiting factor for both submerged macrophytes and epiphytes.

VEGETATION OF PULICAT LAKE ISLANDS

Islands show aquatic vegetation in fresh water environments and in marine environments.

Vegetation of fresh water environments:

The vegetation of islands of pulicat lake shows two kinds of fresh water environments namely still water bodies and streams. *Saccharum spontaneum, Typha angustata* are the dominant species in shallow water. *Fimbristylis sps*., occupy the drier parts. The border of these still water bodies are occupied by *Alangium salvifolilum, Calamus rotang, Exoecaria agallocha, Vitex negundo* etc. These are densely covered by the handsome climbers like *Argyreia cymosa, Capparis zeylanica, Cayratia carnosa, Ipomoea violacea, Oxystelma esculentum* etc.

Along the water courses of streams *Barringtonia acutangula, Calophyllum inophyllum, Dolichandrone spathacea, Trema orientalis* etc. were noticed commonly. Along the moist edges *Aeschynomene indica, Cyperus javanicus, Sesbania sps., Saccharum spontaneum, Typha angustata* are very common. The drier parts of the streams are occupied by *Bacopa monnieri, Fimbryistyllis sps., Sauropus bacciformis etc. Ceratopteris thalictroides and Cyclosurus gongylodes* are very prominent in pure strands or with *Eichornea crassipes* while *Azolla pinnata* found floating and forms green cover in the marooned fields. Dense patches of *Arundo donax* are com-

mon along the fringes of doruvus.

Nelumbo nucifera and Nympaea sps.,are in association with *Nymphoides hydrophylla* render a beautiful sight to the doruvus. *Ceratophyllum demersum, Hydrilla verticillata, Najas minor* are the common submerged aquatics in doruvus. *Corchorus sps., Hydrocera triflora, Hydrolea zeylanica, Limnophyton obtusifollium, Melochia corchorifolia, Polygonum sps., Scirpus articulatus* etc., are the common amphibious species. *Centella asiatica* is conspicuous forming dense mats on the borders of these areas.

Symbiotic association of *Borassus flabellifer* with *Ficus* species is a common feature of these environs.

Vegetation of Saline water environments :

Ipomea pesr-carpae is the most common creeper found in these environs occasionally forming open mats. The areas often inundated by backwaters and are mostly occupied by halophytes like *Aeluropus lagopoides, Atriplex repens, Cressa cretica, Crotalaria retusa, Cyperus haspan, Fimbristylis ferruginea, Salichornia brachiata, Sesuvium portulacastrum, Suaeda species., etc. Halophila ovalis* popularly called the sea grass occurs prominently all along the margins of Buckingham canal.

Pulicat lake has its presence in five mandals of the district. Vakadu, Sullurupeta, Tada are three coastal mandals while Chittamoor and DV Satram are two non-coastal mandals associated with Pulicat Lake. Twenty two true mangroves were recorded in different estuaries and islands in AP. Present study reveals the presence of six species of mangroves of 5 genera belong to 5 families in the regions of pulicat lake. Mandal wise distribution of mangroves in the regions of pulicat lake is given in table:3. Mangroves are observed in three mandals namely Vakadu, Sullurpet and Tada. Mangroves are not reported in Chittamoor and Doravarisatram mandals.

MANGROVE ASSOCIATES

About 35 mangrove associated floral species belonging to 17 families were identified along the inundated and the adjacent regions of the study area by Basha and Rajyalakshmi 2014. A classified list of mangrove associates identified is presented in Table 4

Halophytes

Salt Marshy areas often inundated by backwaters and are mostly occupied by halophytes. They are: *Aeluropus lagopoides, Atriplex repens, Cressa cretica, Crotalaria retusa, Cyperus haspan, Fimbristylis ferrugenea, Salichornia brachiata, Sensuvium portulacastrum, Suaeda species*., etc. The halophytes like *Salcornia, Sensuvium and Suaeda* grow monospecifically in hypersaline areas around Venadu island. Herbs of *Suaeda nudiflora and Suaeda maritima* are widely distributed in the lake region observed in two different colours. Younger herbs are in green colour which turns to red when saturated with salt. These plants are used for reclamation of Saline soils as they can remove excess amounts of salt from the soil.

Psammophytes

The plants living in sand dunes are called Psammophytes which are naturally adapted to stress conditions and survive in experiencing salt spray, sand burial, low moisture content, high light intensity, wind exposure, soil salinity and nutrient deficiency. Psammophytes comprise vital components of CSD (Coastal Sand Dunes) habitats owing to their bioengineering role in sediment accumulation, sand binding and land building processes (Rodrigues, 2011). The typical sand dune vegetation can be studied under three zones viz., pioneer zone, midshore zone and the backshore zone. The pioneer zone is closest to the sea covered by herbaceous crawling plant species and the backshore zone is farthest mostly covered with trees while the middle zone has shrubs. These three zones together form a vegetation slope, which acts as a block to the movement of wind and sand (Desai, 1995*). Derris trifoliata, Ipomea pes-carpae , Launaea sarmentosa , Sessuvium portulacastrum, Pandanus fascucularis.* Etc.,are common pasammophytes of Pulicat lake.

PHYTOINDICATORS

The species with restricted distribution and those tolerating only narrow ranges of aquatic habitat conditions serve as useful indicators. *Typha angustata* is confined to the water of fresh water ponds, lakes, streams etc. Hence it serves as fresh water indicator in view of its complete absence the saline water environments or of its stunted growth in the brackish water. *Ficus hispida* is the marginal or emergent fresh water indicator as it grow exclusively all along the marginal parts of fresh water streams. *Heliotropium curassaricum, Saueda nudiflora, Saueda maritimam,Lumnitzera racemosa, Salvadora persica, Excoecaria agallocha and Arthronemum indicum* are totally absent in fresh water habitats. They are extensively found along the banks of pulicat lake and at or near salt marshes.

TABLE 1A List of Dicotyledonous Wetland Plants

S No	FAMILY	Scientific name	Status	Present/absent in seasons	
				Post monsoon	Pre monsoon
1	ACANTHACCEAE	*Hygrophila asiatica (Schum) Hamilt*	Emergent	+	-
		Cardanthera balsamica(L.f) Benth.ex C.B. Clarke.	Emergent	+	-
		Hygrophila ringens (L.) R. Br. ex Spreng.	Emergent	+	-
		Justicia glabra Koen.ex Roxb	Marginal	+	-
		Rungia repens (L) Nees	Marginal	+	-
2	AIZOACEAE	*Sesuvium portulacastrum*	Emergent	+	+
3	AMARANTHACEAE	*Alternanthera paronychioides A. St..Hill*	Emergent	+	-
		Alternanthera philoxeroides(Mart) Griseb	Emergent	+	-
		Alternanthera sessilis (l) R.Br	Emergent	+	-
		Celosia polygonoides Retz	Emergent	+	-
		Nothosaerva brachiata (L) Wight	Marginal	+	-
4	APIACEAE	*Centella asiatica(L) Urban*	Emergent	+	-
5	ASCLEPIADACEAE	*Oxystelma esculentum(L.f) R.Br*	Emergent	+	-
6	ASTERACEAE	*Eclipata prostrata(L) L*	Emergent	+	-
		Epaltes divaricata(L) Cass	Emergent	+	-
		Glossocardia bosavallea(L.f) DC	Emergent	+	-
		Gnaphalium indicum L	Emergent	+	-
		Grangea maderaspatensis (L) Poir	Emergent	+	-
		Spheranthus indicus L	Emergent	+	-
		Synedrella nodiflora Gaertn	Emergent	+	-
		Synedrella vialis (Less) A Gray	Emergent	+	-
		Wedelia chinensis (Osbeck) Merr	Emergent	+	-
7	BALSAMINACEAE	*Hydrocera triflora (L) Wight &Arn*	Emergent	+	-
		Impatiens leschenaultia (DC) Wall.ex Wight.&Arn	Emergent	+	-
8	BARRINGTONIACEAE	*Barringtonia acutangula(L) Gaertn*	Emergent	+	+
9	BEGONIACEAE	*Begonia malabarica Lam*	Emergent	+	-
10	BORAGINACEAE	*Heliotropium curassavicum L*	Emergent	+	-
		Heliotropium supinum L	Emergent	+	-
11	CAESALPINACEAE	*Cassia alata L*	Emergent	+	-

12	CERATOPHYLLACEAE	*Ceratophyllum demersum L*	Emergent	+	-
13	CLEOMACEAE	*Cleome chelidonii L.f*	Emergent	+	-
		Cleome feline L.f	Emergent	+	-
		Cleome monophylla L.f	Emergent	+	-
14	CHENOPODIACEAE	*Arthrocnemum indicum (Willd) Moq*	Emergent	+	-
		Atriplex repens Roth	Emergent	+	-
		Salicornia brachiata Roxb	Emergent	+	-
		Suaeda fruticosa Moq	Emergent	+	+
		Suaeda maritime (L) Dumort	Emergent	+	+
		Suaeda monoica Forssk. Ex Gamble	Emergent	+	+
		Suaeda nudiflora Moq	Emergent	+	+
15	GOLDENIACEAE	*Coldenia procumbens L*	Emergent	+	-
16	CONVOLVULACEAE	*Cressa cretica L*	Emergent	+	-
		Ipomaea aquatica Forssk	Emergent	+	-
		Ipomaea carnea Jacq	Emergent	+	
		Ipomea pes-capre (L.) R.Br	Emergent	+	-
		Merremia tridentata (L.) Hall. f.	Marginal	+	-
17	ELATINACEAE	*Bergia ammanoides Roxb.*	Emergent	+	-
18	EUPHORBIACEAE	*Sauropus bacciformis (L.) Airy Shaw*	Emergent	+	-
		Chozophora rottleri (Geiscler) A.Juss. ex Spreng	Emergent	+	-
		Excoecaria agallocha L.	Emergent	+	+
		Homonoia riparia Lour.	Emergent	+	+
		Phyllanthus fraternus G.L. Webster	Emergent	+	-
		Tragia plukenetii R. smith	Emergent	+	-
19	FABACEAE	*Aeschynomene aspera L.*	Emergent	+	-
		Aeschynomene indica L.	Emergent	+	+
		Crotalaria quinquefolia L.	Emergent	+	-
		Desmodium trifolium Wight & Arn.	Emergent	+	-
		Desmodium velutinum (Willd.) Dc.	Emergent	+	-
		Eleiotis sororia DC.	Emergent	+	-
		Macrotyloma ciliatum (Willd) Verdc	Emergent	+	-
		Psorelea corylifolia L.	Emergent	+	-
		Sesbania bispinosa (Jacq.) W.F. Wight.	Emergent	+	-
20	GENTIANACEAE	*Canscora decussate (roxb.) Schult.&Schult.f.*	Emergent	+	-
		Canscora diffusa (Vahl.) R.Br.	Emergent	+	-
		Enicostema axillare (Pori. Ex Lam.) A. Raynal	Emergent	+	-
21	HYDROPHYLLACEAE	*Hydrolea zeylanica L.*	Emergent	+	-
22	LAMIACEAE	*Geniosporium elongatum Benth./Syn.*	Emergent	+	-
		Pltostoma elongatum (Benth.) A.J.Paton			

		Geniosporium tenuiflorum (L.) Merr.Syn.Ocimum tenuiflorum L.	Emergent	+	-
		Leucas diffusa Benth.	Emergent	+	-
23	LENTIBULARIACEAE	*Utricularia exoleta R.Br.*	Submerged	+	-
		Utricularia stellaris L.f.	Submerged	+	-
24	LYTHRACEAE	*Ammannia baccifera L.*	Emergent	+	-
		Ammannia multiflora Roxb.	Emergent	+	-
		Rotala verticillaris L.	Emergent	+	-
25	MALVACEAE	*Hibiscus tiliaceus L.*	Emergent	+	+
		Pentapetes phoenicea L.	Emergent	+	-
		Thespesia populneoides (Roxb.) Kostel	Emergent	+	+
26	MELASTOMACEAE	*Osbeckia zeylanica L.f.*	Emergent	+	-
27	MENYANTHACEAE	*Nymphoides hydrophylla (Lour.) Kuntz.*	Floating 2	+	-
28	MIMOSACEAE	*Neptunia oleracea Lour.*	Floating 1	+	-
		Mimosa pudica L.	Emergent	+	-
29	MOLLUGINACEAE	*Glinus lotoides L.*	Emergent	+	-
		Gisekia pharnaceoidesL.	Emergent	+	-
		Mollugo pentaphyllaL.	Emergent	+	-
30	MYRSINACEAE	*Aegiceras corniculatum (L.) Blanco.*	Emergent	+	-
31	NELUMBONACEAE	*Nelumbo nucifera Gaertn*	Floating 2	+	-
32	ONAGRACEAE	*Ludwigia parviflora Roxb.*	Emergent	+	+
		Ludwigia adscendens (L.) Hara	Floating 2	+	-
33	OXALIDACEAE	*Biophytum sensitive DC*	Emergent	+	-
		Oxalis corniculata L.	Emergent	+	-
34	POLYGONACEAE	*Polygonum barbatum L.*	Emergent	+	-
		Polygonum glabrum Willd.	Emergent	+	-
		Polygonum plebeium R.Br.	Emergent	+	-
35	RUBIACEAE	*Hedyotis diffusa Willd.*	Emergent	+	-
		Knoxia sumatrensis (Retz.) DC.	Emergent	+	-
		Spermacoce hispida L.	Emergent	+	-
36	SCROPHULARIACEAE	*Bacopa monnieri (L.) Pennell*	Emergent	+	-
		Bacopa floribunda T.Cook	Emergent	+	-
		Centranthera tranquebarica (Spreng.)Merr.	Emergent	+	-
		Lindernia crustacean (L.) Muell.	Emergent	+	-
		Lindernia ciliate (Colsm)	Emergent	+	-
		Lindernia hyssopioides (L.)Haines	Emergent	+	-
		Lindernia oppositifolia (L.) Mukerjee	Emergent	+	-
		Lindernia heterophylla L.	Submerged	+	-
		Lindernia indica (L.) Druce	Emergent	+	-
		Stemodia viscosa Roxb.	Emergent	+	-

37	SPHENOCLEACEAE	*Sphenoclea zeylanica Gaertn.*	Emergent	+	-
38	STERCULIACEAE	*Melochia corchorifolia L.*	Emergent	+	-
39	TAMARSCIACEAE	*Tamarix gallica L.*	Emergent	+	+
40	TILIACEAE	*Corchorus aestuans L.*	Emergent	+	-
		Corchorus depressus L.	Emergent	+	-
		Corchorus olitorius L.	Emergent	+	-
		Triumfetta rhomboidea Jacq	Emergent	+	-
41	VERBENACEAE	*Phyla nodiflora L.*	Emergent	+	-
		Stachytarpheta jamaicensis(L.) Vahl	Emergent	+	-
		Vitex negundo L.	Emergent	+	-

TABLE-1B List of Dominant Families of Dicots

Name of the Family	No. of Species
SCROPHULARIACEAE	10
FABACEAE	9
ASTERACEAE	9
CHENOPODIACEAE	7
EUPHORBIACEAE	6
CONVOLVULACEAE	5
AMARANTHACEAE	5
ACANTHACCEAE	5
TILIACEAE	4
LAMIACEAE	4
VERBENACEAE	3
RUBIACEAE	3
POLYGONACEAE	3
MOLLUGINACEAE	3
MALVACEAE	3
LYTHRACEAE	3
GENTIANACEAE	3
CLEOMACEAE	3
OXALIDACEAE	2
ONAGRACEAE	2
MIMOSACEAE	2
LENTIBULARIACEAE	2
BORAGINACEAE	2
BALSAMINACEAE	2

TABLE-1C List of Dominant Genera of Dicots	
Name of Genus	No of Species
Lindernia	6
Suaeda	4
Polygonum	3
Ipomaea	3
Hygrophyla	3
Corchorus	3
Cleome	3
Alternanthera	3
Utricularia	2
Synedrella	2
Ludwigia	2
Heliotropium	2
Geniosporium	2
Eclipata	2
Desmodium	2
Canscora	2
Bacopa	2
Ammannia	2
Aeschynomene	2

TABLE -2A List of Aquatic Plants of Monocots					
S.No	Family	Scientific name	Status	Present/absent in seasons	
				Post monsoon	Pre monsoon
1	APONOGETONACEAE	*Aponogeton natans(L) Engler*	Floating 2	+	-
2	ARECACEAE	*Calamus rotang (L*	Emergent	+	+
3	ARACEAE	*Colocasia esculenta (L) Schott*	Emergent	+	+
		Pistia stratiotes (L)	Floating 1	+	-
		Oxystelma esculentum(L.f) R.Br	Emergent	+	-
4	CANNACEAE	*Canna indica (L)*	Emergent	+	+
5	COMMELINACEAE	*Commelina benghalensis L*	Emergent	+	-
		Commelina attenuate Koen. Ex Vahl	Emergent	+	-
		Commelina diffusa Burm.f	Emergent	+	-
		Cyanotis axillaris Roem.&Sch/	Emergent	+	-

		Amischopacelus axillaris Rao & Kamm.	Emergent	+	-
		Cyanotis arachnoidea Clarke	Emergent	+	-
		**Mrdannia nudiflorum (L) Brenan*	Emergent	+	-
		Murdannia spirata (L) Bruckn	Emergent	+	-
6	CYPERACEAE	*Cyperus javanicus Houtt.*	Emergent	+	+
		Cyperus compressus L.	Emergent	+	+
		Cyperus distans L.f.	Emergent	+	+
		Cyperus iria L.	Emergent	+	-
		Fimbristylis bisumbellata (Forsk.) Bubani	Emergent	+	-
		Fimbristylis dichotoma (L.) Vahl	Emergent	+	+
		Fimbristylis ferrguginea (L.) Vahl	Emergent	+	+
		Fuirena uncinata (wild.) Kunth	Emergent	+	-
		Fuirena umbellate L.	Emergent	+	-
		Schoenoplectus articulates (L.) Palla	Emergent	+	-
		Schoenoplectus litoralis (Schrad.) Palla	Emergent	+	+
7	ERIOCAULACEAE	*Eriocaulon heterolepis L*	Emergent	+	-
8	HYDROCHARITACEAE	*Halophila ovalis (R.Br.) Hook.F.*	Submerged	+	+
		Hydrilla verticillapa (L.f).Royle	Submerged	+	-
		Nechamandra alternifolia Roxb.	Submerged	+	-
		Ottelia alismoides Pers.	Submerged	+	-
		Vallisnaria spiralis Roxb.	Emergent	+	-
9	LEMNACEAE	*Lemna perpusilla Torr.*	Floating 1	+	-
		Spirodela polyrrhiza (L.) Schleid.	Floating 1	+	-
		Wolffia arrhiza Wimm.	Submerged	+	-
10	NAJADACEAE	**Utricularia exoleta R.Br.*	Floating 2	+	-
11	NYMPHAECEAE	*Nymphaea nouchali Burm.f.*	Floating 2	+	-
		Nymphaea pubescens Burm.f.	Emergent	+	+
12	PANDANACEAE	*Pandanus fascicularis Lam.*	Emergent	+	-
13	POACEAE	*Arundo donax L.*	Emergent	+	+
		Aeluropus lagopoides (L.)Trin ex Thw.	Emergent	+	+
		**Myriostachya wightiana (Nees ex Steud) Hook.f.*	Emergent	+	-
		Bamboosa arundinacea (Retz.) willd.	Emergent	+	-
		Brachiaria reptans (L.) Gard, & Hubb.	Emergent	+	-
		Hygrorhiza aristata (Retz.) Nees ex Wight. &Arn.	Emergent	+	-
		Panicum repens L.	Emergent	+	+
		Saccharam spontaneum L.	Emergent	+	-
		Oryza sativa L.	Emergent	+	-
		Vetivera zizanioides L.	Floating 1	+	+
14	PONTEDERIACEAE	*Eichhornia crassipes (Mart.) Solms*	Floating 1	+	+
		Monochoria vaginalis (Burm.f.)C. Presl	Emergent	+	-
15	TYPHACEAE	*Typha angustata Bory &Chaub.*	Emergent	+	+

Table-2B List of Dominant Family of Monocots	
Name of the Family	No of Species
CYPERACEAE	11
POACEAE	10
COMMELINACEAE	8
HYDROCHARITACEAE	5
ARACEAE	3
LEMNACEAE	3
NYMPHAECEAE	2
PONTEDERIACEAE	2

Table-2C List of Dominant Genus of Monocots	
Name of the Genus	No of Species
Cyperus	4
Commelina benghalensis L	3
Fimbristylis dichotoma (L.) Vahl	3
Cyanotis arachnoidea Clarke	2
Fuirena umbellata L.	2
Nymphaea pubescens Burm.f.	2

Table 3: Distribution of different species of mangroves

S.No.	Name of the Mangrove	Vakadu	Sullupet	Tada	D.V.Satram	Chittamur
1	*Avicennia marina*	✓	✓	✓	x	x
2	*Avicennia officinallis*	✓	X	✓	x	x
3	*Exoecaria agallocha*	✓	✓	x	x	x
4	*Aegiceras corniculatum*	✓	X	x	x	x
5	*Lumnitzera racemosa*	✓	✓	x	x	x
6	*Rhizophora mucronata*	x	X	✓	x	x

Table:4. List of Mangrove Associates found in Pulicat lake region

Sesuvium portulacastrum	Aizoaceae	Herb
Suaeda maritima	Chenopodiaceae	Herb
Suaeda nudiflora	Chenopodiaceae	Herb
Clerodendron inerime	Verbanaceae	Shrub
Tamarix gallica	Tamaricaceae	shrub
Thespesia populnoides	Malvaceae	Tree

Atriplex repens	Chenopodiaceae	Herb
Pedalium murex	Pedaliaceae	Herb
Ipomea biloba	Convulvulaceae	Herb
Aleuropus logopoides	Poaceae	Herb
Heliotropium curassavi-cum	Boraginaceae	Herb
Suaeda mollis	Chenopodiaceae	Herb
Euphorbia rosea	Euphorbiaceae	Herb
Cressa cretica	Convolvulaceae	Herb
Myriostachys whigtiana	Poaceae	Herb
portulaca quadrifida	Portulaceae	Herb
Caesalpinia bonduc	Caesalpinaceae	Climber
Caesalpinia crista	Caesalpinaceae	Climber
Dalbergia spinosa	Fabaceae	Climber
Derris scandens	Fabaceae	Climber
Derris heterophylla	Fabaceae	Climber
Derris trifoliata	Fabaceae	Climber
Urochondra setulosa	Poaceae	Grass
Fimbristylis ferruginea	Poaceae	Grass
Steniphyllus barbata	Cyperaceae	Grass
Cyperus species	Cyperaceae	Gras
Scripus littoralis	Cyperaceae	Grass
Dolichandrone spathacea	Bignoniaceae	Tree
Phoenix paludosa	Palmae	Tree
Hibiscus tiliaceus	Malvaceae	Tree
Salvadora persica	Salvodoraceae	Tree
Ipomea pes-caprae	Convolvulaceae	Herb
Pandanus odoratissmus	Pandanaceae	Shrub
Spiniflex littoreus	Poaceae	Shrub

CONCLUSION

Climate change has its own specific impacts on the biodiversity. These impacts were already felt, but rather sporadically, since the past 30 years. They have shown up through two major manifestations, through drought, and through cyclonic storms and floods. The water temperatures were uniformly high all over the lake 30^0c with incredibly high salinities of 70-80%. Sanjeev Raj (1985) described the impacts of the Sriharikota cyclone of 1984 that had its eye right on the northern part of Sriharikota Island, and created cataclysmic changes on the lake ecosystem. Natural calamities by cyclones, forest fire, grazing and browsing are alarming in causing damage to the flora of the Pulicat lake (Basha et al., 2010). About 3000 and above wild cattle roam in the forest, pasture lands and also resident areas trampling heavily the under growth grazing and browsing vegetation. A decline in the macrophytic population may indicate water quality problem. They may be the result of excessive turbidity, pollutants including herbicides or salinization. It may lead to a major socio economic problem. Many conservative methods have to be practiced to protect the macrophytic flora of the lake. The lake is now shrunk to about 35% by area and 75% by

depth with an average depth reduction from 3.8m to 1.0 m. Pulicat lake has been getting silted rougly at the rate of one meter per century according to the estimation of Cartini's (1994) carbon-dating technique on the bottom sediments. The pace of the shrinkage of the Lagoon prompts prediction on its virtual disappearance in another 50 years. This renders lack of shelter to various migrating birds and aquatic life which has multi-dimensional repercussions on various eco-friendly species. Therefore serious efforts are to be taken by State Governments of Andhra Pradesh and Tamilnadu along with Central Government, NGO's and Environmentalists for recognizing Pulicat Lake as *RAMSAR SITE* to prevent imminent collapse of Lake Ecology.

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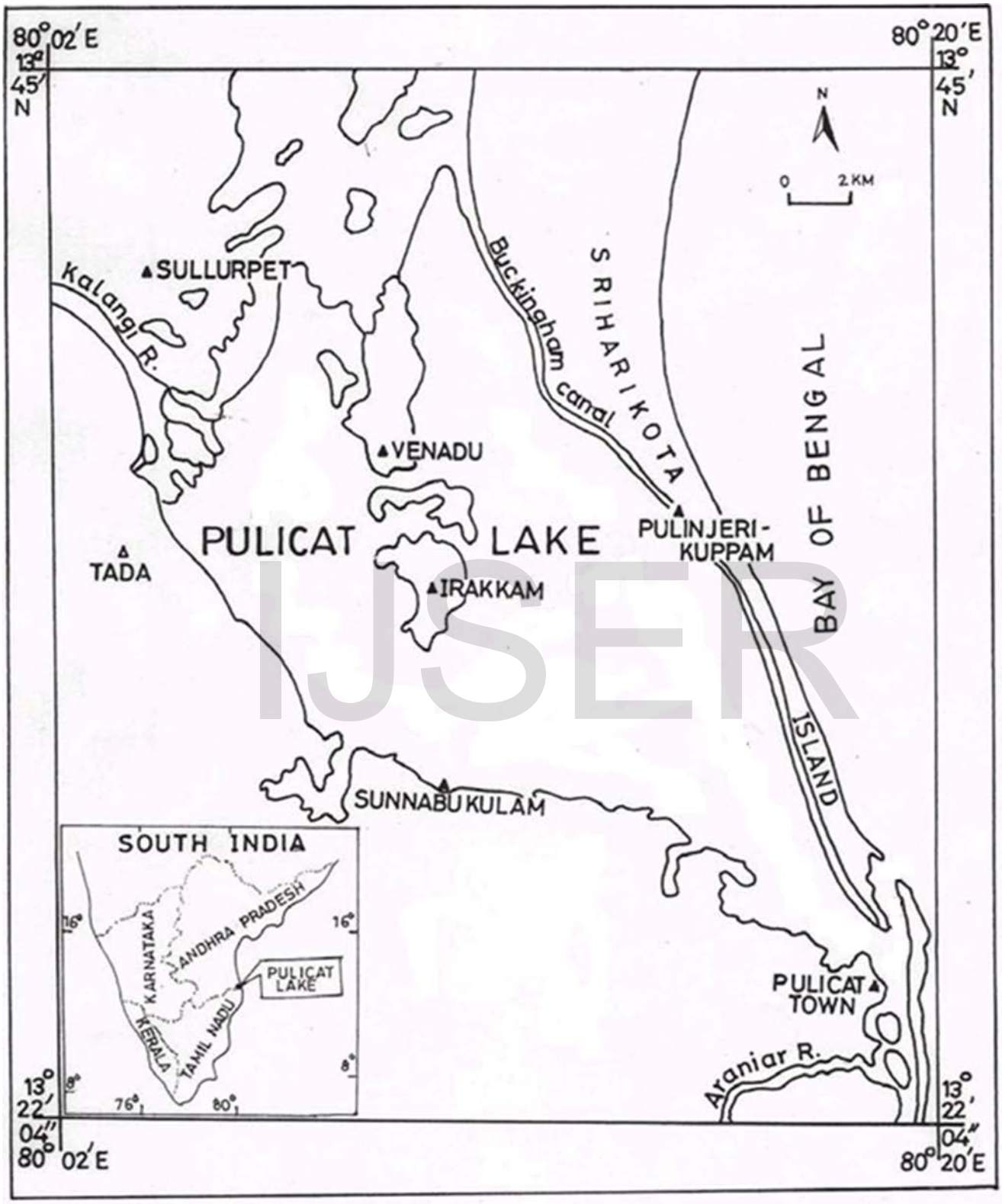

Pulicat lake map showing islands

Pulicat lake at Bhimunivari palem

Floating plants with attached stems in Pulicat lake

Irakkam Island in Pulicat Lake

Calamus rotang at Venadu island