

Checklist Of The Aquatic Macrophyte Flora Abundance In Lower Manair Dam At Karimnagar Dt. Andhra Pradesh, India.

*Rama Rao. K., **Ramakrishna. N and *** Amravati. D

*Department of Zoology, Govt. Degree College, Jammikunta, Satavahana University, Andhra Pradesh

** PGT in Biology, Sainik School, Korukonda, Vizianagaram, Andhra Pradesh

*** Biology, Chitanya College of Education, Bonagi, Parawada, Visakhapatnam. A.P. India.

Abstract: The present investigation concerns with the aquatic macrophyte diversity and its role in understanding the reservoir ecosystem dynamics and species composition of aquatic macrophytes distribution in ten villages around Lower Manair Dam (LMD) were studied during 2013-2014. Forty eight different species of aquatic macrophytes were recorded in 04 classes, 20 orders and 26 families, which include five free floating macrophytes, ten submerged, and thirty three emergent species of weds were recorded. The percentage composition of class, order and families were calculated during this period. The free floating species *Eichornia crassipes* occurs throughout the year, while the submerged species *Vallisneria spiralis*, *Ceratophyllum demersum*, *Hydrilla verticillata* occur throughout the year. In the rooted floating category *Ipomoea aquatica* occurs throughout the year. The common name, habitat and IUCN (2013.2) status of the macrophytes has also been noted in the present paper.

Key words: Macrophytes, Free floating, Submerged, Emergent, LMD.

I. Introduction

Lower Manair Dam (LMD) is situated in Karimnagar District of Telangana region (Fig. 1). This is a large new impoundment of Godavari basin with medium productive potential. The Lower Manair Dam is situated at Kakatiya Canal about 146.00 km to 234 kms and Distributaries D 84 to D 94 and DBM 1 to DBM2. LMD water goes up to 2, 62,326 acs, catchment area of river 6,475 sq.m. Reservoir full level is 280.416 mt. Full capacity of reservoir 0.68 TM Cusecs and water spread area is 81.024 sq. kmt. The Lower Manair Dam harbors a variety of macrophytes in different sub-stratus. Macrophytes serve as a link between the sediment, water, and atmosphere in reservoirs, lakes, and rivers. The most notable function that plants serve is as primary producers. However, macrophytes are also involved in ecosystem processes such as biomineralization, transpiration, sedimentation, elemental cycling, materials transformation, and release of biogenic trace gases into the atmosphere (Carpenter and Lodge, 1986). Recent studies also suggest that macrophytes play a central role in shallow reservoirs which can have two possible stable equilibrium: a clear-water state that is dominated by aquatic macrophytes and a turbid-water state that is dominated by phytoplankton (Jeppesen et al., 1998). Aquatic weeds referred to as Macrophytes constitute an important component of aquatic ecosystem. Their diversity and biomass influence primary productivity and complexities of tropic states (Kumar and Singh, 1987). Since the wetland is considered as a transitional area between land and water, Smith (1980) aptly described it as a half-way world between terrestrial and aquatic ecosystems. It is largely dominated by water and has special type of flora and fauna, which usually undergo time scheduled characteristic changes from hydric to mesic types. Wetlands are well known for high diversity in class, composition and four broad categories of functions viz. physical, hydrological, chemical, biological and socioeconomic (Williams, 1990).

The study of submerged and floating vegetation is of great importance as far as food supply to fish species is concerned. The menace of aquatic weeds can be overcome by their utilization in a number of ways. Lower Manair Dam had been rich fish productivity and in multi dimensional utilization of aquatic weeds Rama Rao. K (2014 a. b) reported 53 ornamental species and 58 larvivorous fishes in this reservoir out of these, 13 species were abundant, 13 species were common, 19 species were moderate and seven species were rare. Aquatic plants constitute an integral component of an aquatic ecosystem. They may serve as good source of food to the mankind, a palatable feed to the water birds and animals thus forming a base for aquatic wildlife conservation practices. They also serve as a potential source of energy (Majid, 1986). Macrophytes of different water bodies in India are studied by researchers such as Wetzel (1975), Majid (1986), Meshram (2003), Ambasht (2005) and Raut and Pejawer, (2005) and many more.

II. Material And Methods

The studies were carried out from April 2013 March 2014 during different seasons at four different sites from the reservoir catchment area. Macrophytes were collected during three different seasons such as monsoon, winter and summer season by field visit to the spots. The survey was conducted to collect the information

regarding floating, emergent, and submerged vegetation. The macrophytes were collected by hand picking, and also using nets and then brought to laboratory preserved in 10% formalin and identified using standard available literature (Cook, 1996). The identification of aquatic plants was done with the help of standard books and monographs like, Singh and Karthikeyan (2000 and 2001), Biswas and Calder (1953). The data collected was used to analyses and diversity indices were calculated.

III. Results And Discussion

The results of the present study revealed that the occurrence of forty eight weed species belong to twenty orders, 33 families and four classes. List of hydrophytes including their class, order, family, genus, species and common name were recorded in the present investigation was given in **Table 1, 2, 3**. The listed species under free floating are *Azolla filiculoides*, *Eichornia crassipes* (Mart.) Solms, *Lemna perpusilla* Torrey, *Ottelia alismoides* (L.) Pers., and *Pistia stratiotes* L. (Table: 1), the Submerged species are *Aponogeton natans* L.f, *Chara globularis* J. L.T, *Ceratophyllum demersum* L., *Hydrilla verticillata* (L. f.) Royle., *Ipomoea aquatica* Forsk (Rooted), *Ipomoea carnea* Jacq, *Marsilea quadrifolia*, *Najas minor* L., *Potamogeton pectinata* L., *Vallisneria spiralis* L. (Table: 2),. The emergent weeds are *Alternanthera sessilis* (L.)R. Br. Ex, *Alternanthera philoxeroides*, *Ammannia baccifera* L., *Aeschynomene indica* L., *Bacopa monnieri* (L.) Wettstein, *Coix aquatica* Roxb., *Commelina benghalensis* L., *Commelina hasskarlii* C. Comm. Cyr., *Cyperus rotundus* L., *Cyperus difformis* L., *Cynodon dactylon* (L.) Pers., *Cyathocline purpurea* (Buch-Ham. ex D. Don) O.Ktze., *Chrozophora rotterli* (Geisel.) A. Juss. ex Spr., *Dopatrium junceum* (Roxb.) Buch-Hum ex Benth., *Eclipta alba*, *Eleocharis geniculata* (L.) R&S., *Eleocharis capitata* R. Br., *Eriocaulon cinereum* R.Br., *Echinochloa colona* (L.) Link. *Fimbristylis miliacea*, *Gomphrena celosioides* Mart., *Glinus lotoides* L., *Gnaphalium pulvinatum* Del., *Grangea maderaspatana*, *Heliotropium supinum* L. *Limnophila sessiliflora* L. *Polygonum glabrum* Willd. *Phyla nodiflora* (L.) Greene. *Rotala serpyllifolia* (Roth.) Brebeck., *Sesbania bispinosa* (Jacq.) w. t. wight., *Sopubia delphinifolia* (L.) G. Don, *Sphaeranthus indicus* L., *Typha angustata* Bory and Chaub.

Thomaz et al., (1999, 2001) found aquatic macrophytes of Itaipu Reservoir at Brazil and a similar study was conducted by Bartodziej, and Ludlow (1997) performed to aquatic vegetation monitoring by natural resource agencies in the United States. Chambers et al., (2010) were classified world checklist of macrophyte species. Patil et al., (2012) explained the hydrophytes and amphibious plants occurred in Panchganga River in vicinity of Ichalkaranji city district Kolhapur, Maharashtra.

The number of classes, orders and families under three types of weeds were shown in **Table 4. Fig: 1**. the free floating and emergent weeds are contributed each two class and submerged weeds contributed highest for four classes in LMD. Recorded aquatic weeds were under twenty orders, the emergent weeds occupied highest 13 species, followed by submerged weeds (06) and free floating weeds (04). In 26 families the emergent weeds occupied highest are 15, followed by submerged weeds (06) and free floating weeds (05). Emergent weeds are dominant with 33 species which contributes 68.75% of the total species followed by submerged weeds with 10 (20.83%) and free floating weeds with 05 (10.42%).

The number and percentage composition of free floating, submerged and emergent weeds were under four classes Liliopsida was dominant with four species which contributed to 80% of the total five species and followed by Polypodiopsida was one species which contributed to 20% of the total free floating aquatic weeds. Recorded submerged weeds out of ten species, Liliopsida contributed five species (50%), followed by Magnoliopsida three species (30%), Polypodiopsida and Charophyceae each with one species (10%). Recorded emergent weeds out of 33 species, Magnoliopsida contributed with 21 (63.64%) species, followed by Liliopsida with 12 species (36.37%).

The number and percentage composition of free floating, submerged and emergent weeds were under twenty orders, Arales was dominant with two species which contributed to 40% of the total five species of free floating weeds and followed by Commelinales, Hydrocharitales and Salviniiales each with one species (20%). Recorded submerged weeds out of ten species Hydrocharitales contributed three species (30%) followed by Najadales and Solanales each with two species (20%) and Salviniiales, Charales and Nymphaeales each with one species (10%). Recorded emergent weeds out of 33 species, Asterales was dominant with five species which contributed 15.15%, followed by Caryophyllales, Poales and Scrophulariales each with four species (12.12%), Commelinales, Fabales and Myrtales each with two species (6.06%) and Boraginales, Lamiales, Malpighiales, Polygonales and Typhales which contributed to each one species (3.03%). Recorded 48 species of aquatic weeds are Asterales and Cyperales were dominant with each five species which contributed to 10.42% and followed by Hydrocharitales, Caryophyllales, Poales and Scrophulariales were each with four species (8.33%), Commelinales was dominant with three species (6.25%), Arales, Salviniiales, Najadales, Solanales, Fabales, and Myrtales each with two species (4.17%), Charales, Nymphaeales, Boraginales, Lamiales, Malpighiales, Polygonales and Typhales contributed each one species (2.08%).

The number and percentage composition of free floating, submerged and emergent weeds were under 26 families, Araceae, Hydrocharitaceae, Lemnaceae, Pontederiaceae and Salviniaceae each with one species

which contributed to 20% of the total five species of free floating weeds. Out of recorded ten species of submerged weeds Hydrocharitaceae was dominant with three species (30%) followed by Convolvulaceae with two species (20%), Aponogetonaceae, Characeae, Ceratophyllaceae, Marsileaceae and Potamogetonaceae contributed to each with one (10%) species. Out of recorded 33 species of emergent weeds Asteraceae and Cyperaceae were dominant with five (15.15%) species followed by Scrophulariaceae with four (12.12%) species, Amaranthaceae and Poaceae each with three (9.09%) species, Commelinaceae, Fabaceae and Lythraceae each with two (6.06%) species, Boraginaceae, Eriocaulaceae, Euphorbiaceae, Molluginaceae, Polygonaceae, Verbenaceae and Typhaceae each with one (3.03%). Recorded 48 species of aquatic weeds are under 26 families; Asteraceae and Cyperaceae were dominated each with five species, which contributed to 10.42% of the total species. Hydrocharitaceae and Scrophulariaceae contributed each with four (8.33%) species. Amaranthaceae and Poaceae contributed each with three (6.25%) species. Convolvulaceae, Commelinaceae, Fabaceae and Lythraceae Scrophulariaceae contributed each with two (4.16%) species. Araceae, Lemnaceae, Pontederiaceae, Salviniaceae, Aponogetonaceae, Characeae, Ceratophyllaceae, Marsileaceae, Potamogetonaceae, Boraginaceae, Eriocaulaceae, Euphorbiaceae, Molluginaceae, Polygonaceae, Verbenaceae and Typhaceae contributed each with one (2.08%) species.

An assessment of macrophyte biodiversity of a freshwater reservoir of Bhadrawati Tehsil in Chandrapur district, by Shashikant R. Sitre (2013). Gokhele, et al (2011) conducted a survey on flora of wet coastal and associated ecosystem to Maharashtra. The similar study was conducted by Kayode, J. and Ogunleye, O.T. (2008) who classified the macrophytes checklist and status of plant species used as spices in Kaduna state of Nigeria.

A total of 48 species of hydrophytes belonging to 4 classes, 20 orders and 26 families were studied. According to IUCN (2013.2) of these 35 species of aquatic weeds are least concerned, 12 are not evaluate (NE), 1 species is vulnerable (VU). In the free floating weeds, three species are least concerned (6.25%), two (4.17%) species are not evaluated. In the submerged weeds, eight species (16.67%) are least concerned and two (4.17%) species are not evaluated. In the emergent weeds 24 species (50%) are least concerned, eight (16.67%) are not evaluated; one (2.03%) is vulnerable.

James et al (2006) surveyed aquatic plants in 38 reservoirs throughout Arizona from 2004 to develop an inventory of species and to determine species distribution and composition patterns. They identified 12 submersed, 3 floating, and 18 emergent aquatic plants to species level; some samples were only identified to genera, and none of the filamentous algae were identified to either genera or species. Adesina, (2007) studied an assessment of aquatic vegetation of Jebba Lake, Nigeria. Olsen, S (1950) and Spence, D.H.N. (1964) represented aquatic plants and hydrospheric factor and the macrophytes vegetation of lochs, swamps and associated fens. Ambasht, R. S. (2005), Billore, D. K. and Vyas, I. N. (1981) studied the macrophytes limnology, distribution and production of macrophytes in the Indian subcontinent. Kiran, B.R. et al., (2006) Krull, J.N. 1970, Madsen, J.D. and P.A. Chambers (2001) studied aquatic macrophytes in fish culture ponds, aquatic plant-invertebrate associations and the Interactions between water movement, sediment dynamics and submersed macrophytes.

IV. Conclusion

A number of macrophyte species are available in Lower Manair Dam at monsoon period and post monsoon season. Free floating and submerged species are more dominant in all seasons. Emergent weed species are dominant in the winter season. Presently, the fresh water aquatic weeds are directly or indirectly more helpful for food and shelter to reservoir fishery at Lower Manair Dam.

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Table: I. Checklist of free floating weeds of their scientific name, common name, class, order, family, habitat and IUCN red list at Lower manair Dam.

S. No	Name of Species	Common name/s	Class	Order	Family	Habitat	IUCN (2013.2)
1	1. ^A zolla filiculoides	Water Fern	Polypodio psida	Salvinial es	Salvinia ceae	It is most frequent in ponds, lakes, canals, ditches and slow flowing rivers.	NE
2	Eichornia crassipes (Mart.) Solms.	Water hyacinth	Liliopsida	Commel inales	Ponteder iaceae	Shallow temporary ponds, wetlands and marshes, sluggish flowing waters, lakes, reservoirs and rivers	NE
3	Lemna perpusilla Torrey	Duckweed	Liliopsida	Arales	Lemnac eae	It grows in paddy fields, ponds and other still water bodies.	LC
4	Ottelia alismsoides (L.) Pers.	Duck- lettuce, waterplantai n ottelia	Liliopsida	Hydroch aritales	Hydroch aritaceae	This species grows in shallow water edges and ponds and in rice field	LC
5	Pistia stratiotes L.	Tropical duck-weed, water lettuce	Liliopsida	Arales	Araceae	It is a free-floating weed and capable of forming dense mats on the surfaces of lakes, ponds, rivers and other water bodies.	LC

Table: II. Checklist of Submerged weeds of their scientific name, common name, class, order, family, habitat and IUCN red list at Lower manair Dam.

S.No	Name of Species	Common Name/s	Class	Order	Family	Habitat	IUCN 2013.2
1	Aponogeton natans L.f	Floating lace Plant, Drifting Sword Plant	Liliopsida	Najadales	Aponogetonaceae	It grows in seasonal and permanent still or flowing waters, rice fields and marshy places.	LC
2	Chara globularis J. L.T	Muskgrass, stonewort, muskwort	Charophyceae	Charales	Characeae	It is found both in freshwater and brackish water. In freshwater it is found in lakes and rivers, oligotrophic as well as eutrophic water. It grows on sand, clay, mud or marl bottom.	NE
3	Ceratophyllum demersum L.	Rigid Hornwort, Coontail, Hornwort	Magnoliopsida	Nymphaeales	Ceratophyllaceae	Less saline parts of sea inlets, ponds, slow-flowing streams	LC
4	Hydrilla verticillata (L. f.) Royle	Florida-elodea, Indian Stargrass, Water-thyme	Liliopsida	Hydrocharitales	Hydrocharitaceae	Rivers and ponds. This species is hardy and tolerant to heavy metals.	LC
5	Ipomoea aquatica Forsk (Rooted)	Water spinach	Magnoliopsida	Solanales	Convolvulaceae	Found in marshy habitats and ditches, muddy stream banks, ponds, lakes, rice paddies and waste areas.	LC
6	Ipomoea carnea jacq	Pink morning glory	Magnoliopsida	Solanales	Convolvulaceae	Grows in dense populations along river beds, river banks, canals and other waterlogged (wetland) areas. It has become naturalized along canals, drains and road sides	NE
7	Marsilea quadrifolia	Water Shamrock	Polypodiopsida	Salvinales	Marsileaceae	It grows in still waters such as ponds, rice fields and ditches.	LC
8	Najas minor L.	Slender Naiad	Liliopsida	Hydrocharitales	Hydrocharitaceae	Ponds, lakes, rivers, streams, ditches and paddy fields.	LC
9	Potamogeton pectinata L.	Fennel Pondweed	Liliopsida	Najadales	Potamogetonaceae	Typical of eutrophic or brackish waters lakes, reservoirs, rivers, streams, canals, ditches, pond	LC
10	Vallisneria spiralis L.	Tapegrass	Liliopsida	Hydrocharitales	Hydrocharitaceae	Estuarine habitats, lakes, rivers, waterlogged swamps with open water, man-made reservoirs,	LC

Table: III. Checklist of emergent weeds of their Scientific name, common name, class, order, family, habitat and IUCN red list at Lower Manair Dam.

S.No	Name of Species	Common Name/s	Class	Order	Family	Habitat	IUCN 2013.2
1	Alternanthera sessilis (L.)R. Br. ex	Sessile joyweed, dwarf copperleaf	Magnoliopsida	Caryophyllales	Amaranthaceae	Aquatic and wetland habitats It may extend into brackish water and estuarine habitats near the coast.	LC
2	Alternanthera philoxeroides	Sessile joyweed, dwarf copperleaf	Magnoliopsida	Caryophyllales	Amaranthaceae	Aquatic and wetland plants.	LC
3	Ammannia baccifera L.	Blistering ammannia	Magnoliopsida	Myrtales	Lythraceae	It is an annual herbaceous plant	LC

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						(therophyte) that is found in swampy areas, rice paddies and freshwater	
4	Aeschynomene indica L.	India joint-vetch	Magnoliopsida	Fabales	Fabaceae	Grows in field margins, ditches, grasslands, trail sides and river margins	LC
5	Bacopa monnieri (L.) Wettstein	Water hyssop	Magnoliopsida	Scrophulariales	Scrophulariaceae	Forms dense mats in marshy places, the banks of pools and along streams and ditches.	LC
6	Coix aquatica Roxb.	Aquatic Job's tears	Liliopsida	Poales	Poaceae	It is a perennial, aquatic herb. Stems (culms) are creeping and rooting from nodes at base, sometimes floating	NE
7	Commelina benghalensis L.	Bengal day flower	Liliopsida	Commelinales	Commelinaceae	A widespread weed often found in ditches, wet fields and places	LC
8	Commelina hasskarlii C. Comm. Cyrt.	Carolina dayflower	Liliopsida	Commelinales	Commelinaceae	Commonly found in fields, swamps, yards, waste places, along roadsides, rarely in the forests.	LC
9	Cyperus rotundus L.	Nut-grass	Liliopsida	Cyperales	Cyperaceae	Occurs in a wide variety of wetland habitats including seasonally wet grasslands, swamps, ditches, pond and lake margins, springs, stream and river banks.	LC
10	Cyperus difformis L.	Smallflower Umbrella Sedge	Liliopsida	Cyperales	Cyperaceae	The plant normally grows in flooded or in very moist soils. It is frequently found in small pools, along rivers, canals, and streams, in open wet places, and in grassy swamps.	LC
11	Cynodon dactylon (L.) Pers.	Bermuda grass, Indian doab, devil's grass.	Liliopsida	Poales	Poaceae	Water courses, wetlands	LC
12	Cyathocline purpurea (Buch-Ham. ex D. Don) Oltze	Purple bane	Magnoliopsida	Asterales	Asteraceae	It is found growing in water logged soils subjected to seasonal inundation and along waterways	LC
13	Chrozophora rotterli (Geisel.) A. Juss. ex. Spr	Suryavarti	Magnoliopsida	Malpighiales	Euphorbiaceae	Paddy fields and reservoir banks	NE
14	Dopatrium junceum (Roxb.) Buch-Hum ex Benth.	Rushlike dopatrium	Magnoliopsida	Scrophulariales	Scrophulariaceae	It grows in post-monsoon pools, rice fields and perennially wet places below 1,800 m	LC
15	Eclipta alba	False Daisy, Bhringraj.	Magnoliopsida	Asterales	Asteraceae	Grows commonly in moist places as a weed in warm temperate to tropical areas worldwide.	LC
16	Eleocharis geniculata (L.) R&S.	Canada spikesedge, spike rush	Liliopsida	Cyperales	Cyperaceae	It is an annual herb, potently grows in clumps, gregarious in shallow water, particularly common in fallow rice fields, sometimes in brackish water by the sea and also grows in wet sandy localities	LC
17	Eleocharis capitata R. Br.	Spike-rush	Liliopsida	Cyperales	Cyperaceae	Wetlands, banks of pools and streams, terrestrial; freshwater	LC
18	Eriocaulon	Pipewort,	Liliopsida	Poales	Eriocaulaceae	Damp shady place. Rice	NE

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	cinereum R.Br.		da		laceae	fields, valleys, and damp soils from near sea level	
19	Echinochloa colona (L.) Link	Wild grass	Liliopsida	Poales	Poaceae	Wetland habitats such as rice fields, roadsides, river banks, shores of ponds, the inner edges of mangrove swamps and old clearings.	LC
20	Fimbristylis miliacea	Lesser Fimbristylis, Grass-Like Fimbristylis	Liliopsida	Cyperales	Cyperaceae	It is an annual or perennial herb growing in wet places, ponds, streams and at the edges of drying pools.	LC
21	Gomphrena celosioides Mart.	Gomphrena weed	magnoliopsida	Caryophyllales	Amaranthaceae	A common plant of roadsides, and sometimes invading pastures as a weed	NE
22	Glinus lotoides L.	Lotus sweetjuice	magnoliopsida	Caryophyllales	Molluginaceae	Lake, marsh	NE
23	Gnaphalium pulvinatum Del.	pinyin	Magnoliopsida	Asterales	Asteraceae	On low land which has been flooded.	NE
24	Grangea maderaspatana	Madras Carpet	Magnoliopsida	Asterales	Asteraceae	The species occurs on the edges of ponds, canals and ditches, as well as rice fields.	LC
25	Heliotropium supinum L.	Dwarf heliotrope	Magnoliopsida	Boraginales	Boraginaceae	Sandy and alluvial plains, waste ground, edges of cultivation.	LC
26	Limnophila sessiliflora L.	Asian marshweed	Magnoliopsida	Scrophulariales	Scrophulariaceae	Wetland habitats, including the margins of ponds, swamps, rice fields, seasonally inundated habitats along streams and low-lying wet areas.	LC
27	Polygonum glabrum Willd.	Marsh buckwheat	magnoliopsida	Polygonales	Polygonaceae	Common, grows gregariously in marshy areas. Plains	NE
28	Phyla nodiflora (L.) Greene	Turkey tangle frogfruit	Magnoliopsida	Lamiales	Verbenaceae	A marshy herb which grows in open and wet places near streams, ponds, paddy fields, ditches, backwaters, brackish water	LC
29	Rotala serpyllifolia (Roth.) Bremeck	Rotala	Magnoliopsida	Myrtales	Lythraceae	It grows submerged in rivers, streams and lakes but is also found in standing water recedes.	LC
30	Sesbania bispinosa (Jacq.) w. t. wight	Sesbania pea	Magnoliopsida	Fabales	Fabaceae	It is not confined to wetlands but often found in swamps, marshy wastelands, water-logged places, banks of ponds and rivers, rice fields and seasonally inundated areas.	LC
31	Sopubia delphinifolia (L.) G. Don	Sopubia delphinifolia	Magnoliopsida	Scrophulariales	Scrophulariaceae	Western India, as a root parasite.	VU
32	Sphaeranthus indicus L.	East indian globe thistle	Magnoliopsida	Asterales	Asteraceae	It is an annual found growing in wet areas, occasionally temporarily submerged. Common in and around irrigation ditches	LC
33	Typha angustata Bory and Chaub.	Reed Mace, Elephant Grass,	Liliopsida	Typhales	Typhaceae	It occurs in shallow water of lakes, ponds, rivers, swamps and channels.	NE

Table: 4. Number of classes, orders, families and species of Macrophytes at lower Manair Dam.

Classification	Total species	Free floating weeds	Submerged weeds	Emergent weeds
Class	04	02	04	02
Order	20	04	06	13
Family	26	05	06	15
Species	48	05	10	33

Table: 5. Number and Percentage contribution of Macrophytes in Four classes.

Class (4)	Free floating		Submerged weeds		Emergent weeds	
	Total No.s	% contribution	Total No.s	% contribution	Total No.s	% contribution
Liliopsida	4	80.00	5	50.00	12	36.37
Polypodiopsida	1	20.00	1	10.00	0	0
Charophyceae	0	0	1	10.00	0	0
Magnoliopsida	0	0	3	30.00	21	63.64

Table: 6. Number and Percentage contribution of Macrophytes in Twenty orders.

Order (20)	Free floating		Submerged weeds		Emergent weeds		Total	
	Total No.s	% contribution	Total No.s	% contribution	Total No.s	% contribution	Total No.s	% contribution
Arales	02	40.00	-	-	-	-	02	4.17
Commelinales	01	20.00	-	-	02	6.06	03	6.25
Hydrocharitales	01	20.00	03	30.00	-	-	04	8.33
Salviniales	01	20.00	01	10.00	-	-	02	4.17
Charales	-	-	01	10.00	-	-	01	2.08
Najadales	-	-	02	20.00	-	-	02	4.17
Nymphaeales	-	-	01	10.00	-	-	01	2.08
Solanales	-	-	02	20.00	-	-	02	4.17
Asterales	-	-	-	-	05	15.15	05	10.42
Boraginales	-	-	-	-	01	3.03	01	2.08
Caryophyllales	-	-	-	-	04	12.12	04	8.33
Cyperales	-	-	-	-	05	15.15	05	10.42
Fabales	-	-	-	-	02	6.06	02	4.17
Lamiales	-	-	-	-	01	3.03	01	2.08
Malpighiales	-	-	-	-	01	3.03	01	2.08
Myrtales	-	-	-	-	02	6.06	02	4.17
Poales	-	-	-	-	04	12.12	04	8.33
Polygonales	-	-	-	-	01	3.03	01	2.08
Scrophulariales	-	-	-	-	04	12.12	04	8.33
Typhales	-	-	-	-	01	3.03	01	2.08
Total	05		10		33		48	

Table: 7. Number and Percentage contribution of Macrophyte in Twenty families.

Families (26)	Free floating		Submerged weeds		Emergent weeds		Total	
	Total No.s	% contribution	Total No.s	% contribution	Total No.s	% contribution	Total No.s	% contribution
Araceae	1	20.00	-	-	-	-	1	2.08
Hydrocharitaceae	1	20.00	3	30.00	-	-	4	8.33
Lemnaceae	1	20.00	-	-	-	-	1	2.08
Pontederiaceae	1	20.00	-	-	-	-	1	2.08
Salviniaceae	1	20.00	-	-	-	-	1	2.08
Aponogetonaceae	-	-	1	10.00	-	-	1	2.08
Characeae	-	-	1	10.00	-	-	1	2.08
Ceratophyllaceae	-	-	1	10.00	-	-	1	2.08
Convolvulaceae	-	-	2	20.00	-	-	2	4.16
Marsileaceae	-	-	1	10.00	-	-	1	2.08
Potamogetonaceae	-	-	1	10.00	-	-	1	2.08
Amaranthaceae	-	-	-	-	3	9.09	3	6.25
Asteraceae	-	-	-	-	5	15.15	5	10.42
Boraginaceae	-	-	-	-	1	3.03	1	2.08
Commelinaceae	-	-	-	-	2	6.06	2	4.16
Cyperaceae	-	-	-	-	5	15.15	5	10.42
Eriocaulaceae	-	-	-	-	1	3.03	1	2.08
Euphorbiaceae	-	-	-	-	1	3.03	1	2.08
Fabaceae	-	-	-	-	2	6.06	2	4.16
Lythraceae	-	-	-	-	2	6.06	2	4.16
Molluginaceae	-	-	-	-	1	3.03	1	2.08
Poaceae	-	-	-	-	3	9.09	3	6.25
Polygonaceae	-	-	-	-	1	3.03	1	2.08

Scrophulariaceae	-	-	-	-	4	12.12	4	8.33
Verbenaceae	-	-	-	-	1	3.03	1	2.08
Typhaceae	-	-	-	-	1	3.03	1	2.08
	05		10		33		48	

Table: 8. Number and Percentage contribution of Aquatic weeds to their IUCN Read list (2013.2).

IUCN (2013.2)	Free floating		Submerged weeds		Emergent weeds	
	Total No.s	% contribution	Total No.s	% contribution	Total No.s	% contribution
LC	03	6.25	08	16.67	24	50.00
NE	02	4.17	02	4.17	08	16.67
VU	0	0	0	0	01	2.03

Fig: 1. Number of classes, orders, families and species of Macrophytes at lower Manair Dam.

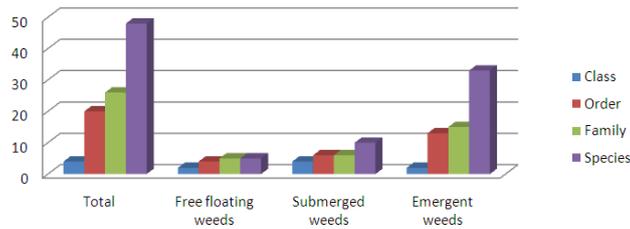


Fig: 2. Number and Percentage contribution of Macrophytes in Four classes.

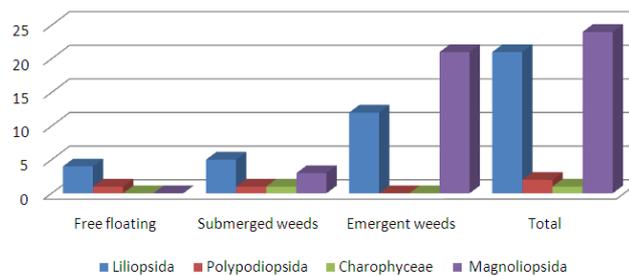


Fig: 3. Number and Percentage contribution of Macrophytes in Twenty orders.

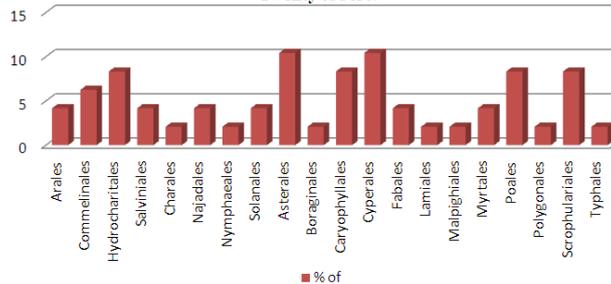


Fig: 4. Number and Percentage contribution of Macrophyte in Twenty six families.

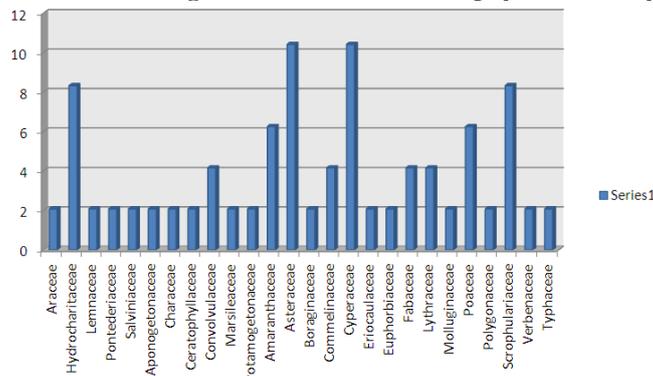


Fig: 5. IUCN Red list 2013.2

