LAKE 2014: *Conference on Conservation and Sustainable Management of Wetland Ecosystems in Western Ghats*
Date: 13th -15th November 2014
Symposium Web: http://ces.iisc.ernet.in/energy

DIVERSITY AND DISTRIBUTION OF MACROPHYTES IN POWAI LAKE, MUMBAI

Vishal Rasal[1*], Ujwala Patil[*], Meeta Bhot[*], S. Dasgupta , , A.K.Pal, W.S. Lakra
[*] Dept. of Botany, Birla College Road, National Highway 222, Kalyan,
Central Institute of Fisheries Education, PanchMarg, Versova, Mumbai ,India.
e-mail: vishal_rasal123@yahoo.co.in

ABSTRACT

Powai Lake was created in 1891 by constructing dam between two hillocks across Mithi River. Currently lake is under severe stress due to silting, sewage and encroachment. Aquatic macrophyte (AM) are primary producers, therefore their diversity and its role in understanding the wetland ecosystem dynamics is very important. Most of studies on Powai lake has neglected aquatic macrophyte. This study was undertaken to fill up the lacuna macrophyte were analyzed in Powai lake. Study was conducted during June 2013 to May 2014.Thirty four species of aquatic macrophytes were recorded from the study area.

Key words: Powai lake, Aquatic macrophyte, diversity

INTRODUCTION

Aquatic macrophytes (AM) are photosynthetic organisms, large enough to see with the naked eye, that grow permanently or periodically submerged below, floating on, or growing up through the water surface. It includes aquatic angiosperms, pteridophytes and bryophytes. (Cook 1996, Chambers et al. 2008). AM are primary producers, their diversity and role in understanding the freshwater ecosystem dynamics is very important. Aquatic plants play a significant role in a river and reservoir ecosystems by several means, such as, providing habitat for aquatic organisms, stabilizing the sediment by reducing erosion, buffering temperature fluctuation and waves, maintaining dissolved oxygen, utilize nutrients, absorbing heavy metals etc. Therefore, knowledge of the distribution and diversity of aquatic macrophytes is necessary for developing management strategies for maintaining healthy ecosystem. Besides, to control established invasive species or to prevent new introductions, assessing potential distribution of endangered species, predicting consequences of many of the threats to aquatic life, base line data of macrophytes in any ecosystem is essential (Fennessy et al. 1998; Aznar et al. 2002). Moreover documentation of tempo-spatial diversity of macrophytes in context of climate change scenario deserves proper attention.

According to India's National Biodiversity Action Plan "nearly 50% of the aquatic plants species of the world are recorded from the Indian sub-continent but only a few have been studied in detail so far (SANDRP 2012). Literature survey shows that scanty information is available on biodiversity of macrophytes in urban lakes of Mumbai.

Considering above factors, the present investigation was undertaken to study species composition of AM in Powai lake. It is situated at L 19^{O}8' N and L 72^{O}54' E, in Mumbai city. The spread of the water body thus achieved was about 370 acres or 2.10 Sq Km and the depth varied from about 10 ft to 40 ft This Lake is, a masonry dam of 10 meter height between two hillocks across Powai basin constructed in 1891. It was constructed to provide drinking water for Mumbai city, however, the water in the lake was found not suitable for drinking. Over the years, encroachment, agricultural activity , domestic sewage has made lake highly eutrophicated. Aquatic weeds such as Ipomoea and water hyacinth grow luxuriantly over the lake causing a serious problem. In 1995, the National Lake Conservation Plan (NLCP) of the Ministry of Environment and Forests (MoE&F), selected the lake for revival and improvements.

MATERIALS & METHODS

Powai Lake (figure 1) was selected to study diversity and distribution of macrophytes. Sampling was done by following surface inventory method (Parsons J. 2001). Collected specimens are thoroughly washed and excess water soaked with a filter paper, kept in polythene bag and brought to the laboratory. The macrophytes were identified and classified following flora of Cook, 1990 and1996 Cronk, and Fennessy, 2001. Seven diff locations (sites) from Powai lake were taken for the study .

Fig. 1.GIS mapping of survey locations and distribution of macrophytes. Sample collection sites S1 to S7

RESULTS AND DISCUSSION

Thirty four species of aquatic macrophytes belong to twenty two families were recorded from the study area (Table 1). Cyperaceae was most dominant families represented by six species followed by Poaceae with four species. AM were categorized as emergent (4 nos.), submerged (2 nos.) and rooted emergent (28 nos). Shannon index (Figure 2) showed that macrophyte composition at St 5 (1.35) was more diverse than other sites studied, followed by St 6 (1.31) . Least diversity of macrophyte was recorded at St 3(0.98) and St 7 (0.93).

	Species	Family	s1	s2	s3	s4	s5	s6	s7	Habit
1	*Hydrillla verticillata (L.f.) Royle*	Hydrocharitaceae	+	+	+		+	+	+	(S)
2	*Vallisneria spiralis L.*	Hydrocharitaceae	+			+	+	+		(S)
3	*Eichornia crassipes (Mart.) Solms.*	Pontederiaceae	+	+	+	+	+	+	+	(F)
4	*Pistia stratiotes L. Royle*	Araceae			+	+	+			(F)
5	*Canna indica L.*	Cannaceae								(RE)
6	*Polygonum glabrumWilld.*	Polygonaceae		+			+	+	+	(RE)
7	*Commelina benghalensis L.*	Commelinaceae		+						(RE)
8	*Commelina hasskarlii C*	Commelinaceae	+							(RE)
9	*Typha . spp.*	Typhaceae			+	+	+	+		(RE)
10	*Lemna minor L.*	Lemnaceae		+	+	+	+			(F)
11	*Ipomoea aquatic Frossk.*	Convolvulaceae			+	+	+	+		(RE)
12	*Ipomoea carnea Jacq.*	Convolvulaceae	+	+	+	+	+			(RE)
13	*Coix aquatic Roxb.*	Poaceae			+	+	+	+		(RE)
14	*Panicum purpurascens Raddi*	Poaceae	+	+	+	+	+			*(RE)*
15	*Dichanthium sp.*	Poaceae			+	+	+	+	+	*(RE)*
16	*Chloris sp.*	Poaceae		+	+	+	+			*(RE)*
17	*Alternanthera sessilis L.*	Amaranthaceae		+	+	+	+			*(RE)*
18	*Bacopa monnieri L.*	Scrophulariaceae				+	+	+		*(RE)*
19	*Scirpus articulates L.*	Cyperaceae			+	+	+	+		(RE)
20	*Cyperus rotundus L.*	Cyperaceae		+	+	+	+			(RE)
21	*Eleocharis geniculata (L.) Roem&Shult.*	Cyperaceae			+	+	+	+		*(RE)*
22	*Cyperus compressus L*	Cyperaceae		+	+	+	+			(RE)
23	*Schoenoplectus littoralis (Schrad.) Palla*	Cyperaceae		+	+	+	+	+	+	(RE)
24	*Elaeocharis capitata R. Br.*	Cyperaceae		+	+	+	+			(RE)
25	*Costus speciosus (J. Koenig) Sm*	Costaceae			+	+	+	+		(RE)
26	*Nymphoidescristata (Roxb.) Kuntze*	Menyanthaceae		+	+	+	+			(F)
27	*Heliotropinum supinum L.*	Boraginaceae		+	+	+	+	+	+	(RE)
28	*Nymphea sp.*	Nympheaceae	+	+	+	+	+	+		(RE)
29	Gomphrena celosioides Mart.	Asteraceae		+	+					(RE)
30	Alternanthera philloxiroides	Alternantheraceae			+	+	+			(RE)
31	Alternanthera sessilis	Alternantheraceae			+	+				(RE)
32	Ceratophyllum demersum L.	Ceratophyllum		+	+	+				(RE)
33	Argemone Maxicana L	Papaveraceae		+	+	+	+			(RE)
34	*Aeschonemene indica L.*	Fabaceae		+	+	+	+			(RE)

Table 1: List of Aquatic Macrophyte in Powai lake

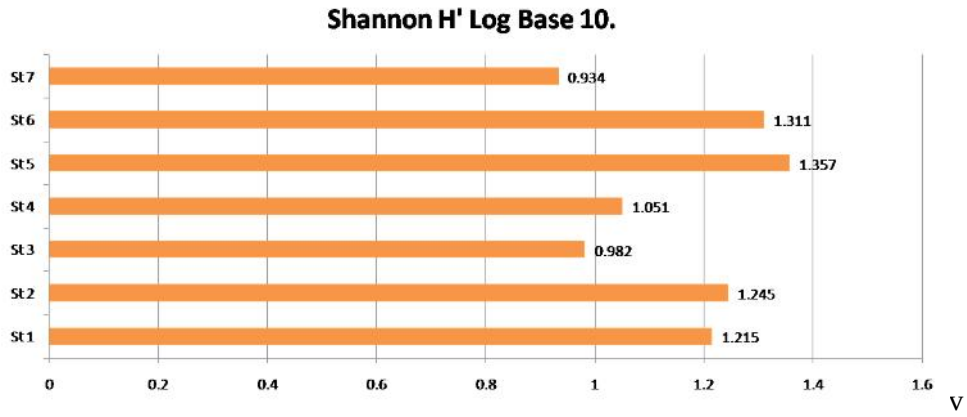

Figure 2.Shannon index of macrophyte composition.1

.

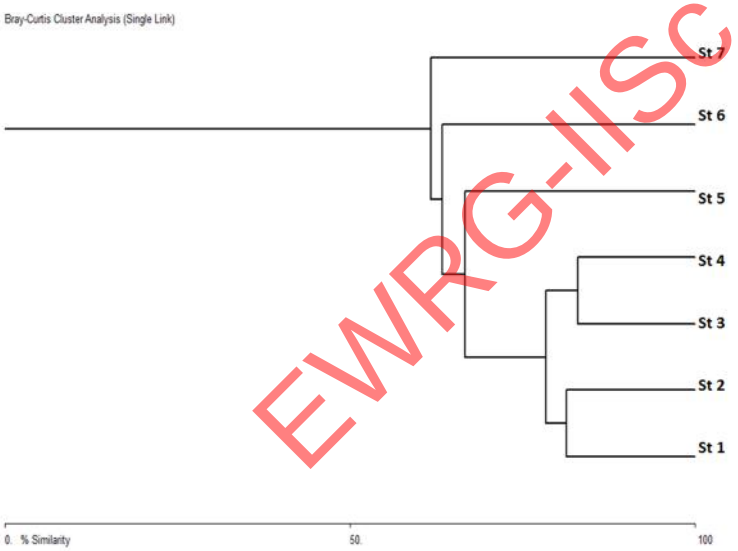

Figure 3: Bray Curtis analysis of macrophytes

Bray Curtis (Fig.3) Cluster showed that Diversity at St 4 and St3 is more similar (83%) than other sites followed by St 1 and St2 (81%). Though St 7 is least diverse site It has most distinct floral composition. *Eichornia crassipes, was found* to be most dominant species with biomass of 20 g/m^2 followed by *polygonum glabrum*(10 gm/m^2), *cana india (*9.25 gm/m^2), (Figure 4). Plants belong to family Cyperaceae and Poaceae was found to be most diverse family with five species each. Both families were reported in June and November. *Ipomoea carnea* and *Polygonum glabrum* were most dominant plants in riparian zone. Rooted emergent plants were found to be most dominant habit form, represented by 28 species followed by 4 floating and submerged comprising of two species. Lake is infested with Alien and invasive species.

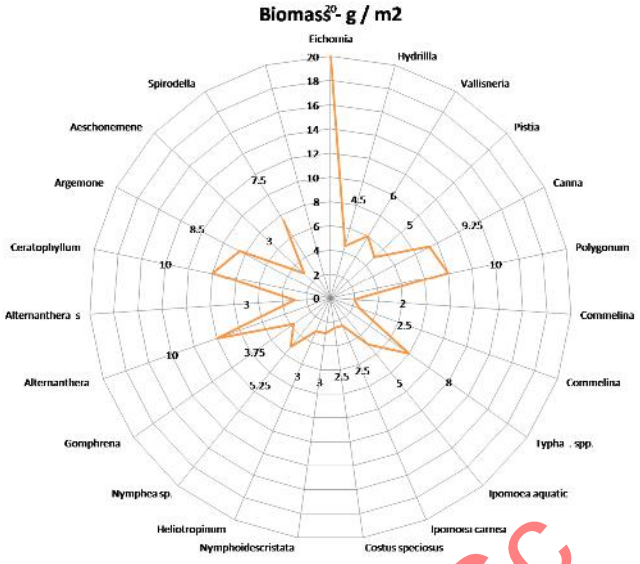

Figure 2: Distribution of biomass

ACKNOWLEDGMENT:
We acknowledge authorities of Birla College and CIFE for providing help and support for completion of this work.

REFERENCES:

1. AlokChorghe, Vishal Rasal andDharmendraKhandal. Riparian flora along the ravines of National Chambal Sanctuary. ; SACON ENVIS Newsletter – Sarovar SaurabhVol.8(1), 2012. ISSN:0972-3153.
2. Capers, R.S. 2000. A comparison of two sampling techniques in the study of submersedmacrophyte richness and abundance. Aquatic Botany 68: 87-92.
3. Carpenter, S. R., Lodge, D. M. (1986) Effects of submersed macrophytes on ecosystem processes. Aquatic Bot 26: 341–370http://nbaindia.org/uploaded/Biodiversityindia/NBAP.pdf, accessed on Oct 5, 2012.
4. Chambers, P.A., Lacoul, P., Murphy, K.J. and Thomaz, S.M. 2008. Global diversity of aquatic macrophytes in freshwater. Hydrobiologia 595: 9-26.
5. Cook C.D.K., Aquatic and Wetland Plants of india, Oxford University Press. Delhi, 22-370 (1996).
6. Cronk, J.K., and Fennessy, M.S. 2001. Wetland plants: biology and ecology. CRC Press LLC. Florida, USA
7. Aznar, J., Dervieux, A., and Grillas, P. 2002. Association between aquatic vegetation and landscape indicators of human pressure. Wetlands,23:149–160.
8. Fennessy, M.S., Geho, R., Elifritz, B., and Lopez, R. 1998.Testing the Floristic Quality Assessment Index as an Indicator of Riparian Wetland Quality, Final Report to US Environmental Protection Agency. Columbus.USA.
9. JANAUER,G.A. 2003. Methods. Arch. Hydrobiol. Suppl. 147(1-2), Large Rivers 14(1-2):9–16.

10. McAleece,N., J.D G,Lambshead , P.J.D., G.L.J. Paterson,G.L.J. (1997) Biodiversity professional statistic analysis software.
11. Molur, S., Smith, K.G., Daniel, B.A. and Darwall, W.R.T. (Compilers). 2011. The Status and Distribution of Freshwater Biodiversity in the Western Ghats, India. Cambridge, UK and Gland, Switzerland: IUCN, and Coimbatore, India: Zoo Outreach organization.
12. Murphy K.J., Aquatic weed problems and their management, a review, The worldwide scale of the aquatic weed problem, Crop Prot. (7), 232-234 (1988).
13. PareshLacoul and Bill Freedman Environmental influences on aquatic plants in freshwater ecosystems Environ. Rev. 14: 89–136 (2006) .
14. Parsons J. 2001 Aquatic plant sampling protocols , Washington state department of Ecology Publication No. 01-03-017.
15. Prasad, S. N., Ramachandra, T. V., Ahalya, N., Sengupta, T., Kumar, A., Tiwari, A. K. & Vijayan, L. (2002). Conservation of wetlands of India-a review. Tropical Ecology, 43(1), 173-186.
16. Ramachandra, T. V., & Kumar, U. (2008). Wetlands of Greater Bangalore, India: automatic delineation through pattern classifiers. Electronic Green Journal, 1(26).
17. South Asia Network on Dams, Rivers & People Nov 2012 Note by www.sandrp.in as part of organising side event at CBD COP 11 at Hyderabad (India) in Oct 2012 on Impacts of Dams on Biodiversity: Socio-economic dimensions in the context of changing climate
18. Mahapatra, D. M., Chanakya, H. N., & Ramachandra, T. V. (2011). Role of macrophytes in sewage fed urban lake. Inst Integ Omics Biotechnol J (IIOABJ),2(8), 01-09.
19. Dhote, S., & Dixit, S. (2007). Water quality improvement through macrophytes: A case study. Asian J. Exp. Sci, 21(2), 427-430.