

MACROPHYTES OF THE INLAND WATER BODIES OF PATNA

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The scattered wetlands in the river valley of Patna are biologically among the richest and most interesting ecosystem. A total of eleven seasonal and perennial water bodies were selected for present floristic study and were surveyed monthly for two continuous years, from March - 2002 to February - 2003.

A total of sixty species of vascular macrophytes have been recorded from the different water bodies. Most of the species belong to the angiosperms and only two belong to pteridophytes. Among angiosperms 38 species belonging to dicotyledons spread over in 23 families and 20 species of monocotyledons belonging to 10 families.

This paper deals only with the distribution pattern of macrophytes in different water bodies with their ecological nature and flowering season.

Key words : Inland, Macrophytes, Patna, Waterbodies.

The Gangetic plains of Bihar, particularly the stretch along the river Ganga, abound with various types of water bodies representing lentic and lotic ecosystem. These water bodies occupy a substantial part of the area and are represented by rivers, lakes, chours, ponds etc. In and around Patna these water bodies provides, one of the means of living in form of fish pond, cultivation of water chestnut, bathing & washing. Moreover, the river Ganga flowing along the northern part of the city represents one of the important water resources of this region. These inland fresh water reservoirs harbour a wealth of aquatic and semi-aquatic plants.

Regarding the aquatic flora of Bihar a very short account is available in "The Botany of Bihar and Orissa" by Haines (1921-25). The reports of Srivastava (1956), Thakur (1962), Jha (1965), Paul (1973), Jha (1978) and Bandyopadhyay & Kumar (2001) are the only information available about the systematics of aquatic macrophytes of this state.

A study on the macrophytic vegetation in conjunction with the physico-chemical properties of seasonal and perennial water bodies was under taken to find out the relation between the distribution pattern of macrophytes and the

seasonal variations of physico-chemical factors. The present paper deals only with the nature, distribution and flowering season of macrophytes of the aquatic bodies.

MATERIALS AND METHODS

A total of eleven water bodies were selected for present study. These water bodies are situated in different parts of Patna City and surroundings (Fig. 1).

- Site-I Western side of the approach road of Gandhi setu.
- Site-II Western side of Site-I.
- Site-III Southern side of site-II
- Site-IV Northern side of bypass road.
- Site-V Southern side of bypass road petrol pump.
- Site-VI Near Bahadurpur level crossing.
- Site-VII Both sides of Chirayatand over bridge.
- Site-VIII Anisabad area.
- Site-IX Ashiana nagar.
- Site-X Gulzarbagh.
- Site-XI Mangal Talab.

RESULTS & DISCUSSION

A total of 60 species of vascular macrophytes

have been recorded from the different water bodies. Most of the aquatic plants belong to angiosperms and only two belong to pteridophytes. Among angiosperms 38 species have been assigned to dicotyledons spread over in 23 families and 20 species of monocotyledons belonging to 10 families. The distribution, floristic period and mode of pollination of these species under present study are supports the view of Thakur (1962) Srivastava (1956), Paul (1973) & Jha (1965). The habit and flowering season of the plant species are shown in Table. Seasonal variations in macrophytic vegetation in different sites are pointed out below :

Site-I. This is large perennial water body. During summer months *Eichhornia crassipes* covered the entire water surface. In monsoon months *Eichhornia* were removed to cultivate *Trapa bispinosa*. At the advent of the winter free floating plants of *Lemna gibba* and *Azolla pinnata* occupied the water surface. During the dry months of March-April wetland herbs like *Marsilea minuta*, *Cleome gynandra*, *Oxalis corniculata*, *Cassia tora*, *Eclipta alba*, *Parthenium hysterophorous*, *Heliotropium indicum*, *Alternanthera sessilis*, *Ranunculus sceleratus*, *Polygonum glabrum*, occupied the different strata of the lake margin. The submersed vegetation during this period was represented by *Hydrilla verticillata*. Plants of *Ipomoea aquatica* and *Wolffia arrhiza* were recorded sporadically.

Site-II. This is the largest water body among the present lot. Throughout the year the waterbody exhibited the dominance of submersed aquatics like *Hydrilla verticillata*, *Ceratophyllum demersum*. In this water body *Vallisneria spiralis* occupied the litoral zone. In monsoon months plants of *Wolffia arrhiza* and *Lemna gibba* were appeared floating in large numbers, *Ipomoea aquatica* was found to occupy the marginal surface of the water body. In March & April, plants of *Polygonum glabrum*, *Aeschynomene indica*, *A. aspara* and *Ranunculus sceleratus* were found in the drier parts of the margins of the pond.

Site-III. This is a linear stretch of water body. In the winter months the dominant plants recorded from the area were *Ottelia alismoides*, *Nymphoides cristatum*, *Utricularia stellata*, *Lemna gibba*, *Azolla pinnata*, *Ceratophyllum demersum* and *Hydrilla verticillata*. *Ranunculus aquatilis* grew sporadically throughout the year. At the end of monsoon season plants of *Nymphaea stellata* & *N. nauchali* were found. The wetland plants like *Malvestrum tricuspidatum*, *Oxalis corniculata*, *Heliotropium indicum*, *Ipomoea carnea*, *Scirpus articulatus* were found to occupy the margins of water body.

Site-IV. This occupy a vast stretch on the northern side of new bypass road. During summer and monsoon months the water surface exhibited luxuriant growth of *Eichhornia crassipes*, *Lemna gibba* & *Wolffia arrhiza*. The only submersed aquatic recorded was *Utricularia stellata*. At the advent of monsoon *Typha angustata* appeared to occupy the shallow margin of the pond. In the dried months the wetland herbs occupied the fringes of water body. The important plants are *Cassia tora*, *Trianthera monogyna*, *Eclipta alba*, *Euphorbia hirta* and *Fimbristylis tetragona*.

Site-V. This is a seasonal water body in which aquatic plants were recorded in the monsoon and post monsoon month. *Aponogeton crispum* and *Ottelia alismoides* were the most dominant plants. *Nymphaea stellata* were recorded in post monsoon months, with the advent of winter amphibians and wetland herbs gradually occupied the area. They were *Ageratum conizoides*, *Scoparia dulcis*, *Veronica anaqallis*, *Justicia simplex*, *Boerhaavia diffusa*, *Euphorbia hirta*, *Commelina benghalensis* & *Cyperus iria*.

Site-VI. This waterbody is subject to maximum human interference. The natural vegetation were removed for cultivation of *Trapa bispinosa*. The dominant macrophytes recorded were *Potamogeton crispus*, *Lemna gibba*, *Pistia stratiotes*, *Hydrilla verticillata* & *Azolla pinnata*.

Site-VII. This waterbody receives all types of

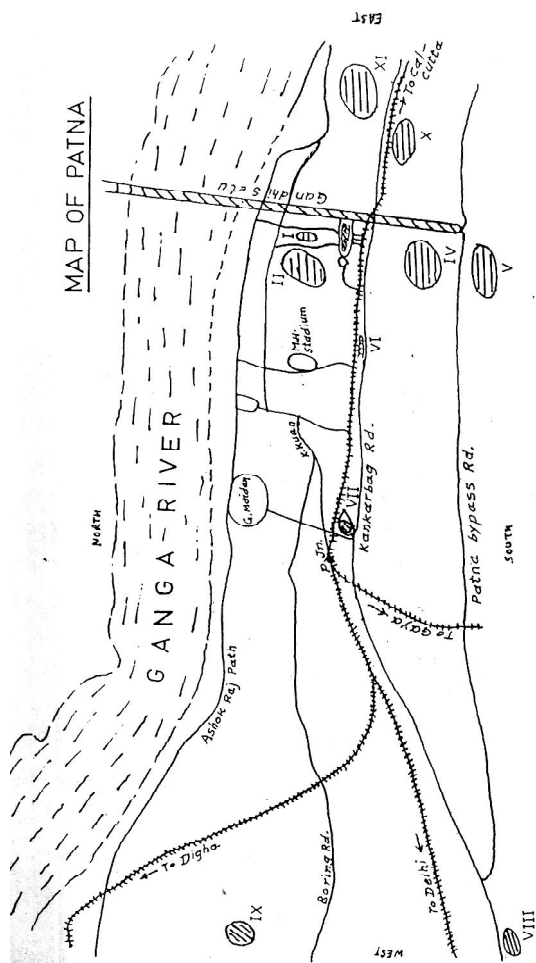


Fig - I. SHOWING DIFFERENT SITES LOCATED IN PATNA.

domestic sewage and waste. The vegetation exhibited the dominant presence of *Eichhornia crassipes* throughout the year. *Azolla pinnata*, *Lemna gibba* & *Wolffia arrhiza* were common aquatics recorded from the area.

Site-VIII. This is a seasonal water body. The water present in monsoon and post monsoon months. The dominant aquatics were *Azolla pinnata*, *Nymphaea stellata*, *Nymphaea nauchali*, *Jussiaea repens*, *Nymphoides cristatum*, *Limnophila heterophylla*, *Monochoria hastata*, *Sagittaria sagittifolia*, *Aponogeton natans*. The wetland plants were *Asterocantha longifolia*, *Justicia simplex*, *Boerhaavia diffusa*, *Polygonum glabrum*, *Acalypha indica*, *Eleocharis dulcis*. Site-IX. In this water body the dominant aquatics were *Eichhornia crassipes*. *Sagittaria sagittifolia*, *Lemna gibba*, *Wolffia arrhiza* & *Typha angustata*. The wetland plants were

Cassia tora, *Ranunculus sceleratus*, *Eclipta alba*, *Heliotropium indicum*, *Asterocantha longifolia*, *Commelina nudiflora*.

Site-X. This is perennial water body. *Eichhornia crassipes* was recorded through out the year. During monsoon and post monsoon months *Nymphaea stellata* and *Nelumbo nucifera* occupied the space in between the floating island of *Eichhornia crassipes*. Site-XI. This water body is large, perennial and is mostly used in Pisciculture. So the natural vegetation was subject to cleaning operation. As such very few species of macrophytes were recorded from the area and were *Nymphoides cristatum*, *Lemna gibba* and *Wolffia arrhiza*. The lowland plants were *Eclipta alba*, *Heliotropium indicum*, *Alternan-thera sessilis*, *Aeschynomene indica*, *Euphorbia hirta* and *Phyllanthus niruri*.

The most characteristic feature of the aquatic vegetation of all the presently studied water bodies was the growth of wetland herbaceous plants on the margins and high land of the bank of water bodies. The prolific growth of wetland herbaceous plants may be accounted for the presence of rich amount of organic matter driven from open defecation on the water margins, decomposition of plants and animals and various municipal and domestic waste.

A comparison of the floristic composition of the different sites are further reveal the effect of sewage water and other drifted pollutants on vegetation. The water bodies of site IV, VII, VIII and V have been associated with the drainage system of the city and are situated amidst human habitation. As such all those water bodies exhibited the dominance of wetland plants.

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Table : Systematic list of plant species along with their habit and flowering season.

S. No.	Name of Plants	Habit	Flowering Season
PTERIDOPHYTA			
MARSILEACEAE			
I. 1.	<i>Marsilea minuta</i> Linn.	Emergent	October - March
AZOLLACEAE			
II. 2.	<i>Azolla pinnata</i> Linn.	Floating	Seen only Vegetative
DICOTYLEDONS			
RANUNCULACEAE			
III. 3.	<i>Ranunculus sceleratus</i> Linn.	Emergent	October-March
4.	<i>Ranunculus aquatilis</i> Linn.	Submerged	October-March
NYMPHAEACEAE			
IV. 5.	<i>Nymphaea stellata</i> Willd.	Floating	April-October
6.	<i>Nymphaea nouchali</i> Burm.	Floating	June-October
7.	<i>Nelumbo nucifera</i> Gaertn.	Floating	June-October
CAPPARIDACEAE			
8.	<i>Cleome gynandra</i> Linn.	Low land	July - August
MALVACEAE			
9.	<i>Malvestrum tricuspidatum</i> A. Gray	Low land	July- December
OXALIDACEAE			
VII. 10.	<i>Oxalis corniculata</i> Linn.	Low land	August-December
PAPILIONACEAE			
VIII. 11.	<i>Aeschynomene indica</i> Linn.	Emergent	September-April
12.	<i>Aeschynomene aspara</i> Linn.	Emergent	October - February
CAESALPINIACEAE			
IX. 13.	<i>Cassia tora</i> Linn.	Low land	After rains
ONAGRACEAE			
X. 14.	<i>Jussiaea repens</i> Linn.	Floating	October-December
TRAPACEAE			
XI. 15.	<i>Trapa bispinosa</i> Roxb.	Floating	July-October
AIZOACEAE			
XII. 16.	<i>Trianthera monogyna</i> Linn.	Low land	July-October
ASTERACEAE			
XIII. 17.	<i>Eclipta alba</i> Hassk.	Low land	June-August
18.	<i>Ageratum conyzoides</i> Linn.	Low land	June-September
19.	<i>Parthenium hysterophorus</i> Linn.	Low land	March-December
MENYANTHACEAE			
XIV. 20.	<i>Nymphoides cristatum</i> Roxb.	Floating	September - March
BORAGINACEAE			
XV. 21.	<i>Heliotropium indicum</i> Linn.	Low land	Throughout the year
CONVOLVULACEAE			
XVI. 22.	<i>Ipomoea aquatica</i> Forsk.	Floating/ Emergent	November-March
23.	<i>Ipomoea carnea</i> Jacq.	Emergent	June-October
SCROPHULARIACEAE			
XVII. 24.	<i>Limnophila heterophylla</i> Benth.	Emergent	September-December
25.	<i>Scoparia dulcis</i> Linn.	Low land	Throughout the year
26.	<i>Veronica anagallis-aquatica</i> Linn.	Emergent	February-June
LENTIBULARIACEAE			
XVIII. 27.	<i>Utricularia stellaris</i> Linn.	Submerged	August-December

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XIX. 28.	ACANTHACEAE <i>Asterocantha longifolia</i> Nees	Low land	October-February
29.	<i>Justicia simplex</i> Don.	Low land	February-March
VERBENACEAE			
XX. 30.	<i>Lippia geminata</i> H.B. & K.	Low land	February-December
NYCTAGINACEAE			
XXI. 31.	<i>Boerhaavia diffusa</i> Linn.	Low land	October-March
AMARENTHACEAE			
XXII. 32.	<i>Alternanthera sessilis</i> Linn.	Emergent	August-November
33.	<i>Alternanthera philoxeroides</i> (Mart) Griseb.	Emergent	October
POLYGONACEAE			
XXIII. 34.	<i>Polygonum glabrum</i> Willd.	Emergent	September-March
35.	<i>Rumex dentatus</i> Linn.	Low land	March-June
EUPHORBIACEAE			
XXIV. 36.	<i>Acalypha indica</i> Linn.	Low land	August-December
37.	<i>Euphorbia hirta</i> Linn.	Low land	Throughout the year
38.	<i>Phyllanthus niruri</i> Linn.	Low land	January-October
39.	<i>Chrozophora rotleri</i> A. Juss.	Low land	February-June
CERATOPHYLLACEAE			
XXV. 40.	<i>Ceratophyllum demersum</i> Linn.	Submerged	January-March
MONOCOTYLEDONS			
HYDROCHARITACEAE			
XXVI. 41.	<i>Hydrilla verticillata</i> (L.F.) Royle	Submerged	October-January
42.	<i>Vallisneria spiralis</i> Linn.	Submerged	October-March
43.	<i>Ottelia alismoides</i> (Linn.) Pers.	Submerged	August-December
PONTEDERIACEAE			
XXVII. 44.	<i>Monochoria hastata</i> (L) solms.	Emergent	After rains
45.	<i>Eichhornia crassipes</i> (Mart) solms.	Floating	March-July
TYPHACEAE			
XXVIII. 46.	<i>Typha angustata</i> Bory & Chamb.	Emergent	October-January
ARACEAE			
XXIX. 47.	<i>Pistia stratiotes</i> Linn.	Floating	During rainy season
COMMELINACEAE			
XXX. 48.	<i>Commelina benghalensis</i> Linn.	Low land	July-October
49.	<i>Commelina nudiflora</i> Linn.	Low land	July-October
LEMNACEAE			
XXXI. 50.	<i>Lemna gibba</i> Linn.	Floating	October-February
51.	<i>Wolffia arrhiza</i> Wimm.	Floating	June - October
ALISMACEAE			
XXXII. 52.	<i>Sagittaria sagittifolia</i> Linn.	Emergent	February-May
APONOGETONACEAE			
XXXIII. 53.	<i>Aponogeton natans</i> (Linn) Krause	Emergent	During rainy season
54.	<i>Aponogeton crispum</i> Thumb.	Floating	July-December
POTAMOGETONACEAE			
XXXIV. 55.	<i>Potamogeton crispum</i> Linn.	Submerged	January-July
56.	<i>Potamogeton pectinatus</i> Linn.	Submerged	Throughout the year
CYPERACEAE			
XXXV. 57.	<i>Scirpus articulatus</i> Linn.	Low land	January-May
58.	<i>Eleocharis dulcis</i> Burm.	Emergent	October-December
59.	<i>Fimbristylis tetragona</i> Br.	Low land	December-March
60.	<i>Cyperus iria</i> Linn.	Low land	December-January

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