



## Study of Floral Diversity with Special Reference to Hydrophytes in Bhubaneswar and its Adjoining Areas, Odisha, India

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### Abstract

Bhubaneswar is located on the eastern side of Odisha covers a geographical area of 124.74 sq km and lies between 20°15' N latitude and 85°15' E longitude. It is located in Khurda district of Odisha. Wetlands are potentially rich in aquatic resources, which play a significant role in maintaining biodiversity. They offer habitats suitable for supporting growth of a variety of aquatic life forms. The study revealed that many water bodies in Bhubaneswar contain wide range of hydrophytes which are economically and medicinally important. A total number of 102 species were recorded belonging to 64 genera of 34 families. Among all the plants 8 species are submerged hydrophytes, 9 species are free floating, 9 species are fixed floating, 21 species are amphibious hydrophytes and 55 species are marshy hydrophytes. Some of the water bodies were completely covered with hydrophytes like *Eichhornia* and *Salvinia* causing ecological negative impact on the aquatic ecosystem. The present work exhibited the database of hydrophytes in Bhubaneswar and its adjoining area which will help in future work for its conservation, preservation and addition of the local biodiversity.

**Keywords:** Bhubaneswar, Odisha, Hydrophytes, Diversity.

### Introduction

Wetlands are potentially rich in aquatic resources, which play a significant role in maintaining biodiversity. They offer habitats suitable for supporting growth of a variety of aquatic life forms. It generally support diverse aquatic vegetation, also called hydrophytic plants or hydrophytes and are plants those have adapted to live in aquatic environments<sup>1</sup>. Wetlands are defined as lands transitional between terrestrial and aquatic eco-systems where the water table is usually at or near the surface or the land is covered by shallow water<sup>2</sup>. And it occupies 4-6% of the earth's land. Wetlands in India are occupied by 58.2 million hectares<sup>3</sup>. Aquatic plants play vital role in the form of tapping of solar energy and in determining the primary productivity of aquatic ecosystem<sup>4</sup>.

Bhubaneswar, the state capital of Odisha is located in Khordha district of Odisha. It is situated in the eastern coastal plains, along the axis of the Eastern Ghat Mountains. The city has an average altitude of 45 m above sea level. It lies southwest of the Mahanadi River that forms the northern boundary of Bhubaneswar metropolitan area, within its delta. The city is bounded by the Daya river to the south and the Kuakhai river to the east, the Chandaka Wildlife Sanctuary and Nandankanan Zoo lie in the western and northern parts of Bhubaneswar, respectively.

A study of hydrophytic plants of India are well documented by many authors<sup>5-8</sup>. Several workers have discussed the wetland plants of the different districts of Odisha state<sup>9-11</sup>. Ansupa lake

of Odisha comprises 46 species of hydrophytes<sup>12</sup>. It was documented 130 aquatic and wet land species during the study of Nandankanan Wildlife Sanctuary<sup>13</sup>. Survey of Eastern Ghats region of Odisha was carried out and reported a good number of aquatic and marshy plant species<sup>14-18</sup>.

Many water bodies present in Bhubaneswar and its adjoining area comprising a wide range of hydrophytes which has not been explored. So an extensive study of hydrophytes of these areas was carried out to find out the detail account of the distribution of hydrophytes, their habitat ecology and association. Which may have economic and medicinal importance.

### Methodology

The study was conducted during 2014-2015 involving field visit, collection of specimen, taking photographs to document the hydrophytes for its abundance and distribution. To facilitate the exhaustive and intensive Plant specimen the facility of collection the area has been divided into different zones and each zone was visited many times in different seasons during September, 2014 to July, 2015. Plant specimen were collected in flowering and fruiting condition as with the reproductive characters it become easy to ascertain the exact identification of the species. The specimens were identified following 'The Botany of Bihar and Orissa'<sup>19</sup> and 'The Flora of Orissa'<sup>11</sup> and a host of recent monographs and reviews. Finally the identified plants were authenticated consulting the authenticate specimens

of Post Graduate Department of Botany herbarium, Utkal University.

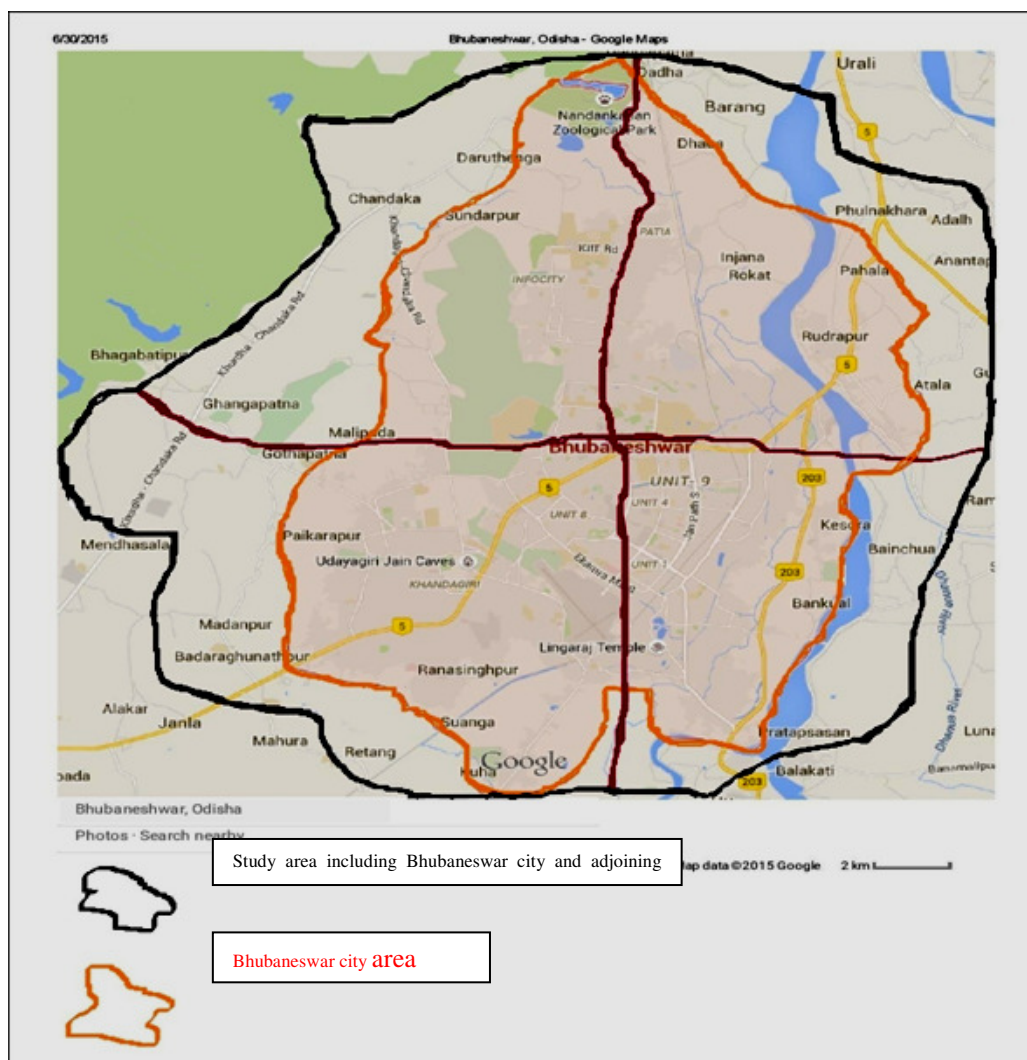
## Results and Discussion

A total number of 102 species were recorded belonging to 64 genera of 34 families from in and around Bhubaneswar (Table-1). Of these monocots were represented by 56 species belonging to 31 genera and 12 families, while dicots contributed by 37 species belonging to 27 genera and 16 families. Also Pteridophyta contributed by 9 species belonging to 6 genus and 6 families (Table-1, Table-2).

Of the total observed species, 55 species were recorded as marshy hydrophytes, 21 species as amphibious hydrophytes, 9 species each as free floating and fixed floating and 8 species as submerged hydrophytes. The collection embraces as many as 92 herbs, 1 shrub and 9 ferns.



**Figure-1**  
 Map showing the location of Bhubaneswar in the state of Odisha<sup>20</sup>



**Figure-2**  
 Map showing study area including Bhubaneswar city and adjoining areas<sup>20</sup>

**Table-1**  
**List of Hydrophytic plants present in Bhubaneswar and its adjoining area**

Sl. No.	Botanical Name	Family	Local Name	Habitat
1.	<i>Alisma plantago-aquatica</i> L.	Alismataceae	-	Amphibious
2.	<i>Sagittaria guayanensis</i> H.B.K. subsp. <i>lappula</i> D.Don	Alismataceae	-	Amphibious
3.	<i>Alternanthera philoxeroides</i> (Mart) Griseb.	Amaranthaceae	-	Amphibious
4.	<i>Alternanthera sessilis</i> (L.) R.Br. ex DC.	Amaranthaceae	Madaranga saga	Marshy
5.	<i>Centella asiatica</i> (L.) Urban	Apiaceae	Thalkuri	Marshy
6.	<i>Hydrocotyle sibthorpioides</i> Lam.	Apiaceae	-	Marshy
7.	<i>Aponogeton natans</i> (L.) Engl. & Krause	Aponogetonaceae	Ghechu	Submerged
8.	<i>Colocasia esculenta</i> (L.) Schott	Araceae	Saru	Amphibious
9.	<i>Pistia stratiotes</i> L.	Araceae	Bora jhanji	Free floating
10.	<i>Eclipta prostrata</i> (L.) L.	Asteraceae	Bhringraj	Marshy
11.	<i>Emilia sonchifolia</i> (L.) DC	Asteraceae	Sarkara	Marshy
12.	<i>Enydra fluctuans</i> Lour.	Asteraceae	Hidimichi	Amphibious
13.	<i>Gnaphalium polycaulon</i> Pers.	Asteraceae	-	Marshy
14.	<i>Spilanthes paniculata</i> Wall. Ex DC.	Asteraceae	-	Marshy
15.	<i>Synedrella nodiflora</i> (L.) Gaertn.	Asteraceae	Hemagra puspi	Marshy
16.	<i>Azolla microphylla</i> Kaulf.	Azollaceae	Chuni dala	Free floating
17.	<i>Azolla pinnata</i> R.Br.	Azollaceae	Chuni dala	Free floating
18.	<i>Ceratophyllum demersum</i> L.	Ceratophyllaceae	Sivara	Submerged
19.	<i>Commelina benghalensis</i> L.	Commelinaceae	Kaniseera	Marshy
20.	<i>Commelina erecta</i> L.	Commelinaceae	Konisir	Marshy
21.	<i>Commelina paludosa</i> Bl.	Commelinaceae	-	Marshy
22.	<i>Ipomoea 3rticul</i> Forssk.	Convolvulaceae	Kalama	Fixed floating
23.	<i>Ipomoea carnea</i> Jacq.	Convolvulaceae	Amari	Marshy
24.	<i>Bulbostylis densa</i> (Wall.) Hand.-Mazz.	Cyperaceae	-	Marshy
25.	<i>Cyperus 3rticulates</i> L.	Cyperaceae	-	Marshy
26.	<i>Cyperus brevifolius</i> (Rottb.) Hassk.	Cyperaceae	Harit mutha	Marshy
27.	<i>Cyperus difformis</i> L.	Cyperaceae	Swonli	Marshy
28.	<i>Cyperus distans</i> L.f.	Cyperaceae	-	Marshy
29.	<i>Cyperus flabelliformis</i> Rottb.	Cyperaceae	-	Marshy
30.	<i>Cyperus halpan</i> L.	Cyperaceae	-	Marshy
31.	<i>Cyperus haspan</i> subsp. <i>Juncoides</i> (Lam.) Kuek.	Cyperaceae	-	Marshy
32.	<i>Cyperus imbricatus</i> Retz.	Cyperaceae	-	Marshy
33.	<i>Cyperus iria</i> L.	Cyperaceae	Swanti	Marshy
34.	<i>Cyperus kyllingia</i> Endl.	Cyperaceae	-	Marshy
35.	<i>Cyperus paniceus</i> (Rottb.) Boeck.	Cyperaceae	-	Marshy

Sl. No.	Botanical Name	Family	Local Name	Habitat
36.	<i>Cyperus pilosus</i> Vahl	Cyperaceae	-	Marshy
37.	<i>Cyperus polystachyos</i> Rottb.	Cyperaceae	-	Marshy
38.	<i>Cyperus puncticulatus</i> Vahl	Cyperaceae	-	Marshy
39.	<i>Cyperus rotundus</i> L. var. <i>tuberosus</i> (Rottb.) Kuek.	Cyperaceae	Mutha	Marshy
40.	<i>Eleocharis dulcis</i> (Burm.f.) Henschef	Cyperaceae	-	Marshy
41.	<i>Fimbristylis argentea</i> (Rottb.) Vahl	Cyperaceae	-	Marshy
42.	<i>Fimbristylis dichotoma</i> (Burm.f.) Kern	Cyperaceae	-	Marshy
43.	<i>Fimbristylis miliacea</i> (L.) Vahl	Cyperaceae	Swanli	Marshy
44.	<i>Scirpus 4rticulates</i> L.	Cyperaceae	Kanri	Amphibious
45.	<i>Eriocaulon quinquangulare</i> L.	Eriocaulaceae	Phurki	Amphibious
46.	<i>Aeschynomene aspera</i> L.	Fabaceae	Sola	Amphibious
47.	<i>Myriophyllum tetrandrum</i> Roxb.	Haloragaceae	-	Submerged
48.	<i>Blyxa echinosperma</i> (C.B.Cl) Hook.f.	Hydrocharitaceae	-	Submerged
49.	<i>Hydrilla verticillata</i> (L.f.) Royle	Hydrocharitaceae	Chingudia dala	Submerged
50.	<i>Ottelia alismoides</i> (L.) Pers.	Hydrocharitaceae	Pani Kundri	Submerged
51.	<i>Vallisneria natans</i> (Lour.) Hara	Hydrocharitaceae	Syala	Submerged
52.	<i>Hydrolea zeylanica</i> (L.) Vahl	Hydrophyllaceae	Balluballua-Kashindri Nayana-tara	Amphibious
53.	<i>Lemna perpusilla</i> Torrey	Lemnaceae	Duckweed	Free floating
54.	<i>Spirodela polyrhiza</i> (L.) Schleiden	Lemnaceae	Duckweed	Free floating
55.	<i>Marsilea minuta</i> L.	Marsileaceae	Sunsunia	Amphibious
56.	<i>Marsilea quadrifolia</i> L.	Marsileaceae	-	Amphibious
57.	<i>Nymphoides hydrophylla</i> (Lour.) Kuntze	Menyanthaceae	Chandra-malla	Fixed floating
58.	<i>Nymphoides indica</i> (L.) Kuntze	Menyanthaceae	Chandra-malla	Fixed floating
59.	<i>Euryale ferox</i> Salisb.	Nymphaeaceae	Kanta Padma	Fixed floating
60.	<i>Nelumbo nucifera</i> Gaertn.	Nymphaeaceae	Padma	Fixed floating
61.	<i>Nymphaea nouchali</i> Burm.f.	Nymphaeaceae	Nilakain	Fixed floating
62.	<i>Nymphaea pubescens</i> Willd.	Nymphaeaceae	Nalikain	Fixed floating
63.	<i>Nymphaea pubescens</i> Willd.	Nymphaeaceae	Dhalakain	Fixed floating
64.	<i>Ludwigia adscendens</i> (L.) Hara	Onagraceae	Jagal	Fixed floating
65.	<i>Ludwigia octovalvis</i> (Jacq.) Raven	Onagraceae	Panilabanga	Amphibious
66.	<i>Ceratopteris thalictroides</i> (L.) Brongn.	Parkeriaceae	-	Marshy
67.	<i>Alloteropsis cimicina</i> (L.) Stapf	Poaceae	-	Amphibious
68.	<i>Brachiaria distachya</i> (L.) Stapf	Poaceae	-	Marshy
69.	<i>Brachiaria milliformis</i> (J.S. Presl) Chase	Poaceae	-	Marshy
70.	<i>Brachiaria mutica</i> (Forssk.) Stapf	Poaceae	Para grass	Marshy
71.	<i>Echinochloa colona</i> (L.) Link	Poaceae	Swanghas	Marshy

Sl. No.	Botanical Name	Family	Local Name	Habitat
72.	<i>Eragrostis ciliaris</i> (L.) R.Br.	Poaceae	-	Marshy
73.	<i>Eragrostis pilosa</i> (L.) P.Beauv.	Poaceae	-	Marshy
74.	<i>Eragrostis uniloides</i> (Retz.) Nees ex Steud.	Poaceae	Phur phuri	Marshy
75.	<i>Melinis repens</i> (Willd.) Hubb.	Poaceae	Natal Grass	Marshy
76.	<i>Oryza rufipogon</i> Griff.	Poaceae	Balunga	Marshy
77.	<i>Panicum paludosum</i> Roxb.	Poaceae	-	Marshy
78.	<i>Panicum psilopodium</i> Trin.	Poaceae	-	Marshy
79.	<i>Paspalidium flavidum</i> (Retz.) A. Camus	Poaceae	Nali Bilailangi	Marshy
80.	<i>Paspalidium geminatum</i> (Forssk.) Stapf	Poaceae	Dhala Bilailangi	Marshy
81.	<i>Setaria pumila</i> (Poir.) Roem. & Schult.	Poaceae	Sial lenguda	Marshy
82.	<i>Polygonum barbatum</i> L. var. <i>barbatum</i> Wight	Polygonaceae	Pani saga	Amphibious
83.	<i>Polygonum glabrum</i> Willd.	Polygonaceae	Bihagni	Amphibious
84.	<i>Polygonum plebeium</i> R.Br.	Polygonaceae	Muthi saga	Amphibious
85.	<i>Eichhornia crassipes</i> (Mart.) Solms- Laub.	Pontederiaceae	Bilati dala	Free floating
86.	<i>Monochoria hastata</i> Solms- Laub.	Pontederiaceae	Nir tamara	Amphibious
87.	<i>Monochoria vaginalis</i> (Burm.f.) Presl.	Pontederiaceae	Kajalapati	Amphibious
88.	<i>Pteris cretica</i> L.	Pteridaceae	-	Marshy
89.	<i>Dentella repens</i> (L.) J.R. & G. Forst.	Rubiaceae	-	Marshy
90.	<i>Hedyotis corymbosa</i> (L.) Lam.	Rubiaceae	Taraka punji	Marshy
91.	<i>Salvinia cucullata</i> Roxb. ex Bory	Salviniaceae	-	Free floating
92.	<i>Salvinia molesta</i> D.Mitch.	Salviniaceae	-	Free floating
93.	<i>Bacopa monneri</i> (L.) Pennell	Scrophulariaceae	Brahmi	Marshy
94.	<i>Limnophila indica</i> (L.) Druce	Scrophulariaceae	Keralata	Amphibious
95.	<i>Lindernia anagallis</i> (Burm.f.) Pennell.	Scrophulariaceae	-	Marshy
96.	<i>Lindernia crustacea</i> (L.) F.v. Muell.	Scrophulariaceae	-	Marshy
97.	<i>Lindernia rotundifolia</i> (L.) Mukherjee	Scrophulariaceae	-	Marshy
98.	<i>Ampelopteris prolifera</i> (Retz.) Copel.	Thelypteridaceae	-	Amphibious
99.	<i>Trapa natans</i> L. var. <i>bispinosa</i> (Roxb.) Makino	Trapaceae	Pani singada	Free floating
100.	<i>Typha angustata</i> Bory & Chaub.	Typhaceae	Hangla	Amphibious
101.	<i>Utricularia stellaris</i> L.f.	Utriculariaceae	Bhaturia dala	Submerged
102.	<i>Phyla nodiflora</i> (L.) Greene	Verbenaceae	Jala Pippali Gosingi	Marshy

**Table-2**  
**List of division-wise distribution of hydrophytic plants present in Bhubaneswar and its adjoining area**

Plant group	No. of Families	No. of Genera	No. of Species
Pteridophyta	6	6	9
Dicotyledons	16	31	37
Monocotyledons	12	27	56

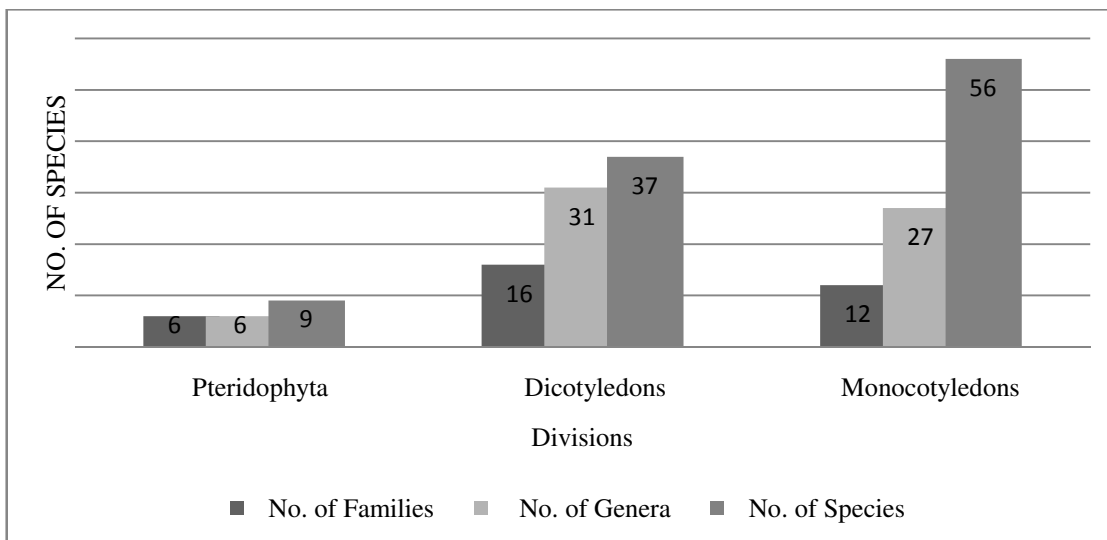


Figure-3

Division-wise distribution of hydrophytic plants present in Bhubaneswar and its adjoining area

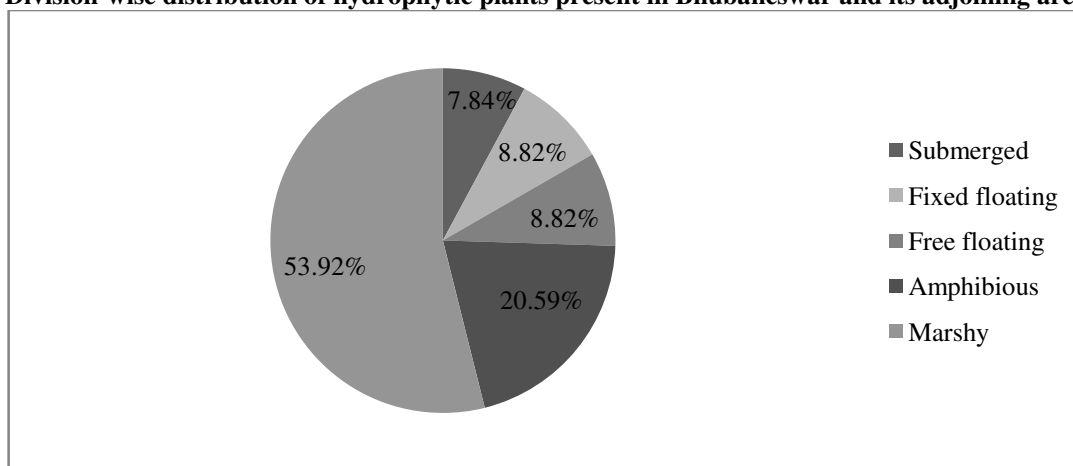


Figure-4

Habitat-wise distribution of hydrophytic plants present in Bhubaneswar and its adjoining area

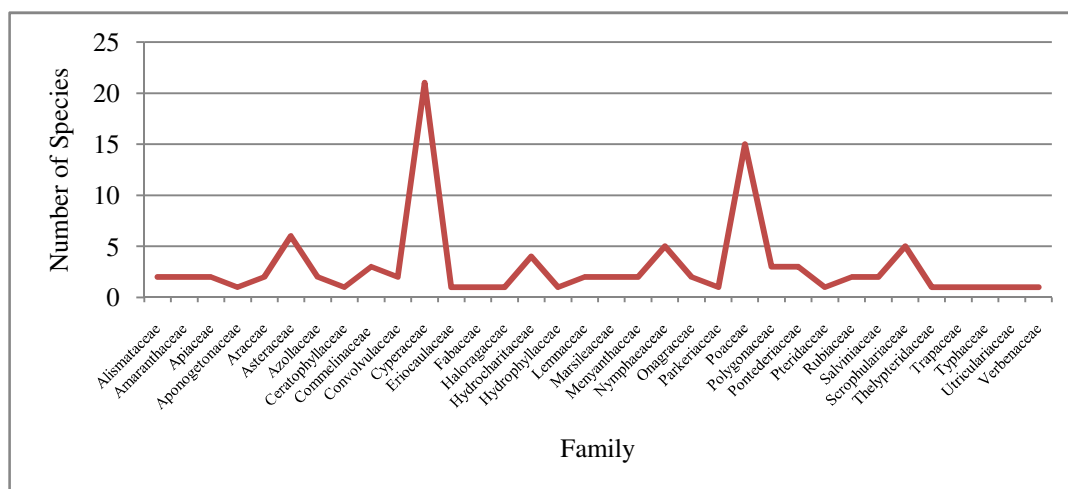


Figure-5

Family-wise distribution of hydrophytic plants present in Bhubaneswar and its adjoining area

**Discussion:** The floristic composition shows that the vegetation of hydrophytes in and around Bhubaneswar includes as many as 55 marshy hydrophytes, 21 amphibious, 9 free floating, 9 fixed floating and 8 submerged hydrophytes. The most dominant family is Cyperaceae (21) followed by Poaceae (15), Asteraceae (6), Nymphaeaceae (5), Scrophulariaceae (5) and Hydrocharitaceae (4). The most dominant genus is *Cyperus* (15) followed by *Brachiaria* (3), *Commelina* (3), *Eragrostis* (3), *Fimbristylis* (3), *Lindernia* (3), *Nymphaea* (3) and *Polygonum* (3). The collection embraces as many as 92 herbs, 1 shrub and 9 ferns.

## Conclusion

The current study revealed that wide ranges of hydrophytes which are economically and medicinally important are found in water bodies in Bhubaneswar and its adjoining areas. Several water bodies were found to be covered with hydrophytes like *Eichhornia* and *Salvinia* causing ecological negative effect on the aquatic ecosystem. Time and again human greed has brought harmful effects on Nature. Among these one such activity is the occupation of land area for habitation, agricultural activity and rearing of cattle. Some part of wetland have been drained and transformed into rice fields and used for other crops. The present work exhibited the database of hydrophytes in Bhubaneswar and its adjoining area which will help in future work for its conservation, preservation and addition of the local biodiversity.

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