

Macrophytes of Rajarani-Dhimal Pokhari Wetland, Churia hills, Eastern Nepal

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Abstract

Growth forms, availability and uses of macrophytes found in Rajarani Dhimal Pokhari wetland, Churia hills, eastern Nepal was carried out in 2016. Altogether, 75 species belonging to 64 genera, 30 families, and 7 growth forms were recorded. Growth form classes were: helophytes and hyperhydrites (34.7%)> tenagophytes (16%)> pleustophytes (8%) rosulates, epihydrites (2.6%)> vittates (1.4%). *Nymphaea nauchelii*, *Rorippa indica*; and *Cephalanthus tetrandra* were new aquatic macrophytes to eastern Terai and Nepal, respectively. Aquatic macrophytes useful to local socio-economy were: feed for livestock (17 sp), edible as pot herbs and wild fruits (5 sp), medicinal (19 sp), green manure/compost (7 sp), fish poison (2 sp), handicrafts as mats/brooms/basketry (8 sp), breeding genetic stock (2 sp) and religious (3 sp). The key species of the wetland *Cephalanthus tetrandra* is under threat. of *Mikania micrantha*-an invasive alien species (IAS).

Key words: *Cephalanthus tetrandra*, Growth forms, Helophytes, Invasive alien species

Introduction

Wetlands are one of the most productive ecosystems in the world and essential life supporting systems providing a wide array of benefits. They are valuable sources, sinks, and transformers of chemical, biological and genetic materials (Mitsch & Gooselink, 2000). Aquatic macrophytes are natural biotic components whose abundance influences the structural and functional characteristics of wetland (Canfield *et al.*, 1984). They dynamically guide cycle of minerals and other organic compounds, thereby influencing overall biomass production of water bodies and it can serve as indicator of monitoring the degree of damage in the ecosystem. Floristic list in a particular area gives reliable background information about the species diversity in community as each plant species has its own specific ecological amplitude and the same indicates the ecological nature of the habitat. There are reports on macrophytes of Terai region (Shrestha, 1996, Jha *et al.* 2005, Siwakoti, 2006, Niroula *et al.* 2010, Niroula & Singh, 2010). Present communication enumerates the aquatic macrophytes, growth forms, use category and availability of macrophytes in the Raja-Rani Dhimal Pokhari wetland located at Churia hills.

Materials and Methods

Study area

Rajarani Dhimal Pokhari wetland (26°44.9'22"N, 87°28.9'10"E; alt. 470 m msl) is situated in Churia hills at Letang-Bhogateni Municipality - 4, Morang district, Province 1, eastern Nepal. It lies within the Rajarani community forest (1700 ha) area. The wetland (133 ha)

consists of Raja, Rani and Rajkumari Pokhari (20 ha). Depth of ponds ranges 2-7 m during rainy season and small Rajkumari Pokhari is almost dry in summer season. The wetland is culturally and religiously important for Dhimal community.

The climate of the wetland is subtropical monsoon type. The average annual minimum and maximum temperature ranges from 12-19 °C, and 22-30 °C, respectively. The total annual rainfall varies from 1,138 mm to 2,671 mm (FRA/DFRS, 2014).

An intensive survey of macrophytes was undertaken seasonally in the year 2016. Identification and growth form categories were determined by standard literature (Hooker, 1872-1897; Cook, 1996). The nomenclature of the plants was based on Hara *et al.* 1978-1982. Availability of the plants were noticed as abundant (++++), frequent (+++), occasional (++) and scarce (+) by visual observation. Use category of the plants was determined with the help of literature (Anonymous, 1948-1976; Banerjee, 1995; Bala & Mukherjee, 2007; Majupuria & Joshi, 2009).

Results and Discussion

Altogether 75 species of aquatic plants belonging to 64 genera and 30 families were recorded in the Rajarani Dhimal pokhari wetland. Dominant families in number of species were: Poaceae (12), Asteraceae (10), Cyperaceae (7), Araceae, Polygonaceae(4), Apiaceae, and Scrophulariaceae (3). *Cephalanthus tetrandra*, *Osbekia stellata* and *Pandanus nepalensis* were woody perennials. Growth forms, availability and various uses of aquatic macrophytes occurring in the Rajarani Dhimal Pokhari wetland Letang-Bhogateni, Morang, eastern Nepal is given in Table 1. *Nymphaea nauchelii* and *Rorippa indica* were new to Terai while *Cephalanthus tetrandra* was new to Nepal in the Rajarani Dhimal Pokhari wetland. Unique natural habitat of the study site is favourable for luxuriant growth of aquatic vegetation. Dhimal Pokhari wetland exceeded in number of species occurring at Betana wetland Belbari, Singhia river and Bhattapokhari of Biratnagr, eastern Terai, Nepal (Niroula, 2011). Conspectus of aquatic species in the wetland is given in Table 2.

Table 1. List of macrophytes in Raja-Rani Dhimal Pokhari Wetland Letang-Bhogateni, Morang, Eastern Nepal.

SN Name of species	L.N/C.N	Gr. Use F. cat.	Avail.
Bryophyta			
Ricciaceae			
1. <i>Riccia fluitans</i> L.	Leu	Ple -	+
Pteridophyta			
Athyriaceae			
2. <i>Diplazium esculentum</i> (Retz.) Sw	Niguro	Hel F	++
Azollaceae			
3. <i>Azolla imbricata</i> (Roxb.) Nakai	Pani uneu	Ple C	++
Equisetaceae			
4. <i>Equisetum diffusum</i> D. Don	Kurkure	Hel M	++
Thelypteridaceae			
5. <i>Thelypteris dentata</i> (Forsk) St. John	Niguro	Hyp -	+++
6. <i>T. prolifera</i> (Retz.) C.F. Reed	Fern	Hel -	+

Angiospermae				
Dicotyledonae				
Acanthaceae				
7.	<i>Hygrophila polysperma</i> (Roxb.) T. Anders	Talmakhan	Hyp M	++
8.	<i>H. quadrivalvis</i> (Buch.-Ham.) Nees	-	Hyp -	++
Amaranthaceae				
9.	<i>Alternanthera sessilis</i> (L.) DC	Bhringi jhaar	Hel F	++
10.	<i>Celosia argentea</i> L.	Raswari saag	Hel -	++
Apiaceae				
11.	<i>Centella asiatica</i> (L.) Urb.	Ghodtapre	Hel M	++
12.	<i>Hydrocotyle sibthorpioides</i> Lamk.	Sano ghodtapre	Hel -	++
13.	<i>Oenanthe javanica</i> (Blume) DC	Pani dhaniya	Hyp F	++
Asteraceae				
14.	<i>Adenostemma lavenia</i> (L.) Kuntze	Pani jhaar	Hyp -	++
15.	* <i>Ageratum conyzoides</i> L.	Ilame jhaar	Hel M	++
16.	* <i>A. haustonianum</i> Miller	Nilo gandhe	Hel -	++
17.	<i>Cotula hemispherica</i> (Roxb.) Wall. ex. C.B. Clarke	Gandha madini	Hel C	++
18.	<i>Eclipta prostrata</i> (L.) L.	Bhringaraj	Hel M/R	++
19.	<i>Gnaphalium affine</i> D. Don	Booki phul	Hel -	++
20.	<i>G. polycaulon</i> Pers.	Bhuin booki	Hel -	++
21.	<i>Grangea maderaspatana</i> (L.) Poiret	Gobre jhaar	Hel C	++
22.	* <i>Mikania micrantha</i> Kunth.	Banmara	Hel -	++
23.	<i>Sphaeranthus indicus</i> L.	Bhuin kadam	Hel M	+
24.	<i>Spilanthes iabadicensis</i> A.H. Moore	Purple	Ten M	++
Gentianaceae				
25.	<i>Nymphoides hydrophyllum</i> (Lour.) O. Kuntze	Floating heart	Eph M	++
Brassicaceae				
26.	<i>Rorippa indica</i> (L.) Hiern	Yellow cress	Ten -	++
Lythraceae				
27.	<i>Rotala rotundifolia</i> (Buch.-Ham. Roxb) ex D. Don	Sim jhaar	Hyp -	++++
Melastomaceae				
28.	<i>Osbekia stellata</i> Buch.-Ham. ex D. Don	Angeri	Hel F	++
Nymphaeaceae				
29.	<i>Nymphaea nauchelli</i> N.L. Burman	Kamal	Eph R	+++
Onagraceae				
30.	<i>Ludwigia octovalvis</i> (Jacq.) Raven	Luwange	Hyp -	+++
31.	<i>L. perennis</i> L.	Luwange	Hyp M	++
Polygonaceae				
32.	<i>Persicaria barbatum</i> (L.) Hara	Pirre jhaar	Hyp M	++
33.	<i>P. glabrum</i> Willd	Pirre jhaar	Hyp M	++
34.	<i>P. hydropiper</i> L.	Pirre jhaar	Hyp FP	++
35.	<i>P. sp.</i>	Pirre Jhaar	Hyp FP	++
Rubiaceae				
36.	<i>Cephalanthus tetrandra</i> (Roxb.)	Pani simali	Hyp -	++++
37.	<i>Hedyotis diffusa</i> Willd	Majithe jhaar	Hel -	++
Scrophulariaceae				
38.	<i>Lindernia oppositifolia</i> (L.) Mukharjee	-	Ten -	++
39.	<i>Limnophila rugosa</i> (Roth) Merrill	-	Ten -	++
40.	<i>Mecardonia procumbens</i> (Mill.) Small	Baby jump up	Hel -	++
Urticaceae				
41.	<i>Pouzolzia zelanica</i> (L.) J. Bennett & Brown	Barbere	Hel -	++

Monocotyledonae			
Aponogetonaceae			
42. <i>Aponogeton appendiculatus</i> H. Bruggen	-	Ros -	++
Araceae			
43. <i>Acorus calamus</i> L.	Bojho	Ten M	+
44. <i>Colocasia esculenta</i> (L.) Schott.	Kachhu	Ten FO	+
45. <i>Lasia spinosa</i> (L.) Thwaites	Morange saag	Hyp F	++
46. <i>Pistia stratiotes</i> L.	Pani banda	Ple C/M	++
Commelinaceae			
47. <i>Commelina paludosa</i> Blume	Swamp day flower	Hel -	++
48. <i>Floscopa scandens</i> Lour.	Kane	Hyp FO/M	+++
49. <i>Murdania vaginata</i> (L.) Bruckn	-	Ten FO	++
Cyperaceae			
50. <i>Carex nubigena</i> D. Don	Hatkatta	Hyp FO	++
51. <i>Cyperus amabilis</i> Vahl	Mothe	Hyp HC	+++
52. <i>C. esculentus</i> L.	Mothe	Hyp HC	++
53. <i>C. pilosus</i> Vahl	Keshar	Hyp HC	+++
54. <i>C. platystylis</i> R. Br.	Mothe	Hyp HC	++
55. <i>Fimbristylis dichotoma</i> (L.) Vahl.	Mothe	Hyp FO	++
56. <i>Kyllinga brevifolia</i> Rottb.	Mothe	Hel FO	++
Hydrocharitaceae			
57. <i>Ottelia alismoides</i> (L.) Pers.	Hile jhaar	Ros FO/M	++++
Lemnaceae			
58. <i>Lemna minor</i> L.	Duckweed	Ple C/M	++
59. <i>Spirodela polyrhiza</i> (L.) Schleiden	Duckweed	Ple C	++
Najadaceae			
60. <i>Najas graminea</i> Dulile	Water nymph	Vit -	+
Pandanaeae			
61. <i>Pandanus nepalensis</i> St. John	Dandi kath	Ten M/R/HC	++++
Poaceae			
62. <i>Arundinella nepalensis</i> Trin.	River grass	Hyp FO	++
63. <i>Cynodon dactylon</i> (L.) Pers	Dubo	Hel M/FO/R	++
64. <i>Digitaria setigera</i> Roth apud Roem. & Schultz.	Banso	Hel FO	+
65. <i>Hemarthria compressa</i> (L. f.) R. Br	Ghode dubo	Ten FO	++
66. <i>*Leersia hexandra</i> Swartz	Karaute	Hyp FO/GR	++
67. <i>Oplismenus composites</i> (L.) Beauvois	-	Hel FO	++
68. <i>Panicum psilopodium</i> Roxb.	Janai ghans	Hyp FO	++++
69. <i>Paspalum distichum</i> L.	Panighans	Ten FO	+
70. <i>Phragmites karka</i> (Retz.) Trin ex. Steudel	Narkat	Hyp HC	++
71. <i>Saccharum spontaneum</i> L.	Kans	Hel M/FO/GR/HC	++
72. <i>Sacciolepis indica</i> (L.) Chase	Panighans	Hyp FO	++++
73. <i>Setaria paludifusca</i> Schumah	Ghoge banso	Ten FO	++
Pontederiaceae			
74. <i>*Eichhornia crassipes</i> (mart.) Solms.	Jalkumbhi	Ple C	++++
Typhaceae			
75. <i>Typha elephantina</i> Roxb.	Pater	Ten HC	++

(Hel = helophytes, Ten = tenagophytes, Hyp = hyperhydrites, Eph = epihydrites, Ple = pleustphytes, Ros = rosulates, Vit = vittates; C = compost manure, F = food, FO = fodder, FP = fish poison, GR = genetic resource, HC = handicrafts, M = medicinal, R = religious; + = scarce, ++ = occasional, +++ = frequent, ++++ = abundant) *Invasive alien species (IAS)

Table 2. Conspectus of macrophytes occurring in Rajarani Dhimal Pokhari, Churia hills eastern Nepal.

Taxa	Family	Genera	Species
Bryophyta	1	1	1
Pteridophyta	4	4	5
Angiosperm-Dicots	14	28	35
Angiosperm-Monocots	11	31	34
Total	30	64	75

Eichhornia crassipes, *ottelia alismoides*, *Panicum psilopodium*, *Rotala rotundifolia* and *Sacciolepis indica* were abundant while *Acorus calamus*, *Arundinella nepalensis*, *Digitaria setigera*, *Paspalum distichum* and *Najas graminea* were scarce. *Ageratum conyzoides*, *A. haustonianum*, *E. crassipes*, and *Mikania micrantha* were invasive alien species of the wetland. The key species of the wetland *Cephalanthus tetrandra* is under threat by *M. micrantha*. Invasive alien species form part of the vegetation in the disturbed areas and they are most susceptible to biological invasion (Mitchell & Gopal, 1991).

Seven growth forms of aquatic plants were recorded in the Raja-Rani Dhimal Pokhari wetland. Percentage contribution to each growth form classes were in the order: Helophytes and Hyperhydrites (34.7%) > Tenagophytes (16%) > Pleustophytes (8%) Rosulates, Epihydrites (2.6%) > Vittates (1.4%).

Aquatic macrophytes were found to play substantial role in local socio-economy; feed for livestock (17 sp.), edible as pot herbs and wild fruits (5 sp.), medicinal (19 sp.), green manure/compost (7 sp.), fish poison (2 sp.), handicrafts as mats/brooms/basketry (8 sp.) and religious (3 sp.). Some plant had multiple uses. Miscellaneous uses of the macrophytes in the Rajarani Dhimal Pohhari wetland included as insect repellent-*Acorus calamus* and *Sphaeranthus indicus*; dyes-*Eclipta prostrate* and *Persicaria hydropiper*; breeding genetic stocks for rice- *Leersia hexandra* and sugarcane- *Saccharum spontaneum*.

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