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DIVERSITY AND ECONOMIC IMPORTANCE OF WETLAND FLORA OF EASTERN UTTAR PRADESH (INDIA)

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ABSTRACT

The paper throws light on diversity, economic importance and conservation aspects of the flora of the Wetlands of Eastern Uttar Pradesh State of India. The study has revealed the occurrence of 162 species belonging to 108 genera and 49 families of Angiosperms. One new record for the State, one new distributional record and one new use of a wetland species are recorded.

INTRODUCTION

Lying between the geographical limits of 25° 10' - 26° 20'N & 81° 00' - 84° 15' E and bounded by the river 'Ghaghra' to the north and the river' Ganga' to the south, east to their confluence near Chapra (Bihar), the Eastern region of Uttar Pradesh State of Indian Union, consists of numerous small lakes, ponds, marshes and water courses in vast low-lying region. The area stretches *ca* 370 km from east to west and up to 120 km from north to south. Although the exact total area of the wetlands of this region is yet to be worked out, it is estimated to be *ca* 2,500,000 ha having over 500 fresh water wetlands of over 100 ha, a few exceeding 500 ha and a large number of small waterbodies (*cf.* W.W.F. 1993). The region falls under Biogeographical province 4.8.4 and the wetland types are 11, 13, 14, 15 and 19. The altitude is *ca* 100 m above sea level. The region has a tropical monsoon climate, typical of the 'Ganges plain, with an average annual rainfall of *ca* 100 m and a temperature range 5°- 45° (-47°) C. The whole area is densely populated and under intensive cultivation. The lands are largely under private ownership.

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These wetlands are mostly utilised for fishing, water supply for irrigation and to some extent for domestic uses as well. These are a source of fodder for domestic live-stock and fuel for cooking for the local people.

Rather meagre research work have been carried out in this important region (*cf.* W.W.F. 1993). In view of the economic importance and social values of these wetlands, present studies were undertaken to assess the diversity and economic importance of the wetland flora of this region. District Gazetteers, Maps from Irrigation Dept., Govt. of U. P. and published literature (Biswas & Calder 1937, Duthie 1960, Sahai & Sinha 1968, Sen 1959, Singh & Singh, Srivastava 1976, Subramanyam 1962) were consulted to find out the location of wetlands. Survey and exploration work was undertaken during 1995-96 and the plant specimens were collected and processed following standard methodology. Herbarium specimens collected earlier from the area under study were studied.

During present studies, following Tals *viz.* Gujar Tal, Mane Tal, Dhesur Tal, in Jaunpur district, Surha Tal, Dah, Pakaria Tal in Ballia district, Ratoi Tal (in Ballia and Azamgarh district); Binna, Kaili and Duhia Tals in

Azamgarh district; Ramgarh Tal in Gorakhpur district were surveyed.

OBSERVATIONS

In this region, the wetlands are given a specific local terminology *e.g.* 'Tal' (the true natural wetlands), Talab, Jheels, Pokhra, Pokhri, Talaiya, Garha, Dah (in Ballia district only). Each of them have a separate identity.

The angiosperms of the wetlands of Eastern Uttar Pradesh may be grouped into following categories :

1. *Surface free floating species* : This category includes the plants which are in contact with water and air only *e.g. Wolffia arrhiza* (L.) Wimm., *Trapa natans* var. *bispinosa* (Roxb.) Makino, *Pistia stratiotes* L., *Eichhornia crassipes* (Mart.) Solms. Some of these like PISTIA and EICHHORNIA are seen in mud as well in drying beds of the Tals.

2. *Submerged free-floating species* : Plants like *Ceratophyllum demorsum* L., *Utricularia aurea* Lour, *U. stellaris* L.f. are rootless plants that remain submerged and are in contact with the water only (not the air/soil).

3. *Submerged-rooted species* : Plants like *Hydrilla verticillata* (L.f.) Royle, *Potamogeton pectinatus* L., *Ottelia alismoides* (L.) Pers., *Vallisneria spiralis* L. etc. are entirely or for the most part in contact with soil and water only.

4. *Floating leaved anchored species* : The plants under this category *viz. Aponogeton natans* (L.) Engl. & Kraus, *Nelumbo nucifera* Gaertn., *Nymphaea nouchali* Burm. f., *N. stellata* Willd., *Nymphoides cristatum* (Roxb.) O. Kuntze, *N. indicum* (L.) O. Kuntze, etc. recorded from the area under study are in contact with soil, water and air as well.

5. *Rooted species with floating shoots*: These include the species like *Ipomoea aquatica* Forsk., *Ludwigia adscendens* (L.) Hara, *Neptunia prostrata* (Lamk.) Baill. etc. which are rooted in the muddy substratum but their shoots spread over the water-surface. These plants become terrestrial when the water of the Tals dry up.

6. *Emergent rooted species* : This category is represented by the plants like *Achyranthes aquatica* Br., *Aeschynomene indica*, *Amischophacellus axillaris* (L.) Rao & Kamm., *Ammania baccifera* L., *Bergia ammannoides* Roxb., *Butomus latifolia* D. Don, *Coix lachryma-jobi* L., *Cyperus difformis*, *Eleocharis dulcis* Henschel, *Eriocaulon quinquangulare* L., *Hydrolea zeylanica* Vahl, *Limnophila indica* Druce, *Polygonum glabrum* Willd., *P. limbatum* Meissn., *Sphenoclea zeylanica* Gaertn., *Scirpus articulatus* L., *Sparagonium erectum* etc. In this category, lower part of the plants often up to lower leaves are usually under water.

7. *Marshy species* : Marshy habitats where the soil is usually saturated with water atleast in the early stages of plant-growth. The main species of this category include : *Canscora decussata* R. & S., *C. diffusa* R. Br., *Corchorus capsularis* L., *Cyperus alulatus* Kern. *C. exaltatus* Retz., *Eleocharis atropurpurea*

Table - I : Analysis of Floristic diversity of wetlands of Eastern Uttar Pradesh (India).

Taxa	Dicots	Monocots	Total
Families	32	17	49
Genera	58	50	108
Species	86	76	162

Ratio between Monocot and Dicot families = 1:1.88
Ratio between Monocot and Dicot genera = 1:1.16
Ratio between Monocot and Dicot species = 1:1.13

Kunth, *Fimbristylis littoralis*, *F. miliacea* Vahl, *Glossostigma spathulatum* Arn. ex Benth., *Gnaphalium pulvinatum* Del., *Hygrophila auriculata* Heine, *Melochia corchorifolia* L., *Microcarpaea minuta* (Koen.) Merr., *Phyla nodiflora* Greene, *Ranunculus scleratus* L., *Rumex dentatus* L., *Xanthium strumarium* L., etc.

DIVERSITY

Present studies revealed the occurrence of 162 species under 108 genera and 49 families of Angiosperms in the wetlands of Eastern Uttar Pradesh. Out of these, Dicots are represented by 86 species under 58 genera and 32 families while Monocots are represented by 76 species under 50 genera and 17 families (Table I & II). Details about their local names (wherever known), flowering/fruiting period and uses (wherever known) are presented in Table III.

The dominant families of the area under study as per the number of species are Poaceae (2), Cyperaceae (23), Asteraceae (8), Scrophulariaceae (8), Polygonaceae (8), Lythraceae (6), Amaranthaceae (5) and Gentianaceae (5). Amongst Monocots, Poaceae is the most dominant family followed by Cyperaceae. Amongst Dicots, Apiaceae, Polygonaceae and Scrophulariaceae each with equal number (8 species) of species make the lead, followed by Lythraceae (6), Gentianaceae (5), Amaranthaceae (5), Acanthaceae (4) and Onagraceae (4).

The economic importance of the wetland flora is manifold particularly in this region. For example *Oryza rufipogon* - locally known as 'Teeni' (wild semi-aquatic rice) is associated with local customs. During religious fasting days, it is recommended for consumption in various ways (plain/cooked as sweet dish *i.e.* rice cooked in milk with sugar). During *Jaitua festival*, the grains of this rice (raw) with little curd and flowers of Mahua (*Madhuca latifolia* var. *latifolia*) are used in worship and then distributed as 'Prasad' for being eaten raw. Behind the use of only this rice during fasts, the local belief is that since during its harvesting no iron instrument is used, hence it is permissible for consumption. However, the table salt is not consumed instead 'Sendha Namak' is used.

Similarly the kernels of *Trapa natans* var.

bispinosa (locally called as singhara) are also consumed in various ways (raw/cooked/in curries/flour prepared by grinding dry kernels).

But due to the shrinking area of the wetlands because of population pressure and more specifically because of the human greed, this wild rice is getting scarce now. Over two decades ago, it was much cheaper than the

Table - II : Floristic Diversity of Wetlands of Eastern Uttar Pradesh

Family	No. of Genera	No. of species
I. Dicotyledons :		
1. Acanthaceae	2	4
2. Amaranthaceae	3	5
3. Apiaceae	3	3
4. Asteraceae	7	8
5. Boraginaceae	1	1
6. Campanulaceae	2	2
7. Ceratophyllaceae	1	1
8. Chenopodiaceae	1	1
9. Convolvulaceae	1	1
10. Elatinaceae	1	1
11. Gentianaceae	3	5
12. Hydrophyllaceae	1	1
13. Lamiaceae	1	1
14. Leguminosae	2	3
15. Lentibulariaceae	1	3
16. Lythraceae	2	6
17. Nelumbonaceae	1	1
18. Nympheaceae	2	3
19. Onagraceae	1	4
20. Plantaginaceae	1	1
21. Polygonaceae	2	8
22. Primulaceae	3	3
23. Ranunculaceae	1	1
24. Rosaceae	1	1
25. Rubiaceae	1	2
26. Scrophulariaceae	5	9
27. Solanaceae	1	1
28. Sphenocleaceae	1	1
29. Sterculiaceae	3	2
30. Tiliaceae	1	1
31. Trapaceae	1	1
32. Verbenaceae	1	1

Family	No. of Genera	No. of species
II. Monocotyledons :		
1. Alismataceae	1	2
2. Amaryllidaceae	1	1
3. Aponogetonaceae	1	2
4. Araceae	1	1
5. Butomaceae	1	1
6. Commelinaceae	3	3
7. Cyperaceae	8	3
8. Eriocaulaceae	1	1
9. Hydrocharitaceae	3	4
10. Juncaceae	1	1
11. Lemnaceae	3	3
12. Najadaceae	1	1
13. Poaceae	20	25
14. Pontederiaceae	2	3
15. Potamogetonaceae	1	3
16. *Sparaganiaceae	1	1
17. Typhaceae	1	1

*Recorded from Pakaria Tal in Ballia only

medium quality rice but now it is costlier than even 'Basmati' and is being sold at the rate of Rs.52-80/- per kg.

An important wetland crop of this region is Sanwa (*Echinochloa stagnina* Poaceae) which was quite common and cheap about two decades ago, but today it is very difficult to get even small quantity of it even in remote villages.

Head loads of the leaves of 'Lotus' (*Nelumbo nucifera*) - locally known as Puraien are collected every day by the rural folk of nearby localities while the fruiting thalamus locally called as 'Kawalgatta, or Kamalgatta' are sold in the local rural markets for its nuts which are eaten raw/cooked in curries or after roasting when dried. The rhizomes known as 'Bhasir' are consumed as vegetable in spicy curries and pickled in vinegar also. This single species is a rich source of income to the rural folk of the adjoining areas. Seeds of Nymphaea ssp. are roasted and eaten. Its flowering stalks are also consumed in vegetable.

The tubers of Aponogeton are eaten by local poor people. It has been observed that pigs dig these tubers and eat it, in drying ponds.

Many wetland plants are consumed as 'Sag' (leafy vegetables). Particularly the leafy twigs of *Ipomoea aquatica* locally known as 'Karemua ka sag' or 'Nari Sag' is seen in plenty in local markets and fetches some money to the poor people.

Pith of *Aeschynomene aspera* and

Table-III : Angiosperms of wetlands of eastern Uttar Pradesh

Botanical name	Local name	Family	Flowering & Fruiting period	Uses/Remarks
1	2	3	4	5
1. *Achyranthes aquatica* Br.	–	Amaranthaceae	Sept.-Dec.	Pith for decorative articles as insulator.
2. *Aeschynomene aspera* L.	Shola	Fabaceae	July-Nov.	Plants of medicinal value
3. *A. indica* L.	–	Fabaceae	July-Nov.	Inferior to *A. aspera* used for same purposes.
4. *Alternanthera parangchoides* St. Hill.	–	Amaranthaceae	July-Nov.	–
5. *A. sessilis* (L.) DC.	–	Amaranthaceae	Aug.-Oct.	Leaves used in soap; medicinal herb, used as fodder increases milk flow in cattle.
6. *Amaranthus gracilis* Desf.	–	Amaranthaceae	April-Sept.	–
7. *A. tenuifolius* Willd.	–	Amaranthaceae	April-Sept.	–
8. *Amischophacelus axillaris* (L.) Rao & Kamm.	–	Commelinaceae	July-Dec.	Plants used for tympanitis. Seeds edible.
9. *Ammania baccifera* L.	Dadmari	Lythraceae	June-Jan.	Antityphoid, antitubercular properties. Leaves used in ringworm.
10. *A. multiflora* Roxb.	–	Lythraceae	Aug.-Nov.	–
11. *A. senegalensis* Lamk.	–	Lythraceae	Aug.-Nov.	Plants used as blistering agent. Rich in Vit. C.
12. *Androsace umbellata* (Lour.) Mew.	–	Primulaceae	Jan.-March	–
13. *Aponogeton crispus* Thunb.	–	Aponogetonaceae	Sept.-Nov.	Tuberous root-stocks edible.
14. *A. natans* (L.) Engl.	Ghechu	Aponogetonaceae	Aug.-Nov.	Root-stocks edible.

1	2	3	4	5
15. *Bacopa monnieri* (L.) Penn.	–	Scrophulariaceae	July-Dec.	Medicinal herbs. Used in nervous diseases, diuretic, aperient, cardiotonic.
16. *Bergia ammonnioides* Roxb.	–	Elatinaceae	Oct.-Jan.	–
17. *Brachiaria ramosa* (L.) Stapf.	–	Poaceae	July-oct.	Grains edible (flour). Straw as fodder.
18. *B. reptans* (L.) Gard.	–	Poaceae	July-oct.	Grains edible. A good fodder.
19. *Bulbostylis barbata* (Rottb.) Kunth	Masa	Cyperaceae	Aug.-Nov.	Brew of the herb (by boiling in water) is given in dysentery.
20. *Butomopsis latifolia* (D. Don) Kunth	–	Butomaceae	Sept.-Jan.	–
21. *Caesulia axillaris* Roxb.	–	Asteraceae	Sept.-Jan.	–
22. *Campanula colorata* Wall. ex Roxb.	–	Campanulaceae	March-April	–
23. *Canscora decussata* R. & S.	–	Gentianaceae	Aug.-Oct.	–
24. *C. diffusa* R. Br.	–	Gentianaceae	Dec.-March	–
25. *Carex fedia* Nees	–	Cyperaceae	Feb.-April	–
26. *Centella asiatica* (L.) Urb.	Brahma manduki	Apiaceae	April-July	Diuretic, tonic, used in leprosy.
27. *Centipeda minima* (L.) R. Br.	Nakchhikni	Asteraceae	Dec.-March	Leaf and seed powder as snuff. Seeds vermifuge, yield essential oil. Leaf infusion in Ophthalmia.
28. *Ceratophyllum demorsum* L.	Sewar	Ceratophyllaceae	Sept.-Nov.	Used as cooling agent and in biliousness.
29. *Chenopodium ambrosioides* L.	Mexicantea	Chenopodiaceae	Feb.-May	Source of an anthelmintic esssential oil.
30. *Coix lachryma-jobi* L	–	Poaceae	Sept.-Feb.	Fodder.
31. *Commelina benghalensis* L.	–	Commelinaceae	July-Nov.	Rhizome and leaves edible. Plants are used in leprosy.

1	2	3	4	5
32. *Corchorus capsularis* L.	–	Tiliaceae	Sept.-Nov.	Source of fibre. Leaves used as a tonic.
33. *Crinum defixum* Kew.-Gawl.	–	Amaryllidaceae	Aug.-Nov.	Bulbs diaphoretic and emollient, poisonous to cattle.
34. *Cyperus difformis* L.	–	Cyperaceae	Aug.-Nov.	–
35. *C. exaltatus* Retz.	–			
36. *C. imbricatus* Retz.	–		Sept.-Dec.	–
37. *C. iria* L.	–		Aug.-Oct.	As fodder, for making mats, also medicinal stimulant, tonic, astringent and stomachic.
38. *Dactyloctenium aegyptium* (L.) Beauv.	Makra	Poaceae	Sept.-Feb.	Grains edible.
39. *Dentella repens* (L.) Forst.	–	Apiaceae	Oct.-Feb.	For poulticing sores.
40. *Digitaria adscendens* (HBK.) Henr.	–	Poaceae	Aug.-Nov.	–
41. *Dopatrium junceum* (Roxb.) Buch.-Ham.	–	Acrophulariaceae	Aug.-Oct.	–
42. *Echinochloa colonum* L.	Sanwa	Poaceae	June-Dec.	Grains edible. Fodder grass.
43. *E. crusgallia* (L.) P. Beauv.	Bara-Sawan, Barhyerd, Millet	Poaceae	July-Nov.	Fodder. Used in soil reclamation. Used in spleen diseases.
44. *E. stagnina* (Retz.) P. Beauv.	–	Poaceae	July-Nov.	Grains edible, fodder. Pith decoction diuretic.
45. *Eclipta prostrata* L.	Bhangraia	Asteraceae	Jan.-Dec.	Medicinal herbs, variously used.
46. *Eichhornia crassipes* (Mart.) Solms.	–	Pontederiaceae	May-Oct.	For manure.
47. *Eleocharis dulcis* (Burm. f.) Hensch.	Chinese Water chestnut	Cyperaceae	Sept.-Jan.	Tubers edible.
48. *E. acutangula* (Roxb.) Schult.	–	Cyperaceae	Aug.-Nov.	

1	2	3	4	5
49. *E. palustris* (L.) R. Br.	–	Cyperaceae	Dec.-March	–
50. *E. atropurpurea* (Retz.) J & K	–	Cyperaceae	July-Nov.	–
51. *Eleusine indica* (L.) Gaertn.	Jangli Marua	Poaceae	July-Oct.	Grains edible, culms used for hats.
52. *Eragrostis tenella* (L.) Gaertn.	–	Poaceae	Aug.-Dec.	Used as fodder, grains nutritious.
53. *E. tremula* Hochst. ex Steud.	–	Poaceae	Aug.-Nov.	Used as fodder, grains edible.
54. *Eriocaulon quinquangulare* L.	–	Eriocaulaceae	Aug.-Nov.	–
55. *Eriochloa procera* (Retz.) C.E. Hubb.	–	Poaceae	Aug.-Nov.	–
56. *Euryale forex* Salisb.	Makhana	Nympheaceae	–	–
57. *Fimbristylis aestivalis* (Retz.) Vahl.	–	Cyperaceae	Aug.-Dec.	–
58. *F. bisumbellata* (Forsk.) Bub	–	Cyperaceae	Sept.-Jan.	–
59. *F. dichotoma* (L.) Vahl	–	Cyperaceae	May-Oct.	–
60. *F. ferruginea* (L.) Vahl	–	Cyperaceae	June-Oct.	–
61. *F. littoralis* Gand.	–	Cyperaceae	Sept.-Nov.	–
62. *F. tenera* R. & S.	–	Cyperaceae	Sept.-Nov.	–
63. *Glossostigma spathulatum* Arn. ex Benth.	–	Scrophulariaceae	Oct.-Feb.	–
64. *Gnaphalium indicum* L.	–	Asteraceae	Dec.-Apr.	Leaves edible.
65. *G. pulvinatum* Del.	–	Asteraceae	Nov.-Apr.	–
66. *Grangea maderaspatana* Poir	–	Asteraceae	Feb.-Apr.	Leaf infusion stomachic, deobstruent.
67 *Heliotropium indicum* L.	–	Boraginaceae	Oct.-Apr.	–
68. *Hemarthria compressa* (L. f.) R. Br.	–	Poaceae	July-Oct.	Moist pasture grass.
69. *Hemiadelphis polyspermus* Nees	–	Acanthaceae	Oct.-Nov.	–

1	2	3	4	5
70. *Hydrilla verticillata* (L.f.) Royle	Jhangi	Hydrocharitaceae	Aug.-Dec.	Plants used in aquerias as oxygenator, fish food, a good-manure.
71. *Hoppea dichotoma* Willd.	–	Gentianaceae	Sept.-Oct.	–
72. *Hydrolea zeylanica* (L.) Vahl	Langali	Hydrophyllaceae	Sept.-Oct.	Leaves poultice applied on ulcers, considered antiseptic.
73. *Hygrophila auriculata* (Schum.) Heine	–	Acanthaceae	Oct.-May	–
74. *H. difformis* (L.f.) Sreemadh.		Acanthaceae	Aug.-March	–
75. *H. pinnatifida* (Dalz.) Sreemadh.		Acanthaceae	Aug.-Oct.	–
76. *Hygrorhiza aristata* (Retz.) Nees	Jungli-dal	Poaceae	Oct.-Dec.	Grains edible, used
77. *Imperata cylindrica* (L.) Beauv.	–	Poaceae	July-Oct.	Plants used for soil reclamation, yield fibre, employed for paper pulp. Roots medicinal.
78. *Ipomoea aquatica* Forsk.	Karemua, Nari	Convolvulaceae	Sept.-Feb.	Plants eaten (cooked), wholesome for women.
79. *Juncus bufonius* L.	–	Juncaceae	Jan.-Mar.	–
80. *Kyllinga brevifolia* Rottb.	–	Cyperaceae	Jan.-Feb.	–
81. *Lemna perpusilla* Tarrey	Duck-weed	Lemnaceae	May-Jan.	Bird and fish food, promotes zooplanktons, used in fisheries; thrives well in foul waters.
82. *Leptochloa panicea* (Retz.) Ohur	–	Poaceae	July-Nov.	Tender plants fed to cattle.
83. *Limnophila gratissima* Bl.	Kuttra	Scrophulariaceae	Oct.-Feb.	Edible (raw/cooked) Medicinal herbs, emit turpentine like odour.

1	2	3	4	5
34. *L. indica* (L.) Druce	Kuttra	Scrophulariaceae	Sept.-Feb.	Medicinal herbs emit camphor odour. Leaves eaten, infusion in dyspepsia and dysentery.
35. *Lindernia cordifolia* (Colsm.)	–	Scrophulariaceae	Aug.-Jan.	Plants used in gonorrhoea.
36. *L. crustacea* (L.) Mueller	–	Scrophulariaceae	Aug.-Jan.	Medicinal herbs, used in poultices, bilious affections, dysentery.
37. *Ludwigia adscendens* (L.) Hara	–	Onagraceae	Sept.-Jan.	–
38. *L. octovalvis* ssp. *sessiliflora* (Micheli) Raven	–	Onagraceae	Oct.-Jan.	–
39. *L. perennis* L.	–	Onagraceae	Sept.-Nov.	Plants boiled in oil and applied on body to bring down fever.
40. *L. prostrata* Roxb.	–	Onagraceae	Sept.-Nov.	Leaves used for toothache and muscular pain.
41. *Lusimachia obovata* Buch.-Ham.	–	Primulaceae	Mar.-July	Eaten with fish.
42. *Mariscus compactus* (Retz.) Bolding	–	Cyperaceae	Aug.-Nov.	Plants used for making mats.
43. *M. sumatrensis* (Retz.) Raynal	–	Cyperaceae	Aug.-Nov.	Used as vermifuge.
44. *Melochia corchorifolia* L.	–	Sterculiaceae	Aug.-Dec.	Leaves eaten, used in dysentry, bark source of fibre.
45. *Microcarpaea minima* (Koen.) Merr.	–	Scrophulariaceae	Nov.-Dec.	–
46. *Monochoria hastata* (L.) Solms.	–	Pontederiaceae	May-Oct.	Root-stocks fed to cattle and pigs. Tender parts eaten. Plants tonic & cooling. Leaf-juice applied on boils. Rhizomes pounded with charcoal used as scurf.

1	2	3	4	5
97. *Monochoria vaginalis* (Burm. f.) K.B. Presl.	–	Pontederiaceae	Sept.-Oct.	Tender leaves and stalk eaten. Medicinal herbs, leaves in cough, root-juice in asthma, toothache, liver problems.
98. *Murdannia nudiflora* (L.) Brenan	–	Commelinaceae	Aug.-Nov.	–
99. *Najas graminea* Del.	–	Najadaceae	Sept.-Dec.	–
100. *Nelumbo nucifera* Gaertn.	Kamal	Nelumbonaceae	June-Dec.	Rhizomes (cooked) eaten.
101. *Nechamandra alternifolia* (Roxb.) Thw.	–	Hydrocharitaceae	Aug.-Feb.	–
102. *Neptunia oleracea* Lour.	–	Fabaceae	Sept.-Dec.	Tender stem and pods edible. Roots used in syphilis; stem juice in earache.
103. *Nymphaea nouchalia* Burm. f.	Kumudini	Nymphaeaceae	Sept.-Oct.	Tender parts eaten. Flower, rhizomes and seeds medicinal.
104. *N. stellata* Willd.	Kumudini	Nymphaeaceae	Sept.-Oct.	Tender parts eaten, Rhizomes, leaves and seeds medicinal.
105. *Nymphoides cristatum* (Roxb.) Kuntze	–	Gentianaceae	April-Dec.	–
106. *N. indica* (L.) Kuntze	–	Gentianaceae	April-Dec.	–
107. *Oenanthe javanica* (Hoom.) DC.	–	Apiaceae	Oct.-Feb.	Eaten (raw/cooked); source of an essential oil.
108. *Oldenlandia corymbosa* L.	Pitpapra	Rubiaceae	Aug.-Oct.	Medicinal herb. Decoction in fever, gastric, liver troubles.
109. *O. paniculata* L.	–	Rubiaceae	July-Oct.	Medicinal herbs used in fever, gastric irritation and nervous depression.
110. *Oplimensus burmanii* P. Beauv.	–	Poaceae	July-Oct.	–

1	2	3	4	5
11. *Oryza rufipogon* Griff.	–	Poaceae	July-Nov.	Fodder for buffaloes only.
12. *Ottelia alismoides* (L.) Pers.	–	Hydrocharitaceae	Sept.-Oct.	Leaves and fruits edible. Leaves medicinal.
13. *Paspalum paspaloides*	–	Poaceae	June-Sept.	–
14. *P. scrobiculatum* L.	Modo	Poaceae	Aug.-Dec.	Fodder. Stored grains edible. Medicinal also; stem-juice in corned opacity; grain in diabeties.
15. *Pentapetes phoenicia* L.	–	Sterculiaceae	Sept.-Oct.	Roots and fruits variously used in cure of several ailments.
16. *Perotis indica* (L.) Kuntze	–	Poaceae	Sept.-Nov.	A good fodder.
17. *Phragmites karka* (Retz.) Trin.	Narkul	Poaceae	Sept.-Dec.	For paper-pulp, thatching, making chairs, fences, fish-traps. Hookah-pipes, flutes and pen. Panicles as broom; flowering stalks yield fibre. Roots used in fracture.
18. *Phyla nodiflora* (L.) Green	–	Verbenaceae	Jan.-Dec.	Leaves edible. Whole plant of medicinal value.
19. *Physalis minima* L.	–	Solanaceae	Aug.-Nov.	Leaves and fruits edible and medicinal.
20. *Pistia stratioides* L.	–	Araceae	July-Oct.	Leaves edible, ash as manure, juice in skin diseases.
21. *Plantago ovata* Forsk.	Isubgol	Plantaginaceae	Jan.-Mar.	Seeds and husk medicinal.

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122. *Polygonum barbatum* L.	–	Polygonaceae	Sept.-Jan.	Fodder. Seeds tonic, purgative and emetic; stem-decoction to wash ulcers.
123. *P. glabrum* Willd.	–	Polygonaceae	Sept.-Apr.	Parched fruits and tender shoots (cooked) as vegetable. Roots & leaves medicinal.
124. *P. lapathifolium* L.	–	Polygonaceae	Nov.-Mar.	Used in cancer. Plants said to cause dermatitis and death in cattle.
125. *P. limbatum* Meissn.	–	Polygonaceae	Oct.-June	Leaves edible.
126. *P. minus* Huds.	–	Polygonaceae	Oct.-Jan.	Leaves eaten in curries. Leaf-decoction medicinal. Infusion of herbs used as fish poison.
127. *P. persicaria* L.	–	Polygonaceae	Dec.-Apr.	Medicinal herbs, source of an essential oil and a fatty oil.
128. *P. plebatum* R. Br.	–	Polygonaceae	Feb.-June	–
129. *Potamogeton crispus* L.	–	Potamogetonaceae	Dec.-Mar.	Fodder.
130. *P. nodosus* Poir	–	Potamogetonaceae	Nov.-Mar.	–
131. *P. pectinatus* L.	–	Potamogetonaceae	Dec.-Mar.	Root-stock yield starch.
132. *Potentilla supina* L.	–	Rosaceae	Jan.-May	Root-stocks astringent, tonic and febrifuge, source of tannin.
133. *Primula umbellata* (Lour.) Benth.	–	Primulaceae	Jan.-Mar.	–

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134. *Pulicaria crispa* Benth.	–	Asteraceae	Jan.-Mar.	Used as substitute for tea. Medicinal herb.
135. *Ranunculus scleratus* L.	Jaldhania	Ranunculaceae	Nov.-June	Acrid causes blisters, non-toxic after boiling drying, consumed as vegetable after boiling; many medicinal uses.
136. *Rotala densiflora* (Roth) Koechne	–	Lythraceae	July-Jan.	–
137. *R. indica* (Willd.) Koechne	–	Lythraceae	Dec.-Mar.	–
138. *R. rotundifolia* (Buch.-Ham.) Koechne	–	Lythraceae	Jan.-May	–
139. *Rottboelia exaltata* L.f.	Bhursali	Poaceae	July-Nov.	Not suitable for grazing due to stiff sheath hairs but used as fodder, hay and silage; also for making mats. Leaves are used as anodyne.
140. *Rumex dentatus* L.	Ban Palak	Polygonaceae	Jan.-June	Leaves edible (cooked); roots yield dye also used in skin diseases.
141. *Sagittaria guayanensis* H.B.K.	–	Alismataceae	Sept.-Nov.	Employed as green manure.
142 *S. sagittifolia* L.	–	Alismataceae	Sept.-Mar.	Medicinal herbs; tubers are used in cutaneous troubles; leaf-powder in itch; leaves mashed with molases in sore-throat and breast inflammation. Plants are used in fish-ponds as oxygenator.

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143. *Schoenoplectus articulatus* L.	Chichora	Cyperaceae	Oct.-Mar.	Dried plants for thatching. Tubers are efective in diarrhoea and vomitting.
144. *S. juncoides* Roxb.	Chichora	Cyperaceae	Oct.-Mar.	As green manure.
145. *S. mucronatus* L.	–	Cyperaceae	Oct.-Mar.	For making mats.
146. *S. supinus* L.	–	Cyperaceae	Sept.-Feb.	–
147. *Sparaganium erectum* L.	Burreed	Sparaganiaceae	Nov.-Apr.	Seeds are edible; fruits astringent and haemostatic; decoction as a vulnerary. Seeds used in preparation of Tilwa - a local sweet dish.
148. *Spharanthus indicus* L.	Mundi	Asteraceae	Jan.-Apr.	Medicinal herb.
149. *Sphenoclea zeylanica* Gaertn.	Jhil-mirich	Sphenocleaceae	Aug.-Feb.	Tender parts eaten (steamed), bitter in taste.
150. *Spirodella polyrrhiza* (L.) Schleid	–	Lemnaceae	Feb.-Apr.	–
151. *Teucrium viscidum* Bl.	Germander	Lamnaceae	Apr.-June	Medicinal herb.
152. *Trapa natans* var. *bispinosa* (Roxb.) Makino	Singhara	Trapaceae	Sept.-Dec.	Fresh kernels are eaten (raw/ cooked); dried ones made into flour which is variously used like wheat-flour.
153. *Typha angustifolia* L.	Elephant grass, Indian Reed-Mace	Typhaceae	Oct.-May	Leaves and stems used for thatching, making ropes, mats etc; dried stem as pen; yields high-strength fibre suitable for

1	2	3	4	5
				marine/fishing ropes; young-shoots edible. Rhizomes astringent and diuretic.
154. *Urochloa panicoides* Beauv.	Kuri	Poaceae	Aug.-Nov.	Grains edible. A good fodder.
155. *Utricularia aurea* Lour.	–	Lentibulariaceae	Oct.-Jan.	Of horticultural value.
156. *U. gibbosa* ssp.	–	Lentibulariaceae	Oct.-Jan.	–
exoleta (R. Br.) P. Taylor	–	Lentibulariaceae	Oct.-Jan.	
157. *U. stellaris* L.f.	–	Lentibulariaceae	Oct.-Jan.	Used in cough.
158. *Vallisneria spiralis* L.	El-grass	Hydrocharitaceae	Jan.-Apr.	Young leaves are eaten in salads. Plants are stomachic, refrigerant and demulcent; used in leucorrhoea.
159. *Veronica anaqalis-aquatica* L.	Titlokia	Scrophulariaceae	Jan.-Apr.	Leaves are used in salads. Roots are used in gargle preparation. Plants are antiscorbutic.
160. *Vetiveria zizanioides* (L.) Nash.	Khas-Khas	Poaceae	Aug.-Jan.	Source of vetiver oil of perfumery. Medicinal grass. Mats made from roots are used as cooling screens during summer days.
161. *Wahlenbergia marginata* (Thunb.) DC.	–	Campanulaceae	May-June	Crushed herbs are used in skin diseases and strengthening loose teeth. Roots are used in lung-infection.
162. *Wolffia arrhiza* (L.) Wimm.	–	Lemnaceae	Jan.-Oct.	A botanical curiosity.

A. indica is still used to some extent for making variously designed 'Maur' (an indigenous crown like ornamental cap put on the heads of the grooms at the time of marriage ceremony) in rural areas.

NEW RECORDS

These studies have revealed some interesting distributional records and a new use of a wetland species. For example :

Achyranthes aquatica and *Microcarpaea minima* have been recorded from Jaunpur district only.

Curious plants like species of Utricularia (*viz. Utricularia aurea*, *U. gibbosa* var. *exoleta*, *U. stellaris* and *U. striatula*) also occur in association with Trapa in shallow ponds. *Sparaganium erectum* whose seeds are locally used in preparation of a sweet dish 'Tilwa' and stems are used for weaving indigenous mats-locally known as 'Gonar' or 'Gonri', was seen along the edges of (in shallow waters) 'Pakaria Tal' of Ballia district only. It was not seen earlier anywhere else in U.P. except Beharaich. Its use in preparation of 'Tilwa' is not recorded so far.

Carex fedia - a sedge was found in drying wetlands in Bandish area of Ballia district and the wetlands of the 'Bahiradeo' sacred grove in Azamgarh district only.

Threats :Most of the natural wetlands (locally known as Tals) are continuously under threat. Their very existence is in danger because of the human lust/greed to grab more and more area/land for personal use. Binna, Duhia and Kaili Tals in Atraulia Tehsil of Azamgarh district are on the verge of extinction. These get almost fully dried up (except for a smaller central core zone) during May-June resulting in death of many wild-life including 'Neel-gai'.

The phytodiversity is almost fully destroyed in Gujar Tal in Jaunpur district due to populations of 'Grass carp' (*Ctenopharygdon idella*). Populations of 'Wild rice' (*Oryza rufipogon*) are disappearing in Jaunpur district but quite common in Atraulia Tehsil area of Azamgarh district.

There is an urgent need for proper management of Binna, Duhia and Kaili Tals, which includes desilting, stopping encroachment by land-grabbers.

An urgent need of the time is to conduct a detailed survey/census of the wetlands of this region, to work out their morphometry, biodiversity and to develop a well-planned strategy for their conservation.

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