

## Biodiversity and their socio-economic importance of Wetlands of Madhubani District (North Bihar)

---

**AJAY KUMAR\*, S. H. BAZMI\*\* AND MD. RAHMATULLAH**

---

Principal, Millat College, Darbhanga 846004, India

\*Research Scholar, Department of Botany, Millat College, Darbhanga 846004, India.

E-mail: [kajaydbg@gmail.com](mailto:kajaydbg@gmail.com)

\*\*Department of Environment and Water Management, Millat College, Darbhanga -846004, India

### ABSTRACT

Madhubani district (25°59'2" to 26°59'1" N. Lat. and between 85°42'5" E. Long.) of North Bihar is a vast chunk of low land and occupied by different types of wetlands. Permanent and temporary ponds, marshes are the characteristic features of this area. It contains area of 3501 sq. km. (350100 ha) of which 4.64% of total area is occupied by 84 non-forested freshwater wetlands locally known as chauras (marshy lands). In Block No. 6 (Rahika) 10 wetland is found in which Jagatpurchaur is largest in this Block. 224 taxa have been identified which include 72 species of Algae, 2 Bryophyta, 3 Pteridophyta and 38 species of angiospermic plant. Monocotyledons outnumber Dicotyledons in these wetlands. Besides, these 13 zooplankton species of micro-invertebrates, 18 varieties of avian faunal, 52 species of fishes and 8 other vertebrates were recorded from the wetlands in which most of them are socio-economically important.

Hence, proper awareness programmes for the protection of wetlands must be undertaken in this area.

**Keywords:** *Biodiversity, Madhubani, Wetlands, Socio-economic, North Bihar*

### INTRODUCTION

Wetlands are lands transitional between terrestrial and aquatic systems, where the water table is usually at or near the surface or the land is covered by shallow water. They play an important role in any ecosystem, hydrology of the area and in economy. The biodiversity found in wetlands is very large. The ecological function and benefits of wetlands are biodiversity, water cycle maintenance and hydrology, flood control, biogeochemical cycle functioning, carbon sequestration and climatic stability. Overall wetlands are highly productive. An approachable work in the area of soil microbiology, livelihood management and biodiversity has been done in wetlands of Bihar by some workers (Kumar and Hafiz, 2000; Panigrahi *et al.*, 2014; and Jha, 2015).

To understand and to analyse the biodiversity and wise-use of wetlands, a case study pertaining to Madhubani district of North Bihar in India was undertaken. North Bihar, in general and Madhubani district in particular abounds in ponds and marsh lands (locally known as chauras) to an extent rarely seen anywhere else in the country excepting some parts of West Bengal (WWF and AWB 1993). According to the survey report wetlands cover 16.254 ha of land which is 4.64% of the total area of the district. The value is higher than the normal values cited 1.7% of Bihar and 1.2% for India (Anonymous, 1992) but less than world i.e. 6.4% (Mitsch and Gosselink, 1986).

Wetland inventories of Madhubani district so far undertaken (Bazmi *et al.*, 1996; and Kumar *et al.*, 2012) have provided only basic information. In this paper, it has been tried to summarize the available knowledge on the biodiversity and their socio-economical importance of wetlands of Madhubani district of North Bihar.

**RESEARCH SITES AND METHODS**

Madhubani district is situated in North Bihar and lies between 25°59'2" and 26°39'1" north latitude and between 85°42'51" and 86°41'50" east longitudes. It contains area of 3501 sq. km. (350100 ha), and has a population of 4476044 according to 2011 census of Government of India. The entire Madhubani district lies on low level and has vast stretch of lands occupied by wetlands of different types *i.e.*, ponds, swamps and marshes. A detailed map of wetlands of Madhubani district has been shown in Fig. 1(a & b). Eighty-six chauras have been recognized so far covering an area of 16410 ha. Rivers such as Bagmati, Kamla Balan and Adhwara group are the main sources of water to these wetlands (Table 1). Larger wetlands of Rahika Block are Jagatpur (600 ha), Saurashtra (Mimra Chaur 440 ha) and Polharauni (Kapsia Mirzapur Chaur 400 ha) *etc.*, whereas other small wetlands are: Chandrashenpur, Rahika, Balecya, Panchgacchiee, Bhacchi, Bhakrauli, Malangia. During monsoon the entire district looks like a floating area. The depth of water and average depth of wetland vary from 0.10-1.75 m.



Fig 1a: Wetlands (Map) of Madhubani



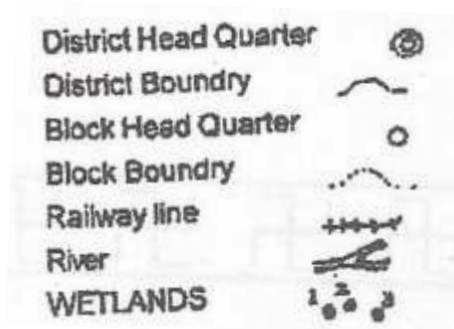
Fig 1b: Wetlands (Chaur) of Madhubani

The climate of Madhubani is tropical and shows three different seasons viz. summer (March to June), monsoon (July to October) and winter (November to February).

For collection and preservation of biota, standard methods were adopted as suggested by APHA (1985). Identification of biota was made with the help of standard literature and herbaria of international repute.

**Table 1**  
**Showing Rivers and details of Wetlands (Chauras) of Madhubani district, North Bihar**

		Rivers			
		Dhaus	R1	Kali	R8
		Yamuni	R2	Sugarve	R9
		Vachhraj	R3	Bhithibalan	R10
		Jiwachh	R4	Bihul	R11
		Kamla	R5	Kharag	R12
		Jhahur	R6	Panchi	R13
		Trisula	R7	Tilyugi	R14



BLOCK 1: MADHOPUR	BLOCK 6: RAHIKA	BLOCK 15: LAKHNAUR
1. Mintuwara	1. CXhandrashenpur	1. Balbhadrapur
2. Bishanpur	2. Rahika	2. Lakhnaur
	3. Jagatpur	3. Sonwarsa
BLOCK 2: HARLAKHI	4. Baleeya	
1. Tenggara	5. Panchgachheeya	BLOCK 16: MADHEPUR
2. Jhinktee	6. Bhachchi	1. Ramchandra
	7. Bhakrauli	2. Prasad
BLOCK 3: BASOPATTI	8. Malangia	3. Phatkee
1. Birpur	9. Saurashtra	4. Babujivan
2. Sohachahan	10. Pokhrauni	5. Rohuwa
		6. Bhakrain
BLOCK 4: BENIPATTI	BLOCK 7: KHAJAULI	7. Kamladaha
1. Janardanpur	1. Turkaha	8. Bakua
2. Benipatti		9. Maynahi
3. Behta	BLOCK 8: JAINAGAR	
4. Damodarpur	1. Kamlabari	BLOCK 17: GHOGHARDIHA
5. Uchaith		1. Wisunpatti
6. Andhri	BLOCK 9: LADANIA	2. Behrari
7. Lorika		3. Chikta
8. Karhara	BLOCK 10: BABUBARHI	4. Bathnaha
9. Ranipur	1. Israin	5. Deorh
10. Trimuhan		
11. Bishanpur	BLOCK 11: ANDHRATHADI	BLOCK 18: PHULPARAS
12. Gamharia		1. Phulparas
	BLOCK 12: RAJNAGAR	
BLOCK 5: BISFI	1. Bhagwanpur	BLOCK 19: KHUTAUNA
1. Damla		1. Urhwa
2. Parsauni	BLOCK 13: PANDAUL	
3. Bhoj Pandal	1. Pachadhi	BLOCK 20: LAUKHI
4. Rupauli	2. Lohat	1. Kakaiya
5. Macheeya	3. Poptasitra	2. Mansapur
6. Rathaus	4. Rajokhar	3. Hanumannagar
7. Chapadia	5. Bithwar	4. Phulkahi
8. Machhoa	6. Udaipur	5. Harraha
9. Bisfi	7. Debhari	6. Baruara
10. Noorchak		7. Ladania
11. Kokila	BLOCK 14: JHANJHARPUR	8. Kariot
12. Janipur	1. Sweema	9. Chhatapur
13. Bardaha	2. Baghat	10. Kukurdora
14. Balha	3. Launichaur	11. Jiroga
		12. Matha

TOTAL NUMBER OF WETLANDS: 86

## **RESULTS AND DISCUSSION**

Two hundred and thirty-four taxa have been identified from various wetlands of Madhubani which include: 12 algae, 2 bryophytes, 3 pteridophytes, 38 angiosperms, 13 zooplankton, 18 macro-invertebrates, 18 avifauna, 52 fishes and 8 other vertebrates. The dominant forms of algae were heterocystous blue-greens (*Anabaena*, *Nostoc*, *Gloeotrichia*, *Rivularia*), and filamentous green algae (*Spirogyra*, *Mougeotia*, *Zygnema*, *Chactophora*). Some other frequently occurring algae collected are *Gloeocapsa*, *Microcystis*, *Coelastrum*, *Cosmarium*, *Closteridium*, *Staurastrum*, *Euglena* and *Compsopogon*. Among Bryophyta and Pteridophyta, species of *Riccia*, *Azolla*, *Salvinia*, *Marsilea* and *Ophioglossum* were collected

from moist places. Monocotyledons outnumber dicotyledons. Among zooplankton *Brachionus calycyflorus* and *Daphnia carinata* were common. *Pila globosa*, a macroinvertebrate, was found to be very common and seen in bulk. 18 varieties of avifauna were identified, which include some threatened migratory birds like *Ancer indicus* and *Ciconia boyciana*. The most frequent migratory birds are *Netta nifiana*, *Anser anser* and *Ancer indicus*. Common residential birds are *Podiceps nificollie*, *Capella galinago*, *Passer domesticus* and *Centropus sinensis*. 52 species of fishes were also identified (Table 2, Figs. 2a, 2b, 2c and 2d, just below).

**Table 2**  
**Showing identified taxa of Madhubani Wetland**

Different Groups of Producer Organisms, Detritus and Their Biomass			WB1	WB2	WB3	WB4	WB5	
Producer Organism	Phytoplanktons	Small algae	<i>Chlamydomonas</i>	+	-	+	-	-
			<i>Spirogyra</i>	-	+	+	+	-
			<i>Volvox</i>	+	+	+	+	-
			<i>Nostoc</i>	+	+	+	+	-
			<i>Microcystis</i>	+	-	-	-	-
		Macroscopic flora	<i>Wolfia</i>	-	+	+	+	+
			<i>Azolla</i>	-	+	+	+	+
			<i>Salvinia</i>	+	+	+	+	+
	<i>Lemna</i>		+	-	+	-	+	
	Macrophytes	Algae	<i>Chara</i>	+	-	-	+	-
			<i>Nitella</i>	+	-	-	+	-
			<i>Limnophila</i>	+	+	+	-	+
			<i>Ceratophyllum</i>	-	+	+	-	-
			<i>Hydrilla</i>	+	+	+	+	-
		Angiosperms	<i>Vallisneria</i>	+	-	-	+	+
			<i>Potamogeton</i>	+	-	+	-	+
			<i>Pistia</i>	-	+	+	+	+
			<i>Eicchornia</i>	-	+	+	+	+
			<i>Hydrocharis</i>	+	+	+	+	-
			<i>Nymphaea</i>	-	+	+	+	-
			<i>Nelumbium</i>	-	+	-	+	-
			<i>Euryale</i>	-	+	-	+	+
			<i>Myriophyllum</i>	+	+	+	+	-
			<i>Trapa</i>	-	+	+	-	+
Consumer Organism			Zooplanktons	<i>Cyclops</i>	+	+	+	-
	<i>Macrotheris</i>	+		+	-	+	-	
	<i>Arcella</i> <i>Brachionus</i>	+		+	-	-	-	
	<i>Baetis</i> <i>Daphnia</i>	+		+	+	-	+	
	<i>Pila</i>	+		+	+	+	+	
	Snails	<i>Limnaca</i>	+	-	-	-	+	
		<i>Prawn</i>	+	-	-	+	-	
		"Tengra", <i>Garai</i> , <i>Mangur</i>	+	+	+	+	+	
	Small Fish	<i>Berbus</i> <i>Pothia</i> , <i>Khosti</i> , <i>Kabai</i>	+	-	+	-	-	
		<i>Labeorohita</i>	+	+	+	+	-	
		<i>Hilsa</i>	+	-	+	+	-	
		<i>Catlacatla</i>	+	-	+	-	-	
	Large Fish	<i>Cirrhina</i> <i>W. attu</i>	+	+	+	-	-	
		<i>Whistling teal</i>	+	+	+	+	-	
		<i>Rain quad</i>	+	+	-	-	-	
		<i>Tern (tehari)</i>	+	-	+	+	-	
		<i>Stork</i>	+	+	+	+	+	
		<i>Passer domesticus</i>	-	+	-	+	-	



**Fig. 2a - 2d: Showing Identified Taxa of Madhubani Wetland**

It is observed that the number of birds has been reduced. It is possibly due to reduction in number of wetlands, indiscriminate shooting in the past and other reasons. Some of the birds like peafowl, spurfowl, grey quail, shoveller and gadwall, which were once in plenty in this area, are now almost exterminated by local bird trappers. Wetland resources in Bihar were regarded as 'waste places'. Therefore, in need of becoming 'useful', wetlands are drained, ditched and filled at an alarming rate.

#### **PRESENT STATUS AND SOCIO-ECONOMICAL ASPECTS OF WETLANDS**

The wetlands of Madhubani support a large number of flora and fauna. The biotic components mainly include macrophytes, phytoplankton, periphyton, zooplankton, macroinvertebrates, air-breathing fishes, molluscs, crabs and migratory as well as local birds in abundance showing high biodiversity. The great natural wealth of wetlands of the district is intimately linked up with the livelihood of original inhabitants.

Macrophytes comprising emergent, free-floating and submerged forms are remarkable plant life and they find a more or less precarious footing in wetland ecosystem. Inhabitants of this district utilize macrophytes for food, medicine, fibre, thatching and basketry *etc.* Some economically important plants are as follows:

1. *Nymphaea nouchali* : Rhizomes in powdered form are prescribed for piles, dysentery and dyspepsia; peduncles and seeds are eaten by local people.
2. *Euryale ferox*: Locally known as 'makhana' is the main aquatic cash crop of Madhubani district. It has both nutritional and medicinal properties. Edible part of the seed (perisperm) contains only 0.1% of fat and high quality protein; thus, making it fit for old and invalid persons (Jha *et. al.* 1991). The seeds are used for treatment of micturition and seminal loss in Ayurvedic and Unani systems of medicine. The seeds have further been reported as tonix for seminal organs as well as remedy of diseases of spleen and gonorrhoea.
3. *Nelumbo nucifera*: The beautiful red and white flowers are used for decorative and religious purpose and are considered sacred by Hindus. The flowers are recommended as cardiac tonic and for disease of liver. The seeds form cooling medicine for skin; the rhizomes in powdered form are prescribed for piles.
4. *Ludwigia ascendens*: The herb is used for curing ulcer and skin diseases.
5. *Trapa natans var. bispinosa*: The starch cotyledon is edible either raw or cooked.
6. *Nymphaeoides indicum*: The plants are used as medicine in fever and jaundice.
7. *Hydrocleya zeylanica*: The leaves of the plant are used in fever and jaundice.
8. *Ispomea aquatica*: The young leaves, shoots and roots are eaten. The juice of the leaves act as a mild purgative and is supposed to purify blood.
9. *Ceratophyllum demersum*: The plant is used in scorpion sting; as feed for duck.

10. *Vallisnara spiralis*: The plant is used for treatment of leucorrhoea and also used as stomachic.
11. *Leersia hexandra*, *Hygroryza aristata* and *Paspalidium geminate* are some important grasses which are very much liked by cattle.
12. *Phragmitis karka* is weed grass and popularly known as 'narkul'. Stems of the plant are made into pipes and are potential source of paper making industry. Culms are used in making chairs, baskets and mats.
13. *Typha angustata*: Known as 'pater'. Silky florets of spikes are used for stuffing purpose. Leaves are used for making trays and baskets etc.
14. *Saccharum munja*: Known as 'sarkands', is used for making pens for village school children.

The above plants of economic importance are based on the information gathered from local people. *Euryale ferox* supports a full-fledged industry which is intimately linked up with livelihood of a large section of human population of the area. The plant has been found to be under stress in North Bihar. The threat, however, is not on account of industrial wastes or toxicants as there are practically no heavy industries in North Bihar, as yet; it is due to the rapid shrinkage in wetland area under 'makhana' cultivation. Biotopes are filling up naturally with mud, silt and detritus due to recurring floods and eutrophication by weeds like *Eichhornia*, *Ipomoea*, *Pistia*, *Salvinia* and a number of submerged species. Kadona and Schneider (1987) have reported that *Euryale ferox* is disappearing from Japan due to eutrophication of water.

Because of the high rate of plant growth, the marsh supports a much higher number of animals than many other habitats. Marshland invertebrates can be grouped according to their mode of life into aquatic and terrestrial species. In some cases, the adult forms are terrestrial and the larval stages are aquatic. *Daphnia* and *Cyclops* are very common and can be seen swimming about in the water. The bottom fauna of the wetland is comprised of oligochaetes, leeches, insects and molluscs. A huge amount of molluscs like *Limnaea*, *Nivipera* and *Planorbis* etc. were observed feeding on aquatic macrophytes. During winter season a huge amount of snails were observed at or near marshlands. The shells of snails are of economic values as they are used for making lime.

### CONCLUSION

The wetlands of Madhubani serve as ideal ground for prolific breeding of the fishes and give a lucrative harvest of fish each year. The people of this area are great connoisseurs of fish. Not only that, the fish became a symbol of Mithila (North Bihar). Fishes of high market value, such as *Labeo rohita*, *Clarias batrachus*, *Mystus tengara*, *Wallago attu*, and *Heteropneustes fossilis* are very common in the wetlands. Over exploitation of fish is common phenomenon and fishermen of the area using some piscicidal plant extracts known as 'ziramai' for immobilization of fishes for easy catch. Large population of fish and gastropods get pocketed and exposed in winter due to which a large number of migratory birds are attracted. One of the interesting features of wetland is that along with fish auction, the right for bird trapping is also auctioned by private land owners. Thus, at this stage some of the following steps are suggesting for wise use of wetland resources:

1. Steps should be taken to conserve the wetlands of Madhubani as they are rich in biodiversity. The expected benefit is economic in the form of food, medicine, fibre *etc.*,

and ecological in the form of air/water purifier, sinks for flood water etc. Forest coverage in Madhubani District is minimal which necessitates the retention of wetlands.

2. Denudation of catchment areas, overgrazing and other anthropogenic pressures are the causative factors for soil erosion and consequent siltation of wetlands, therefore, afforestation activities are to be undertaken with more vigour for controlling soil erosion and also for habitat improvement.
3. Suggestions may be made to Bihar Government for renaming the above act as “Wetland Protection Act” which should ensure that no one can encroach wetland areas for urban extension, agriculture and other purposes.
4. Proper awareness programmes for the protection of wetlands must be undertaken with the slogan “Save Wetland, Save Life”.

### **REFERENCES**

1. Anonymous, 1992. Conservation of wetlands in India, Government of India, Ministry of Environment and Forests, New Delhi, United Printing, C-6 Hari Nagar, New Delhi, India, p. 48.
2. Bazmi, S. H., Akhtar, S. M. S., Ahmad, M. S., Siddiqui and Hussain, M. A. 1996. Biodiversity of a tropical wetland of Madhubani, North Bihar, *J. Freshwater Biol.*,8(3):127-135.
3. Jha, V. 2015. Indigenous methods of livelihood management in a flood prone region –a case study of Kusheshwarsthan area in Darbhanga District of North Bihar. *Bioglobia*,2(1):32-41. ([www.bioglobia.in](http://www.bioglobia.in))
4. Kadona, Y. and Schneider, E. L. 1987. The life history of *Euryale ferox* Salib. In south western Japan with special reference to reproductive ecology. *Plant Species Biology*, 2:109-115.
5. Kumar, J., Kumar, P., Sheel, M. and Kumar, M. 2012. Analytical study of some wetlands for their strategic conservation and positive utilization. *JESTFT*, 1(2):10-20.
6. Kumar, J. and Hafiz, A. 2000. Schematic conservation of wetlands of Bihar. *Int. J. Mendel*, 17(1-2):17-18.
7. Mitsch, W. J. and Gosselink, J.G. 1986. Wetlands. Van Reinhold Company, New York. p. 537.
8. Panigrahi, A. K., Dasgupta, S. and Mondal, A. 2014. Studies of formal biodiversity and their impact on livelihood in Indian Sunderban area. *Bioglobia*, 1(2):67-73. ([www.bioglobia.in](http://www.bioglobia.in))
9. Roy Choudhary, 1964. Bihar District Gazetteers, Darbhanga. Superintendent, Secretariat Press, Patna .p. 770.
10. WMF and AWB, 1993. Directory of Indian Wetlands. Compiled by World Wide Fund for Nature, India in collaboration with Asian Wetland Bureau, Malaysia Publication.