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Article

Aquatic weeds diversity of Fatki River in Magura district, Bangladesh

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Abstract: The study was conducted at Fatki River under Magura district to learn the aquatic weeds diversity and abundance. This paper focused on species variation, number of species, water quality parameter and identification of aquatic weeds. It was assessed by collecting samples from Chukinogor Ghat, Kechuadubi and Arpara bazar during May to August, 2016. Aquatic weeds were abundant in rainy season and the semi-aquatic weeds were available almost all the year round. According to this study, total 22 species belonging to 12 orders, 16 families and 21 genuses were found. Again, 46%, 28%, 26% of total aquatic weeds percentages identified from the Chukinogor Ghat, Kechuadubi and Arpara bazar respectively. During this study period, nine species of family *Pontederiaceae*, *Convolvulaceae*, *Menyanthaceae*, *Asteraceae*, *Poaceae*, *Araceae*, *Amaranthaceae*, *Polygonaceae* were common in Chukinogor Ghat, Kechuadubi and Arpara bazar. Noticeable species– *Lemna minor*, *Marsilea quadrifolia*, *Ludwigia palustris*, *Aeschynomene aspera*, *Najas graminea*, *Hydrilla verticillata*, *Najas guadalupensis*, *Utricularia* inflate were only found in Chukinogor Ghat. This species are easily adapted in large areas. On the other hands, two species were common in Chukinogor Ghat, Kechuadubi – *Pistia stratiotes* and *Equisetum hyemale*. Prominent species of Arpara bazar were *Cyperus rotundus* and *Xanthium indicum*. Total 11 species of aquatic weeds were mainly recognized from these Kechuadubi, while greatest number was recorded of 20 species from Chukinogor Ghat and 12 species were have its place to Arpara bazar. Management technique and water quality parameters were also studied during study period and the temperature was recorded 29.0-30.00 ºC in Chukinogor Ghat, same as 28.0-320 ºC in Kechuadubi. Furthermore, 29.0-31.00 ºC temperature was found in Arpara bazar. DO levels were stable at ranged from7.0-7.5 ppm in Chukinogor Ghat and 4.7-5.3 ppm was recorded in two experimental Kechuadubi 4.5-5.0 in Arpara bazar respectively. This difference may arise due to the using of aerator in the Chukinogor Ghat same as decomposition, intensity of light in Kechuadubi and Arpara bazar. Transparency was 28-32cm in Chukinogor Ghat, 36-44cm in Kechuadubi, and 38-42 cm in Arpara bazar.

Keywords: aquatic macrophytes; diversity; abundance; water parameter; habitat

1. Introduction

The vegetation of haors, beels, lakes, and ponds are rich in aquatic weed and constitute very important resources of food medicine for rural population (Khan and Halim, 2011). Aquatic weeds constitute an important role in aquatic ecosystems and contribute to the general fitness and diversity of a healthy aquatic ecosystem (Flint and Madsen, 1995) by acting as indicators for water quality and aiding in nutrient cycling (Carpenter and Lodge, 1986). From ecological point of view, aquatic plants stabilize bottom sediment, protect the shoreline from wave erosion, and serve as feeding and nesting habitat for waterfowl. These plants provide food, shelter and reproductive habitat or breeding ground for numerous fish and other aquatic animals (Lancer and Krake, 2002).

There is an ecosystem imbalance between aquatic plants and other aquatic organisms when the plants invade the system and grows excessively to a nuisance level. The excessive growth of aquatic weed restricts fishing, swimming and recreational activities, causes foul taste and odour of drinking water supplies. It also leads to stunting of fish populations and fish kill due to decomposition (Lansing, 2005). Aquatic weeds are used by man as vegetables and fruits in the country and in some other countries. Some are used as human food and many aquatic weeds are used for making compost fertilizer to use in River and agriculture land. Some fishes use aquatic weed as food. Grass carp (*Ctenopharyngodon idella*) largely uses aquatic weed as food. Tilapia spp. *Cyprinus carpio* use weeds as food to some extent. Many fishes eat soft parts of these plants in small quantity. Moreover these plants harbour many insects, small invertebrates and periphyton which are used as fish food. Rooted aquatic weeds prevent erosion of bottom soil. Many insects and invertebrates and some fishes used as breeding places. Higher plants reduce turbidity. Turbidity producing silt and other particles settle on the different parts of the plants body. They can be used carefully in well-managed and controlled conditions that can increase fish production and as animal food and as fertilizer (Rahman, 1992). A very few researcher worked on the percentage, composition, seasonal variation and occurrence of aquatic weed diversity from different water body in Bangladesh. In Noakhali and Mymensingh region, any notable work had not done yet on these aquatic weeds by any researcher. Research main motive was to identify various species of aquatic weeds and their abundance and diversity. Knowledge on the aquatic weeds, we can understand the conditions of these different water bodies and also how to improve these conditions which ultimately related to the fish production. So this research was conducted in The River of Fatki which is originated from the River of Chitra and it's located in Kaligonj upazila under Jhenaidah district The River runs through the Upazila of Kaligonj, Magura Sadar, and Shalikha within the district of Jhenaidah and Magura. This present study was carried out to identify the aquatic weed species in different region of Fatki River and to determine the species variation of aquatic weeds in Arpara bazar, Chukinogor Ghat and Kechuadubi of Fatki River under Magura district.

2. Materials and Methods

2.1. Sampling sites and periods

Samples were collected from four different locations at an interval of 1 km for 6 km which is adjacent to Fatki River of Shalikha upazila of Magura (located at 23°15' and 23°41' north latitudes and in between 89°15' and 89°42' east longitudes at a mean elevation of 4 m above the sea level). Samples were taken from three places Chukinogor Ghat, Kechuadubi and Arpara bazar of Fatki River under Magura district. The study was conducted for a period of four (4) months from May 2016 to August 2016.

2.2. Sampling procedures and preservation

The samples were collected from selected areas of Fatki River. The samples were collected in plastic bags aseptically following the methods and analysed the same day.

2.3. Sample collection

Some plastic bags are collected for sampling because samples should be protected. Samples were collected on selected site basis from selected area in using different plastic bags for each sample. Samples were taken from every sampling point during the study period. The samples were collected from water surface and below the water surface in the morning hour between 8 to 10 AM. Samples were taken to the laboratory in appropriate temperature (30-32)°C.

2.4. Taxonomic study and identification

Based on the photographs and sample observation taxonomy of the samples were determined following references in Encyclopaedia of flora and fauna of Bangladesh**,** Aquatic angiosperms of Bangladesh. The analysis was carried out within 3-4 hr. after collection. After capturing image, to complete the identification process several books.

2.5. Data analysis

Data were processed and finally analyzed with Microsoft Excel 2007.

3. Results

3.1. Aquatic weed abundance

At the time of study, different types of species of weeds were found in the study area. The available weeds in the selected area are given in Table 1 to Table 6 with their local names and scientific names.

Table 1. Available species of aquatic weeds in Chukinogor Ghat-1.

Sl No.	Local name	Scientific name
1	Biskatali	*Polygonum coccineum*
2	Tara lota	*Mikania cordata*
3	Topapana	*Pistia stratiotes*
4	Malancha	*Alternanthera philoxeroidis*
5	Arail	*Leersia hexandra*
6	Kalmilata	*Ipomoea aquatica*
7	Spike rush	*Equisetum hyemale*
8	Helencha	*Enhydra fluctuans*
9	Kochu	*Colocasia esculenta*
10	Kachuripana	*Eichhornia crassipes*
11	Chand mala	*Nymphoides aquatica*

Table 2. Available species of aquatic weeds in Chukinogor Ghat-2.

Sl No.	Local name	Scientific name
1	Chand mala	*Nymphoides aquatica*
2	Helencha	*Enhydra fluctuans*
3	Kachuripana	*Eichhornia crassipes*
4	Kalmilata	*Ipomoea aquatica*
5	Topapana	*Pistia stratiotes*
6	Tara lota	*Mikania cordata*
7	Kochu	*Colocasia esculenta*

Table 3. Available species of aquatic weeds in Kochuadubi-1.

Sl No.	Local name	Scientific name
1	Chand mala	*Nymphoides aquatica*
2	Shapla	*Nymphaea nouchali*
3	Kalmilata	*Ipomoea aquatica*
4	Arail	*Leersia hexandra*
5	Spike rush	*Equisetum hyemale*
6	Kachuripana	*Eichhornia crassipes*
7	Najas grass	*Najas graminea*
8	Topapana	*Pistia stratiotes*
9	Malancha	*Alternanthera philoxeroidis*
10	Kochu	*Colocasia esculenta*
11	Tara lota	*Mikania cordata*
12	Biskatali	*Polygonum coccineum*
13	Goromi	*Najas guadalupensis*
14	Kormota	*Ludwigia palustris*
15	Shushnipata	*Marsilea quadrifolia*
16	Helencha	*Enhydra fluctuans*
17	Khudipana	*Lemna minor*
18	Hydrilla grass	*Hydrilla verticillata*
19	Hobon	*Utricularia inflata*

Table 4. Available species of aquatic weeds in Kochuadubi-2.

Sl No.	Local name	Scientific name
1	Spike rush	*Equisetum hyemale*
2	Shapla	*Nymphaea nouchali*
3	Arail	*Leersia hexandra*
4	Kachuripana	*Eichhornia crassipes*
5	Chand mala	*Nymphodies aquatica*
6	Hobon	*Utricularia inflate*
7	Helencha	*Enhydra fluctuans*
8	Malancha	*Alternanthera philoxeroidis*
9	Tara lota	*Mikania cordata*
10	Vatshola	*Aeschynomene aspera*
11	Biskatali	*Polygonum coccineum*
12	Goromi	*Najas guadalupensis*
13	Topapana	*Pistia stratiotes*

Table 5. Available species of aquatic weeds in Arpara bazar- 1.

Sl No.	Local name	Scientific name
1	Biskatali	*Polygonum coccineum*
2	Helencha	*Enhydra fluctuans*
3	Chand mala	*Nymphoides aquatica*
4	Kalmilata	*Ipomoea aquatica*
5	Kochu	*Colocasia esculenta*
6	Tara lota	*Mikania cordata*
7	Shapla	*Nymphaea nouchali*
8	Arail	*Leersia hexandra*
9	Kachuripana	*Eichhornia crassipes*

Table 6. Available species of aquatic weeds in Arpara bazar-2.

Sl No.	Local name	Scientific name
1	Gagra	*Xanthium indicum*
2	Helencha	*Enhydra fluctuans*
3	Chand mala	*Nymphoides aquatica*
4	Kalmilata	*Ipomaea aquatic*
5	Kochu	*Colocasia esculenta*
6	Tara lota	*Mikania cordata*
7	Shapla	*Nymphaea nouchali*
8	Arail	*Leersia hexandra*
9	Biskatali	*Polygonum coccineum*
10	Malancha	*Alternanthera philoxeroidis*
11	Mutha	*Cyperus rotundus*
12	Kachuripana	*Eichhornia crassipes*

3.2. Taxonomic status

The taxonomic details of the aquatic weeds are enormous variant in the study area. The taxonomic formation is shown in Table 7. The number of the species which found in the study area is also shown in Table 8.

Table 7. Taxonomic status of the aquatic weeds recorded from selected sites.

Sl No.	Order	Family	Genus	Species	Habitat Type
01	Commelinales	Pontederiaceae	*Eichhornia*	*E. crassipes*	CG, KD, AB
02	Alismatales	Araceae	*Pistia*	*P. stratiote*	CG, KD
			Colocasia	*C. esculenta*	CG, KD, AB
			Lemna	*Lemna minor*	KD
		Hydrocharitaceae	*Najas*	*N. guadalupensis*	KD
				N. graminea	KD
			Hydrilla	*H. verticillata*	KD
03	Solanales	Convolvulaceae	*Ipomoea*	*I. aquatic*	CG, KD. AB
04	Poales	Poaceae	*Leersia*	*L. hexandra*	CG, KD. AB
		Cyperaceae	*Cyperus*	*C. rotundus*	AB
05	*Asterales*	*Asteraceae*	*Enhydra*	*E. fluctuans*	CG, KD, AB
			Mikania	*M. cordata*	CG, KD. AB
			Xanthium	*X. indicum*	AB
		Menyanthaceae	*Nymphoides*	*N. aquatic*	CG, KD, AB
06	Nymphaeales	Nymphaeaceae	*Nymphaea*	*N. nouchali*	KD, AB
07	Lamiales	Lentibulariaceae	*Utricularia*	*U. inflate*	KD
08	Caryophyllales	Amaranthaceae	*Alternanthera*	*A. philoxeroides*	CG, KD, AB
		Polygonaceae	*Polygonum*	*P. coccineum*	CG, KD, AB
09	Equisetales	Equisetaceae	*Equisetum*	*E. hyemale*	CG, KD
10	Myrtales	Onagraceae	*Ludwigia*	*L. palustris*	KD
11	Salviniales	Marsileaceae	*Marsilea*	*M. quadrifolia*	KD
12	Fabales	Fabaceae	*Aeschynomene*	*A. aspera*	KD

**CG= Chukinogor Ghat; KD= Kechuadubi; AB= Arpara bazar

Table 8. Number of Order, Family, Genus, Species in different habitat location.

Place	No. of Order	No. of Family	No. of Genus	No. of Species
Chukinogor Ghat	7	9	11	11
Kechuadubi	12	15	19	20
Arpara bazar	6	9	12	12

3.3. Comparison of aquatic weed in different water bodies

Among the sampling points there are two types of aquatic weed were found. Highest amount of species variation found in the Kechuadubi. On the other hand, Chukinogor and Arpara bazar showed the lowest amount of species (Figure 1).

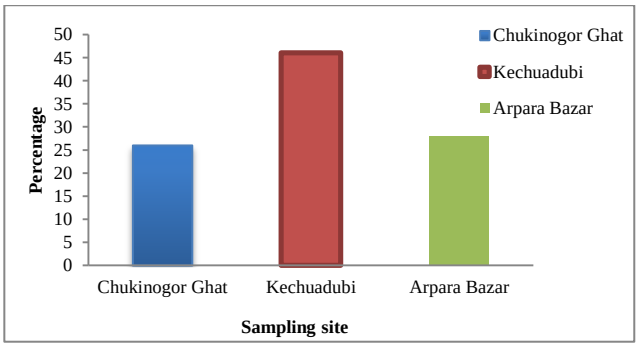

Figure 1. Comparison of aquatic weed in different water bodies.

3.5. Water quality parameters observed in the different water bodies.

Water temperatures were found to be stable always at range of 29-30^{0}C and was found within suitable range for fish production. During the study period, DO levels were found high value in Chukinogor Ghat. The lowest values are found in roadside canals. Transparency was recorded high number at Kechuadubi and lowest at Chukinogor Ghat. The water quality parameters have been shown in Table 9.

Table 9. Water quality parameters in different water bodies.

Parameters	Chukinogor Ghat	Kechuadubi	Arpara bazar
DO mg/l	7.25±0.25	5±0.3	4.75±0.25
Salinity (ppt)	0	0	0
Temperature (^{0} c)	29±1	30±2	30±1
Transparency(cm)	30±2	40±4	40±2

4. Discussion

Aquatic weeds are classified according to various habitats which form their eco-environment and become conducive for their growth; reproduction and According to this study, a total of 22 species of 16 families, 12 orders and 21 genes were found. Among them some was highly dominated and some are only found in single selected site. During this study period, nine species- *Eichhornia crassipes, Ipomoea aquatica, Nymphiodes aquatica, Enhydra fluctuans, Leersia hexandra, Mikania cordata, Colocasia esculenta, Polygonum coccineum, Alternanthera philoxeroydis* were common in Chukinogor Ghat, Kechuadubi, and Arpara bazar. But their abundance is significantly different. Rahman (2013) recorded the total angiosperm weed species under 123 genera and 50 families were recorded in that study. Out of the total number of species 98 were frequent, 41 were abundant, 15 were rare and 1 was very rare species. Islam *et al.* (2017) found that, a total of 39 weed and aquatic species were identified in the Bangladesh Agricultural University campus. Kaisar *et al.* (2016) recognised 22 aquatic weed species in Noakhali sadar area, Bangladesh. Billah *et al.* (2018) found 37 marine species in Saint Martin Island. In this study, eight species were only found in floodplain – *Lemma minor, Marsilea quadrifolia, Ludwigia palustris, Aeschynomene aspera, Najas graminea, Hydrilla verticillata, Najas guadalupensis,* and *Utricularia inflata.* This species are easily adapted in large areas. On the other hands, two species were common in Chukinogor Ghat, Kechuadubi – *Pistia stratiotes* and *Equisetum hyemale. Cyperus rotundus* and *Xanthium indicum* were the two species which only found in Arpara bazar. Chowdhury and Ahmed (2012) included a total of 29 genera belonging to 24 families of aquatic macrophysics were recorded. Among these, 25species were recorded from the freshwater aquatic ecosystems, 4 species from both the shrimp Chukinogor Ghat sand

freshwater aquatic ecosystems and only one from the shrimp Chukinogor Ghat. Regarding this study, Chukinogor Ghat had the lowest number of species because of proper maintenance through pollution. Jayan and Sathyanathan (2012) recorded the major aquatic weeds found in Kerala include *Salvinia spp*., *Eichhornia crassipes*, *Pistia stratiotes*, *Alternanthera* spp., *Azolla*, common duckweed, and *Hydrilla verticillata*. In present study, Kechuadubi has the greatest amounts of aquatic weed variety and among all 22 species around 20 species were identified from this Kechuadubi. Shallow waters were found to be ideal habitat for most of the aquatic weed species due to the highest amount of light penetration. As the Kechuadubi had the high diversity of aquatic weed because of it was not filled with larger aquatic weed like as water spinach, water hyacinth, Hydrilla grass etc. The network of drainage channels, are so badly infested in Arpara bazar which was responsible for larger amounts of aquatic weeds. Turbid water which causes low light penetration limits the aquatic weeds. Aquatic weeds such as duckweeds, azolla etc. amount was so high for that species variation was low in the Arpara bazar. Uka *et al*. (2009) detected eight aquatic plants have been incriminated as weeds. From the current study, the most prevalent of these weeds are water hyacinth and cattail plants. Aquatic weeds cause taste and odours problems and also increase biological oxygen demand because of organic loading. They increase the organic matter content of water which affects the strength of the concrete structures when used as curing and mixing water. Water temperature is a pre-requisite for increasing the weed density. In the present study, temperature and pH value was recorded 29.0-30.0^{0}C and 7.5-7.8 in Chukinogor Ghat, 28.0-32^{0}C and 7.9-8.2 in Kechuadubi, 29.0-31^{0}C and 8.3-8.7 in Arpara bazar respectively. Chowdhury *et al.*, (2007b) recorded the temperature yearly ranged from 18.5^{0}C in December to 33.72^{0}C in August and pH value is 7.12-8.68 at Borobila beel in Rangpur district. Eloff and Vander (1981) reported that temperature 27^{0}C to 29^{0}C and the pH value 6.5 to 10.5 in their study. Raju *et al.* (2018) also performed such similar study in plankton population and the water parameters were also relatively similar. During the study period, DO levels were stable at ranged from7-7.5 ppm in Chukinogor Ghat and 4.7-5.3 ppm was recorded in two experimental Kechuadubi, 4.5-5.0 in Arpara bazar respectively. This difference may arise due to the using of aerator in the Chukinogor Ghat and decomposition in Kechuadubi and Arpara bazar. According to this study, transparency was 28-32cm in Chukinogor Ghat, 36-44 cm in Kechuadubi, and 38-42 cm in Arpara bazar. But this wide range of variation in pond due to the using only hormonal feed and not using other feed and fertilizer. During this study there was no salinity found in the study area, which hampers the growth of aquatic weeds. High levels of salinity in wastewater can limit the growth of water hyacinth and other aquatic macrophysics (Sooknah and Wilkie, 2004; Chowdhury *et al.*, 2007a). Chowdhury and Ahmed (2012) showed that the physicochemical conditions of both the habitats indicate that very poor number of macrophysics can grow in the shrimp due to high salinity of water and soil.

5. Conclusions

In conclusion, Macrophytes are an important component of the aquatic ecosystem and broad changes in the abundance of individual species and community composition provide valuable information on how and why an ecosystem might be changing. Aquatic weed concentrations are highly responsive to nutrient levels, temperatures, transparency, DO level and also the management option. So density of weeds varies from water bodies to water bodies on the basis of water quality parameter etc. Study of diversity of aquatic weeds is important for evaluating the water quality and also the fish production.

Conflict of interest

None to declare.

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