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Aquatic weeds of Haor area in Kishoregonj district, Bangladesh: Availability, Threats and Management Approaches

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Abstract

A study was conducted to find out the biodiversity of aquatic weeds of haor areas, located in Karimgonj upazila under the district of Kishoregonj from July to December, 2012. A total of 10 weed species were identified from the haor. Among 3 common groups of weeds, 4 species of floating, 4 species of emergent and 2 species of submerged were collected. The major aquatic weeds found in Karimgonj haor include *Eichhornia crassipes*, *Pistia stratiotes*, *Alternanthera philoxeroides*, *Azolla pinnata*, *Lemna minor*, *Hydrilla verticillata*, *Ipomea aquatica*, *Cartophyllum demersum*, *Aponogeton sp.* and *Ipomea carnea*. Use of herbicide, fertilization, irrigation and siltation were the main causes for decreasing of aquatic weeds biodiversity. Various recommendations and measures have been suggested to improve the biodiversity of aquatic weeds of haor areas.

Keywords: Aquatic weeds, Haor, Threats, Management, Kishoregonj and Bangladesh

1. Introduction

Bangladesh is a relatively small country criss-crossed by innumerable rivers, lakes, haor, baor, beel, tributaries, floodplain and man-made ponds which offer one of the largest inland fisheries in the world [1, 2, 3]. Water resource of Bangladesh is a natural capital. Fisheries and aquatic resources are economically, ecologically, culturally and aesthetically important to the nation. In Bangladesh fisheries is one of the major sub sectors of agriculture, which plays a dominant role in nutrition, employment, earning foreign currency and other areas of economy of the country [4]. As a result of the availability of inland water fish production, fish constituted the second most important component of the Bengali diet next to rice [5, 6, 7].

In Bangladesh about 350 species are recorded as weeds of cultivated field. The number of species in an area depends on the land use pattern and its ecological conditions. Among the weeds, about one-third are monocotyledonous and the remaining is dicotyledonous. Members of the families Poaceae, Cyperaceae, Leguminosae, Asteraceae, Euphorbiaceae, Amaranthaceae, Solanaceae Scrophulariaceae and Acanthaceae are common. The most successful and common genera are *Cyperus*, *Lindernia*, *Eragrostis*, *Panicum*, *Cynodon*, *Hygropylla*, *Euphorbia*, *Phyllanthus*, *Leucas*, *Scoparia*, *Croton*, *Celosia*, *Alternanthera* and *Solanum*. In aquatic conditions *Eichhornia*, *Potamogeton*, *Pistia* and *Monochoria* spp. are the most common weeds in deep water rice fields. Three species of ferns (*Marselia*, *Ceratopteris* and *Salvinia*) are also recorded as weeds of rain-fed rice fields [2].

The plant species known as aquatic weeds grown entirely or partly in water bodies has adverse physical, chemical or biological effects on aquatic ecosystem resulting economic and aesthetic losses. These aquatic plants may be algae, bryophyte, petridophyte and angiosperm and are capable of adapting to different habitats and environmental conditions. They may grow in all aquatic habitats and according to their mode of adaptation could be classified as planktonic, floating, benthic, submerged or emergent types. About 20% of the present weed flora has been recognized as naturalized exotic weeds. Among these *Argemone maxicana*, *Alternanthera philoxeroides*, *Croton bonplandianum*, *Nicotiana plumbaginifolia*, *Lathyrus aphaca*, *Celosia argentea* and *Vicia angustifolia* [8].

In low-lying areas e.g. haors, baors, beels, ditches where no crop cultivation is practiced, a large number of aquatic plants grow and form thick natural vegetation and sometimes these are

also listed as weeds, although they are not. In such vegetations, plants like *Aeschynomene aspera*, *A. indica* (Shola), *Trapa* spp. (Paniphal), *Ipomoea aquatica* (Kalmi), *Hygroryza aristata*, species of *Cyperus*, *Eleocharis*, *Hydrilla*, *Utricularia*, *Sagittaria*, *Monochoria*, *Nelumbo*, *Nymphaea*, *Aponogeton*, *Potamogeton*, *Polygonum*, *Ottelia*, *Ceratopteris*, and many species of grasses and other families are found crowded together. Such 'weed' species are the sources of food and shelter of many aquatic birds, fishes and other animals including man. When any such species invade the crop-fields, they are termed as weeds.

In Bangladesh common carp (*Cyprinus carpio*) has been stocked from last few decades in the haors and beels. It is a matter of great concern that, there is almost no scientific research about this issue. Whether as it is subjected to native fish species to new competitors, predators, habitat and water quality alterations, hybridization, tile importation of parasites

and diseases or other agents that they are unable to withstand. Considering the above stated facts the present study was undertaken to evaluate the impact of common carp (*Cyprinus carpio*) stocking in the haor of Kishoregonj especially on the aquatic weeds and to identify different groups of aquatic weeds of studied haor.

2. Materials and methods

2.1 Selection and Description of the Study Site

Karimgonj upazila of Kishoregonj district was selected for the study. The primary criterion for the selection of the study area was a suitable geographical coverage of haor as far as possible. At first, primary information was collected from Karimgonj Upazila Fisheries Officer regarding concentration of aquatic weeds in the study area. On the basis of preliminary survey the final decision was taken for the study of this locality.



Fig 2: Map showing the study area

2.2 Collection of Data

The study was conducted for a period of 6 months from July to December, 2012. During collection of data, both primary and secondary sources were considered. Primary data were collected from fishermen, fish farmer, teacher, doctor, politician, elite person, public representative, day labor etc. Several visits were made to the study area to collect accurate information related to objectives of the study through interview schedule. For the study, a combination of individual interview, such as focus group discussions (FGD) and key informant interviews were used for collecting the data from the respondents.

2.3 Sample Collection

Aquatic weed samples were collected from the haor on each sampling days. The samples were collected from various sites of the haor.

2.4 Identification

For the easy contrast of vision. Identification was done by only eye observation. Identification was done up to possible taxonomic groups. Finally the results were tabulated.

3. Results and Discussion

3.1 Classification of aquatic weeds

Aquatic weeds are classified according to various habitats which form their eco-environment and become conducive for their growth, reproduction and dissemination. Three types of aquatic weeds were found in Karimgonj as follows:

- A. Emergent weeds
- B. Floating weeds
- C. Submerged weeds

A. Emergent weed: Emergent weeds grow in shallow waters and situations existing near the water bodies where water recedes and rises with the seasons or regular releases from a large water body or reservoir (Figure 2).

B. Floating weed: Floating weeds are observed in the surface of the large, deep and shallow depths of water bodies, deep continuous flowing canals, continuously flowing rivers, large ponds, tanks etc. Some of the weeds in this ecosystem freely float and move long distances, while some of them float on the water surface but anchor down to soil under water body. These weed species make loss of water through evapotranspiration in addition to obstruction caused in flow of water [11]. They are classified into two sub-groups as free floating and rooted floating weeds (Figure 3).

C. Submerged weed: Submerged weed species germinate or sprout, grow and reproduce beneath the water surface. Their roots and reproductive organs remain in the soil at the bottom of the water body [12]. These weeds cause maximum damage, because they are not visible on the surface and impede the flow of water varying upon the degree of their intensity and growth [13]. Most of these weeds are found in shallow and medium deep water bodies and continuous flowing canals and drainage ditches (Figure 4).

3.2 List of available aquatic weeds in haor area at Kishoregonj

During the study period, a total of 10 species were identified. Among these 10 species, 4 species of floating, 4 species of emergent, 2 species of submerged were recorded. The

available floating, emergent and submerged aquatic weeds in haor area are presented in Table 1, 2 and 3.

Table 1: List of emergent weeds

Scientific name	Common name	Local name	Percent of occurrence (volume)
<i>Aponogeton spp.</i>	Aponogeton	Gechu	5.88
<i>Ipomea carnea</i>	Gloria-d la manana	Dhol kolmi	70.60
<i>Ipomea aquatica</i>	Water spinach	Kolmi	11.76
<i>Alternanthera philoxeroides</i>	Alligatorweed	Malancha	11.76

Table 2: List of floating weeds

Scientific name	Common name	Local name	Percent of occurrence (volume)
<i>Eichhornia crassipes</i>	Water hyacinth	Kachuripana	94.94
<i>Pistia stratiotes</i>	Water lettuce	Topapana	2.52
<i>Lemna minor</i>	Duck weed	Khudipana	1.27
<i>Azolla pinnata</i>	Mosquito fern	Kutipana	1.27

Table 3: List of submerged weeds

Scientific name	Common name	Local name	Percent of occurrence (volume)
<i>Hydrilla verticillata</i>	Water thyme	Hydrilla	50
<i>Cartophyllum demersum</i>	Coontail	Kata jhanji	50

3.3 Briefing about available aquatic weeds

Bangladesh has a globally important wetland ecosystem and associated with approximately 150 species of weeds [9]. But during the study period a total of 10 species were found in the haor at Kishoregonj district. So, it is very little in comparison with the total number of weeds in Bangladesh. A total 10 species of weeds were recorded from the haor (Figure 2, 3 and 4).

3.3.1 Emergent weeds

3.3.1.1 *Aponogeton spp.* (Gechu)

Gechu is one kind of emergent weed. Leaves come out from the root. Its color is green and found in small amount. This is probably the *Aponogeton* specks most suited to aquarium use. Its leaves are approximately 10 inch (25cm) long with wavy, translucent pale green blades. In turbulent water, it may exhibit a certain variety of shapes, with longer and narrower or shorter and wider leaves, depending on the current. Its position was very low which approximately 1% was observed. Previous record showed that the abundance of gechu was highly used by fishes as their shelter [9, 10].

3.3.1.2 *Ipomea carnea* (Dhol kolmi)

Dhol kolmi is an available aquatic weed in the study area. It is tall and lanky; the branch tips of the bush morning glory bear clusters of pink funnel-shaped flowers when weather is warm. Its lowest stem reaches become woody, but in frosty regions it usually is killed back to the ground and quickly rejuvenates in spring. The leaves are narrowly oval with long tapering tips

and are distinguished from the noxious vining weed *Ipomoea cairica* by five-lobed leaves. About 12% dhol kolmi was seen in this haor but it is not similar as the study of ^[10].



Fig 2: Photographs of the emergent weeds of Haor area, Kishoregonj.

3.3.1.3 *Ipomea aquatica* (Kolmi)

Kolmi is one kind of green leafy vegetable. It also grows in embankment and spread over the water. Herbivores fishes take it as their feed. This plant forms dense, floating mats of intertwined stems in slow-moving water, impeding boat traffic and shading or choking out native aquatics. It is a serious weed in the Philippines and other tropical countries, and it must be carefully monitored to prevent it from becoming one in our country. About 2% of kolmi was observed while ^[9] found about 15%.

3.3.1.4 *Alternanthera philoxeroides* (Malancha)

Malanch is also one kind of leafy vegetable consumption. It is a large perennial herb which is rooted at the edge of the water bodies and spreads out as a floating mat over the water surface and over the adjacent moist ground as well. Mats may be up to 1m thick. Stems are spreading, hollow and may be green, yellow or red. Leaves are in opposite pairs, narrow, slightly fleshy and with a waxy surface. It was observed about 2%. But previous record denoted the availability of malancha in our country. About 5% of aquatic weeds were reported by ^[10] which are not similar with present study.

3.3.2 Floating weeds

3.3.2.1 *Eichhornia crassipes* (Kachuripana)

Kochuripana is an exotic species in our country. This attractive but very weedy species can be found mainly in our country but is probably more common than is reported. The plant is easy to identify because of its floating habit, distinctive leaves, and fantastic flowers. The petioles of the leaves are filled with spongy mesophyll tissue and give the plant its ability to float. *Eichhornia crassipes* is one of the most noxious weeds in our country because of its ability to double its mass daily. The plant clogs waterways and chokes out other native plants. It should never be willingly spread. A pair of these plants can multiply up to about four thousand times in one season. It was abundant in haor (75%). Small amount of kochuripana is suitable for aquatic animal, but in abundant is harmful. On the other hand, Kevin *et al.* ^[9] found 43% of kochuripana in haor region of Bangladesh.

3.3.2.2 *Pistia stratiotes* (Topapana)

Topapana is a nice looking aquatic weed and small in size, usually floating on the water surface on the edges of waterways and also anchored in the substrate during receding water levels. The leaves are fleshy in appearance and have a covering of tiny hairs, giving them a velvety texture. The primary production for fish consumption the abundance is increasing day by day. About 2% of topapana was observed while Kevin *et al.* ^[9] observed very low amount of topapana.



Figure 3: Photographs of the floating weeds of Haor area, Kishoregonj.

3.3.2.3 *Lemna minor* (Khudipana)

Khudipana is a very small size free floating aquatic weed. It is the most favorite food for fish. It is also taken by duck and so this is called as duck weed. It is a fast growing tiny plant with oval leaves and a small single root under each leaf. It grows in full sun-part shade. A pair of these plants can multiply up to about seven thousand times in one season. About 1% of duck weed was observed where Kevin *et al.* ^[9] recorded about 15% which is not similar with the present study.

3.3.2.4 *Azolla pinnata* (Kutipana)

It is a free-floating annual water fern 0.8–2.5 cm long, with tiny scale-like 2-lobed leaves. Each lobe are 1–2 mm long, leaves green or red, often giving water surface reddish appearance. Main stem has pinnate branches and branches long towards the base gives the plant a triangular shape. Roots have fine lateral rootlets, appearing feathery. It produces both male and female spores. It is favorite food for fishes. A pair of these plants can multiply up to about five thousand times in one season. Lower amount of kutipana was observed in haor region.

3.3.3 Submerged weeds

3.3.3.1 *Hydrilla verticillata* (Hydrilla)

Hydrilla is one kind of emergent weed. Leaves come out from the root. Its color is green and found in small amount. Fish take it as their food. It is also a good shelter for small fishes. The stems grow up to 1–2 m long. The leaves are arranged in whorls of two to eight around the stem, each leaf 5–20 mm long and 0.7–2 mm broad, with serrations or small spines along the leaf margins; the leaf midrib is often reddish when fresh. Now hydrilla was found about 2%. Ten years ago, it was available ^[10] which is not similar with present study.



Fig 4: Photographs of the submerged weeds of Haor area, Kishoregonj.

3.3.3.2 *Ceratophyllum demersum* (Kata jhanji)

Kata jhanji is a submersed aquatic plant native to all of North America and now is distributed worldwide. It is a rootless perennial which floats just below the surface of the water. It has long stems which are mostly green, occasional with a touch of red at the nodes. The leaves are attached directly to the stem in a circular arrangement or whorled. Each leaf is thin, linear and forked several times. They are bright green, stiff, brittle and often have barbs or bristles at the base and tips. As reported ^[9] about 20% kata jhanji was found in the haor but about 2% kata jhanji was observed in study area which was not similar with previous data.

Finally there was no effect of stocking of carpio (*Cyprinus carpio*) on weed diversity however weed mainly destructed by man-made causes mainly using of herbicide in the paddy field. Maximum weeds were destructed before stocking of Carpio.

4. Cause of aquatic weeds destruction

According to opinion and remarks of the local fishermen, Upazila Fisheries Officers and other elite persons, weed-diversity was being drastically reduced due to

- Use of chot jal (fine mesh net)
- Use of herbicide
- Fertilization and irrigation
- Siltation

5. Recommendations for Management

Following steps should be taken to improve the weed-diversity of haor area at Karimgonj upazila:

- To increase awareness and understanding about the beel ecosystem, the fishermen should be educated through establishment of educational institution in the locality.
- Use of chot jal (fine mesh net) should be prohibited.
- Weed should be controlled manually and small amount of herbicide should be used.
- The amount of used inorganic fertilizer should be reduced and use of organic fertilizer should be increased.
- Haor should be dug after particular time interval.
- Haor should be properly managed.

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