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Vegetation of Sunderban mangrove forest after the devastating cyclone Sidr in Bangladesh

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Abstract

The present study investigated the floristic composition of the Sunderban mangrove forest after cyclone Sidr in order to infer about the severity of the damage of the forest plants. Data was collected by vegetation analysis using quadrat (10 m X 10 m) and focus group discussion with the local people. Data showed that the study area is rich in plant diversity with 5 to 8 species and dense in population having 712 to 1484 individuals per quadrat. Data also revealed that at least one tree was broken or uprooted in an area of 100 square meter (10 m x 10 m) indicating the severity of the damage by Sidr in the context of whole forest area. It is also found that tall plants like Keora (Sonneratia apetala) were most affected species. This study suggests that vegetation analysis should be conducted with more sampling sites after any devastating cyclones in order to monitor the damage of the tree and its consequences on the floristic composition.

Key words: Damage of plants, Sidr, Sunderban mangrove forest, Vegetation analysis.

Introduction

Mangroves are among the most productive coastal ecosystems in the world (Rawte et al. 2002, Kathiresan 2002). The larger part of the Sunderban mangrove forest falls under the southern parts under Khulna, Satkhira, and Bagerhat districts of Bangladesh and the rest lies in the West Bengal of India (Ramanathan et al. 2008). The area of the Sunderban forest of Bangladesh is about 3,726 km^2 (Khan 1991) and divided in to four ranges namely Khulna, Shoronkhola, Chandpai and Satkhira. The role of this forest in the socio-economy of the country is immense as it provides the livelihood of about 5 million people living surrounding this forest. The forest is rich in biodiversity and provides valuable resources such as timber, fuel, honey, and fish. Further this

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forest acts as a barrier to protect coastal people from the devastating activities of cyclones. Therefore, better understanding about the effects of natural calamities and anthropogenic activities on this forest, particularly on plant vegetation is of great importance from the aspects of both economy and ecology of this region.

Being a typical ecosystem located in the coastal zone, mangrove forests are exposed to a number of natural calamities such as salinity, cyclones, flush of water, tidal variation, and tsunami. Among the natural calamities so far happened in the coastal belt of Bangladesh, the incidence of cyclone Sidr that happened on 15 November 2007 can be marked as the black day in the history of natural calamities in Bangladesh, because major part of the country and the whole Sunderban forest were affected by this cyclone (Fig. 1). More than 3 million people are thought to have been affected by the cyclone, with around 3,000 people dead, and a similar number missing, 273,000 homes have been destroyed and more than 900,000 damaged, while 855,000 acres of crops have been damaged and nearly 30,000 acres completely destroyed according to government figures (www.ethnicnow.com). Although much have been talked about the loss of natural and infrastructural resources there is little scientific attempt to study on the effects of Sidr on the plants of Sunderban mangrove forest. The objective of the study was to investigate the plant vegetation condition of the forest after cyclone Sidr.

Material and methods

Study site and vegetation analysis

The study was conducted in the Satkhira range of Sunderban mangrove forest of Bangladesh. Vegetation analysis was conducted mainly to identify the plant species that were affected by Sidr. A 10 m x 10 m quadrat was used in this study. Herbaceous plants were not taken under consideration in the vegetation analysis because of their small size and difficulty to count them along the trees in a 10 m x 10 m quadrat. Quadrats were placed non-randomly and purposively to a place after every 2 km and 50 m interior to the forest from the bank of the river while traveling with an engine boat. A total of three sites were studied. Plants those were of at least breast height were taken under consideration in this study. Then the number of the individuals for each of the species in the quadrat was noted. Plants that were uprooted or of those the main stems were broken were noted as damaged (Fig. 2). The broken or uprooted plants that contained green leaves were considered as damaged by Sidr.

Focus group discussion

A total of four focus group discussions were made with the people of various occupations those live surrounding the forest. These people were of fishermen, boatmen, honey collector, wood collector, and small businessmen. The people those who experienced the Sidr, travelled to the affected areas, and observed the damaged forests were selected for focus group discussion. The investigation was conducted during 9 to 10 December 2007.

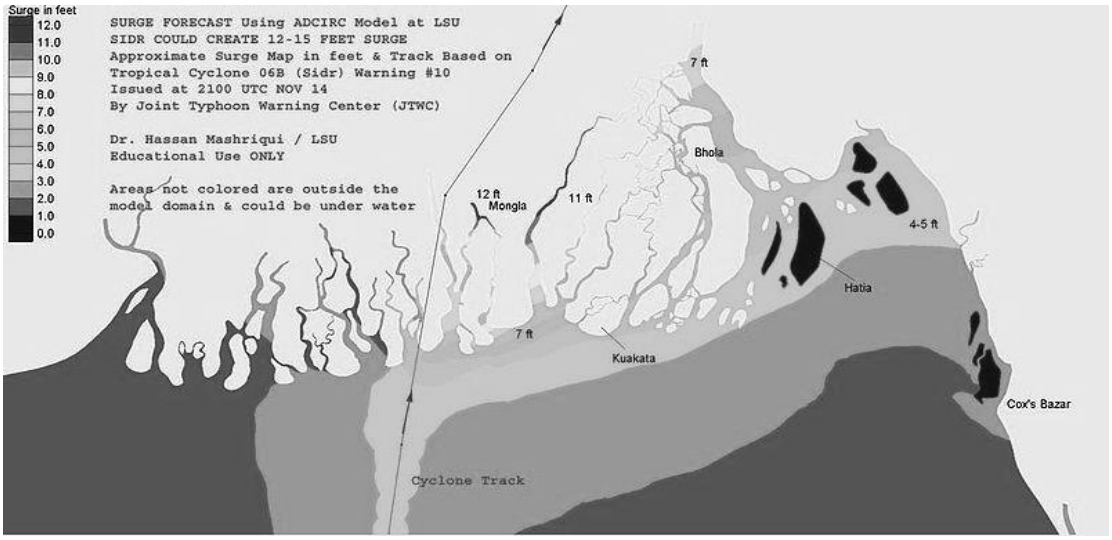

Figure 1. Map showing cyclone affected area in the Sunderban mangrove forest of Bangladesh (Source: Wikipedia)

Results and discussion

The floristic composition and the effects of Sidr on the plants of Sunderban mangrove forest have been shown in Table 1. Data showed that the study area is rich in plant diversity. Number of tree species per quadrat (10 m X 10 m) ranged from 5 to 8 in the study area. Data also showed that the density of the forest tree plants is also very high ranging from 712 to 1484 individuals per quadrat (10 m X 10 m). At least in two quadrats Khalisha (*Aegiceras corniculatum*) was found as the most abundant (>70%) followed by Gewa (*Excoecaria agallocha*).

At least one tree per quadrat was found to be damaged by Sidr. Keora (*Sonneratia apetala*) was found damaged at least in two quadrats. Passur (*Xylocarpus molluccencis*) and Sundari (*Heritiera fomes*) were also damaged.

From the focus group discussion it was found that Shoronkhola range was the most affected areas and the Satkhira range was the less affected one in Sunderban forest of Bangladesh. It is also found that tall plants like Keora (*Sonneratia apetala)* were most affected plants by Sidr. Thus, the results of the focus group discussion support the result of the vegetation analysis by quadrat. A few number of a palm tree, locally

known as Hital (*Phoenix paludosa*) was also observed broken randomly in the visited area of the forest.

The reason that the tall plants were more damaged can be linked logically with the fact that these plants are more exposed to the destructive activity of the cyclone. Higher severity of the damage in the Shoronkhola range than the Satkhira range indicates that there exists a difference in the devastating effects of Sidr from place to place. The reason of such difference might be related to the altitudinal differences of the places or the variation in the devastating effects of Sidr from place to place as driven by wind.

Overall, the results of the present investigation suggest that the vegetation of the Sunderban mangrove forest of Bangladesh is highly diverse and the population is also dense. Although the number of sampling sites was limited, the results of this investigation showed that at least one tree was broken or uprooted in an area of 100 square meter (10 m x 10 m). This indicates that the severity of the damage by Sidr in the whole forest area is high. Since tall trees were more affected it can be predicted that the area where number of tall trees were higher the damage was also higher. Therefore, it can be suggested that vegetation analysis should be conducted with more sampling sites after any devastating cyclones in order to monitor the damage of the tall trees and its consequences on the floristic composition.

Table 1. Floristic composition and the effect of Sidr on the plants of Sunderban mangrove forest, Bangladesh. Data obtained from a 10 m X 10 m quadrat.

Local name	Scientific name	No. of individuals	Coverage (%)	No. of damaged plant
Site 1				
Goran	*Ceriops decandra*	998	67.25	
Gewa	*Excoecaria agallocha*	402	27.10	
Hargoza	*Acanthus ilicifolius*	51	3.44	
Khalisha	*Aegiceras corniculatum*	24	1.62	
Keora	*Sonneratia apetala*	4	0.27	1
Baen	*Avicennia officinalis*	3	0.20	
Passur	*Xylocarpus moluccencis*	1	0.07	
Kakra	*Bruguiera gymnorhiza*	1	0.07	
Total		1484	100.00	1
Site 2				
Khalisha	*Aegiceras corniculatum*	515	72.33	
Gewa	*Excoecaria agallocha*	135	18.96	
Baen	*Avicennia officinalis*	50	7.02	
Keora	*Sonneratia apetala*	10	1.40	
Passur	*Xylocarpus moluccencis*	2	0.28	1

Local name	Scientific name	No. of individuals	Coverage (%)	No. of damaged plant
Total		712	100.00	1
Site 3				
Khalisha	*Aegiceras corniculatum*	603	74.81	
Gewa	*Excoecaria agallocha*	97	12.03	
Baen	*Avicennia officinalis*	62	7.69	
Golpata	*Nypa fruticans*	23	2.85	
Keora	*Sonneratia apetala*	10	1.24	1
Passur	*Xylocarpus moluccencis*	6	0.74	
Sundari	*Heritiera fomes*	5	0.62	2
Total		806	100.00	3

Figure 2. Plants affected by cyclone Sidr in the Sunderban mangrove forest of Bangladesh.

Table 2. Effects of Sidr on the Sunderban mangrove forests, Bangladesh. Data obtained from focus group discussion.

Parameters	**Description**
Most affected area	Shoronkhola range. Notably Kochikhali, Kotka and Hironpoint were also most affected areas.
Less affected area	Satkhira range. In this area only tall tree like Keora (*Sonneratia apetala)* was mostly affected. Besides, Sundari (*Heritiera fomes*) and Passur (*Xylocarpus moluccencis*) are also damaged species.
Most affected plant	Tall plants mostly Keora (*Sonneratia apetala)* was affected.

Future challenges

It is evident that climate is changing due to global warming and it will be harsher if the current rate of increase of atmospheric CO_2 continues. The consequences of such climate change include increased frequency of natural calamities such as cyclones, unusual tidal variation, and sea level rise. Increased number of occurrences of cyclone is likely to cause more damage on the forest resources including plants and wild lives. Rise of

sea level will cause increased salinity in the coastal habitats. Due to lack of scientific data, effects of sea level rise and increased salinity on the floristic composition of the mangrove forest is unclear.

Bangladesh is an overcrowded country. Due to scarcity of land and resources to meet the demand by the excess population there is a pressure on the forests. The population pressure and anthropogenic activities will cause deforestation, destruction of habitats and other pollution.

The Sunderban mangrove forest of Bangladesh has been declared as the world heritage site by the UNESCO. Further, this forest recently has been listed as one of the candidates for the new natural seven wonders of the world. As a result, more people are now interested to visit this forest. Uncontrolled number of tourists and their activities as well as increased movement of the vehicles will disturb the natural environment of the forests.

Reduced flow of fresh water through the rivers towards the Bay of Bengal will cause increased salinity in the brakish water zone. The increased salinity will then affect the vegetation of the mangrove forests.

These challenges, therefore, should be overcome by taking proper actions in order to protect this economically and ecologically important ecosystem.

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