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Original Article

Impact of diseases on fish production of baors in Jessore, Bangladesh

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Abstract

The study was carried out to assess the impact of diseases on fish production in *baors* of Jessore district, Bangladesh from March 2012 to January 2013. Studied *baors* were selected randomly from each sub-district which covered 39.22% of total *baors* and 71.87% *baor* areas in Jessore district. All the surveyed *baors* were affected more or less by various diseases and in 80% *baors* noticeable production loss occurred almost every year. The main diseases were epizootic ulcerative syndrome (EUS), dropsy, gill rot and fin rot; out breaking time ranged from November to February each year. EUS was recorded in 85% *baors* whereas other diseases were found in various *baors* at various percentages: dropsy (75%), gill rot (45%) and fin rot (55%). Conferring to the number of affected fishes, 31.25% were affected by EUS, 37.5% by dropsy, 12.5% by gill rot and 18.75% by fin rot. In the year 2012, 0.513% loss of production has occurred that designated 0.7599 million BDT. Through successful work on disease control and management, production loss may be minimized.

Keywords: Impact, fish diseases, production, *baor*, oxbow lake

INTRODUCTION

Bangladesh has achieved remarkable progress in the fisheries sector since its independence in 1971 and this sector have been playing a very significant role and deserve potential for future development in the agrarian economy of Bangladesh (DoF 2012). The sector's contribution to the national economy is much higher than its 4.39% share in GDP, as it provides about 60% of the animal protein intake and more than 11% of the total population of the country is directly or indirectly involved in this sector for their livelihoods (DoF 2012). The increasing rate of exporting of fish and fishery products was 45.54% from the fiscal year 2009-2010 to 2010-2011. In recent years, this sector performs the highest GDP growth rate in comparison to other agricultural sectors (crop, livestock and forestry) (DoF 2012). The growth rate of this sector over the last 10 years is almost steady and encouraging, varying from 4.76% to 7.32% with an average 5.61%. Whereas last four years average growth rate of this sector is 6.22%. The country's export earnings from this sector were 2.46% during the fiscal year 2011-12 (DoF 2012).

Bangladesh is one of the world's leading fish producing countries and it's total fish production shows a consistently increasing trend from the fiscal year 1983-1984 to 2011-2012 and the production increased more than four times (754,000 MT in 1983-1984 to 3,262,000 MT in 2011-12) (DoF 2013). The diversified fisheries resources of the country are divided into three groups, *i.e.*, inland capture, inland culture and marine capture. Inland culture includes mainly pond/ditch, *baor* (oxbow lake), shrimp/prawn farm, seasonal cultured water body etc. covering an area of about 774,055 ha and produces 1,726,067 MT fish and shrimp that covers 52.92% of total production during the fiscal year 2011-2012 (DoF 2013). There are about six hundred oxbow lakes in four greater districts of Jessore, Faridpur, Khulna and Kushtia having many of these concentrations in greater Jessore district (Hasan 2003, Biswas *et al.* 2009 and Abdullah-Bin-Farid *et al.* 2013). Total 51 *baors* are situated in Jessore region

(Personal communication: Mr. Haridash, Statistics Officer, DoF, Jessore). Total area of *baors* in Jessore region is 1,882 ha (DoF 2011). Though the inland closed water area is only 16.47% of the total inland water-bodies, but 52.92% of the total yield comes from this inland closed water area (DoF 2013).

Fishery is the second export earning sector which contributes about 4.43% of the gross domestic product (GDP) and it contributes 22.21% in agriculture 2.73% of total foreign exchange income comes from Fisheries sub sector (DoF 2012). Disease is one of the major limiting factors to obtain the production target and among various diseases bacterial disease in fish is a serious threat to aquaculture system in Bangladesh. Fish farmers have been facing great problems due to fish diseases that cause severe damages and mortality in both culture and wild fishes (Rahman and Chowdhury 1996). Various types of diseases such as ulcer type disease including epizootic ulcerative syndrome, bacterial hemorrhagic septicemia, tail rot and fin rot, bacterial gill rot, dropsy, columnar disease, fungal disease and parasitic disease are important limiting factors for sustainable fish production (Chowdhury 1997). The major fish diseases occurred in Bangladesh are epizootic ulcerative syndrome (EUS), different types of fungal and parasitic diseases etc. (Chowdhury *et al.* 2003). Moreover, Tail rot and Fin rot disease is also found in different fish farms and the rate of incidence of this type of disease is assumed to be increased in the recent years (Faruk *et al.* 2004).

Bangladesh has many *baors* and Jessore district possesses a great portion of *baor* area but no remarkable work was conducted on fish diseases in *baors*. So, in the present study, impact of fish diseases on fish production of *baors* in Jessore district was investigated.

METHODOLOGY

Study area and duration: The study was conducted in various *baors* of Jessore district, situated in the south-west part of Bangladesh (Figure 1). The total area of sample *baors* is 1352.63 ha which covers 71.87% of total area of *baors* in Jessore and the duration of the study was March 2012 to January 2013.

Sampling framework: Sample *baors* were selected randomly ensuring the inclusion of each Upazila (sub-district, 7 in number). Bangladesh has 5,488 ha *baor* area and in Jessore district the total area of *baors* is 1,882 hectors and thus the Jessore district contains 34.29% *baor* area of Bangladesh. Twenty *baors* (Table 1) were selected and primary data were collected employing effective techniques such as personal interview (home visit), focus group discussion (FGD), and telephonic interview.

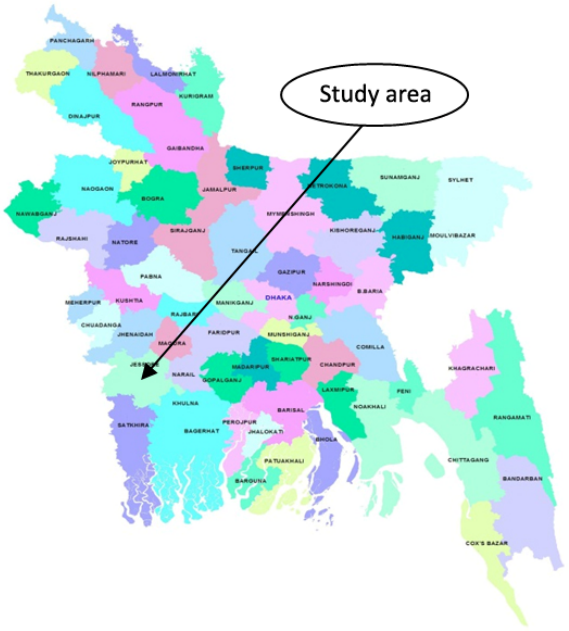

Figure 1: Map of Bangladesh indicating the study area.

All the studied *baors* were managed under community based fisheries management approach. A total of 144 farmers and concerned members were interviewed for primary data collection. Fish production, investment and income data were collected from the respondents during interview.

Table 1: Surveyed *baors* and their areas

Name of the baors	*Area (ha)*	*Name of the baors*	*Area (ha)*
Hamidpur	17.40	Hariharnagar	21.25
Bukvora	153.0	Morshina	21.18
Koikhali	47.00	Uzzalpur	24.29
Joghati	46.47	Krishnachandrapur	21.63
Radhanagar	31.56	Bergobindapur	226.12
Manikdaha	08.51	Kharincha	94.67
Purakhali	54.25	Konnadaha	36.37
Zhapa	245.39	Rajgonj	37.85
Khedapara	57.00	Mohishakura	22.64
Khatura	65.00	Bahadurpur	121.05

Total area: 1352.63 ha

Common fishes of those *baors* were *Labeo rohita*, *Catla catla*, *Cirrhina mrigala*, *L. calbasu*, *Hypophthalmichthys molitrix*, *Ctenopharyngodon idella*, *Cyprinus carpio*, *Puntius* spp., *Colisa fasciatus*, *Channa punctata*, *C. striatus*, *Salmostorma bacaila*, *Amblypharyngodon mola*, *Mystus tengra*, *Notopterus notopterus*, *Heteropneustes*

fossilis, *Clarias batrachus*, *Glossogobius giuris*, *Wallago attu* and *Chanda ranga*. The main diseases were EUS, dropsy, gill rot and fin rot which were identified in relation to identifying keys (Table 2). Secondary data were collected from various government and fisheries correlated institutions and also collected from websites and published literatures.

Table 2: Identifying keys for various diseases

Disease	*Identifying keys*
EUS	Abnormal swimming with project out of water; floating listlessly near the bank; red spots on the body; ulceration covers large area; deep hemorrhage and necrosis with black.
Dropsy	Distended abdomen; straw colored inside the body; scale protrusion; exophthalmia; inflammation of intestine; swelling and vacuolation of hepatocytes.
Gill rot	Grasping; remain to the surface; lethargic; anorexic opercula become swollen; frayed appearance of affected gill tissues; excessive mucus secretion; damaged opercula.
Fin rot	Whitening area and lesions on the fin margin; frayed and disintegration of soft tissues between fin rays; loss of the total fin; damaged caudal fin.

The following equations were used for estimation of production loss, the percentage of disease affection and are average production loss are as follows:

Percentage (%) of production loss

$$=\frac{Total\ loss}{Total\ production}x100$$

Percentage (%) of specific disease

$$=\frac{No.\ of\ fishes\ affected\ by\ a\ particular\ disease}{Number\ of\ total\ affected\ fish}x100$$

Percentage (%) of average production loss

$$=\frac{Average\ loss}{Average\ production}x100$$

Data analysis: The collected data were subjected to descriptive analyses using the computer software Microsoft Excel version 2007.

RESULTS

Total fish production, total cost and total income from the studied *baors* are presented in Table 3. Total income was increased in maximum cases between the year of 2007 and 2012. Total cost was also increased this time with some rare exceptions (Table 3).

Table 3: Total fish production, total cost and total income from the studied *baors*

Baor	*Issues*	*Year*					
		2007	*2008*	*2009*	*2010*	*2011*	*2012*
Hamidpur	TFP	23.00	27.00	34.00	38.00	42.00	45.23
	TC	00.65	00.54	00.58	00.60	00.65	00.69
	TI	00.75	01.16	01.05	01.23	01.35	01.40
Bukvora	TFP	155.0	163.0	206.0	281.0	337.0	360.5
	TC	03.24	03.48	04.29	05.21	06.41	07.24
	TI	09.85	12.50	13.84	14.25	19.52	20.75
Koikhali	TFP	62.30	62.00	89.30	180.3	110.0	112.6
	TC	01.52	01.00	01.92	01.00	01.13	01.13
	TI	4.299	3.100	6.230	7.255	7.925	7.928
Joghati	TFP	87.43	89.30	94.63	98.79	102.0	105.7
	TC	12.98	13.89	18.01	18.79	21.77	25.30
	TI	45.79	46.07	49.74	54.93	58.71	62.00
Radhanagor	TFP	54.60	56.72	62.33	69.02	74.33	80.01
	TC	00.82	00.94	01.70	01.96	01.71	01.83
	TI	03.80	03.96	04.20	04.63	05.25	05.54
Manikdaha	TFP	15.03	15.98	18.35	20.01	20.37	22.29
	TC	00.20	00.22	00.28	00.30	00.35	00.38
	TI	00.60	00.60	00.71	00.78	00.80	00.84
Purakhali	TFP	42.20	52.20	63.80	73.80	108.5	115.1
	TC	01.56	01.51	02.07	02.13	02.80	03.09
	TI	01.54	02.49	02.96	03.17	05.62	06.05
Zhapa	TFP	95.03	99.50	106.8	112.1	116.3	119.7
	TC	01.08	01.15	01.32	01.40	01.60	01.78
	TI	05.91	06.08	06.68	07.19	07.28	07.49
Khedapara	TFP	51.50	59.30	91.70	114.5	116.9	125.6
	TC	00.45	00.65	00.96	01.36	01.55	01.72
	TI	02.06	02.97	05.28	07.14	06.74	07.20
Khatura	TFP	89.25	87.00	114.2	126.8	143.3	153.2
	TC	01.52	01.55	01.51	01.98	02.55	02.72
	TI	04.84	04.40	06.28	07.79	08.99	09.78
Hariharnagar	TFP	37.70	35.50	42.60	46.20	50.20	54.70
	TC	00.74	00.73	00.73	00.83	00.94	01.17
	TI	02.39	02.33	02.57	02.57	02.79	02.99
Morshina	TFP	29.70	21.58	28.75	27.15	31.12	34.20
	TC	00.28	00.31	00.35	00.35	00.30	00.37
	TI	01.53	01.62	01.83	01.43	02.20	02.70
Uzzalpur	TFP	17.00	26.00	34.00	37.50	48.52	51.91
	TC	00.24	00.28	00.42	00.47	00.62	00.71
	TI	01.04	01.78	02.62	02.76	03.19	03.61
Krishnachan-drapur	TFP	23.00	23.50	28.00	34.57	47.68	52.71
	TC	00.35	00.40	00.41	00.54	00.76	00.83
	TI	01.50	1.800	2.885	2.701	3.176	3.620
Bergobinda-pur	TFP	327.0	330.0	336.0	340.9	344.1	350.3
	TC	04.10	04.51	05.02	05.20	05.27	05.65
	TI	18.46	20.48	21.34	21.41	21.77	22.63
Kharincha	TFP	218.0	221.1	225.4	227.0	227.0	230.6
	TC	01.91	02.20	02.11	02.31	02.35	02.50
	TI	12.08	12.50	12.81	13.06	13.02	13.25
Konnadaha	TFP	63.60	72.72	76.33	80.02	87.33	93.57
	TC	01.09	01.16	01.91	02.17	01.91	02.07
	TI	03.82	04.36	05.65	04.36	05.65	06.08
Rajgonj	TFP	54.88	56.78	69.60	74.05	86.78	92.25
	TC	00.63	00.66	00.86	00.93	00.96	01.13
	TI	03.13	03.29	03.80	04.43	05.22	07.08
Mohishakura	TFP	31.50	36.25	40.40	44.50	50.94	55.58
	TC	00.50	00.58	00.65	00.71	01.02	01.18
	TI	01.89	02.18	02.42	02.67	02.85	03.13
Bahadurpur	TFP	175.5	182.5	202.1	247.5	273.3	292.3
	TC	05.01	05.11	05.83	06.31	06.74	07.02
	TI	09.65	10.22	11.32	11.65	12.92	13.63

TFP=Total Fish Production in metric tons, TC=Total cost in million BDT, TI=Total income in million BDT

No specific treatment was used in these *baors* for specific fish disease and liming is the only one treatment in every type of diseases in some *baors* (Table 4). In 50% baors lime is used without calculation of the required dose. The highest average loss from the year 2007 to 2012 has occurred in Manikdaha Baor (1.446%) and the lowest in Koikhali Baor (0.428%) (Table 4). Carps and other native species were found to be affected by disease in all the *baors* except Zhapa Baor where only snakeheads (*Channa* sp.) were affected. The most violent disease was dropsy (37.5%), covered the greatest portion in pie chart and then EUS (31.25%) followed by fin rot (18.75%) and gill rot (12.5%) in fishes (Figure 2). Because of those diseases some loss has occurred in almost every year (Table 4). In 80% *baors* mortality was found noticeable (Table 4). In 50% *baors* lime was used as control measure of the diseases and potash ($KMnO_4$) was applied in only one *baor* (Table 4).

Table 4: Disease status in studied *baors*

Baor	Disease	Time of outbreak	Existing treat-ment	Average production (kg/yr)	Average loss (kg/yr)	% of average loss
Hamidpur	EUS, dropsy, gill rot	Dec-Jan	Liming	34871.67	420	1.204
Bukvora	EUS, dropsy, gill rot	Dec-Feb	-	250418.33	2100	0.839
Koikhali	EUS, dropsy, fin rot	Dec-Feb	-	102743.17	440	0.428
Joghati	EUS, gill rot, fin rot	Dec-Jan	Only liming	96306.67	2600	2.700
Radhanagar	EUS, dropsy, gill rot	Dec-Jan	-	66168.33	320	0.484
Manikdaha	EUS, dropsy, fin rot	Nov-Jan	Only liming	18671.67	270	1.446
Purakhali	EUS, dropsy	Dec-Feb	-	75922.17	Ng	-
Zhapa	EUS	Nov-Jan	Only liming	108221.67	Ng	-
Khedapara	EUS, dropsy, gill rot	Dec-Jan	Only liming	93241.67	800	0.858
Khatura	Dropsy, gill rot	Dec-Jan	-	118955.00	1100	0.925
Harihornagar	EUS, dropsy	Dec-Feb	Potash and lime	44483.33	236	0.531
Morshina	EUS, fin rot	Nov-Jan	Lime	28749.50	210	0.730
Uzzalpur	EUS, gill rot	Nov-Jan	-	35820.83	215	0.600
Krishnachan-drapur	EUS, dropsy, fin rot	Dec-Jan	Lime	34909.33	430	1.232
Bergobindo-pur	EUS, dropsy, gill rot, fin rot	Dec-Jan	Lime	338046.67	2092	0.619
Kharincha	Dropsy	Nov-Jan	Lime	224841.67	Ng	-
Konnadaha	EUS, dropsy	Dec-Jan	-	78928.33	496	0.628
Rajgonj	Dropsy, fin rot	Dec-Feb	-	72390.00	Ng	-
Mohishakura	EUS, gill rot, fin rot	Dec-Jan	-	43195.00	285	0.660
Bahadurpur	EUS, dropsy, fin rot	Dec-Jan	Lime	228855.00	1030	0.450

[Yr=Year; Ng=Negligible]

Due to mortality for diseases total loss of production of fishes in plotted *baors* was 0.513% in weight (Table 5) and that referred 0.7599 million BDT on the aspect of the year 2012.

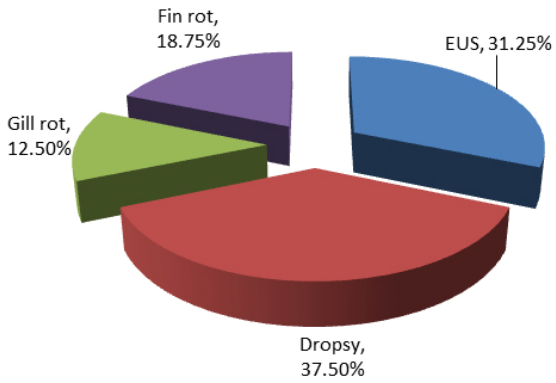

Figure 2: Various fish diseases recorded in *baors*

Table 5: Fish production and percentage of fish loss in 2012

Name of the *baors*	Total production (MT)	Total loss (MT)	(%) of loss
Hamidpur	45.23	0.42	0.513%
Bukvora	360.51	2.10	
Koikhali	112.59	0.44	
Joghati	105.71	2.60	
Radhanagar	80.01	0.32	
Manikdaha	22.29	0.27	
Purakhali	115.07	-	
Zhapa	119.67	-	
Khedapara	125.57	0.80	
Khatura	153.24	1.10	
Harihornagar	54.70	0.24	
Morshina	34.21	0.21	
Uzzalpur	51.91	0.22	
Krishnachandrapur	52.71	0.43	
Bergobindopur	350.28	2.09	
Kharincha	230.56	-	
Konnadaha	93.57	0.50	
Rajgonj	92.25	-	
Mohishakura	55.58	0.29	
Bahadurpur	292.31	1.03	
Total (MT)	2547.97	13.06	

[MT=Metric Ton]

DISCUSSIONS

In present study, surveyed *baors* were stocked with Indian major carps and some exotic carp species. EUS, dropsy, gill rot and fin rot were the common diseases. Because of these diseases some lose has occurred due to death of fish in *baors*. Similar findings was also reported by Frerichs and Roberts (1989), they have mentioned that

tail rot and fin rot diseases are widely distributed in tropical as well as temperate countries and most species of fish are susceptible to these diseases. The major fish diseases occurred in Bangladesh are EUS, *Aeromonas septicemia*, different types of fungal and parasitic diseases etc. affording to Chowdhury *et al.* (2003).

In this study, in all studied *baors*, time of disease outbreak ranges from November to February (4 months) and during this period mortality of fishes has been reported in many *baors*. During December 1992 to February 1993 EUS was found in *Puntius* sp. and another carp in Karnataka, India (Karunasagar *et al.* 1995). Various diseases of fish were also recorded in Indian major carps in the months November to December in Mymensingh, Bangladesh (Baqui 1995). Necrosis, inflammation, hemorrhage, hypertrophy, hyperplasia missing of primary secondary gill lamellae were found within the months of December and January in *Anabas testudineus* that was recounted by Ahmed *et al.* (2007). So, it can be said that fishes are susceptible to various diseases among the months of November to February.

This was estimated that 31.25% fishes were affected by EUS, 18.75% by fin rot, 12.5% by gill rot and 37.5% by dropsy and totally 0.513% production loss has occurred during the year of 2012. Most species of fish are susceptible to tail rot and fin rot diseases and those may cause large mortality that was stated by Frerichs and Roberts (1989). Tail rot and fin rot diseases also reported in *C. catla* and *A. testudineus* in some fish farms of Bangladesh and the affected fishes showed lesion and erosion on the tail and fins and approximately 40% mortality was recorded in those farms (Foysal 2010).

Among the studied *baors*, the fish production and income are increased with the increasing cost and/or investment except some exceptions; some losses were occurred between 2007 and 2012.Four diseases were responsible for the loss of 0.513% of total fish production in the year of 2012. In 50% disease affected *baors* lime was used which was not sufficient to control the diseases.

Further study on fish diseases to find out their causes and pathogens are recommended. An adaptable treatment process should be developed and recommended to the farmers so that loss of fish production due to fish diseases could be reduced.

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