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## Intervention of tilapia cage culture in the River Dakatia: Threaten or blessed to local fish diversity

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### Abstract

The study was undertaken to represent the comparison of availability of fish species before and after intervention of Tilapia cage culture in the Dakatia River. Data were collected on the basis of surveying from local cage farmers, local fishers and fish retailer of local markets. The study was conducted in the five different cage culture areas of the River Dakatia at Chandpur Sadar Upazilla for two years from July/2014 to June/16 on monthly basis. Fishes from twenty four different families under different orders such as Pleuronectiformes, Syngnathiformes, Anguilliformes, Tetraodontiformes, Cypriniformes, Clupeiformes, and Perciformes were available in those areas. Before the intervention of tilapia cage culture total numbers of available fish species were 75 and after intervention of the cage culture the number becomes 77 because two species tilapia and Nile tilapia/Nilotica were added in those areas. Higher number of fish species found under Cypriniformes and the number was forty-four which comprised 57% and family Cyprinidae comprised 25 species which is 32% of total fish species found in this study. The feed which supplied to the cage not only used by that Tilapia and Nilotica but also other fish species that habited in those areas. Therefore, Tilapia cage culture in the Dakatia River was found not threatened to local fish diversity but it helped to increase the production of local species as well as cultured species.

**Keywords:** Intervention, tilapia, cage culture, Dakatia River

### 1. Introduction

Bangladesh is the land of Rivers. It is composed of mainly the great combined delta and flood plains criss-crossed by many Rivers with their tributaries. Bangladesh is one of the largest aquaculture producing country with its estimated production of 1525672 tones and its inland open water capture is 957095 tones fish<sup>[4]</sup>. Bangladesh is a densely populated country of 1, 47, 570 km<sup>2</sup> with population of 160 million people<sup>[2]</sup>. It is blessed with a vast extensive water resources in the form of ponds, natural depressions (haors and beels), lakes, canals, Rivers and estuaries covering an area of 4.56 million ha and 2,640 sq nautical miles area in Bay of Bengal<sup>[3]</sup>. The country is composed of the great combined delta and flood plains criss-crossed by numerous Rivers and their tributaries. Bangladesh has about 46, 99, 345 ha of inland open water area and 7, 74, 055 ha of inland closed waterbed<sup>[3]</sup>.

Bangladesh has vast water resources but the total production of fish from hatcheries and natural sources cannot fulfill the demand of increased population. Moreover, large portion of inland water are not used in fish production. Cage culture is such a technique to use this inland water-body properly and have significant impacts on aquaculture production, income and employment generation and the nutritional status of people of Bangladesh. It offers good opportunities for resource poor people often located next to *khas* (public owned) water-body to involve in aquaculture<sup>[5]</sup>. Cage culture could be practiced in any types of aquatic environment such as lakes, Rivers, streams, ponds, irrigation canals, mining pits, tidal streams, haors, baors, beels, estuaries, bays and coastal region. It was also used intensively in low productive water bodies by using the formulated feed. Tilapia (*Oreochromis niloticus*) is a hardy, comparatively more disease resistant, most cultured freshwater fish in the world; very popularly known as “aquatic chicken”. Among the different cultured fish species, it is a highly promising fish species now in Bangladesh. The cage culture of finfish, especially freshwater cage farming is becoming more popular because of many economic advantages associated with it. Moreover, tilapia culture in cage has been found quiet resilience to adverse climatic changes. As a result,

Tilapia (*Oreochromis niloticus*) cage culture has gained great popularity in certain parts of Bangladesh such as Dakatia River in Chandpur, different Rivers in Laxmipur and Kapati lake in Rangamati as evidenced by the growing number of Tilapia fish cage farmers in the country. During 1999 to 2007, there was a tremendous progress in tilapia farming in this country [6]. Tilapia cage culture is one of the most popular aquaculture practice used in Chandpur area to better utilization of the lotic inland open water like the River Dakatia since 1997 after intervention. Fish in cages is easy to manage, advantageous to rear quality and selective fishes easy to harvest. It is easy to eliminate predation and competition and easier to treat diseases and parasites. About 3,500 cages are in operation now in Chandpur along the Dakatia River, 500 cages in Laxmipur along the Meghna River [1]. So the present study was envisioned to observe the impact of Tilapia cage culture on local fish diversity of Dakatia River.

## 2. Materials and Methods

### 2.1 The study area and target group

The study was carried out on tilapia cage culture in different cage culture areas in the River Dakatia near the villages of Chandpur Sadar Upazilla besides Dakatia River. The villages were Roghunathpur (23°12'09.565" N - 90°40'01.708" E), Echoli (23°12'35.256" N - 90°40'28.204" E), Gachtola (23°13'31.037" N - 90°40'50.150" E), Mominpur (23°12'25.54" N - 90°41'29.153" E) and Shatoli (23°14'16.635" N - 90°43'25.111" E) Data from cage farmers and local market of those were collected for two years from July, 2014 to June, 2016.

### 2.2 Design and formulation of questionnaire

For data collection from cage farmers and local markets a questionnaire was prepared in accordance with the objectives set for the study. Before preparing the questionnaire, a draft questionnaire was developed and then pre-tested in the study area.

### 2.3 Questionnaire interviews

For questionnaire interviews, simple random sampling method was followed for 40 cage farmers and fishermen: 10 from Roghunathpur, 8 from Echuli, 8 from Gachtola, 6 from

Mominpur, 8 from Shahtoli and 26 fish retailer at local markets in Chandpur Upazilla Sadar. Cage farmers and local fishermen were interviewed at River sites, on the boat and house and fish retailer were interviewed at local fish market.

Fish sample collection and identification

Fish samples were collected monthly basis from each cage culture area. Collected samples from each sampling area were preserved separately in 10% formalin for identification. Fishes were identified from order to species following [8].

## 3. Result and Discussion

From the present survey fishes found from twenty four different families under eight orders viz. Pleuronectiformes, Syngnathiformes, Anguilliformes, Cypriniformes, Clupeiformes, Perciformes, Tetraodontiformes and Beloniformes were identified according to Rahman (2005), and the number of total fish species were 77. All the species found from surveys are shown in table 1 (List of fish species of different families under different orders found in the Dakatia River at Chandpur). Higher number of fish species found under Cypriniformes is forty-four which comprised 57% (Figure 1) and family Cyprinidae comprised 25 species (Figure 2) which is 32% (Table 2) of total fish species found in this study. Jodder (2015) has reported that 71 species were recorded belonging to 10 orders, 26 families and 54 genera in the Padma River during his study. The most dominant fish order was Cypriniformes contributing 28 species in 16 genera whereas in present study Cypriniformes also contributing the major number of fish species and the number is 44.

All the species were available before and after introduction of Tilapia cage culture. Available number of fish under perciformes order was twenty one. Nineteen were available before introduction of cage culture. Two species Tilapia and Nile tilapia/Nilotica were found after introduction of the cage culture. This was happened because these species escaped from the cage. The number of fish species under Clupeiformes, Pleuronectiformes, Anguilliformes order were five, two, and two respectively and one species for each belongs to the families are Syngnathiformes, Tetraodontiformes and Beloniformes. All the species were available before and after introduction of Tilapia cage culture.

**Table 1:** List of fish species of different families under different orders found in the Dakatia River at Chandpur

Sl. No.	Local Name	Scientific Name	Before introduction of cage culture	After introduction of cage culture
<b>Order – Pleuronectiformes Family - Soleidae (Soles)</b>				
1.	Kathalpata, Pan pata	<i>Brachirus pan</i> (Hamilton)	Present	Present
<b>Family - cynoglossidae (Tongue soles)</b>				
2.	Kukurjeeb	<i>Cynoglossus cynoglossus</i> (Hamilton)	Present	Present
<b>Order - Syngnathiformes</b>				
<b>Family - Syngnathidae (pipe-fishes)</b>				
3.	KumirerKhil	<i>Microphis cunocalus</i> (Hamilton)	Present	Present
<b>Order - Anguilliformes</b>				
<b>Family - Ophichthidae</b>				
4.	Kharu, Hijra	<i>Pisodonophis boro</i> (Hamilton)	Present	Present
<b>Family - Moringuidae (worm eel)</b>				
5.	Rata boura	<i>Moringua raitaboura</i> (Hamilton)	Present	Present
<b>Order - Tetraodontiformes</b>				
<b>Family - Tetraodontidae (Puffer fishes)</b>				
6.	Potka, Tapa	<i>Tetraodon cucutia</i> (Hamilton)	Present	Present
<b>Order - Beloniformes</b>				
<b>Family - Belonidae (Gars)</b>				
7.	Kaikka, Kakila	<i>Xenentodon cancila</i> (Hamilton)	Present	Present
<b>Order - Cypriniformes</b>				

<b>Family - Cyprinidae (craps, minnows, barbsets)</b>				
8.	Chela	<i>Salmostoma argentea</i> (Day)	Present	Present
9.	Fulchela	<i>Salmostoma phulo</i> (Hamilton)	Present	Present
10.	Katari, Narkalichela	<i>Salmostoma bacaila</i> (Hamilton)	Present	Present
11.	Darkina, Darka	<i>Esomus danricus</i> (Hamilton)	Present	Present
12.	Chep chela	<i>Chela cachus</i> (Hamilton)	Present	Present
Sl. No.	Local Name	Scientific Name	Before introduction of cage culture	After introduction of cage culture
13.	Morari	<i>Aspidoparia morar</i> (Hamilton)	Present	Present
14.	Along	<i>Bengala elanga</i> (Hamilton)	Present (rare)	Present (rare)
15.	Darkina	<i>Rasbora daniconius</i> (Hamilton)	Present	Present
16.	Chapchela, chebli	<i>Danio devario</i> (Hamilton)	Present	Present
17.	Anju	<i>Danio rerio</i> (Hamilton)	Present	Present
18.	Molongi, Mola, Moya	<i>Amblypharyngodon mola</i> (Hamilton)	Present	Present
19.	Dhela, Dhipali, Lohasura, chela, keti	<i>Osteobrama cotio</i> (Hamilton)	Present	Present
20.	Ghainna, Goni	<i>Labeo gonius</i> (Hamilton)	Present	Present
21.	Kalibaus, Baus	<i>Labeo calbasu</i> (Hamilton)	Present	Present
22.	Rui, Rou, Rohit	<i>Labeo rohita</i> (Hamilton)	Present	Present
23.	Bata, Bhanganbata	<i>Labeo bata</i> (Hamilton)	Present	Present
24.	Mrigal, Mirka	<i>Cirrhinus cirrhosus</i> (Bloch)	Present	Present
25.	Tatkini, Laccho, Raik, Bata, Bhagna	<i>Cirrhinus reba</i> (Hamilton)	Present	Present
26.	Sarpuntisarnapunti	<i>Barbodes sarana</i> (Hamilton)	Present	Present
27.	Chalapunti	<i>Puntius chola</i> (Hamilton)	Present	Present
28.	Phutanipunti	<i>Puntius phutunio</i> (Hamilton)	Present	Present
29.	Kanchanpunti, Taka punti	<i>Puntius conchoni</i> (Hamilton)	Present	Present
30.	Tit punti	<i>Puntius ticto</i> (Hamilton)	Present	Present
31.	Punti, Jatpunti	<i>Puntius sophore</i> (Hamilton)	Present	Present
32.	Teri punti	<i>Puntius terio</i> (Hamilton)	Present (rare)	Present (rare)
<b>Family - Cobitidae (Loaches)</b>				
33.	Gutum, puiya	<i>Lepidocephalus guntea</i> (Hamilton)	Present	Present
<b>Family - Siluridae (Butter cat fishes, Freshwater sharks)</b>				
34.	Boal	<i>Wallago attu</i> (Bloch)	Present	Present
35.	Boalipabda	<i>Ompok bimaculatus</i> (Bloch)	Present	Present
36.	Madhupabda	<i>Ompok pabda</i> (Hamilton)	Present	Present
<b>Family - Chacidae (Square-head catfish)</b>				
37.	Cheka, Gangainna	<i>Chaca chaca</i> (Hamilton)	Present (rare)	Present (rare)
<b>Family - Schilbeidae</b>				
38.	Shillong	<i>Silonia silondia</i> (Hamilton)	Present	Present
39.	Pangas	<i>Pangasius pangasius</i> (Hamilton)	Present	Present
40.	Kajuli, Baspata	<i>Ailia coila</i> (Hamilton)	Present	Present
41.	Batasi	<i>Pseudeutropius atherinoides</i> (Bloch)	Present	Present
Sl. No.	Local Name	Scientific Name	Before introduction of cage culture	After introduction of cage culture
42.	Bacha	<i>Eutropiichthys vacha</i> (Hamilton)	Present	Present
43.	Muribacha	<i>Eutropiichthys murius</i> (Hamilton)	Present	Present
44.	Ghaura	<i>Clupisoma garua</i> (Hamilton)	Present	Present
<b>Family - Bagridae</b>				
45.	Rita	<i>Rita rita</i> (Hamilton)	Present	Present
46.	Ayre	<i>Sperata aor</i> (Hamilton)	Present	Present
47.	Guizzaayse	<i>Sperata seenghala</i> (Sykes)	Present	Present
48.	Golsha, Golshateugra	<i>Mystus cavasius</i> (Hamilton)	Present	Present
49.	Tengra, Golshatengra	<i>Mystus bleekeri</i> (Day)	Present	Present
50.	Bhajari-tengra, Ghuitatengra	<i>Mystus tengara</i> (Hamilton)	Present	Present
51.	Tengra	<i>Mystus vittatus</i> (Bloch)	Present	Present
<b>Order - Clupeiformes</b>				
<b>Family - Notopteridae (Feather backs)</b>				
52.	Chital	<i>Chitala chitala</i> (Hamilton)	Present	Present
53.	Foli	<i>Notopterus notopterus</i> (Pallas)	Present	Present
54.	Phasa	<i>Setipinna phasa</i> (Hamilton)	Present	Present
<b>Family - Clupeidae (Shads, herrings etc)</b>				
55.	Chapila	<i>Gudusia chapra</i> (Hamilton)	Present	Present
56.	Kechki	<i>Corica soborna</i> (Hamilton)	Present	Present
<b>Order - Perciformes</b>				
<b>Family - Mastacembelidae (spiny eels)</b>				
57.	Tara baim	<i>Macrognathus aculatus</i> (Bloch)	Present	Present
58.	Baim, Bam, Salbaim	<i>Mastacembelus armatus</i> (Lacepede)	Present	Present

59.	Guchi, Baim, chirka	<i>Mastacenebelus pancalus</i> (Hamilton)	Present	Present
<b>Family - Mugilidae (Mullet)</b>				
60.	Khorsula, Khalla, Bata	<i>Rhinomugil corsula</i> (Hamilton)	Present	Present
<b>Family - Anabantidae (Climbing perches goramies)</b>				
61.	Neftani	<i>Ctenopos nobilis</i> (McClelland)	Present (rare)	Present (Rare)
62.	Koi	<i>Anabas testudineus</i> (Bloch)	Present	Present
<b>Family - Eleotridae (Gudgeon)</b>				
63.	Kuli	<i>Eleotris lutea</i> (Day)	Present	Present
64.	Kuli, Budhbailla	<i>Eleotris fusca</i> (Bloch & Schneider)	Present	Present
<b>Sl. No.</b>	<b>Local Name</b>	<b>Scientific Name</b>	<b>Before introduction of cage culture</b>	<b>After introduction of cage culture</b>
<b>Family - Gobiidae (Gobies, Mudskippers)</b>				
65.	Chiring, Rutta	<i>Apocryptes bato</i> (Hamilton)	Present	Present
66.	Dali chewa	<i>Parapocryptes batoides</i> (Day)	Present	Present
67.	Bele	<i>Awaous guamensis</i> (Valenciennes)	Present	Present
68.	Bele	<i>Awaous grammepomus</i> (Bleeker)	Present	Present
69.	Nunabaila	<i>Brachygobius nunus</i> (Hamilton)	Present	Present
70.	Bele, Baila	<i>Glossogobius giurus</i> (Hamilton)	Present	Present
<b>Family - Taenioididae</b>				
71.	Lalchewa	<i>Odontamblyopus rubicundus</i> (Hamilton)	Present	Present
72.	Chewa	<i>Taenioides cirratus</i> (Blyth)	Present	Present
<b>Family - Nandidae (Mud perch)</b>				
73.	Meni, Bheda	<i>Nandus nandus</i> (Hamilton)	Present	Present
<b>Family - Ambassidae (Glass perches)</b>				
74.	Chanda, Namachanda	<i>Chanda nama</i> (Hamilton)	Present	Present
75.	Chanda, Rangachanda, Lalchanda	<i>Pseudambassis ranga</i> (Hamilton)	Present	Present
<b>Family - Cichlidae (Cichlid fishes)</b>				
76.	Tilapia	<i>Oreochromis mossambicus</i>	Absent	Present
77.	Nile tilapia /Nilotica	<i>Oreochromis niloticus</i> (Linnaeus)	Absent	Present

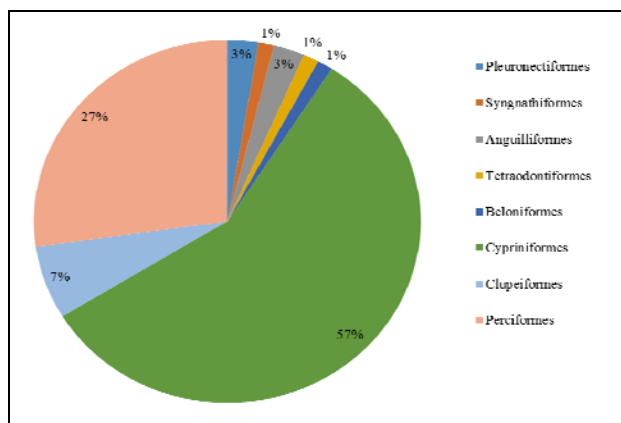


Fig 1: Percentage of fish species under different orders found in the Dakatia River from July, 2014 to June, 2016.

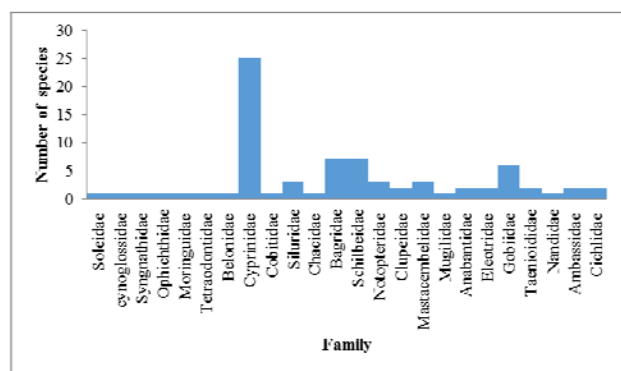


Fig 2: Number of fish species under different families found in the Dakatia River from July, 2014 to June, 2016.

Table 2: Percentage of fish species under different families found in the Dakatia River from July, 2014 to June, 2016.

Family	Percentage
Soleidae	1.30%
cynoglossidae	1.30%
Syngnathidae	1.30%
Ophichthidae	1.30%
Moringuidae	1.30%
Tetraodontidae	1.30%
Belonidae	1.30%
Cyprinidae	32.46%
Cobitidae	1.30%
Siluridae	3.90%
Chacidae	1.30%
Bagridae	9.09%
Schilbeidae	9.09%
Notopteridae	3.90%
Clupeidae	2.60%
Mastacembelidae	3.90%
Mugilidae	1.30%
Anabantidae	2.60%
Eleotridae	2.60%
Gobiidae	7.79%
Taenioididae	2.60%
Nandidae	1.30%
Ambassidae	2.60%
Cichlidae	2.60%

During the rainy season Dakatia River usually becomes connected with different canals and nearby low laying rice and other crop fields. This is why, Koi (*A. testidenues*) was found in the Shatoli, Mominpur and Gachtola area of Dakatia River. The Dakatia River also connected with the mighty Meghna River. For this reason many fish species like Kathal pata (*Brachirus pan*), Kukur jeeb (*Cynoglossus cynoglossus*),

Kumirer khil (*Microphis cunocalus*), Kharu/Hijra (*Pisodonophis boro*), Lalchewa (*Odontamblyopus rubicundus*) and Chewa (*Taeniodes cirratus*) are available especially in Echoli area which is adjacent to the Meghna River.

From the study it was found that the supplied unused feed in the cage culture system also used by the native species which are grazed outside of the cages. As a result the fish catch also increased in those particular areas. The Tilapia/Nilotica was also found near the cage culture area and used that feed. But they cannot make nest for successful breeding due to fishing activities in several times and flowing water round the year like the River Dakatia. As a result, they did not cause any harm to native species of the Dakatia River. However, many small indigenous species (SIS) also found near the cage. The areas near the cage culture are usually kept clean so that any kind of predator such as Snake, Mongoose and other aquatic birds were not able to cause any harm to the species. For this reason, the fish availability was also higher near the cages than other portion of the River. Although there was no findings on this topic.

#### 4. Conclusion

The study was carried out to realize the impact of cage culture on the native fish species in the Dakatia River. Data were collected from 56 stakeholders through a survey for a period of two years July/14 to June/2016. The collected data were summarized by tabulation and graphical presentation. However, Tilapia cage culture was found not threatened to the native species but it was blessed to them by providing habitat and feed to some extent in the Dakatia River.

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