

Production of small and big fishes of selected ponds

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Abstract: To study the big and Small Indigenous Species (SIS) of fish production, 15 ponds of Rajshahi University campus were selected. The pond production was ranged from 326.16 to 2187.40 kg/ha. The ratio of SIS and big fish production was calculated maximum as 1 : 0.10 (by number) and 1 : 7.46 (by weight). Majority of these SIS fish are Self Recruiting Species (SRS), because they were not stocked in the studied ponds. The F/C ratio was obtained as 4.583 in average.

Key Words: SIS, Production.

Introduction

Bangladesh is a country having vast water bodies with high production potential of fish which are very much nutritionally enriched. Fish is one of the most important sources of animal protein and has been widely accepted as a good source of protein and other elements for the maintenance of health body (Andrew, 2001) at low cost.

The Small Indigenous Species (SIS) of fish in Bangladesh are generally considered to be those which grow to a length of approximately 5-15 cm at maturity (Felts *et al.*, 1996). Detailed biological information of these fishes are not presently available except few publications as stated by Hossain and Afroze (1991).

The SIS fishes have short life cycle and can grow in all types of inland waterbodies. Because of overfishing and reduced waterbodies a number of small fishes are now under the threat of extinction. In Bangladesh 143 freshwater fish species are categorized as small indigenous fish. In the past, these fishes were abundant in the rivers, beels, canals, streams and ponds. Both natural and man made catastrophes caused degradation of the aquatic environment, and reduction of many wet lands and water areas of Bangladesh have resulted in the disappearance of many suitable habitats for floodplain, riverine and brackish water small indigenous fish species. Many of these valuable small indigenous fish species have been threatened or endangered. Indeed, some are already on the verge of extinction. So, there is presently an urgent need to conserve and to increase the production of the SIS fishes through proper management of the waterbodies of Bangladesh. Side by side these species should be introduced in the farming systems of country.

Conservation of SIS can also help to control mosquito larvae. In the past, some of the small fishes were regarded as weed fishes and eradicated from the fish ponds using pesticides. But recently these species have been considered as an important source of essential macro and micro-nutrients, which can play an important role in the elimination of malnutrition in Bangladesh (Ahmed *et al.*, 1997; Thilsted *et al.*, 1997; Hossain, 1997; Hossain *et al.*, 2003; Wahab *et al.*, 2003 and Faculty of Fisheries, BAU, 2008).

The swamps are one of major source of small indigenous fish species in which it grow without care

and without culture. These fishes enter in the swamps with the river water or flood water from the different sources, grow and reproduce there, so why is called as Self Recruiting Species (SRS).

The present research describes the production of SIS and big fishes from selected waterbodies. Where SIS fishes were not cultured they were naturally introduced.

Materials and Methods

Study of the habitats

Selected water bodies: For the present research, ponds of different types and swamps were selected. These waterbodies are situated within the Rajshahi University (RU) campus.

Total 15 ponds were selected.

Fish production

The total harvested weight of fishes of individual water bodies was recorded. Fishing of the swamps was done by cast net (larger fishes); and the smaller fishes were caught by hand after dewatering. Bamboo traps like Kholsoon and Dhiar were used to trap fish.

The ponds were harvested using encircled gill net and cast net. The miniponds were dewatered and fishing was done by hand. Total weight of individual species of bigger fishes were recorded.

However, fish diversity of the swamps was noted, with recording the total length (cm) and total weight (g) of the individuals of each species.

Calculation of F/C ratio

The ratio between the carnivorous and the other fishes (forage) (F/C ratio) were determined following Swingle's (1950) simple formula, as below:

$$F/C \text{ ratio} = \frac{\text{Weight of the forage fish (F)}}{\text{Weight of the carnivore fish (C)}}$$

Results and Observations

Description of the ponds

Location: All the study ponds are situated scatteredly within the Rajshahi University campus. These ponds were formed gradually in man made dugout cavities made for different purposes

Pond type: Among the studied 15 ponds, in 10 water stand for 9 months, in five for 7 months. Other nine

ponds are perennial. Pond no. 11 is not exactly a pond. It is a narrow natural canal.

Soil condition: The condition of the bottom soil of ponds are very important for fish culture. Among the 15 study ponds bottom of all ponds were sandy-muddy.

Water supply: The source of water of these ponds are rainwater, drain water, sewerage water. However, during the flood the flood water from rivers and canals also enter in these swamps.

Water area: The water area of these swamps ranged from 45.50m³ to 1144 m³

Water colour: Water colour of most of the ponds was found to be greenish.

Total production

Total production by weight of SIS (*C. fasciatus*, *A. testudineus*, *C. nama*, *C. ranga*, *P. ticto*, *P. gonionotus*, *C. reba*, *O. mossambicus*, *E. danricus*, *C. punctatus*, *N. nandas*, *A. mola*, *G. giuris*, *M. tengara*, Prawn) and big (*L. rohita*, *L. calbasu*, *C. cirrhosus*, *H. molitrix*, *C. carpio*, *A. nobilis*, *C. striatus*, *C. catla*) fishes from individual pond are presented in Tables 1 and 2. Among the ponds, maximum production 135.863 g/m³ was recorded from pond no. 10, and minimum production was calculated as 16.31 g/m³ in pond no. 13 (Table 2). The estimated weight produced per hectare of these ponds were ranged from 326.16 kg/ha to 2187.40 kg/ha in pond no. 13 and 10 respectively.

The ratio of production of SIS and big fishes in ponds were calculated as the minimum 1 : 0.02 in pond no. 6 (by number) and 1 : 0.48 in pond no. 14 (by weight); the maximum ratios are 1:0.13 (by number) in pond no. 11 and 1:7.46 (by weight) in the same pond, though the production rate of this pond (actually a canal) is too less compared to other ponds.

Ratio between carnivorous and forage fish (F/C ratio)

As production of the ponds which are not stocked or managed scientifically, and the fish population can be designated as "self recruiting species" (SRS), the ratio between the carnivorous and non-carnivorous (forage) fishes was determined to find out fish population these ponds (no. 1-15) are either balanced as unbalanced.

The F/C ratio of the fish population of individual 15 ponds are presented in Table 3. The results show that the population of pond no. 2 and 14 are unbalanced having F/C ratio as 1 : 2.79 and 0.913 respectively (Table 3). The population of pond no. 2 was unbalanced due to higher production of forage fish than carnivore fish, and in other cases the production of carnivore fish was more than that of the forage fish. However, the total population of the ponds showed an average balanced value (Table 3).

Table-1. Pondwise production of SIS and big fishes by number and by weight in the studied ponds

Pond No.	Total no. of small fishes	Total weight of small fishes (g)	Total no. of big fishes	Total weight of big fishes (g)	Ratio of SIS : big fish	
					by no.	by weight
1	463	4547.60	31	8974.00	1 : 0.07	1 : 2.17
2	318	1234.40	16	7745.00	1 : 0.05	1 : 6.27
3	524	3162.00	26	10380.00	1 : 0.05	1 : 3.28
4	478	3646.00	26	11352.00	1 : 0.05	1 : 3.11
5	496	2994.80	25	13697.00	1 : 0.05	1 : 4.57
6	761	3071.30	12	6015.00	1 : 0.02	1 : 2.22
7	566	3111.00	21	9500.00	1 : 0.04	1 : 3.05
8	488	3827.00	28	11016.00	1 : 0.06	1 : 2.88
9	565	4650.07	30	10892.00	1 : 0.06	1 : 2.79
10	848	7391.00	33	11600.00	1 : 0.04	1 : 1.57
11	62	636.00	8	4746.00	1 : 0.13	1 : 7.46
12	868	8489.00	78	49382.00	1 : 0.09	1 : 5.82
13	324	3244.20	32	5660.00	1 : 0.10	1 : 1.74
14	265	1116.11	15	535.00	1 : 0.06	1 : 0.48
15	158	1664.60	16	1185.00	1 : 0.10	1 : 0.71

Table-2 The average fish production per unit area of different ponds

Pond No.	Area		Production			
	Area (m ²)	Water area	Total wt. of	Weight/m ²	Weight/m ³ (g)	Weight per
1	82.22	124.97	13521.60	164.4563	108.1988	1644.56
2	82.03	124.69	8979.40	109.4648	72.0138	1094.65
3	86.64	139.48	13542.00	156.3019	97.0892	1563.02
4	87.42	131.13	14998.00	171.5626	114.3750	1715.63
5	89.30	133.95	16691.80	186.9183	124.6122	1869.18
6	85.32	128.83	9086.30	106.4967	70.5294	1064.97
7	86.82	140.65	12611.00	145.2545	89.6623	1452.55
8	81.78	122.67	14843.00	181.4991	120.9994	1814.99
9	88.35	132.53	15542.70	175.9219	117.2768	1759.22
10	86.82	139.78	18991.00	218.7399	135.8635	2187.40
11	74.989	44.99	5382.00	71.7705	119.6266	717.71
12	880.00	1144.00	57871.00	65.7625	50.5865	657.63
13	273.00	546.00	8904.20	32.6161	16.3081	326.16
14	50.00	45.50	1651.11	33.0222	36.2881	330.22
15	572.00	572.00	2849.60	4.9818	4.9818	49.82

Table-3 . Forage fish and carnivorous fish production in ponds and F/C ratio

Sl. No.	Forage fish		Carnivorous fish		Value of F/C ratio	Balanced (B) or Unbalanced (U) production	Average F/C ratio in ponds (n=15)
	No.	Wt (g)	No.	Wt (g)			
1	179	9952.8	351	3568.8	2.788	B	
2	141	8221	193	758.4	10.897	U	
3	206	10880	344	2662	4.087	B	
4	236	12120	268	2878	4.211	B	
5	226	14520	295	2171.8	6.685	B	
6	442	7220	331	1866.3	3.868	B	
7	205	10192	382	2419	4.213	B	
8	293	12388	223	2455	5.046	B	4.583
9	272	12394	323	3148.7	3.936	B	(Balanced)
10	457	13574	424	5417	2.505	B	
11	45	4882	25	500	9.764	B	
12	441	50240	505	7631	6.583	B	
13	162	6115	194	2789.2	2.192	B	
14	89	788.11	191	863	0.913	U	
15	96	1469	78	1380.6	1.064	B	

Discussion

The present results showed that as a habit the small waterbodies with rich aquatic vegetation and permitted to be flooded, can yield or produce a satisfactory quantity (by number and by weight) of a variety of both indigenous and introduced a number of SIS fishes which were naturally introduced, are listed as highly nutritious

and containing vitamins and minerals (Roos *et al.*, 2003). Among the SIS fishes, mola fish (is also a SRS) have been successfully introduced in the commercial fish farms in carp polyculture system (Roos *et al.*, 2003). Alam (2009) suggested that the featherback *N. notopterus* can be cultured with carps without affecting the production.

Swingle (1950) suggested that in the balanced population the F/C ratio will range from 1.4 to 10. Among the 15 experimental ponds, 13 showed balanced population. The average F/C ratio of the ponds was determined as 4.583 which is a balanced population. The unbalanced population is that one which unable to produce accepted amount of fish year after year (Swingle, 1950). When the carnivorous fish is dominant in the water body the F/C ratio is unbalanced, and as a result the fish production is less. So, the entry of the carnivorous fishes in any fish culture area is likely to affect the fish production (Hasan, 1983).

In Bangladesh total annual fish production from pond and ditch was 2839 kg/ha from July 2007-June 2008 (DoF, 2007-2008). The fish production in our country is comparatively less than other countries. Jhingran (1977) noted the all time Indian record fish production was 9,056 kg/ha/yr. A maximum fish production from freshwater ponds of China was reported as 7.5 tons/ha/yr (Lin, 1982). Lakshmanan *et al.* (1971) reported the average production to be 3,062 kg/ha/yr, while Sinha *et al.* (1973) found 3232.30 kg/ha production in six months. Davis *et al.* (1983) recorded fish yields ranging from 1980 to 3,820 kg/ha/yr. Miah *et al.* (1993) obtained a gross production of 3,670 kg/ha from polyculture of Indian major carps and Chinese carp. Uddin *et al.* (1994) obtained a production of 2,019 to 3,415.60 kg/ha/yr and Mazid *et al.* (1997) found a gross production ranging from 2545.50 to 3687.80 kg/ha/11 month from carp polyculture system.

Production of SIS fishes both in diversity and biomass, were found comparatively higher in small unmanaged ponds than in large stocked fish ponds. Total production of ponds in 9 months period was obtained maximum as 2187.40 kg/ha. Total SIS production for ponds was ranged from 0.636 to 7.391 kg. Most of the ponds were found to be a balanced one, from their F/C ratio of fish biomass.

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