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Computational statistics on growth variation of *Catla catla* (HAM)

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Abstract
Growth rates of *Catla catla* (Ham.) the one of the major IMC is communicated here. Weight gains are observed and recorded at various growth stages. Our results indicate that the weight is a physiological factors controlled by aquatic environments. Such factors are identified are mainly amount of feeding and length of fish run when genetically same stock is maintained and environmentally reared in the same water body. It is also found that the growth variation is more (75 g, S.E. 8.3) in middle aged (20 months) stage and less (15 g and 60 g, S.E. 1.6 and 17.6) in early (8 months) and later (32 months) growth stages respectively. Optimal growth rate is found in the 10th month

Keywords: Growth variation, Aquatic environment, *Catla catla*, Computational statistics.

1. Introduction
Catla catla (Ham.) is an important Indian major carp. It has got importance both in culture and capture fisheries. Naturally this species is found in river, reservoir, lake, boar and in cultured ponds. Catla is basically a zooplankton feeder and lives in upper water layer. Going in to the literature we found that Rao's polynomial growth curve model has been successfully used (Basu, 1999) [1] to analyze length growth data of *Catla catla* (Ham.) in the fry stage. The average growth curve and subsequent prediction of growth were computed using SAS program was also studied by him. Swain *et al* (1999) [13] studied the growth and survival of catla spawn in various stocking densities fed on a dry artificial diet. He found linear and positive relationship between the dietary carbohydrate with specific growth rate (SGR), protein efficiency ratio (PER), protein and energy retention. However, Erfanullah and Jafri (1998) [4] found negative relationship among dietary carbohydrate intake and feed conversion ratio (FCR). Dietary carbohydrate significantly (P<0.05) affected carcass moisture, lipid and gross energy content; while crude protein and ash remained unaffected (P0.05). The acceleration in length growth of *Catla catla* from two rearing conditions was studied by Basu (1997) [2]. Effect of different levels of protein, fat and carbohydrate on growth, feed utilization and body carcass composition of fingerlings in Catla was investigated by Seenappa and Devaraj (1995) [12]. They found significant weight gain in the fish due to influence of three major nutrients (25% to 35% protein, 4% to 12 % lipid and 15% to 35% carbohydrate). Protein sparing was observed with carbohydrate but not with lipid (Seenappa and Devaraj, 1995) [12]. The morphology, feeding habit and growth of *Catla catla* was investigated by Gang *et al.* (1993) [5]. Johal and Tandon (1992) [8] studied the age and growth of catla from Gobindasagar reservoir (Northern India). The essential amino acid requirements of *Catla catla* was also studied by several authors (Ravi and Devaraj, 1991 and 1991b; Jana and Pal, 1987) [6]. Effect of aeration on growth of Catla under polyculture condition was observed by Patil (1987) [9]. While, Vijayan (1987) [14] has conducted experiments on growth and survival of carps with artificial aeration. The growth performance of catla in the Amtalab reservoir, Raichur, India through taging experiment was recorded by Devaraj *et al*. (1986) [3]. Jhingran (1968) [7] has made a synopsis on biological data of *Catla catla*.

2. Materials and Method
In the present study the catch data of *Catla catla* was collected during four different periods

(7th, 8th, 20th and 32 nd months of fish rearing) from the water bodies where cultured based capture fisheries is practiced and having moderate stocking density is followed. Experimental data is collected from the water body of Jeerut of Hooghly district. Data were sampled and analyzed using MS-Excel.

3. Results and Discussion

Growth variations data of *Catla catla* are sampled at various four different growth stages and displayed by using following bar diagrams. This data are also used for application of generated data mining for a multi-dimensional view of the species. Descriptive statistics are also shown in Table 1 and data generated in Table 2.

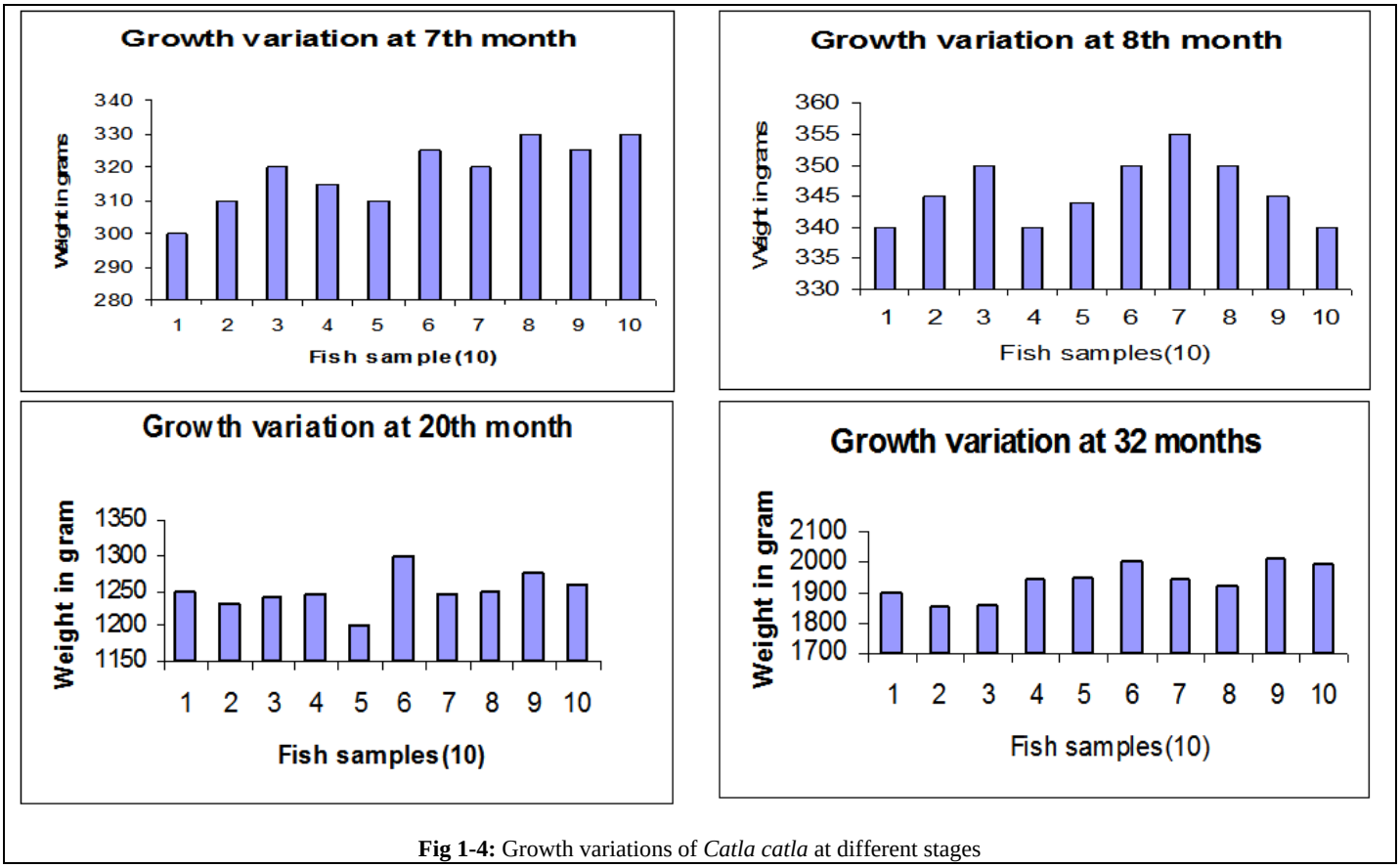

Fig 1-4: Growth variations of *Catla catla* at different stages

Table 1: Descriptive Statistics in growth variation of *Catla catla* under favorable condition.

Age (Month)	Minimum weight(gm)	Maximum weight(gm)	Mean weight(gm)	Standard deviation	Standard error
7	300	330	318.5	9.73	3.0
8	340	355	345.9	5.19	1.64
20	1200	1275	1249.5	26.39	8.3
32	1850	2010	1936.5	55.77	17.63

Table 2: Generated data mining on body weight and increment of *Catla catla*

Month	Body weight(gm)	Weight increment (gm)	Month	Body weight(gm)	Weight increment(gm)
9	512.74		25	1595.59	43.27
10	624.41	111.67	26	1637.16	41.57
11	725.43	101.02	27	1677.16	40.00
12	817.65	92.22	28	1715.70	38.55
13	902.49	84.84	29	1752.90	37.19
14	981.04	78.55	30	1788.83	35.93
15	1054.16	73.13	31	1823.58	34.75
16	1122.57	68.40	32	1857.23	33.65
17	1186.82	64.26	33	1889.85	32.61
18	1247.41	60.58	34	1921.49	31.64
19	1304.71	57.31	35	1952.21	30.72
20	1359.08	54.37	36	1982.07	29.86
21	1410.79	51.71	37	2011.11	29.04
22	1460.10	49.31	38	2039.38	28.27
23	1507.21	47.11	39	2066.91	27.53
24	1552.32	45.11	40	2093.74	26.83

4. Conclusion

In the present study the weight gain during the initial rearing stage was found to be higher than the later stage. It may be due to more utilization of metabolic energy for reproductive growth (gonad development) in advanced stage of life history than somatic growth. There are differential growth variations observed at four different stages. Growth variation is found due to physiological factors like amount of feeding and metabolic activity (energy gain), distance of fish run (energy loss) etc where environmentally and genetically species remains the same.

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