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FEEDING AND GROWTH PATTERNS IN THREE FRESHWATER FISHES FROM RIVER GODAVARI IN MAHARASHTRA (INDIA)

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Abstract
2865 fresh water fishes i.e. *Channa gachua, Labeo kontius* and *Rasbora daniconius* for the period of two years [January 2006 to December 2008] were scanned for the study of growth pattern and feeding habitats.
Fishes at fingerling stages, 5cm in length and 3g in weight in *R. daniconius*, 3cm in length and 2.5 g in weight in *C. gachua* and 7 cm length and 4.5g in weight in *L kontius* were collected in the vicinity of river Godavari and reared in laboratory in big [3'x2.5'x2] glass aquarium under ambient conditions for a period of 3 months fishes were fed with suitable food [planktons].
In early life stages [fingerling], all fishes were herbivorous and no definite food selectivity was observed. After two months, selection of the food items has been noticed and found continued in their respective feeding habitats.
Average feeding rate [0.26%] found in *Channa gachua* than *Labeo kontius* [021%] and *R. daniconius* [0.19%] but on the contrary, average growth rate was more in *L .kontius* [68%] than *C. gachua* [49%] and R. daniconius [38%].
Isometric growth was found in all fishes attributing to feeding rate, selectivity and food conversion coefficient in each species. The Metric and Meristic measurement helps to establish certain relationship which later on justifies significantly the growth pattern in the fish. Regression values in *C. gachua* as growth coefficient, r=0.7288 in *R. daniconius* r = 0.6897 and r = 0.6789 in *L. kontius* are statistically significant.

Key Words: Freshwater fishes; *C. gachua; R. daniconius; L. kontius*; Length – weight

Introduction

Availability of natural food has great effect on the distribution, abundance and growth of fish species, knowledge of the food of fish and its feeding behavior can help in understanding ecological relationship and therefore useful in the fish management. Food of an animal may different at different stages of life and also differ from place to place and from season to season. It also differs according to abundance and availability of the food organisms. Therefore it became necessary to study the food of fishes of different fish species at different localities, seasons and stages of life history to get complete picture of feeding habitat in respective species. Studies on the growth performance in fishes in relation to feeding period are useful information for successful application in the management and exploitation of the resources. Growth rate is different in animal to animal pretending to sexual maturity (Asdell, 1946). The algal feeding and it's digestion by the herbivorous fish was studied by Moriarty. (1973).

The Present worked was undertaken to study the feeding and growth patterns in three fresh water fishes, i.e. *R. daniconius, C. gachua and L. kontius.*

Material and Methods

Collection of fish sample

Fresh water fishes [fingerling] of *Channa gachua, Labeo kontius* and *Rasbora daniconius* were collected from river Godavari in Maharashtra (India) for the present study from January 2006 to December 2008. Fingerlings (5cm in length and 3g in weight) in *R. daniconius*, 3cm in length and 2.5 g in weight in *C. gachua* and 7 cm length and 4.5g in weight in *L kontius* were collected in the vicinity of river Godavari and reared in laboratory under ambient conditions for a period of 2 months. Fishes were fed with planktons as a natural food. The fishes were fed twice a day, at the rate of 4% to the body weight of fish. Twenty percent of fish were sampled monthly for their growth check-up.

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Determination of growth

Growth was determined on the basis of length-weight relationship, the condition factor (k). The fish exhibits a relationship between length and weight as stated by Le Cren, (1951). Condition (*K*) of fish was calculated as K = 100 x W x L^{-3}, where W is body weight in g, and L is total length in cm

Separation of planktons

With the help of different sized sieve drag-net the planktons mixture was collected from the vicinity of the river. The simple method was followed to separate planktons. The phytoplankton was easily separated based on their colour shape and sizes. The quantity of planktons was provided to fishes. The plankton (food) feeding was provided to the fishes after examine the natural feeding of selected fishes in the present work.

Result and Discussion

The results on the fresh water fishes feeding and growth pattern show that the fish food selectivity towards planktons after providing suitable dosages of food (planktons).

During study, herbivorous feeding was found during fingerling life stage of *C. gachua* which later on partially directed to carnivorous feeding after 2-month. *R. daniconius* and *L. kontius* also shown similar pattern of life history.

In early life stages [fingerling], all fishes were herbivorous and no definite food selectivity was observed. After two months, selection of the food items has been noticed and found continued in their respective feeding

habitats. Average feeding rate [0.26%] found in *Channa gachua* than *Labeo kontius* [021%] and *R. daniconius* [0.19%] but on the contrary, average growth rate was more in *L .kontius* [68%] than *C. gachua* [49%] and *R. daniconius* [38%].Isometric growth was found in all fishes attributing to feeding rate, selectivity and food conversion coefficient in each species. The Metric and Meristic measurement help to establish certain relationship which later on justifies significantly the growth pattern in the fish. Similarly in a recent study, (C. Talbot, unpublished results) the voluntary food intake of *500-600* g rainbow trout at 10" was measured over short periods (9 d) when the fish were fed on a range of commercially available diets. (Clive, 1993)

Food selected by *C. gachua, L. kontius and R. daniconius,* it is seen that importantly not only algal material ingested but also able to readily digest and assimilate by the fishes (Moriarty, 1973).

Conclusion

The freshwater fishes prefers to eat planktons observed in three freshwater fishes *L. kontius, C. gachua and R. daniconius*. Similar feeding is also noticed in the Carp. It also prefers to eats zooplankton and phytoplankton during young stage and more than 10 cm size, eats insects, decayed vegetable matter and bottom dwelling organisms, notably other worker also shown in fishes, *Tubificids, Molluscs, Chironomids, Ephemerids and Trichopterans* (Ash and Bista, 2001). The average growth rate was 49% in *C. gachua*, 38% in *R. daniconius* and 68% in *L. kontius.*

Our results showed normal growth pattern in *L. kontius* show 68% but vary in length and the weight not only due to planktons as food availability, but also body reserves and seasonal maturity. The increased body weight and mass associated with gonadal maturity in a specific period of the fish is considerable for growth. Increase in weight of fish is due to excess feeding and deposition of reserved body in muscles through bioaccumulation of various organic and inorganic matters.

Acknowledgement

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Table 1 Showing feeding in three freshwater fishes *C. gachua, R. daniconius and L. kontius*

Months	Fish species.			Planktons in (%/gm) in total mixture		
	R. daniconius	*C. gachua*	*L. kontius*	Zooplanktons		
				Cyclops	Daphnia	Larvae
January	10	10	10	3.5	1.2	0.1
February	10	10	10	4.9	2.3	0.2
March	10	10	10	5.0	3.2	2.0
April	10	10	10	4.0	3.5	1.0
May	10	10	10	0.8	3.8	4.0
June	10	10	10	0.5	3.9	3.4
July	10	10	10	0.9	3.9	5.1
August	10	10	10	1.5	4.0	1.5
September	10	10	10	2.1	4.0	3.2
October	10	10	10	3.5	4.0	2.5
November	10	10	10	1.6	4.0	1.5
December	10	10	10	4.3	4.1	4.2

Table 2 Showing gut contain in three freshwater fishes *C. gachua, R. daniconius and L. kontius*

Months	Fish species.			Planktons in (%/gm)			Unidentified mixture (%/gm)	Solid particles (%/gm)
	R. daniconius	*C. gachua*	*L. kontius*	Phytoplankton				
				Odogonium	Nostoc	Spirogyra		
January	10	10	10	1.2	1.2	3.9	0.5	2.5
February	10	10	10	0.9	2.3	5.0	2.5	0.5
March	10	10	10	0.5	3.2	4.1	4.0	2.5
April	10	10	10	0.8	4.0	4.1	3.1	2.8
May	10	10	10	1.2	4.0	4.0	6.8	3.1
June	10	10	10	1.5	4.1	4.0	5.1	3.9
July	10	10	10	1.4	3.9	4.0	2.8	4.0
August	10	10	10	1.8	3.8	4.0	3.9	4.2
September	10	10	10	2.0	3.5	4.0	7.5	4.4
October	10	10	10	2.1	4.0	4.0	4.4	5.1
November	10	10	10	1.4	3.9	3.9	4.2	6.8
December	10	10	10	3.0	4.0	3.0	2.5	7.5

Table 3 Showing average growth in fingerling of three fresh water fishes *Channa gachua, Labeo kontius* and *Rasbora daniconius.*

Sr. No.	Fish species	Growth ranges		Average growth		Growth rate in (%)
		Length (cm)	Weight (gm)	Length (cm)	Weight (gm)	
1	*Channa gachua,*	06	08	5.0	07	49 %
2	*Labeo kontius*	08	10	7.0	08	68 %
2	*Rasbora daniconius.*	05	05	3.0	04	38 %

Table 4 Showing Metric and Meristic measurements in *Rasbora daniconius*

Length of fish In (cm) X	Weight of fish In (gm) Y	X^2	Y^2	XY
5.5	1.6	30.25	256	8.8
9.5	10.9	90.25	118.81	103.55
5.8	9.2	81.5	84.64	85.5
10	2.5	33.64	6.25	14.5
8.9	10.1	100	102.1	101
9.8	9	79.21	81	80.1
5.9	11	79.21	121	107.8
6.5	1.8	34.81	3.24	10.62
7.3	3.3	42.25	4	13
8	6	53.29	10.89	24.09
9.3	10	64	36	48
10	10.2	86.46	100	93
9	10	100	106.04	102
8	9	81	10	90
9.2	10.2	64	81	72
9	10	84.64	104.04	93.84
7	4	81	100	90
7.5	6	49	16	28
8.2	8	56.25	36	45
8	7.9	67.25	64	65.6
8	8	64	62.41	63.2
9	10	64	64	64
7.5	7	81	100	90
9.9	11	56.25	49.0121	52.5
11	13	98.01	169	108.9
11.2	13.9	121	193.21	143
10	2.5	33.64	6.25	14.5
10	10.2	86.46	100	93
9.8	9	79.21	81	80.1
9.5	10.9	90.25	118.81	103.55

9.3	10	64	36	48
9.2	10.2	64	81	72
9	10	100	106.04	102
8.9	10.1	100	102.1	101
8	6	53.29	10.89	24.09
8	9	81	10	90
7.3	3.3	42.25	4	13
6.5	1.82.0	34.81	3.24	10.62
5.9	11	79.21	121	107.8
8.9	10.1	100	102.1	101
9	10	100	106.04	102
9	10	84.64	104.04	93.84
9	10	64	64	64
9	10	100	106.04	102
9	10	100	106.04	102
9	10	84.64	104.04	93.84
9	10	64	64	64
9	10	100	106.04	102
9.2	10.2	64	81	72
9.2	10.2	64	81	72
9.2	10.2	64	81	72
9.2	10.2	64	81	72
9.3	10	64	36	48
9.3	10	64	36	48
9.3	10	64	36	48
9.3	10	64	36	48
9.5	10.9	90.25	118.81	103.55
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9.5	10.9	90.25	118.81	103.55
9.5	10.9	90.25	118.81	103.55
9.8	9	79.21	81	80.1
9.8	9	79.21	81	80.1
9.8	9	79.21	81	80.1
9.8	9	79.21	81	80.1

9.9	11	56.25	49.0121.0	52.5
9.9	11	56.25	49.0121.0	52.5
10	2.5	33.64	6.25	14.5
10	10.2	86.46	100	93
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10	10.2	86.46	100	93
11	13	98.01	169	108.9
11	13	98.01	169	108.9
11.2	13.9	121	193.21	143
11.2	13.9	121	193.21	143
8.9	10.1	100	102.1	101
8	6	53.29	10.89	24.09
8	9	81	10	90
7.3	3.3	42.25	4	13
6.5	1.80	34.81	3.24	10.62
5.9	11	79.21	121	107.8
8.9	10.1	100	102.1	101
8.9	10.1	100	102.1	101
9	10	100	106.04	102
9	10	84.64	104.04	93.84
9	10	64	64	64
9	10	100	106.04	102
9	10	100	106.04	102
9	10	84.64	104.04	93.84
9	10	64	64	64
9	10	100	106.04	102
9.2	10.2	64	81	72
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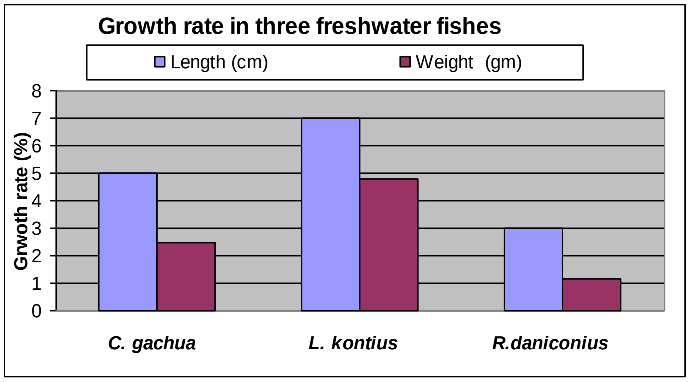
r = 0.6897 **

Fig. 1 Showing Growth comparison in three fishes (Growth rate in %)



The relation as *R. daniconius* < *C. gachua* < *L. kontius*. Feeding and growth in *L. kontius* was high than both.

Fig.2. Showing Metric and Meristic measurement in *Rasbora daniconius*

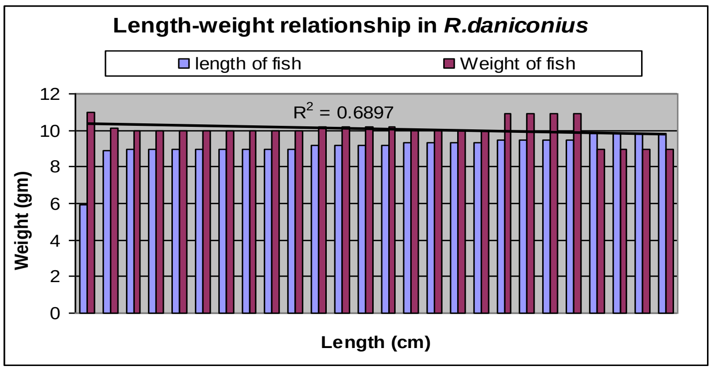


Fig.3.Showing Metric and Meristic measurement in *L. kontius*

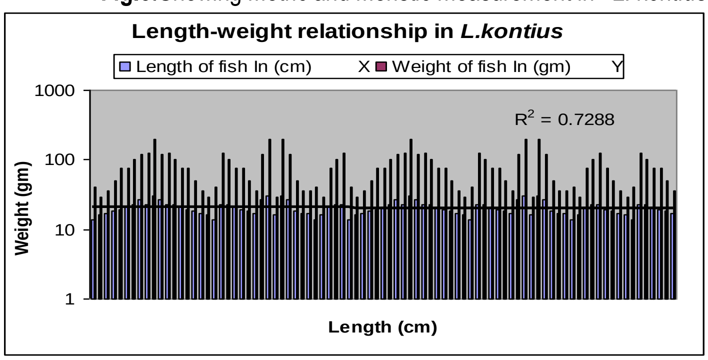
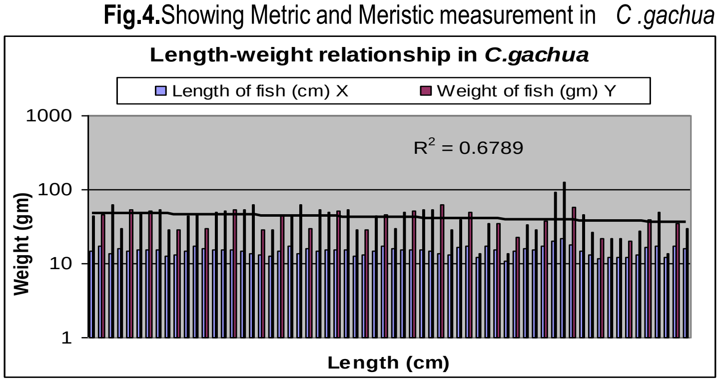


Fig.4. Showing Metric and Meristic measurement in *C .gachua*



The significant and positive correlation between length and weight in *C. gachua R. daniconius and L. kontius* have been found, out of total population calculated found Regression values in *C. gachua* as growth coefficient, r = 0.7288 in *R. daniconius* r = 0.6897 and r = 0.6789 in *L. kontius* are statistically significant.

Table 5. Showing Metric and Meristic measurement in *L .kontius*

Length of fish In (cm) X	Weight of fish In (gm) Y	X2	Y2	XY
13.7	40.3	187.69	1624.09	552.11
16	29	256	876.16	473.6
17	36.1	289	1303.21	613.7
18.5	49	342.25	2401	906.5
19.5	76	350.25	5698	1497.6
20.7	76.8	350.25	5898.24	2103.12
22.5	101.6	428.99	10322.6	2724.75
26.5	121.1	506.25	14665.2	3351.55
22.8	126.7	702.25	16032.9	4448.25
30.3	195.1	519.84	350640	10735.3
26.5	121.1	506.25	14665.2	3351.55
22.8	126.7	702.25	16032.9	4448.25
22.5	101.6	428.99	10322.6	2724.75
20.7	76.8	350.25	5898.24	2103.12
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19.5	76	506.25	14665.2	3351.55
18.5	49	519.84	350640	10735.3
17	36.1	256	876.16	473.6

r = 0.7288 **

Table 6 Showing Metric and Meristic measurement in *C. gachua*

Length of fish (cm) X	Weight of fish (gm) Y	X^2	Y^2	XY
15	43.32	225	2088.49	644.8
17	45.7	240.25	4033.52	308.3
13.5	63.51	289	914.4	1079.6
16	30.14	182.25	2917	4082.24
14.8	54.01	256	2367.7	864.16
15.2	48.66	219.04	2701.9	720.6
15.2	51.98	231.04	2961.5	790
15.1	54.42	228	830.5	825.7
12.5	28.82	156.25	813.3	360.2
13.3	28.52	176.89	2024.1	379.3
15	43.32	225	2088.49	644.8
17	45.7	240.25	4033.52	308.3

16	30.14	182.25	2917	4082.24
15.2	48.66	219.04	2701.9	720.6
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15.1	54.42	228	830.5	825.7
12.5	28.82	156.25	813.3	360.2
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15	43.32	225	2088.49	644.8
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16	30.14	182.25	2917	4082.24
15.2	48.66	219.04	2701.9	720.6
15.2	51.98	231.04	2961.5	790
15.1	54.42	228	830.5	825.7
14.8	54.01	256	2367.7	864.16
13.5	63.51	289	914.4	1079.6
13.3	28.52	176.89	2024.1	379.3
16.3	38.6	265.6	1489	4489
17.5	48.8	306.2	2381	854
12	13.5	144	182.2	162
17	35	289	1225	595
15.5	34.6	240.2	1197	536.3
11	13.8	121	190.4	151.8
14.5	22.9	210.2	524.41	332
16	33	256	1089	528
15.2	29.1	231	846.8	442.3
17.1	38	292.4	1444	649.8
20	93.5	400	8742.2	1870
22	126.58	484	15876	2784.7
18	56.93	324	3241	1024.7
15	46.07	225	2122.4	691.05
13	26.65	169	716.2	346.45
11.9	21.41	141.61	458.3	234.7
12	21.91	144	480	262.9

12	21.5	144	462.25	258
12	20	144	400	240
13	27.1	169	2856.1	352.3
16.3	38.6	265.6	1489	4489
17.5	48.8	306.2	2381	854
12	13.5	144	182.2	162
17	35	289	1225	595
16	30.14	182.25	2917	4082.24
14.8	54.01	256	2367.7	864.16
15.2	48.66	219.04	2701.9	720.6
15.2	51.98	231.04	2961.5	790
15.1	54.42	228	830.5	825.7
12.5	28.82	156.25	813.3	360.2
13.3	28.52	176.89	2024.1	379.3
15	43.32	225	2088.49	644.8
17	45.7	240.25	4033.52	308.3
15.1	54.42	228	830.5	825.7
14.8	54.01	256	2367.7	864.16
13.5	63.51	289	914.4	1079.6
13.3	28.52	176.89	2024.1	379.3
16.3	38.6	265.6	1489	4489
20.2	73.4	408	5387.5	482.6
17.8	54.5	316.8	2970.2	988.2
18.1	54.6	327.6	2981.1	888.1
18.2	48.8	331.2	2381.4	1623.8
20	81.18	400	6591.8	1390.3

r = 0.6789 **