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AGE AND GROWTH RELATIONSHIP OF CATLA CATLA IN AQUATIC ECOSYSTEM OF RIVER GHAGHRA AT AYODHYA

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ABSTRACT

Growth of fishes means a change in length or weight or both with increasing age. Growth is generally an increase in size due to conversion of the food matter into the building matter of the body by means of the process of nutrition. The rate of growth varies to a large extent among fishes as these are cold blooded. It varies from species to species. It may vary for the same fish from different localities or for the same individual at different seasons (temperature etc). Also, different parts of the body or even different organs have different rates of growth.Fishes continue to grow practically throughout their life (indeterminate growth). However, in extreme old age fish's growth is extremely slow. Thus, for many fishes the growth curve at first rise up slowly with an increasing slope, representing an increasing rate of growth. In the remainder part, the curve rises with a decreasing slope, representing decline in the rate of growth. The point at which deaceleration occurs, i.e. there is a change from an increase to a decreasing rate, is called the point of inflection. The increase in rate of growth reaches its maximum at the point of inflection.

Keywords: major carps, catla, age, growth, scale reading. Annuli, Saryu River

INTRODUCTION

Catla catla is the largest Indian carp, attaining a maximum length of about a meter. Found throughout India, although rather scarce south of the Krishna river. Body broad, deep and stout. Dorsal profile more convex. Head large with prominent lips. Colour blackish grey above and silvery on the sides. Scales with pink or coppery centre on the dorsal side and whitish below.Growth of fish is dependent on population density also.

Although the relationship between the two is not clearly understood. Some effects are clear. Higher densities tend to slow down growth, and low densities tend to hasten it.

Growth reflects the adaptive property of the species. Fast growth resulting in large rise (sturgeons, sharks, sheat fishes) affords protection against predators and is associated with stable food supply. On the other hand, slow growth resulting in small size (anchovy, goby) is an adaptation to meet limited food supplies, and is associated with increased reproductive capacity as it is more vulnerable to destruction by predators.

During the life time of fish, growth characteristics vary at various periods. As for as the linear growth is concerned, it is at its maximum rate during the period preceding the onset of maturity. Since growth rate is directly dependent upon the food supply, large scale fluctuations may occur subject to the availability of the food. Once maturity is attained the growth rate falls. The maintenance of the growth attained and maturation of the gonads but not for any further linear growth comes to a standstill. It must be mentioned that growth pattern and growth rate are highly species-specific. Each species has growth characteristic of its own with respect to the following factors:

(i) Optimum temperature for metabolism and growth
(ii) Adequatic and correct food in quantity and quality (caloric content)
(iii) Presence of vitamins in food, particularly vitamin C whose defficiency may cause retarted growth, and
(iv) Periodicity of seasons of rapid and slow growth in one year. There factors determine the rate of growth within limits of species characteristics for growth variations in these factors affect the growth rate and result in varying degrees of fluctuations in the growth rate within a population.

MATERIALS AND METHOD

Age of fish is determined by counting the number of periodic rings (markings) on scales.Scale reading has been considered most reliable and employed universally. Scales are removed from the fish body without causing any visible injury.

Mark four or five locations on the fish's body. Remove three or four scales from each location using large number of specimens from each size group. Measure the lateral scale radius of each scale. Find the correlation coefficient between total fish length and lateral scales radius for each location. Only that location was used for removing key scales which gives high value of correlation coefficient.

Scales collected in the field are washed, cleaned and studied as dry mounts, after removing extraneous matter and mucus by washing them in tap water and rubbing in between finger tips. To make scales more clear and soft (In case of large scales), diped them in weak solution (1%) of KOH for about 5-10 minutes, then washed in tap water and dried it in air.

Small sized scales are mounted between two glass slides and studied with the help of compound microscope or stereoscopic binocular at appropriate magnification, provided the eye piece is fitted with oculometer. In some cases in small scales the circuli are not clear. Under such situations, scales can be stained with Alizarin red S and mounted in glycerin for study.

Large sized scales were read under the microfilm reader commonly known as "*Dokumantor"*. After washing, these scales are placed in between the glass strips and the magnified image is observed on the screen at appropriate magnification. Lateral scale radius and the distance between the focus and annuli are measured for studying relationship between scale radius/scale length and fish length. By extrapolating the regressions line, correction factor was found out. The value so obtained is used for back-calculations and other growth parameters.

Since scales were found very convenient and authentic in use for age and growth, the following formulae have been used for calculating various growth parameters based on scales readings.If the fish length and scale radius has linear relationship, the previous length can be calculated with the help of standard methods.

We studied Catla catla in rivers Ghaghra.We Collected the key scales of selected

fishes from selected places, and washed in water with tip of finger and brush.After that we dried it with the help of Blotting paper and made 45 to 50 slides of fishes in different age group by using above method.We took photo of these slides from NBFGR.With the help of Magnifying glass, Scale and Calculator, we derived the Total scale radius and distance of ***first, second, third*** and so on annulus From focus this is showed in my table as *l1,l2 l3* etc.The *l*1 showes Distance between focus and first annual ring, *l*2 showes distance between Focus and second annual ring and so on.

By using formula, which is given below, we calculated the back-calculated length of selected fishes in different age group.

$$\frac{S^1}{S} = \frac{L^1}{L}$$

OR

Where S^1 = length of scale radius to annulus X.

$$L^1 = \frac{S^1}{S} L$$

S = length of total scale radius

L^1= length of fish when annulus X was formed.

L= length of fish when scale sample was obtained.

By using back- calculated length of different age group, we derived the growth rate of fish and plotted graph.

OBSEVATION AND DISCUSSION

During the period of observation of *Catla-catla* in river Ghaghra, we examined 03 fishes of the zero years age group, the length of these fishes were 23.1, 24.5 and 25.1 cm respectively.

We examined 02 fishes in one year age group, the length of these fishes were 28.4 and 30.1 cm. The l_1 of these fishes were 0.2 and 0.21 cm.

We examined 03 fishes in two years age group the length of these fishes were 32.2, 34.1, 36.2 cm. The l_1 of these fishes were 0.22, 0.24, and 0.3 cm. The l_2 of these fishes were 0.40, 0.42, 0.5 cm respectively.

We examined 12 fishes in three years age group, the length of these fishes were 38.7, 40.1, 41.4, 43.18, 43.5, 44.2, 45.3, 46.4, 48.2, 49.3, 52.4, 53.3 cm respectively. The l_1 of these fishes were 0.4, 0.5, 0.5, 0.55, 0.56, 0.56, 0.58, 0.6, 0.65, 0.7, 0.75, 0.8 cm. The l_2 of these fishes were 0.6, 0.7, 0.7, 0.72, 0.72, 0.75, 0.8, 0.85, 0.9, 0.95, 1.0 cm. The l_3 of these fishes were 0.8, 0.9, 0.9, 1.0, 1.5, 1.05, 1.1, 1.0, 1.05, 1.1, 1.15, 1.2 cm respectively.

We examined 06 fishes in four years age group, the length of these fishes were 55.3, 56.2, 58.2, 60.3, 61.1, 63.3 cm respectively. The l_1 of these fishes were 0.85, 0.9, 0.95, 1.0, 1.05, 1.1 cm. The l_2 of these fishes were 1.05, 1.1, 1.15, 1.2, 1.25, 1.3 cm. The l_3 of these fishes were 1.25, 1.3, 1.35, 1.4, 1.45, 1.5 cm. The l_4 of these fishes were 1.45, 1.5, 1.55, 1.6, 1.65, 1.7 cm respectively.

We examined 03 fishes in five years age group, the length of these fishes were 64.4, 65.5, 67.2 cm. The l_1 of these fishes were 1.15, 1.15, 1.2 cm. The l_2 of these fishes were 1.35, 1.35, 1.4 cm. The l_3 of these fishes were 1.55, 1.55, 1.6 cm. The l_4 of these fishes were 1.75, 1.75, 1.8 cm. The l_5 of these fishes were 1.8, 1.85, 1.9 cm respectively.

We examined 04 fishes in six years age group, the length of these fishes were 70.1, 72.2, 75.5, 76.2 cm. The l_1 of these fishes were 1.2, 1.21, 1.21, 1.25 cm. The l_2 of these fishes were 1.4, 1.41, 1.45 cm. The l_3 of these fishes were 1.6, 1.61, 1.61, 1.65 cm. The l_4 of these fishes were 1.8, 1.81, 1.82, 1.85 cm. The l_5 of these fishes were 1.9, 1.91, 1.92, 1.95 cm. The l_6 of these fishes were 1.95, 1.96, 1.97, 2.0 cm respectively.

We examined 02 fishes in seven years age group, the length of these fishes were 80.1, 82.2 cm. The l_1 of these fishes were 1.25, 1.3 cm. The l_2 of these fishes were 1.45, 1.5 cm. The l_3 of these fishes were 1.65, 1.7 cm. The l_4 of these fishes were 1.85, 1.9 cm. The l_5 of these fishes were 1.95, 2.0 cm. The l_6 of these fishes were 2.0, 2.1 cm. The l_7 of these fishes were 2.1, 2.2 cm respectively.

During the period of investigation scale sample of 35 specimens of *Catla catla* in river Ghaghra, ranging in length from 23.1 to 82.2 cm and belonging to 0 to 7 age classes were examined. The maximum number of specimens belonged to age class three.

The mean back calculated lengths (in cm) obtained by the analysis of pooled key scale samples were 29.89, 40.53, 51.93, 62.25, 67.86, 72.04, 78.41 for first to seventh age classes respectively**.**

Table-1 : Back-calculated lengths (cm) of *Catla catla* from river Ghaghra at Faizabad.

Age Class	No. of Specimens Examined	Total length (cm) (Average)	Length of fish (cm) at the time of annulus formation						
			L_1	L_2	L_3	L_4	L_5	L_6	L_7
0	03	24.23 (23.1-25.1)							
1	02	29.25 (28.4-30.1)	13.12 (12.04-14.2)						
2	03	34.16 (32.2-36.2)	11.33 (10.7-13.57)	21.18 (19.48-22.6)					
3	12	45.49 (38.7-53.3)	20.76 (17.2-28.4)	29.69 (25.8-35.5)	39.01 (34.4-42.19)				
4	06	59.06 (55.3-63.3)	34.34 (30.3-38.6)	41.42 (37.46-45.7)	48.46 (44.6-52.75)	55.52 (51.7-59.78)			
5	03	65.7 (64.4-67.2)	40.34 (39.64-41.35)	47.25 (46.53-48.24)	54.17 (53.43-55.13)	61.07 (60.32-62.0)	63.96 (62.65-65.47)		
6	04	73.5 (70.1-76.2)	42.86 (41.6-44.3)	49.90 (48.47-51.39)	56.95 (55.35-58.47)	64.06 (62.2-65.56)	57.59 (65.66-69.11)	69.33 (67.38-70.8)	
7	02	81.15 (80.1-82.2)	46.49 (45.5-47.49)	53.79 (52.79-54.8)	61.05 (60-62.1)	68.37 (67.35-69.4)	72.02 (70.99-73.06)	74.76 (72.8-76-72)	78.41 (76.45-80.37)
Total/ average	35	51.57 (23.1-82.2)	29.89 (10.7-47.40)	40.53 (19.48-54.8)	51.93 (34.4-62.1)	62.25 (51.7-69.4)	67.86 (62.65-73.06)	72.04 (67.38-76.72)	78.41 (76.45-80.37)

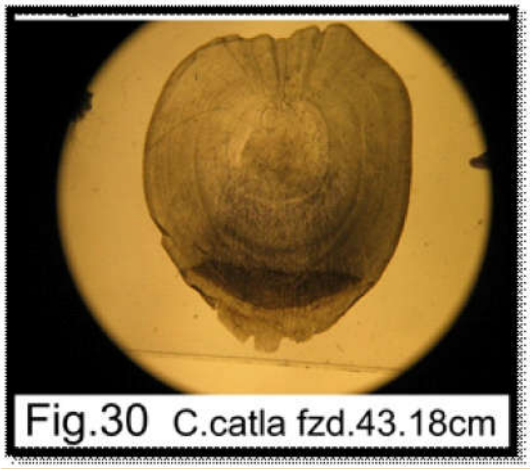
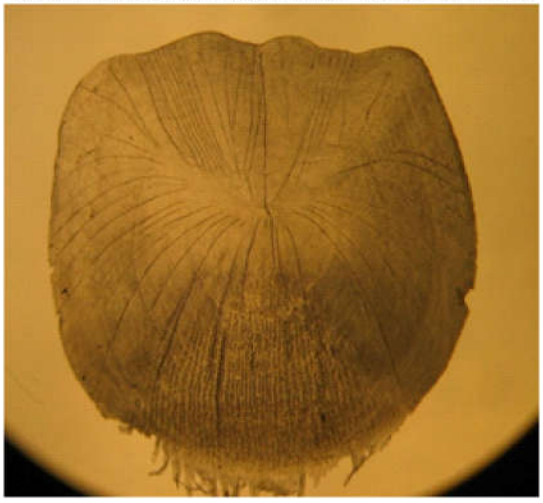


Fig.30 C.catla fzd.43.18cm



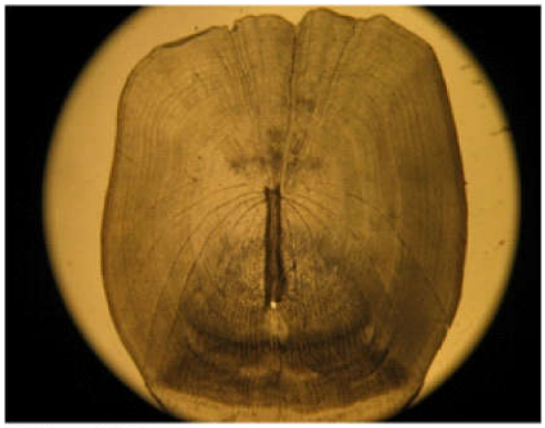


Fig.32 C.catla fzd.43.18cm

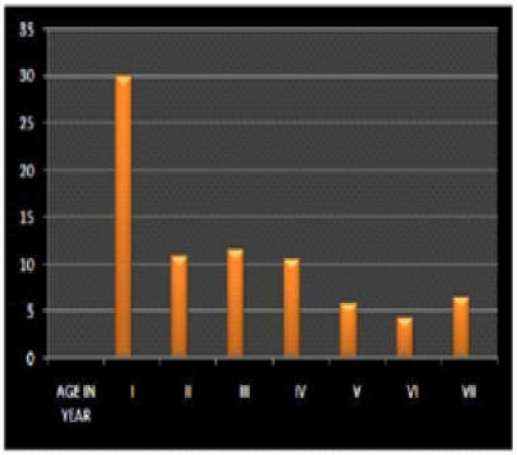


FIG.73 GROWTH RATE OF CATLA CATLA IN GHAGHRA

Unemployment and starvation is very big problem in north India.Fishes are good source of protein and vitamins.Thus production of edible food fishes can solve this problem. The fishermen are poor socio-economicaly.The production and catching of major carps can solve both problem. The economy of many fishermen depends upon growth, catchment and production of fishes in river Ghaghra.Catla catla in most important edible fish in this region and it is main major carp of river Ghaghra. My work revealed that the growth rate of Catla catla thus it has very significant role in empowerment of fishermen. This work is very helpful in production of different fishes as well as Catla catla.

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