DETERMINATION OF AGE AND GROWTH OF *CATLA CATLA* (HAM.) FROM OPERCULAR BONES

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Powel (1981) mentions that the validity of any skeletal methods for the study of growth depends in the occurrence of isometric growth between skeletal structure and body length of fish. The determination of age and growth of fish from opercular bones is well established in fishes of temperate waters and has been found to be more satisfactory than other methods e.g. from scales, vertebrae, spines, or hard parts (Le Cren 1947, Frost and Kipling 1959, Shafi and Maitland 1971, Mann 1973). The present study deals with the role of opercular bones of *C. catla* in determining the age and growth of the species.

Opercular bones were collected from 194 specimens of *C. catla* ranging from 21 cm to 80 cm in total length. The fishes were collected from the pond of BCSIR Laboratories, Rajshahi. Total length of fishes were measured by means of wooden length measuring board graduated into cm. The length of the opercular bone was taken by a small scale divided into cm. Length and age were fitted to the Von Bertalanffy growth curve by "Ford-Walford Plot".

Treatment of opercular bones: Frost and Kipling (1959) method was applied for treatment of opercular bones. The left opercular bone was removed from each specimen with a scalpel and immediately put into hot water and cleaned easily with a cloth. The age rings on the opercular bones were visible drying. The opercular bones were numbered and stored in envelops.

The age rings on the opercular bones can be seen with nacked eye but a more reliable count of them could be made holding the opercular bone against a narrow, sharp light source in a dark room. The maximum distance between the centre of the opercular bone and its margin was taken as the length of the opercular bone.

The relationship between bone length (Y) and toatl length (X) of *C. catla* was established. The age groups were considered as 0_+ (less than one year), 1_+ (less than two years), 2_+ (less than two years) and so on. The yearly increase in length for each of the age groups was found by subtracting the mean length of each age-group from the next older age-groups.

The total length of the fish varied from 21 to 80 cm. No complete age ring was visible in the opercular bone of 0_+ age group. Age ring was first visible in the fishes of 1_+ age group. In a single fish of the sample, measuring 80 cm in length, seven (7) complete rings were counted; which seems that in the total collection that specimen was the oldest one. Age group 2_+ was the most dominant one with a total number of 64 specimens. In the opercular bone of a single fish of 80 cm length a total number of 7 complete age rings were the oldest specimen in the sample. This findings agrees with Shafi *et al.* (1977) who found mean length for a 8 years old *C. catla* from Kaptai lake as 12.40 cm. They obtained no ring formed on scale after the completion of first year of life. However, this is not true for opercular bone. The formation of first annual ring on opercular bone after completion on one year of life is not related with spawning. Shafi *et al.* (1977) have found that the first ring on scale appears during spawning time at two years of age.

The fish of the younger age-groups grew more rapidly in length than the older age groups (Table 1). Similar findings have also been made by Jhaingran (1959), Natarjan and Jhingran (1963), Kamal (1969) Khan and Siddiqui (1973) from other carp species. The rings on the opercular bones of younger age-groups were clearer and more easily identifiable than in the older age-groups. This agrees with the findings of Frost and Kipling (1959) and Shafi and Maitland (1971).

Table 1. Data on the age and growth of sampled specimens of *Catla catla*.

Age group (year)	Frequency	Average length (cm)	Length range (cm)	Growth increment (cm)	Growth increment Mean±SD
0+	1	21	-	21	21
1+	56	26	22-30	26	26.83±2.15
2+	64	42	37-44	16	20.41±18.57
3+	48	54	50-58	12	11±2.82
4+	19	63	62-67	9	8±1
5+	3	70	70-73	7	5.96±0.05
6+	2	76	75-78	6	4.95±0.07
7+	1	80	-	4	3

The regression equation of opercular ring length and total length is linear and the equation is Y=31±34 + 0.353X (Fig 1). The significant test of relationship between the total length (TL) and opercular ring length in cm is 2.66 (P<0.01) with 386 DF which shows similar agreement in the growth pattern of different ages. The co-efficient (0.97) between total length and opercular radius shows the validity of skeletal methods to the study of growth depends in the occurrence of isometric growth between skeletal structure and body lengths. The positive intercepts value of the regression e.g. 2.66 of total length versus opercular radius has further justified to be taken in the direct consideration in the computation of length-for age (Blackburn 1950, Frost and Kipling 1959, Tesch 1968), but their significantly different relation (t=0.063; DF=P<0.001) have indicated the use of length intercept separately for back calculation.
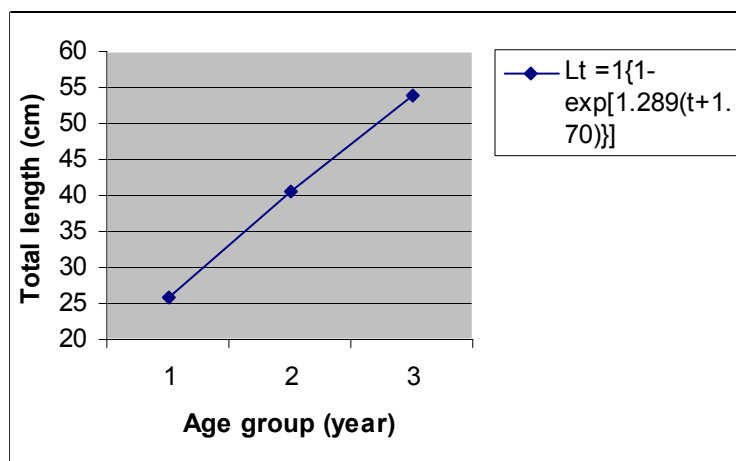

Fig 1. Von Bertalanffy growth curve for *Catla catla*

For age determination in fish normally scales or vertebrae are used by the scientists or technichians in the field. The present work revealed that for cyprinid fishes, opercular rings can be used to determine the age. This method is quite easy and simple and provide more better result than the traditional technique where scales or vertebrae are used for this purpose.

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