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Research Article

Studies on the Age and Growth of the Orange fin labeo, *Labeo calbasu* (Hamilton) from Lower Anicut, Tamil Nadu

V. Sudha* and R. Sivakumar

PG. and Research Dept. of Zoology, Govt. Arts College (Autonomous), Kumbakonam-612 001

1*Author to whom correspondence should be addressed; E-Mail: sudhamanikarnika@gmail.com

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Abstract: The age determination of a carp, *Labeo calbasu* (Hamilton-1822) from Vadavar river Lower Anicut, Tamil Nadu has been assessed from the 110 specimens collected between April 2010 and March 2011. Using length-frequency method and scale study, it was found that *Labeo calbasu* attains model length of 250, 283, 385 and 442 mm at the end of zero, 1st, 2nd and 3rd years of life respectively. The relationship between the total length (TL) of the fish and scale radius (S) was found to be linear. The age estimates from scale resulted into five age groups 0 to 4 at the model length of 150, 283, 335, 395 and 442 mm. The age estimates compared the scale and length frequency methods.

Keywords: *Labeo calbasu,* Age and Growth, Length-frequency and scale study.

INTRODUCTION

A sound knowledge of age and growth of fishes is of prime importance in management and forecast of their fisheries. Age determination is a central part of all work directed to the rational exploitation of a fish stock (Begenal, 1973; Daget and Le Guen, 1975; Meunier and Beamish, 1980; Mills and Beamish, 1980; Panfili *et al.* 2002). Knowing the age of a fish provides a clue to its longevity, age at first maturity, age of recruitment, and growth (Summerfelt and Hall, 1987); moreover the age–length key, or age-composition data, allows the development of catch curves from which the annual mortality rates can be calculated. So, ageing fish accurately is indispensable to the understanding of the dynamics of their stocks (Beamish *et al.* 1987 and Meunier, 1988). Scale method, in addition to otoliths, pectoral spines and opercular bones techniques is employed widely for the determination of age and growth of different fishes (Azadi and Kuddus, 1995). Various workers (Rao and Rao, 1972; Gupta and Jhingran, 1973; Azadi and Kuddus, 1995) used scales for age and growth studies of *Labeo calbasu* from different localities of India and Bangladesh. No work so far has been carried done on these lines on *L. calbasu* from Tamil Nadu. Giving emphasis on the above deficiency and importance of age study of fish from both scientific and commercial point of view, the present investigation was undertaken on age determination of *L. calbasu* from Lower Anicut, using length- frequency and scale methods. This in turn will help its population biology from the said reservoir.

2.0. Materials and Methods

In this study the freshwater fish orange fin labeo *L. calbasu* (Hamilton, 1822) (vernacular name is Karuppu chal) were collected from a branch of Kollidam river namely Vadavar river, Tamil Nadu. A total of 110 specimens of *L. calbasu* (total length ranging from 10.2 to 44.2 cm) were used for the length-frequency analysis and scale methods. The experimental fishes were divided into 50 mm length groups for length-frequency analysis. For age determination, scales were taken from the same point from each fish (i.e. from the left side of the body above the lateral line, in shoulder region). 5-10 scales were taken from each fish and stored in small coded envelope. Later these scales were washed in tap water and dried on a filter paper. Three scales from each fish were mounted dry between two glass slides, fastened each end by means of cello tape. The examination and measurements of scales were made using a binocular microscope and light microscope, fitted with ocular micrometer. The total length of scale was recorded from anterior to posterior margin, along a vertical imaginary line passing through the center.

3.0. Results

3.1. Age Determination by Length-Frequency Method

The length of *L. calbasu* during the present study varied from 124 mm to 541 mm. The female fishes were found in great abundance (**Table-1).** Four length groups are discernible in the length frequency polygons **(Fig. 1)** at modal lengths 250, 283, 385 and 442mm. The entire data were pooled; **Males**, females and juveniles and their combined length frequencies as percentage are shown in **(Fig. 2).** It is therefore, probable that modal length 250 mm represents as 0+ age group and the subsequent modal length 283mm 385mm and 442 mm as 1^+, 2^+ and 3^+ age group

respectively. Beyond three years, the peaks are less distinct. The age estimate from the length frequency analysis of *L. calbasu* in the present study yielded four age groups i.e. from 0+ to 3+.

3.2. Reading of scales

The radii on all scales were more or less evenly spaced except a few peripheral ones. Ages were determinate by counting the number of radii. Both complete and incomplete radii were counted. The analysis of scales, as seen from the **(Table-2)**, showed average number of radii on the scales of same fish. The average number of radii, however, increased proportionately with the size of fish. In the length group of (101-150) possess 0 (zero) radii, in the length group (151- 200) and (201- 250) possess 1radii, in the size group of (251-300) and (301-350) possess 2 radii, in case of size group (351-400) and (401-450) possess 3 radii, and (401-450) possess 4 radii **(Fig. 3)**. In the scales of largest size group, some sorts of erosion and absorption of tissue was also noticed. The age determination of *L. calbasu* in the present study from scales method resulted into six age groups i.e. from 0+ to 5+.

3.3. Body- scale length relationship

Table-2. Showed the size of scales in mm, the range and average number of radii recorded on scales, and the body length versus scale length ratio for specimens arranged in 50 mm interval size group. It will be seen from this data that, L/S ratio increased as total length of fish increased, or in other words the relative size of scales decreases with the increase in total length of fish. The empirical data of total length and scale length when plotted, gave a weak curve. This relationship was converted into a straight line by log-log relationship. The computed regressions gave the following equation.

Log L = + Log S

Where L = total length of fish in mm, and

S = is total length of scale in mm.

Thus, the relationship between body length and scale length was observed to be linear.

4.0. Discussion

In the present study the age determination of the carp, *Labeo calbasu* (Hamilton) from, Vadavar river Lower Anicut has been assessed from the 110 specimens. Using length-frequency method and scale study, it was found that *L. calbasu* attains model length of 250, 283, 385 and 442 mm at the end of zero, 1st, 2nd and 3rd years of life respectively. Rao and Rao (1972) used length frequency method for the age determination in *L. calbasu* from River Godavari, India. They concluded that the fish attains modal length of 210, 270, 330 and 410 mm as zero, 1, 2 and 3 years of life. Narejo *et al.,* (1999) reported age in *Tenualosa ilisha* from River Indus at modal length of 225, 275, 325 and 375 mm at the end of zero+, 1+, 2+, and 3+ year of life and Narejo *et al.,* (2009) used length frequency method or the age determination *L. calbasu* from Keenjhar lake, Sindh. They concluded that the fish attains model length of model length of 275, 332, 370 and 415 mm at the end of zero, 1st, 2nd and 3rd years of life. The results of the present study agreed or very close to the findings of Rao and Rao (1972) in *Labeo calbasu*, little variations might be due to the different environmental conditions where two populations were live.

During the present investigations the scale method was also used for the age determination of *L. calbasu*. The age determination from scale method in the present study resulted in five groups from 0 to 5 at the modal lengths of 150, 283, 335, 395 and 445 mm. Similar observations have been reported by Gupta and Jhingran (1973) used scale method for aging *Labeo calbasu*. They reported seven age groups at the modal lengths of 188, 291, 381, 468, 543, 618 and 681 mm from Allahabad, India and Narejo *et al.,* (1999) reported seven age groups from scale method in *Tenualosa ilisha* from River Indus at modal lengths of 188, 227, 288, 335, 375, 440 and 460 mm. In the present study the body-scale relationship of *L. calbasu* from Keenjhar Lake was calculated and found liner relationship between the two variables. Various workers in different fish species were reported similar linear relationship between the body length and scale length by Rao and Rao (1972), Gupta and Jhingran (1973), Vinci and Sugunan (1981) in L. calbasu from India. Narejo *et al.,* (1999) in *T. ilisha* from River Indus and Narejo et al., (2000) in *Gudusia chapra* from Keenjhar Lake and Narejo *et al.,* (2009) *L. calbasu* from Keenjhar Lake, Sindh.

The efficacy of age determination by the length frequencies depend upon a restricted single spawning season, and growth being such that length of fish of an age group confirm to normal distribution. In the present study, the length frequency distribution showed model increments with fish size and assuming that *Labeo calbasu* in the Lower Anicut has single spawning season, the above age estimates may be regarded as satisfactory. However, there was no direct evidence to prove the accuracy of these estimates. It is difficult to draw any valid conclusions regarding the age of *Labeo calbasu* from the length frequency distribution method unless validated by some other techniques of an age determination. The reason is that extensive overlap of the frequency distribution of the successive age groups, selectivity of gear, poor representation of one or two year classes, deferential rate of growth in males, females and juveniles.

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Table 1: Length frequency distribution of *Labeo calbasu* from Lower Anicut according to sex and their combined percentage frequencies

Length group	No. of male	No. of female	No. of Juvenile	Total No. of fish	Percentage frequency
10.1-15	7	-	8	15	1.5
15.1-20	8	-	3	11	1.1
20.1-25	35	2	1	37	3.8
25.1-30	18	1	-	19	1.9
30.1-35	9	1	-	10	1.0
35.1-40	7	3	-	8	0.8
40.1-45	5	2	-	9	0.9
	89	9	12	110	100%

Table 2: Relationship between body length, scale length and number of radii on scales of *Labeo calbasu* from Lower Anicut

Length Group(mm)	Mean length(mm)	Mean scale Length(mm)	No. of radii	Age group assigned
101-150	13.7	3.94	0-1	0+
151-200	17.7	5.50	1-2	1
201-250	23.7	5.80	1-2	1
251-300	26.5	8.20	2-3	2
301-350	31.4	10.1	2-3	2+
351-400	38	11.0	3-4	3
401-450	41.6	12.4	3-4	4

Fig. 1: Length frequency distribution of *Labeo calbasu* from Anicut

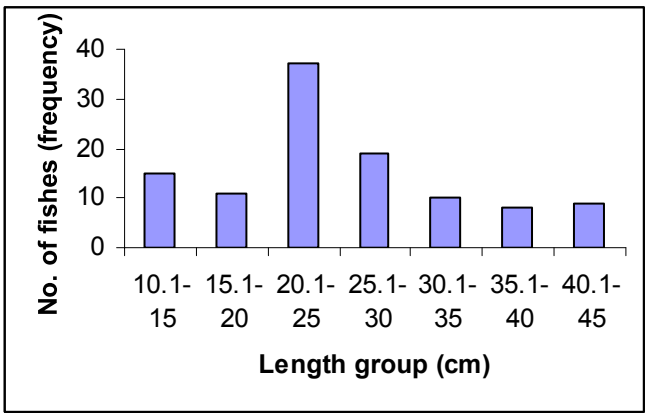
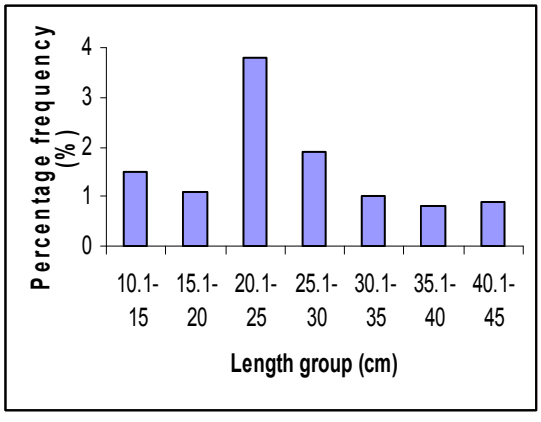


Fig 2: Percentage frequency of *Labeo calbasu* from Lower Anicut



CONFLICTS OF INTEREST

"The authors declare no conflict of interest".