

Relationship between total length and mouth gap of some commercially important carp fry

S.M. Rahmatullah*, M.I. Miah¹, J.K. Saha and M.M. Rahman

Department of Aquaculture, Bangladesh Agricultural University, Mymensingh 2202, Bangladesh

¹Department of Fisheries Management, BAU, Mymensingh

*Corresponding author

Abstract

The estimated regression equation for total length and mouth gape computed were $\text{Log TL} = \text{Log } 0.23 + 0.663 \log \text{MG}$ (vertically) ($r = 0.960$) and $\text{Log TL} = \text{Log } 0.08 + 0.686 \log \text{MG}$ (horizontally) ($r = 0.949$). In case of rohu average total length from 11350 mm to 23775 mm and mouth gape 805 μm to 1225 μm (vertically) and 700 μm to 1110 μm (horizontally) between the first day of mouth opening up to 15 days. The regression equation for total length and mouth gap were $\text{Log TL} = \text{Log } 0.20 + 0.660 \log \text{MG}$ (vertically) ($r = 0.935$) and $\text{Log TL} = \text{Log } 0.02 + 0.698 \log \text{MG}$ (horizontally) ($r = 0.907$). In case of silver carp average total length from 12800 μm to 33555 μm and mouth gape 690 μm to 1210 μm (vertically) and 615 μm to 1115 μm (horizontally) between the first day of mouth opening up to 15 days. The regression equation for total length and mouth gape were $\text{Log TL} = \text{Log } 0.36 + 0.596 \log \text{MG}$ (vertically) ($r = 0.936$) and $\text{Log TL} = \text{Log } 0.26 + 0.607 \log \text{MG}$ (horizontally) ($r = 0.891$). The relationship between total length and mouth gape (vertically and horizontally) of the studied fry were found to be linear and highly significant.

Key words: Total length- mouth gape relationship, Carp fry

In Bangladesh, the commercially important carps fry were traditionally reared without providing any feed and fertilizer. There were very few published data on mouth size of larval fishes and predictable food size. Shirota (1970) measured the size of the mouth in several fish species both fresh water and marine, during antigenic growth. Hunter (1980) reviewed the effect of mouth size on the feeding behavior of marine fish larvae. Considering all these in mind, the present study was designed to examine the relationship between total length and mouth gape of catla, rohu and silver carp fry.

Three carp species of both native and exotic origin, namely, *C. catla*, *L. rohita* and *H. molitrix* were selected for determination of total length and mouth gape of these fish fry. The study were conducted in a rain fed artificial pond situated at the experimental pond area of the Department of Aquaculture, Bangladesh Agricultural University, Mymensingh for one month. The total length and mouth gap of live fish fry were

measured. The fry with closed mouth were preserved in 5% formalin. For this purpose some live fry were placed on a glass slide, with little water sufficient to keep it alive and the fry had respiratory trouble, then it frequently opened mouth. Some measurement were taken with the fry previously preserved in 5% formalin. For measuring mouth gap, a needle was used for creating some pressure upon the jaws laterally. The total length were measured from the anterior most tip of snout to the posterior most tip of the caudal fin. Then the measurement were taken with the help of an ocular micrometer fitted in a compound microscope. The distance of each division of ocular micrometer was determined by calibrating the ocular micrometer division with those of an stage micrometer. Total length and mouth gape of fish fry were measured to the nearest milimicron (μm).

The total number of fry of each specimen were plotted against total length of fish and mouth gape. The arithmetic relationship between them are as follows:

$$\text{Total length - Mouth gap: } TL = a + b \text{ MG (} r = \dots \text{)}$$

TL = Total length, MG = Mouth gape, a = Intercept, b = Regression co-efficient and r = Correlation co-efficient.

The logarithmic relationship between total and mouth gape derived from the following formula:

$$\text{Log Total length - Log Mouth gap: } \text{Log TL} = \text{Log } a + b \text{ Log MG (} r = \dots \text{)}$$

The results of the relationship between total length and mouth gape (vertically and horizontally) of the three species namely catla, rohu and silver carp at their fry stage were presented in Table 1.

From the result it was observed that the size of the studied fry attained an average total length ranged from 11065 μm to 12800 μm at the time of their first exogenous feeding. Silver carp had highest total length and catla had lowest total length, respectively. Similar result was observed by Mustufa *et al.* (1994) where they found highest total length for silver carp and lowest total length for catla.

Dabrowski and Bardega (1984) reported 6400 μm total length of silver carp at the commencement of exogenous feeding. Shafi and Quddus (1982) reported catla attained 7560 μm total length at the commencement of first feeding and also reported total length of 7570 μm in case of rohu, when the yolk sac was fully absorbed.

In the present study, seven days after first feeding silver carp attained 21755 μm body length. Ahmed *et al.* (1990) recorded 12400 μm reared in plastic bowl and Ling *et al.* (1980) recorded 18000 μm total length in case of silver carp in natural condition. Catla attained 17360 μm of total length 7 days after first feeding. Shafi and Quddus (1982) recorded 16500 μm of total length in case of catla after 7 days of exogenous feeding and attained 17840 μm in case of rohu. In this study period total length of catla, rohu and silver carp attained 26350 μm , 23775 μm and 33555 μm , respectively.

Alvarez *et al.* (1993) recorded growth rate of *Mugil liza* at 550 μm / day. In this study catla, rohu and silver carp grew 1019 $\mu\text{m}/\text{day}$, 828.33 $\mu\text{m}/\text{day}$ and 1383.67 $\mu\text{m}/\text{day}$, respectively up to 15 days of age. Within the study period silver carp attained the highest total length 33555 μm and rohu attained the lowest total length 23775 μm .

Table 1. Total length-mouth gap (vertically and horizontally) relationship in *Catla catla*, *Labeo rohita* and *Hypophthalmichthys molitrix* (arithmetic and logarithmic value)

Species	Intercept (a)	Regression co-efficient (b)	Correlation co-efficient (r)	Fitted line
<i>Catla catla</i> (Ver.)	390.39	0.040	0.953*	TL = a + b MG Log TL = Log a + b Log MG
<i>Catla catla</i> (Hor.)	325.91	0.037	0.945*	TL = 390.39 + 0.040 MG TL = 325.91 + 0.037 MG
<i>Catla catla</i> (Ver.)	0.23	0.663	0.960*	Log TL = Log0.23 + 0.663 Log MG
<i>Catla catla</i> (Hor.)	0.08	0.686	0.949*	Log TL = Log0.08 + 0.686 Log MG
<i>Labeo rohita</i> (Ver.)	297.53	0.039	0.949*	TL = 297.53 + 0.039 MG
<i>Labeo rohita</i> (Hor.)	240.24	0.037	0.916*	TL = 240.24 + 0.037 MG
<i>Labeo rohita</i> (Ver.)	0.20	0.660	0.935*	Log TL = Log0.20 + 0.660 Log MG
<i>Labeo rohita</i> (Hor.)	0.02	0.698	0.907*	Log TL = Log0.02 + 0.698 Log MG
<i>Hypophthalmichthys molitrix</i> (Ver.)	309.55	0.026	0.951*	TL = 309.55 + 0.026 MG
<i>Hypophthalmichthys molitrix</i> (Hor.)	250.69	0.024	0.918*	TL = 250.69 + 0.024 MG
<i>Hypophthalmichthys molitrix</i> (Ver.)	0.36	0.596	0.936*	Log TL = Log0.36 + 0.596 Log MG
<i>Hypophthalmichthys molitrix</i> (Hor.)	0.26	0.607	0.891*	Log TL = Log0.36 + 0.607 Log MG

Ver. = Vertically, Hor. = Horizontally, * Significant

Mouth gap (vertically) of the studied fry at the initial stage of mouth opening was recorded to be lower 690 μm in case of silver carp and higher 820 μm in case of catla and mouth gape (horizontally) was recorded to be lower 615 μm in case of silver carp and higher 735 μm in catla.

A linear relationship was recorded between total length and mouth gape in the present study. Similar linear relationship were recorded by Dabrowski and Bardega (1984) in case of silver carp, grass carp and bighead carp. Guma'a (1978) found linear relationship between mouth opening height and body length in case of *Perca fluviatilis*. Osmani and Kohinoor (1994) observed linear relationship between mouth size and total length in case of *Ompok pabda* and *Mystus golio*. Hunter and Kimbrell (1980) observed that the mouth size of larvae generally increases with larval size. Shirota (1970) studied the relationship among mouth size, food size and growth of various larval fishes and obtained on definite relationship between the mouth size and the total body length but observed a close relationship between the mouth size of various larval fishes (ranged from 200 μm -1000 μm) and the size of their natural foods. Mathias and Li (1982) studied with larvae and juveniles of walleye and described the relationship mouth opening height and body length by a linear regression. The relationship between total length and mouth gape in all cases studied were found to be linear in the arithmetic and logarithmic form. The regression co-efficient was nearer to one and the correlation co-efficient between total length and mouth gap were stronger. This means that the growth of the fish was isometric and with the increase in total length, the mouth gap increased.

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