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Growth and Condition of Exotic Fish Grass Carp (*Ctenopharyngodon idella*, Steindachner 1866) Reared in Small Village Pond

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Abstract: The objective of the current paper was to assess the growth and condition of small village pond reared grass carp *Ctenopharyngodon idella* (Steindachner, 1866) on the basis of length weight relationship and condition factor. For current study length and weight of the selected species was measured in two phases during January to March 2021. The result depicted that length ranged from 19.1 to 63.1 cm (44.581±0.837 cm) and weight ranged from 90 to 2902 g (1458.518±55.814 g). The length frequency distribution showed that population was dominated by large fishes. The correlation coefficient (r^2) 0.811, 0.705 and 0.990 was noted during the phase I, phase II and pooled data showed the strong linear relationship between the length and weight variables. The growth constant or regression coefficient (b) of the studied fish for phase I, phase II and pooled population were noted as 2.336, 2.798, and 3.027, respectively. The value of growth constant (b) was <3.000 during the phase I and phase II showed the negative allometric growth while it was (b ≥ 3.000) for pooled population which resulted isometric to positive allometric growth of the fish. The mean value of "K" was more than 1.00 for the phase I, phase II and pooled population was depicted good condition of fish in small village pond. These findings clearly indicated that the growth of the fish was good in village pond which showed that aquatic environment of studied village was conducive for the fish.

Keywords: *Ctenopharyngodon idella*, Length-weight relationship, Growth, Condition factor

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Introduction

The *Ctenopharyngodon idella* (Steindachner, 1866) is termed as grass carp which is well built silvery elongated carp with dark grey back and dark fins. It lives in stagnant and slows flowing water with full of aquatic plants (Prabha and Kusum, 2017). It has herbivorous appetites and feeds on macro vegetation, including grass, aquatic plants and aquatic macrophytes (Pillay, 2004). Grass carp selected as the most obvious and safest choice due to availability of nutrient-rich ponds overgrown

Fig. 1: Grass carp (*Ctenopharyngdon idella* Steindachner, 1866).

with aquatic plants (HorvaÂth *et al*., 2002) which can serve as biological control to decreasing the thick floating submerge plant. According to Bondad (2007) the first cultured species around the world is grass carp (370 million tons) followed by silver carp (346 million tons) and common carp (236 million tons) while in 2010 grass carp reached about 430 million tons (FAO, 2012). The study of length-weight relationship (LWR) in fishes is of primary importance in setting up yield equations (Ricker, 1958), estimating the number of fish landed and in comparing population in the time and space (Chanchal *et al*., 1978). It is dynamic in biological education to make preparation of length-weight relationships in order to markedly separate the weight of known groups from expected ones and to estimate breeding, feeding state, fatness, appropriateness of environment (Saha *et al*., 2009) and provides sympathetic of species biology. The condition factor (K) provides a quantitative information that represents the condition of the fish, depicting its habitat as vital indices such as physiological condition and feeding habit in a given position based on species length and weight (Taymaa *et al*., 2018) and also fish maturity stage, spawning, biotic and abiotic factors (Anene, 2005; Mansor *et al*., 2012), food sufficiency in the environment, which all fall under physiological features which are important values to be reckoned of fish species (Ujjania *et al*., 2012). Coefficient values resulting from the length weight relationships figures are products of the condition factor (K) as a key to understand the lifecycle of fish (Esenowo *et al*., 2016). Considering the importance of length, weight and condition factor, present study was carried out to evaluate the growth and condition of grass carp to resolve the environmental issues and better production strategies in village pond.

Materials and Methods

The grass carp morphologically has low set eyes very near to the mouth with elongated body, broad head, short snout and sub-terminal mouth and large square shape operculum (Fig. 1). The specimens of grass carp were collected with help of caste net from a small village pond of 6 ha situated at Atgam, Valsad district, Gujarat, India and located on Latitude - 20º39'05" N Longitude - 73º00'27" E geographical location. The morpho-metric measurements (length and weight) were randomly measured from 369 specimens during January 2021 and March 2021 and termed as sampling phase I and sampling phase II. The total length of specimen was measured from the tip of the snout to the end tip of the longer lobe of the caudal fin with the help of measuring board while weight was taken by using an electronic balance to the nearest 0.01 g. These length data were divided in different length groups at the distances of 5 cm.

Table 1: Growth parameter measurement of grass carp during the study

Sampling	Length group	N	Min	Max	Mean	SE
Total length (cm)						
I	**15-20**	2.000	19.100	19.900	19.500	0.400
	20-25	62.000	20.000	25.000	23.160	0.203
	25-30	83.000	25.100	29.000	26.651	0.105
II	**50-55**	30.000	50.100	55.000	53.447	0.212
	55-60	135.000	55.100	59.800	56.940	0.122
	60-65	57.000	60.100	63.100	60.932	0.115
Pooled		369.000	19.100	63.100	44.58	0.837
Weight (g)						
I	**15-20**	2.00	90.00	90.00	90.00	0.00
	20-25	62.00	94.00	210.00	159.84	4.72
	25-30	83.00	164.00	240.00	203.05	2.02
II	**50-55**	30.00	1365.00	2100.00	1783.43	32.34
	55-60	135.00	1500.00	2820.00	2256.82	27.27
	60-65	57.00	2200.00	2902.00	2620.83	31.90
Pooled		369.00	90.00	2902.00	1458.58	55.81
Condition Factor (K)						
I	**15-20**	2.00	1.142	1.292	1.217	0.075
	20-25	62.00	0.970	1.577	1.265	0.020
	25-30	83.00	0.945	1.264	1.072	0.007
II	**50-55**	30.00	1.085	1.312	1.165	0.012
	55-60	135.00	0.719	1.389	1.222	0.013
	60-65	57.00	0.989	1.327	1.160	0.016
Pooled		369.00	0.719	1.577	1.181	0.007

The length-weight relationship was calculated from the transformed data using nonlinear power function $Y= aX^b$ (Ricker, 1973) and simple linear equation Log W = log a + b log L (Pauly, 1983). The condition factor (K) was determined from the equation $K=W/L^3\times100$ (Htun-Han, 1978), where 'K' is condition factor, 'W' is weight (g), 'L' is total length (cm).

Results

During the period of study total length and body weight of 369 samples of grass carp were noted and total length 19.1–29 cm (25.081±0.184 cm) and weight 90-240 g (183.286±3.021 g) were observed during the phase I whereas, length 50.1-63.1 cm (57.493±0.178 cm) and weight 1365-2902 g (2286.306±25.414 g) were observed during the phase II (Table 1). Similarly, the pooled population showed the length 19.1-63.1 cm (44.58±0.837 cm) and weight 90-2902 g (1458.58±55.81 g) of grass carp in the studied pond (Table 1). In the current study, length frequency distribution showed that population of the grass carp was dominated by larger fishes 22.50% and 36.60% during the phase I and phase II, respectively (Table 1, Fig. 2) whereas, condition factor (K) was 0.719 to 1.577 (1.181±0.007) noted from pooled population (Table 1). Apart from this, the morphometric variables (length and weight) showed the positive strong linear relationship that was evident by graphical presentation and correlation coefficient (r^2) which was noted 0.811,

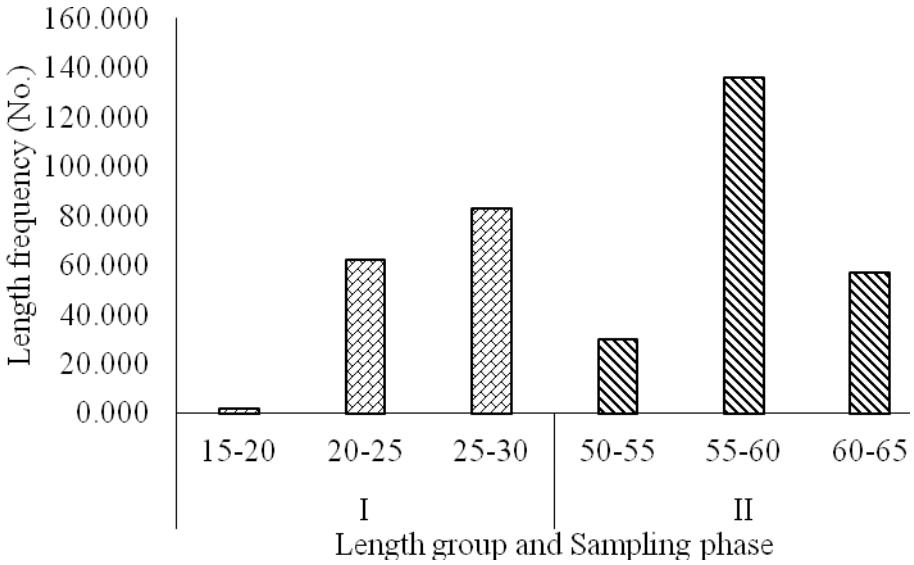

Fig. 2: Length frequency distribution of grass carp during the different sampling phases.

0.705 and 0.990 for phase-I, II and pooled population, respectively (Fig. 3). The growth constant (b) were observed 2.336, 2.798, and 3.027 during the phase I, II and pooled population, respectively (Fig. 3).

Discussion

The LWR is a mathematical relationship between length and weight which yields necessary information about the general condition, comparative growth patterns of a fish (Moutopoulos and Stergiou, 2002). The dominance of the larger fishes in studied water body showed that aquatic environment of village pond is appropriate and favorable to survive the fishes (Saha *et al*., 2009). The condition factor (K) reflects condition of fish and acceptability of the surrounding aquatic environmental condition and variations. The factors affecting the values of K include sex, stages of maturity, and state of stomach contents (Gayanilo and Pauly, 1997). It is also an indicator of habitat, behavior, physiological condition and feeding of fish in the environment (Bagenal, 1978). In present study, the resulted value of K was >1.0 which indicated that the condition of grass carp population was conducive, good and well established in village pond.Prabha and Kusum (2017) reported similar findings on condition factor in grass carp of Nepal and Taymaa *et al*. (2018) and Abowei *et al*. (2009) in common carp from Iraq and Nigeria, respectively.

The length-weight relationship shows the conversion of growth-in-length to growth-in-weight (Silva *et al*., 2015). Prabha and Kusum (2017) reported correlation coefficient 0.710 in grass carp of Nepal which is similar to findings of the present study. Bhosale and Bhilave (2014) reported highly positive correlation of length and weight in the grass carp and resulted 0.97 which was very close to findings of the present study while Ujjania *et al.* (2022) reported comparatively high value of 'r²' (0.886) and Taymaa *et al*. (2018) reported comparatively low value of 'r²'(0.20 to 0.67) in other carps from India and Iraq, respectively.

The growth constant and regression coefficient (b) in LWR presented the increment in body weight in relation to length (Martin, 1996). In present study, the growth constant (b) for phase I and phase II was observed b<3.000 which indicated that the growth of the studied fish was negative allometric and increase in length was more with respect to weight but the value of b=3.000 was noted for pooled population which depicted isometric growth of the studied fish which express that increase in weight was more or

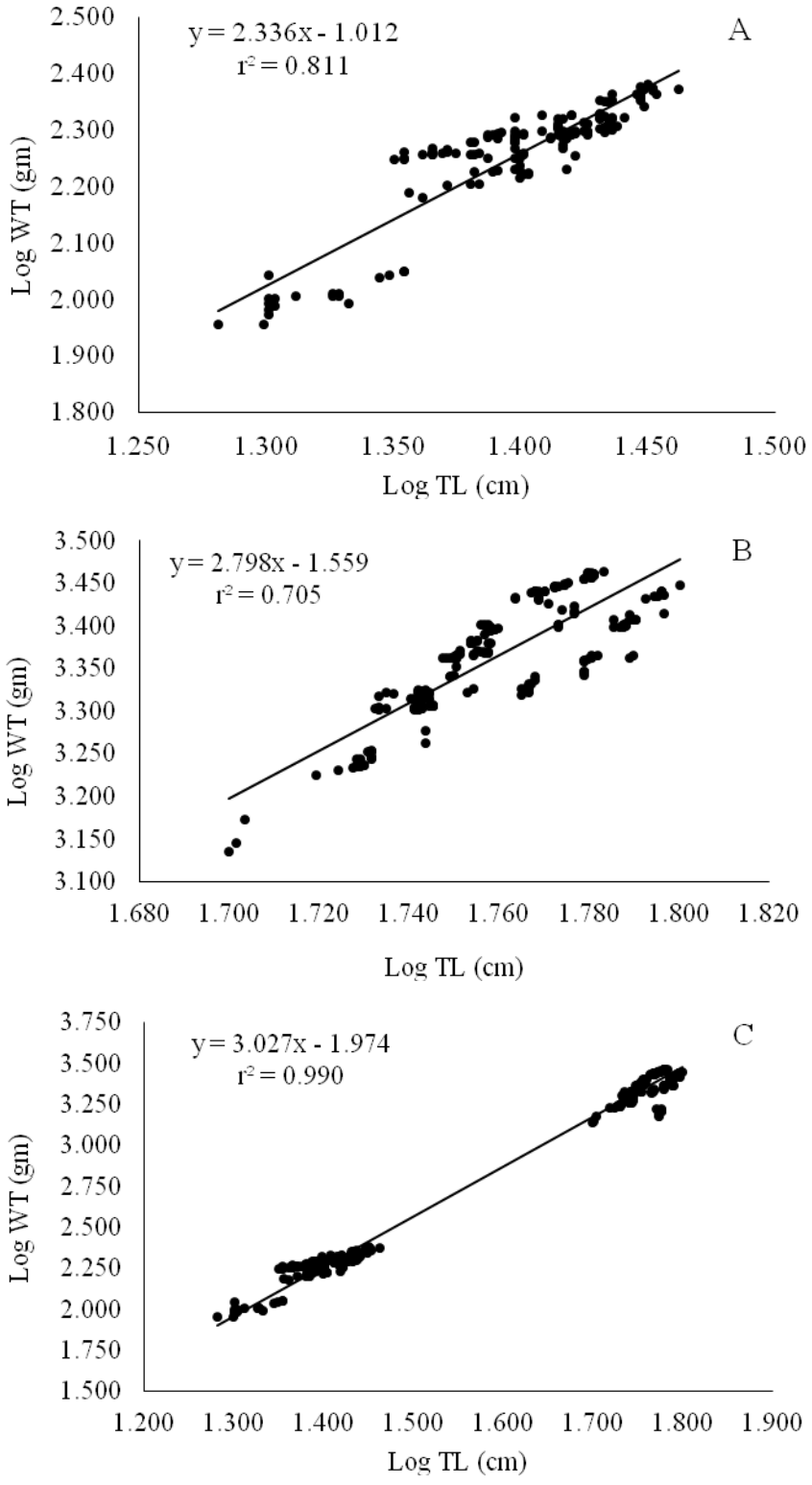

Fig. 3: Length - weight relationship of grass carp. (A) Phase I, (B) Phase II and (C) Pooled data

equal to the length. Similarly, other studies on grass carp reported growth constant 2.87 from experimental pond (Bhosale and Bhilave, 2014) whereas in common carp it was reported 1.03 to 3.54 (Taymaa *et al*., 2018), 2.27 to 2.46 (Fagbuaro *et al*., 2015), 3.097 (Rishikanta *et al*., 2015), 1.9 to 2.3 (Callen *et al*., 2014), 2.901 (Sedaghat *et al*., 2013), 3.01 to 3.301 (Bayhan *et al*., 2008) and 2.50 to 3.44 (Abdallah, 2002).

Conclusion

The length-weight relationship of grass carp showed that length and weight variables are positively correlated and growth constant (b) indicated negative allometric growth during the phase I and II while isometric for the pooled population of exotic grass carp. The values of condition factor (K) being >1.0 is sign of good condition and wellbeing of the fish in studied village pond. On the basis of these findings it is concluded that aquatic environment of village pond was conducive and suitable for survival and growth of studied fish. The information of present study could be considered for the researchers as baseline data for further monitoring and growth assessment of exotic fish grass carp.

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References

Abdallah M. (2002) Length-weight relationship of fishes caught by trawl off Alexandria, Egypt. Naga, the ICLARM Quarterly 25(1): 19-20.

Abowei J, Davies O and Eli A. (2009) Study of the length-weight relationship and condition factor of five fish species from Nkoro River, Niger Delta, Nigeria. Curr. Res J Biol Sci. 1(3): 94-98.

Anene A. (2005) Condition factor of four cichlid species of a man-made lake in Imo State, Southeastern Nigeria. Turkish J Fish Aquat Sci. 5: 43-47.

Bagenal TB. (1978) Methods for assessment of fish production in freshwaters. IBP Handbook, 3rd edn. London, pp. 300.

Bayhan B, Sever TM and Taskavak E. (2008) Age, length-weight relationships and diet composition of scaldfish *Arnoglossus laterna* (Walbaum, 1792) (Pisces: Bothidae) in Izmir Bay (Aegean Sea). J Anim Vet Ad. 7(8): 924-929.

Bhosale SV and Bhilave MP. (2014) The length-weight relationship of *Ctenopharyngodon idella* fed with formulated feed. J Appl Ichthol. 2(2): 227-231.

Bondad RMG. (2007) Assessment of freshwater fish seed resources for sustainable aquaculture. FAO Fisheries Technical Report, pp. 669.

Callen NA, Kembenya ME, Erick OO, Cecilia MG, Andrew Y, Nicholas O and Jonathan MM. (2014) Length-weight relationship and condition factor of common carp, *Cyprinus carpio* in lake Naivasha, Kenya. Int J Curr Res. 6(9): 8286-8292.

Chanchal AK, Pandey BN and Singh SB. (1978) Studies on some aspects of biology of *Anabas testudineus* (Teleostei: Anabantidae). Matsya 4: 15-19.

Esenowo I, Ogidiaka E and Brownson I. (2016) Length-weight relationships of some economic freshwater fishes of Nwaniba River, Southeast Nigeria. Int J Fish Aquat Stud. 4(5): 233-236.

Fagbuaro O, Oso JA, Olurotimi MB and Akinyemi O. (2015) Morphometric and meristic characteristics of *Clarias gariepinus* from controlled and uncontrolled population from Southwestern Nigeria. J Agri Ecol Res Inter. 2: 39-45.

FAO. (2012) The State of World Fisheries and Aquaculture. Food and Agriculture Organization of the United Nation, Rome, pp. 238.

Gayanilo FJ and Pauly D. (1997) The FAO-ICLARM Stock Assessment Tools (FiSAT) Reference Manual. FAO Computerized Information Series (Fisheries), 8: 262.

HorvaÂth L, TamaÂs G and Seagrave C. (2002) Carp and pond fish culture, 2nd edn. Fishing News Books, A division of Blackwell Science Ltd.

Htun-Han M. (1978) The reproductive biology of the dab *Limanda* (L.) in the North Sea: gonosomatic index, hepatosomatic index and condition factor. J Fish Biol. 13(3): 369-378.

Mansor MI, Mohamad NAB, Mohamad ZMZ, Khairun Y and Mohamad SAN. (2012) Length-weight relationships of some important estuarine fish species from Merbok Estuary, Kedah. J Nat Sci Res. 2(2): 8-19.

Martin SK. (1996) Length/weight relationships of fishes in a diverse tropical freshwater community, Sabah, Malaysia. J Fish Biol. 49(4): 731-734.

Moutopoulos DK and Stergiou KI. (2002) Length-weight and length-length relationships of fish species from the Aegean Sea (Greece). J Appl Ichthyol. 18(3): 200-203.

Pauly D. (1983) Some simple methods for the assessment of tropical fish stocks. FAO Fisheries Technical Paper No. 234, pp. 52.

Pillay TVR. (2004) Aquaculture and the Environment. 2nd edn. Fishing News Books: pp. 196.

Prabha C and Kusum P. (2017) Length and weight relationship studies of alimentary canal compared to the total body weight of grass carp *Ctenopharyngodon idella* (Valenciennes, 1844) at Balkhu live fish Market of Kathmandu, Nepal. Int J Fish Aquat Stud. 5(6): 185-190.

Ricker WE. (1973) Linear Regressions in Fishery Research. J Fish Res. Bd Canada 30: 409-434.

Ricker WE. (1958) Handbook of computations for biological statistics of fish populations. Bull Fish Res Bd Canada 119: 300.

Rishikanta SN, Das SK, Sanjeev K, Behera S and Nagesh TS. (2015) Length-weight relationship and condition factor of *Cyprinus carpio* var. communis (Linnaeus, 1758) reared in bheries of South 24 Parganas district in West Bengal. Int J Fish Aquat. Stud. 2(6): 239-242.

Saha SN, Vijayanand P and Rajagopal S. (2009) Length-weight relationship and relative condition factor in *Thenus orientalis* (Lund, 1793) along East Coast of India. Curr Res J Biol Sci. 1(2): 11-14.

Sedaghat S, Hosini SA, Larijani M and Ranjbar KS. (2013) Age and growth of common carp (*Cyprinus carpio* Linnaeus, 1759) in Southern Caspian Sea, Iran. World J Fish Mar Sci. 5(1): 71-73.

Silva TM, Medeiros AN, de Oliveira RL, Gonzaga NS, Ribeiro MD, Bagaldo AR and Ribeiro OL. (2015) Peanut cake as a substitute for soybean meal in the diet of goats. J Anim Sci. 93(6): 2998-3005.

Steindachner F. (1866) Ichthyologische Mittheilungen. (IX.). Verhandlungen der Kaiserlich-Königlichen Zoologisch-Botanischen Gesellschaft in Wien 16: 761-796.

Taymaa AJ, Simon DK, Gires U, Bakar Y and Ali AH. (2018) Length-weight and length-length relationships of common carp (*Cyprinus carpio* L.) in the middle and southern Iraq Provinces. The 2017 UKM FST Postgraduate Colloquium AIP Conf. Proc. 1940, 020025-1–020025-6.

Ujjania NC, Kohli MPS and Sharma LL. (2012) Length-weight relationship and condition factors of Indian major carps (*Catla catla*, *Labeo rohita* and *Cirrhinus mrigala*) in Mahi Bajaj Sagar, India. Res J Biol. 2(1): 30-36.

Ujjania NC, Shah NP, Patel AD and Prajapati SD. (2022) Length-weight relationship and condition factors of village pond reared exotic fish (*Cyprinus carpio* Linnaeus, 1758). Appl Biol Res. 24(2): 234-239.