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Note

Length-weight relationship of Asian seabass *Lates calcarifer* Bloch, 1790 reared in pond

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ABSTRACT

The length-weight relationship of Asian seabass (*Lates calcarifer*) reared for 225 days in a pond culture system using formulated feed, was studied. Length-weight data were collected monthly and grouped into four based on their weight *i.e.*, 1-50 g, 50-100 g, 100-500 g and > 500 g. Higher coefficient of correlation between length and weight in the 1-50 g and 50-100 g size groups indicated better linear relationship in smaller size groups. Condition factor (K) decreased significantly ($p<0.05$) with increasing weight. Growth of seabass in pond culture system was negatively allometric ($b<3.0$), and was found comparable with that of the natural population.

Keywords: Brackishwater, Condition factor, Growth, Length, Seabass, Weight

Asian seabass *Lates calcarifer* (Bloch), known as *bhetki* or *barramundi* in India and giant seaperch in Australia, is gaining rapid popularity as a candidate species for diversification of coastal aquaculture. This species fetches higher market price owing to its good taste and flesh quality, and is recognised as a highly suitable species for culture in ponds and cages (Barlow *et al.*, 1996; Singh, 2000). The potential for *L. calcarifer* farming has considerably increased many fold in India after the successful induced breeding of this fish at the Central Institute of Brackishwater Aquaculture (CIBA), Chennai, India (Thirunavukkarasu *et al.*, 2001). Condition factor (K) and length-weight relationship (LWR) are two important parameters for the management of culture systems as they provide the producer with an evaluation of the specific conditions under which organisms are growing (Araneda *et al.*, 2008). Length-weight relationship plays a significant role in studying the growth, rate of feeding, metamorphosis, fatness, onset of maturity, gonadal development and general wellbeing of the fish population (Le Cren, 1951; Pauly, 1993). Further, it helps in establishing the biomass and also in converting one variable to another as is often required during regular samplings for culture operation. Condition factor is a quantitative parameter estimated based on length-weight data which indicates the state of wellbeing of the fish for determining the present and future population success by its influence on growth, reproduction and survival (Hossain *et al.*, 2006). Documented information is available on LWR and condition factor of the Asian seabass pertaining to fishes from the wild (Rajkumar *et al.*, 2006), and reared in closed recirculatory systems (Volvich and Appelbaum, 2001), saline soil pond (Venugopal *et al.*, 2003), tide fed pond where fishes were fed with live prey and trash fish (Biswas *et al.*, 2011) and hatchery rearing system (Kailasam *et al.*, 2006). The present study was conducted to examine the LWR and condition factor of seabass cultured in brackishwater tide-fed ponds using formulated feed.

The study was conducted in Danti Farm of Navsari Agricultural University, Gujarat, India for a period of eight months (225 days) from May 2009 to December 2009 in a tide-fed pond having an area of 1500 m^2. The newly excavated ponds were dried, filled with tidal water, bleached with bleaching powder (available chlorine 30%) @ 300 kg ha^{-1}, limed with calcium carbonate @ 100 kg ha^{-1} and subsequently fertilised with fermented rice juice (5 kg rice bran + 5 kg jaggery + 100 g yeast in 100 l of seawater) @ 500 l ha^{-1}. The pond was stocked with uniform sized seabass seeds (1.98± 0.42 g weight; 4.86 ± 0.62 cm total length) @ 10,000 numbers ha^{-1}. Fish were fed with a pellet feed (protein 45%, fat 8%) formulated by CIBA, of 1-4.5 mm size at a daily rate of 10% (at the beginning of the experiment) to 3% (towards the end of the study) of the fish body weight. Water exchange at the rate of 30-40% was done fortnightly during high tides by maintaining 1.5 m water level throughout the culture period. Two aerators (1 HP) were placed diagonally in the pond and operated

during early morning hours to avoid oxygen depletion if any. Fermented rice juice and lime was applied at monthly interval to maintain the natural productivity of the pond. Water samples were collected from surface of the experimental ponds between 0800 and 0900 h at 15 day intervals to measure parameters such as temperature, pH, dissolved oxygen (DO), and salinity (APHA, 1989). Monthly sampling was done using a drag net to assess the biomass, and the quantity of feed was adjusted accordingly. During sampling, total length (L) in cm and weight (W) in g of the fish were measured. Total length and body weight were measured using graduated scale and digital electronic balance for 30 samples from each sampling. All the collected data were grouped into four based on their weight *i.e.,* 1-50 g, 50-100 g, 100-500 g and >500 g. The mathematical relationship between length and weight was calculated using the conventional formula $W = a L^b$, by regression after log transformation (Pauly, 1993). Fulton's condition equation (Ricker, 1975; Chow and Sandifer, 1991) was used to find out the condition factor:

$$K = W/L^3 \times 100$$

where, K is condition factor, W is weight of fish (g) and L is total length (cm).

Comparison of K value between groups was made using one way analysis of variance (ANOVA). The analyses were performed using SPSS for windows v. 17.0 program.

The water parameters of the pond recorded during the culture period were within the optimum ranges for brackishwater aquaculture (DO 5.2-5.8 ppm; pH 7.3-8.34) as reported by Bhowmik *et al.* (1992) and Chakraborti *et al.* (2002). However, temperature (13 - 29 ^{0}C) and salinity (5-32 ppt) showed wide variations, highest temperature was observed in May (summer) and lowest in December (winter), whereas highest salinity was observed in May (summer) and lowest in August (monsoon). Fish showed normal feeding and swimming activity during the rearing period and no symptoms of diseases or abnormalities were observed. Occasional mortality caused by handling stress during sampling was 20%. The initial and final average length and weight were 26 cm, 237g and 41 cm, 983 g respectively after 225 days of culture (DOC). Parameters of the length-weight relationship, correlation (r) and coefficient of correlation (R^2) for different size groups and overall are shown in Table 1. Higher R^2 value revealed that the linearity is more in smaller size groups *i. e*., 1-50 g and 50 -100 g. This may be due to higher feed consumption at smaller size due to higher metabolism. Condition factor (K) is used to compare the condition, fatness or wellbeing of the fish and is based on the hypothesis that heavier fish of a given length are in better condition. Condition factor data can be useful for proper management of culture system as it provides the culturist with an indication of favourable or stress factors in the system. Change in condition factor with different size groups is shown in Fig. 1. In the present study, condition factor decreases significantly ($p<0.05$) with increasing weight, which may be related to gonadal development of these fishes as observed after dissection. Similar observation was made by Mohsin and Ambak (1996), Pillay (1999) and Rajkumar *et al.* (2006). The K value was significantly higher ($p<0.05$) in the smaller size groups (1-50 g and 50–100 g). The overall K value in the present study is more than one (K>1) indicating that the fish were in healthy condition.

Comparison of length-weight regression coefficient '*b*' of *L. calcarifer* from the wild and from different culture systems is shown in Table 2. The present study shows that the LWR of seabass reared in pond culture system with formulated feed is comparable to the LWR of natural population.

Table 1. Length-weight relationship, regression coefficient (*b*) and coefficient of correlation (R^2) for different size groups of *L. calcarifer* reared in pond culture system

Size group (g)	$W = a L^b$	R^2	*b*
1 - 50	$W = 1.6583L^{2.7911}$	0.9525	2.7911
50 - 100	$W = 1.6502L^{2.7937}$	0.9045	2.7937
100 - 500	$W = 1.2454L^{2.5795}$	0.8960	2.5795
Above 500	$W = 0.6805 L^{2.2346}$	0.7790	2.2346
Pooled	$W = 1.6937^{2.8861}$	0.9899	2.8861

Table 2. Comparison of length-weight regression coefficient '*b*' of *L. calcarifer* in cultured and natural stock

Authors	Rearing system	*b*
Biswas *et al.* (2011)	Pond (with trash fish fed)	2.93
	Pond (with live feeds)	2.87
Venugopal *et al*. (2003)	Pond (with mash feeds)	4.87
Volvi and Appelbaum (2001)	Indoor recirculatory system	3.03
Rodgers (1996)	Tank	2.83
Patnaik and Jena (1976)	Wild caught	2.91
Rajkumar *et al.* (2006)	Wild caught	2.66
Present study	Pond (with formulated feed)	2.89

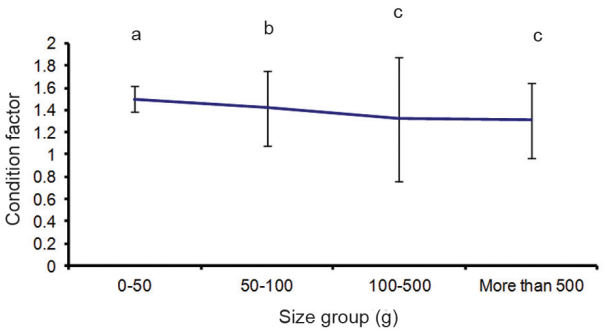

Fig. 1. Condition factor in different size groups of *L. calcarifer* in pond rearing system. (with bars showing standard error value (±) and superscripts a, b and c indicate that K in size groups with same superscript do not vary significantly (p>0.05))

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