

## Note

# Length-weight relationship and condition factor of karut croaker *Johnius carutta*, Bloch, 1793 off Visakhapatnam coast

M. SWAMY KUMAR, G. RAJESWARI, K. SREERAMULU\* AND B. KISHORE\*

Research Centre of Central Institute of Fisheries Technology, Pandurangapuram, Andhra University P. O.

Visakhapatnam – 530 003, Andhra Pradesh, India

\*Department of Zoology, Andhra University, Visakhapatnam – 530 003, Andhra Pradesh, India

e-mail: swamykumarmoka@yahoo.in

## ABSTRACT

Length-weight relationship (LWR) and condition factor (K) of karut croaker *Johnius carutta*, Bloch, 1793 was studied using 3,406 specimens (1718 males and 1688 females) ranging in length from 11.00 to 24.50 cm collected from Visakhapatnam coast. Regression equation was calculated for males as:  $\text{Log } W = -1.4879 + 2.6801 \text{ Log } L$  ( $R^2 = 0.81$ ), for females as  $\text{Log } W = -1.3327 + 2.5651 \text{ Log } L$  ( $R^2 = 0.78$ ) and for pooled data as:  $\text{Log } W = -1.4378 + 2.6448 \text{ Log } L$  ( $R^2 = 0.80$ ) indicating negative allometric growth. The values of K were found to be above one in all the months in both sexes, and the value is influenced by gonadal maturity, spawning season and feeding rate of fish.

Keywords: Condition factor, *Johnius carutta*, Length-weight relationship, Visakhapatnam

Investigations on length-weight relationship (LWR) of different species of the family sciaenidae in India have been conducted by several researchers from different parts of the Indian coast viz., Rao (1963), Murty (1979; 1980), Muthiah (1982), Rao (1982), Vivekanandan (1985), Murty and Ramalingam (1986; 1996), Chakraborty (1987; 1988), Jayasankar (1989), Chakraborty *et al.* (2000), Rajkumar *et al.* (2004), Telvekar *et al.* (2006a, b), Manojkumar (2007) and Ghosh *et al.* (2009; 2010). The present study with ample length weight data (3,406 samples) aims to derive the LWR and study the condition factor (K) of *Johnius carutta* from Visakhapatnam on the north-east coast of peninsular India.

A total of 3,406 samples were collected on weekly basis from experimental fishing operations of the departmental research vessel CIFTECH-1 and from fish catches landed by private mechanised trawlers operated from Visakhapatnam Fishing Harbor during the two-year study period from January 2008 to December 2009. Of this, 1,718 were males of length ranging from 110 to 236 mm total length (TL) and weight ranging from 16.1 to 200.7 g and 1,688 were females of length ranging from 116 to 245 mm TL and weight ranging from 20 to 230 g. Length-weight relationship is expressed as  $W = aL^b$  (Le Cren, 1951), where, 'W' is weight, 'L' is length and 'a' and 'b' are constants. The LWR was established for both males and females by linear regression of the natural logarithms of the length and weight data. Regression analysis and Analysis of Covariance (ANCOVA) were carried out as per standard statistical procedures (Snedecor and Cochran, 1967). Variations from the general LWR is an indication of general well-being or overall condition of the fish. This is expressed as "ponderal index" or "condition factor" (K) which was derived by the formula:  $K = 100 \cdot W/L^3$ . The 'K'

values for different length groups and for various months were calculated after obtaining the mean lengths and mean weights for the corresponding length groups and months respectively.

Regression equation for LWR was estimated separately for males and females as follows:

Male :  $\text{Log } W = -1.4879 + 2.6801 \text{ Log } L$  ( $R^2 = 0.81$ ) (N= 1,718)

Female :  $\text{Log } W = -1.3327 + 2.5651 \text{ Log } L$  ( $R^2 = 0.78$ ) (N= 1,688)

The regression line as well as curvilinear graph for both males and females of *J. carutta* exhibited a close relationship. No significant difference was exhibited between males and females in regression coefficient or slope ( $\alpha = 0.05$ ). Hence, a common regression equation was calculated (Fig. 1) for both the sexes as :

$\text{Log } W = -1.4378 + 2.6448 \text{ Log } L$  ( $R^2 = 0.80$ )

The present 'b' value (2.6448) for pooled data is similar to the value obtained by Vivekanandan (1985) (Table 1).

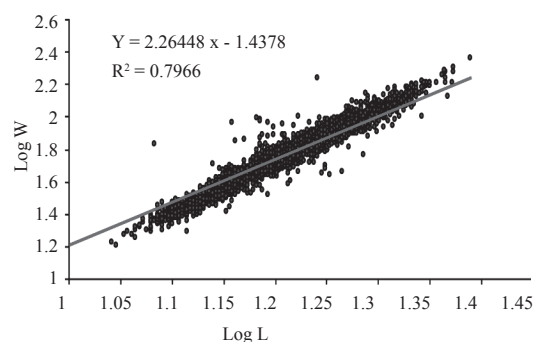


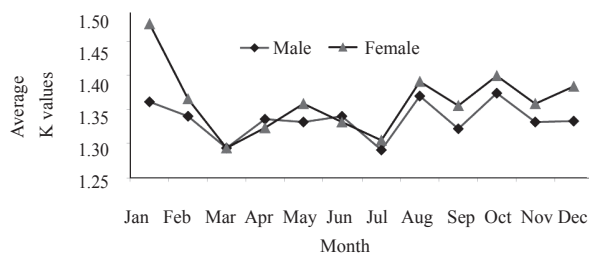
Fig. 1. Length - weight relationship of *J. carutta* (sexes pooled)

Table 1. Comparison of estimated length-weight relationship of *Johnius carutta* by different authors

Place	sex	Equation	R <sup>2</sup>	No. of samples	Length (cm)	Weight (g)	Author
Kakinada	Male	$\log W = -5.41602 + 3.22584 \log L$	0.99	163	8.6-20.0	5.0-94.0	Murty (1979)
	Female	$\log W = -5.46190 + 3.24570 \log L$	0.99	191	8.4-21.6	6.0-59.0	
	Pooled	$\log W = -5.43389 + 3.23343 \log L$	0.99	354	8.4-21.6	5.0-94.0	
Andhra Pradesh and Odisha	Male	$W = 0.008630 L^{3.1575}$	-	-	-	-	Rao (1982)
	Female	$W = 0.006017 L^{3.3030}$	-	-	-	-	
	Pooled	$W = 0.006135 L^{3.2821}$	-	222	4.0-22.0	-	
Madras	Male	$\log W = -4.2969 + 2.7501 \log L$	-	213	10.8-21.8	-	Vivekanandan (1985)
	Female	$\log W = -4.5278 + 2.8559 \log L$	-	253	10.9-21.0	-	
	Pooled	$\log W = -4.4063 + 2.7990 \log L$	-	466	10.8-21.8	-	
Visakhapatnam	Male	$\log W = -4.97749 + 3.04798 \log L$	0.94	307	-	-	Rajkumar <i>et al.</i> (2004)
	Female	$\log W = -4.85011 + 2.912804 \log L$	0.96	307	-	-	
	Pooled	$\log W = \log -4.9304 + 3.027867 \log L$	0.95	614	-	-	
Visakhapatnam	Male	$\text{Log } W = -1.4879 + 2.6801 \text{ Log } L$	0.81	1718	11.0-23.6	16.1-200.7	Present study
	Female	$\text{Log } W = -1.3327 + 2.5651 \text{ Log } L$	0.78	1688	11.6-24.5	20.0-230.0	
	Pooled	$\text{Log } W = -1.4378 + 2.6448 \text{ Log } L$	0.8	3406	11.0-24.5	16.1-230.0	

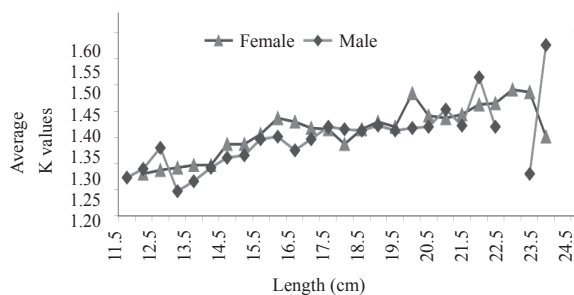
The 'K' values of males and females in different months showed similar trend (Fig. 2). In males and females, highest and lowest 'K' values were recorded during the month of October (1.374) and July (1.29014540) and January (1.4744) and March (1.294) respectively. Males and females showed 'K' values above 1 in all the months of two-year study period from January 2008 to December 2009.

The 'K' values observed in different size groups showed a parallel trend between males and females; with the values increasing with increase in size of fish except in one or two length groups (Fig. 3). The highest (1.527) and lowest (1.247) 'K'

Fig. 2. Condition factor (K) of *J. carutta* (male and female) in different months

values were observed in males in the size groups of 23.5-23.9 cm and 12.5-12.9 cm respectively. In females, highest (1.564) and lowest (1.2813) 'K' values were observed in the length groups of 24.5-24.9 cm and 11.5-11.9 cm respectively (Fig.3).

The results of the present study are valuable inputs in setting up yield equations, in assessing the number of fish landed and also in comparing populations over space and time. The knowledge gained from this study will be helpful in studying the population dynamics and also in fishing gear selectivity of the species.

Fig. 3. Condition factor (K) of *J. carutta* (male and female) in different size groups

## Acknowledgements

This paper formed part of the Ph. D. thesis submitted by the first author to the Andhra University, Visakhapatnam. Authors are grateful to Dr T. K. Srinivasa Gopal, Director, Central Institute of Fisheries Technology, Cochin for according permission to publish this paper.

## References

- Chakraborty, S. K. 1987. Population dynamics of *Otolithes cuvieri* (Trewavas) off Bombay waters. *CMFRI Bulletin : National Symposium on Research and Development in Marine Fisheries : Sessions I & II*, 44 (1): 238-244.
- Chakraborty, S. K. 1988. *A study on the sciaenids of Bombay waters*. Ph. D. Thesis. Bombay University, India, 159 pp.
- Chakraborty, S. K., Devadoss, P., Manojkumar, P. P., Feroz Khan, M., Jayakumar, P., Sivakami, S., Gandhi, V., Appanna Sastry, Y., Raju, A., Livingston, P., Ameer Hamsa, K. M. S., Badruddin, M., Ramalingam, P., Dharieswar, V.M., Seshagiri Rao, C. V., Nandakumaran, K., Chavan, B. B. and Seetha, P. K. 2000. The fishery, biology and stock assessment of jew fish resources of India. In: Pillai, V. N. and Menon, N. G. (Eds.), *Marine fisheries research and management*, Central Marine Fisheries Research Institute, Kochi, p. 604-616.
- Ghosh, Shubhadeep, Mohanraj, G., Asokan, P. K. and Dhokia, H. K. 2009. Trophodynamics and reproductive biology of *Otolithoides biauritus* (Cantor) landed by trawlers at Vanakbara, Diu along the west coast of India. *Indian J. Fish.*, 56(4): 261-265.
- Ghosh, Shubhadeep, Mohanraj, G., Asokan, P. K., Dhokia, H. K., Zala, M. S., Bhint, H. M. and Suker Anjani 2010. Fishery and population dynamics of *Protonibea diacanthus* (Lacepede) and *Otolithoides biauritus* (Cantor) landed by trawlers at Vanakbara, Diu along the West Coast of India. *Indian J. Fish.*, 52(2): 15-20.
- Jayasankar, P. 1989. Some observations on the biology of the blotched croaker *Nibea maculata* (Schneider, 1801) from Mandapam. *Indian J. Fish.*, 36 (4): 299-305.
- Le Cren, E. D. 1951. The length-weight relationship and seasonal cycle in gonad weight and condition in the perch (*Perca fluviatilis*). *J. Anim. Ecol.*, 20: 201-219.
- Manojkumar, P. P. 2007. Fishery of sciaenids off Veraval with special reference to growth, mortality and stock assessment of *Otolithes cuvieri* (Trewavas, 1974). *Indian J. Fish.*, 54(1): 21-26.
- Murty, V. Sriramachandra 1979. Observations on some aspects of biology of the croakers *Johnius (Johnieops) dussumieri* (Cuvier) and *Johnius (Johnius) carutta* Bloch from Kakinada. *J. Mar. Biol. Ass. India*, 21(1&2): 77-85.
- Murty, V. Sriramachandra 1980. Observations on some aspects of biology of the black croaker *Atrobuca nibe* (Jordan and Thompson) from Kakinada. *Indian J. Fish.*, 27 (1&2): 66-75.
- Murty, V. Sriramachandra and Ramalingam, P. 1986. Observations on some aspects of biology of *Johnius (Johnieops) vogleri* (Bleeker) and *Pennahia macrophthalmus* (Bleeker) in the Kakinada region. *J. Mar. Biol. Ass. India*, 28(1&2): 57-62.
- Murty, V. Sriramachandra and Ramalingam, P. 1996. Characteristics of the exploited stock of *Nibea maculata* (Schneider) (Sciaenidae) as revealed by trawl landings at Kakinada. *J. Mar. Biol. Ass. India*, 38(1&2): 40-49.
- Muthiah, C. 1982. Study on the biology of *Johnieops vogleri* (Bleeker) of Bombay waters. *Indian J. Fish.*, 29(1&2): 118-133.
- Rajkumar, U., Narayana Rao, K., and Jose Kingsly, H. 2004. Sciaenid fishery off Visakhapatnam with some aspects of population dynamics of *Johnius carutta* (Bloch). *Indian J. Fish.*, 51(3): 311-318.
- Rao, Subba. K. V. 1963. Some aspects of biology of 'Ghol', *Pseudosciaena diacanthus* (Lacepede). *Indian J. Fish.*, 10A(2): 413-459.
- Rao, Appa, T. 1982. Length-weight relationship in *Pennahia macrophthalmus* (Bleeker) and *Johnius carutta* (Bloch). *Indian J. Fish.*, 29(1&2): 263-266.
- Snedecor, G. W. and Cochran, W. G. 1967. *Statistical methods*, 6<sup>th</sup> edn. Ames: The Iowa State Univ. Press, 593 pp.
- Telvekar, P. A., Chakraborty, S. K. and Jaiswar, A. K. 2006a. Some aspects of the biology of *Johnius macrorhynchus* (Mohan, 1976) from Mumbai waters. *J. Mar. Biol. Ass. India*, 48(1): 124-127.
- Telvekar, P. A., Chakraborty, S. K. and Jaiswar, A. K. 2006b. Length-weight relationship and food and feeding habits of *Otolithes cuvieri* (Trewavas, 1974) from Mumbai. *Indian J. Fish.*, 53(4): 131-134.
- Vivekanandan, E. 1985. The sciaenid fishery and some biological aspects of *Johnius carutta* from Madras. *J. Mar. Biol. Ass. India*, 27(1&2): 9-14.