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Certain Biological Aspects of *Carangoides ferdau* (Forsskal, 1775) and *Scomberoides lysan* (Forsskal, 1775) Caught from Drift Gillnets off Kanyakumari Coast

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Carangid species of *Carangoides ferdau* and *Scomberoides lysan* caught using large mesh drift gillnets with mesh sizes of 135, 140, 145 and 150 mm from Kanyakumari coast of Tamil nadu, India were studied for two years from September 2002 to April 2004. Biological aspects such as fork length-weight, girth-weight, fork length-gill girth and fork length-maximum girth ratio of these two species were studied. In addition, condition factor and length at first maturity also were studied. Both the species exhibited negative allometric growth and 'b' value of the length-weight and girth-weight relationship differed significantly ($P<0.01$). Estimated mean condition factors for *C. ferdau* were 1.826 and 4.021 based on length and maximum girth respectively. In the case of *S. lysan* mean condition factors estimated were 0.873 and 6.359 based on fork length and maximum girth respectively. Relationship of fork length-gill girth and fork length-maximum girth differed significantly from '1'. Coefficient of determination for length-girth relationships for both the species were high. *C. ferdau* and *S. lysan* attained length at first maturity at the fork length of 48.6 cm and 53.4 cm respectively.

Key words: Carangids, *Carangoides ferdau*, *Scomberoides lysan*, Gill net, Length at first maturity

Studies on carangid fishes and their biology are restricted to few species (Sreenivasan, 1981a). Study on biological aspects like length-weight, girth-weight and length-girth relationship, condition factor and length at first maturity in a particular geographical area is important to understand and correlate with other factors. Length-weight relationship is important to estimate the weight at age from total reported catch weight and length frequency distribution, to work out length-weight relation as a practical index of the condition of fish and for life history comparison between regions. Length-girth relationships are used to derive method for rapid estimation of selection factor (Pet *et al.*, 1995). In Indian waters, biological aspects of some of the carangids have been studied by Sreenivasan (1981a and b), Venkatramani & Natarajan (1984), Murty (1991) and Reuben *et al.* (1992). The study by Venkatramani & Natarajan (1984) was in *Carangoides malabaricus*, Reuben *et al.* (1992) in *Decapterus dayi*, *Alepes kalla* and *Atule mate*, Sivakami (1995) in *Megalapsis cordyla*, Kasim & Hamse (1994) and Venkataramani *et al.*

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(1995) in *Caranx carangus* and *Caranx leptolepis*.

Materials and Methods

Bi-weekly samples were collected from Kanyakumari coast from September 2002 to April 2004 using large mesh drift gillnets (*Vazhi vala*) having mesh sizes of 135, 140, 145 and 150 mm for species of *Carangoides ferdau* and *Scomberoides lysan*. The fork length, gill girth, maximum girth, weight of individual fish and maturity stages of fishes were recorded. Fork length was measured from the tip of the snout to vertical through fork of the caudal fin to the nearest mm and weight was recorded to the nearest gram. Data on gill girth and maximum girth *i.e.*, just before the first dorsal fin was recorded to the nearest mm. The length–weight and girth-weight relationship were determined by fitting log-transformed form of allometric equation given by LeCren (1951) and Hayes *et al*. (1995) respectively. The exponential form of above relationships are $W = aL^b$ and $W = aJ^b$, where W is weight in gram, L is length in cm, J is girth in cm, 'a' and 'b' are parameters.

Condition factor (CF) was also estimated using the following formula $CF = 100W/L^3$ given by LeCren (1951). Relationship between fork length and gill girth and fork length and maximum girth were determined by simple linear regression method. Correlation coefficient, coefficient of determination and standard error were estimated for length-weight, girth-weight and length-girth relations and 95% confidence intervals for the slope of concerned relations were also worked out.

Gonads of both *C. ferdau* and *S. lysan* were collected and their maturity stages were determined by a seven-scale point method given by Venkataramanujam & Ramanathan (1994). The classified stages were immature, maturing virgins, maturing, mature, gravid, ripe and spent. After examining, the gonads that contained the eggs of stage 4 to 7 were considered as mature. Taking the fork length expressed in cm in 'X' axis and percentage of mature specimens in "Y" axis, a graph was drawn. Length at which 50 % of the animals found mature was taken as length at first maturity (Lm).

Results and Discussion

The results of length-weight and girth-weight relationship for *C. ferdau* and *S. lysan* are given in Table 1. The above relationships for both the species were non-linear and their exponent 'b' was negatively allometric. The 'b' value for *C. ferdau* differed from three at 95% Confidence Interval and the 'b' value ranged from 2.687 to 2.882 with SE_b 0.0488 for length-weight relationship and 3.012 to 3.31 with SE_b 0.075 for girth-weight relationship. Similarly, 'b' value for *S. lysan* differed from three at 95% Confidence Interval and it ranged from 2.692 to 2.938 with SE_b 0.0626 for length-weight and 2.403 to 2.7 with SE_b 0.077 for girth-weight relationship respectively. The determination of coefficient was high in above relationships for both the species (Fig. 1.).

In the present study, the calculated slope values obtained from length-weight relationship for the speices *C. ferdau* and *S. lysan* and girth-weight relationship for *S. lysan* were significantly lower than '3'. This indicates the negative allometric growth. However, the slope value obtained from girth-weight relationship for the speices *C. ferdau* shows positive allometric growth and it could be explained that the weight of the fish increases as they grew in terms of girth. In the case of negative allometric growth, weight of fish did not increase with the length. Similarly, it has been reported that

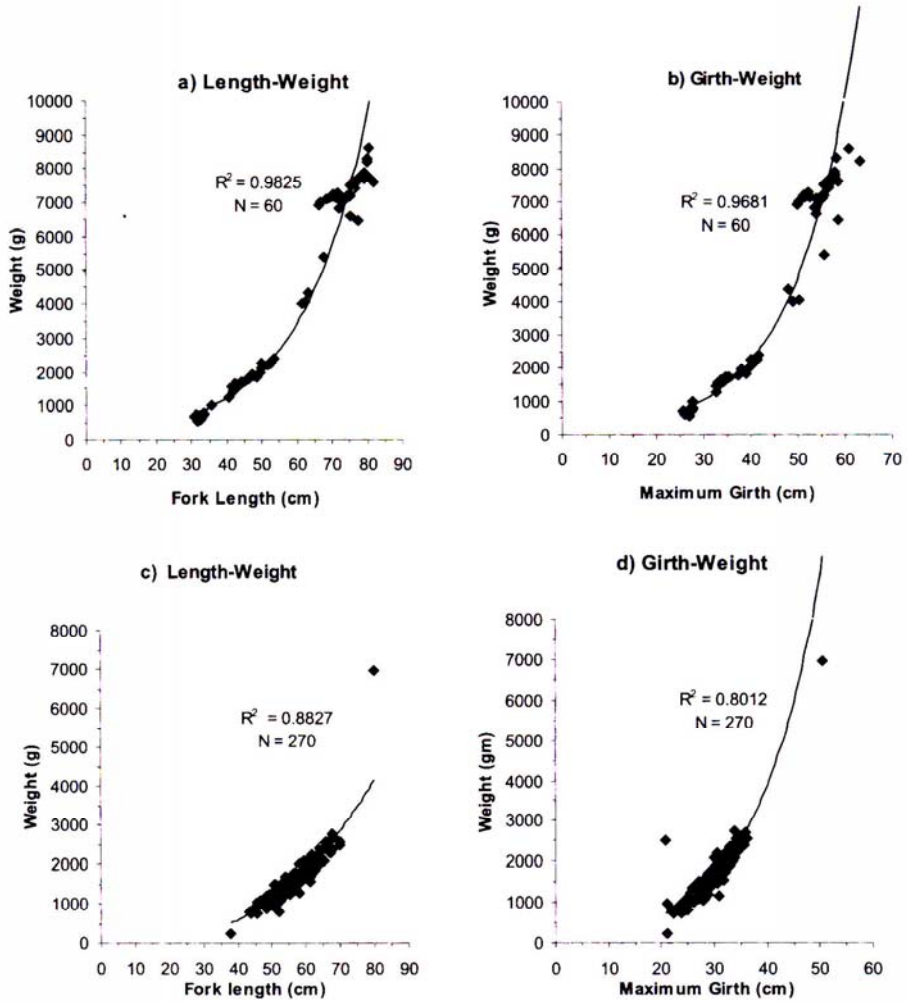

Fig. 1. Length-weight and Girth-weight relationonships of *Carangoides ferdau* (a & b) and *Scomberoides lysan* (c &d)

C. ferdau had a negative allometric growth in Philippines waters (Schroeder, 1982) and Gulf of Aden water of Yemen (Edwards *et al.*, 1985). In *S. lysan*, negative allometric growth was found by Letourneur *et al.* (1998) in New Caledonia water and Harrison (2001) in South African waters (Table 1).

The condition factor based on fork length and maximum girth for *C. ferdau* ranged from 1.386 to 2.469 and 2.794 to 5.5 respectively. In *S. lysan* the calculated condition factor based on fork length and maximum girth ranged from 0.4556 to 1.151 and 2.778 to 8.34 respectively. The length and girth based mean values of CF for *C. ferdau* were 1.826 and 4.021 respectively whereas in *S. lysan*, the mean values were 0.873 and 6.359 respectively. The determined CF-fork length and CF-maximum girth relationships for *C. ferdau* were CF= -0.0074FL + 2.2731 (r^2 = 0.244) and CF= 0.013Gmax + 3.2349 (r^2 = 0.1086) respectively. In the case of *S. lysan* the estimated CF-fork length and CF-maximum girth relationships were CF= -0.0031FL + 1.05 (r^2 = 0.0383) and CF = -0.0112Gmax + 6.6497 (r^2 = 0.0017) respectively. Poor and negative correlation between CF versus fork length and CF versus maximum girth existed in both the species. However, *C. ferdau* showed positive allometric growth while calculating the relationship between condition factor and maximum girth.

Table 1. Length-weight and Girth-weight regression parameters for *Carangoides ferdau*and *Scomberoides lysan* estimated by various Researchers

Species	Length range (cm)	Mean Weight (kg)	Length-Weight relationship	Area	Reference	Maximum girth range (cm)	Maximum Girth - Weight relatioship a	b
Carangoides ferdau	30.8 - 81.8	4.74 ± 2.9	$W = 0.0434FL^{2.784}$	Kanyakumari Tamil Nadu, India	Present study	25.5 - 63.3	0.0213	3.163
	10.8 - 36		$W = 0.0414SL^{2.85}$	Philippines Honda Bay, Palawar	Schroeder (1982)			
	ND		$W = 0.13SL^{2.46}$	Gulf of Aden, Yemen	Edwards *et al.* (1985)			
	24.5 - 60.5		$W = 0.4516FL^{2.792}$	New Caledonia	Letourneur *et al.* (1998)			
Scomberoides lysan	38 - 70	1.6 ± 0.55	$W = 0.0183FL^{2.815}$	Kanyakumari Tamil Nadu, India	Present study	20.8 - 36.2	0.282	2.554
	11.5 - 55.5		$W = 0.0117FL^{2.896}$	New Caledonia	Letourneur *et al.* (1998)			
	22 - 32.2		$W = 0.579SL^{2.685}$	S. Africa	Harrison (2001)			

In the present study, mean value of condition factor based on length and girth for both the species *C. ferdau* and *S. lysan* was very less. It might be due to thin sample of population and the sample studied contained advanced stages of matured fishes as reported by Lokkeborg *et al.* (1995) and Huse *et al.* (2000). They also opined that the sample size may be increased and various size groups of samples to be collected for further analysis of this result. Condition factor of both the species studied increased with length of fishes as reported by Anderson & Gutreuter (1983).

The linear regression equation gave a good fit for the fork length-gill girth and fork length-maximum girth data of *C. ferdau* and *S. lysan*. The coefficient of determinations were high in both the relationships for the above two species. The length-gill girth and length-maximum girth relationships significantly ($P<0.01$) differed from '1'. The mean fork length, gill girth and maximum girth are given in Table 2. Slope value for the relationship of fork length-gill girth and fork length-maximum girth were 0.645 and 0.661 respectively for *C. ferdau* and respective values for *S. lysan* were 0.398 and 0.442. The test for linearity showed a statistically significant deviation and coefficient of determination was very high for both the relation in both the species. *C. ferdau* had relatively larger mean girth with increasing length than *S. lysan*. Linear fit of length-girth relationship of both the species revealed close fit (Fig. 2).

Length-girth relationship revealed that maximum girth increased faster with length than did gill girth in both *C. ferdau* and *S. lysan* as observed by Ehrhardt and Die (1988) in Spanish mackerel and Santos *et al.* (1995) in axillary sea bream and common Pandora of Algarva Coast of South Portugal.

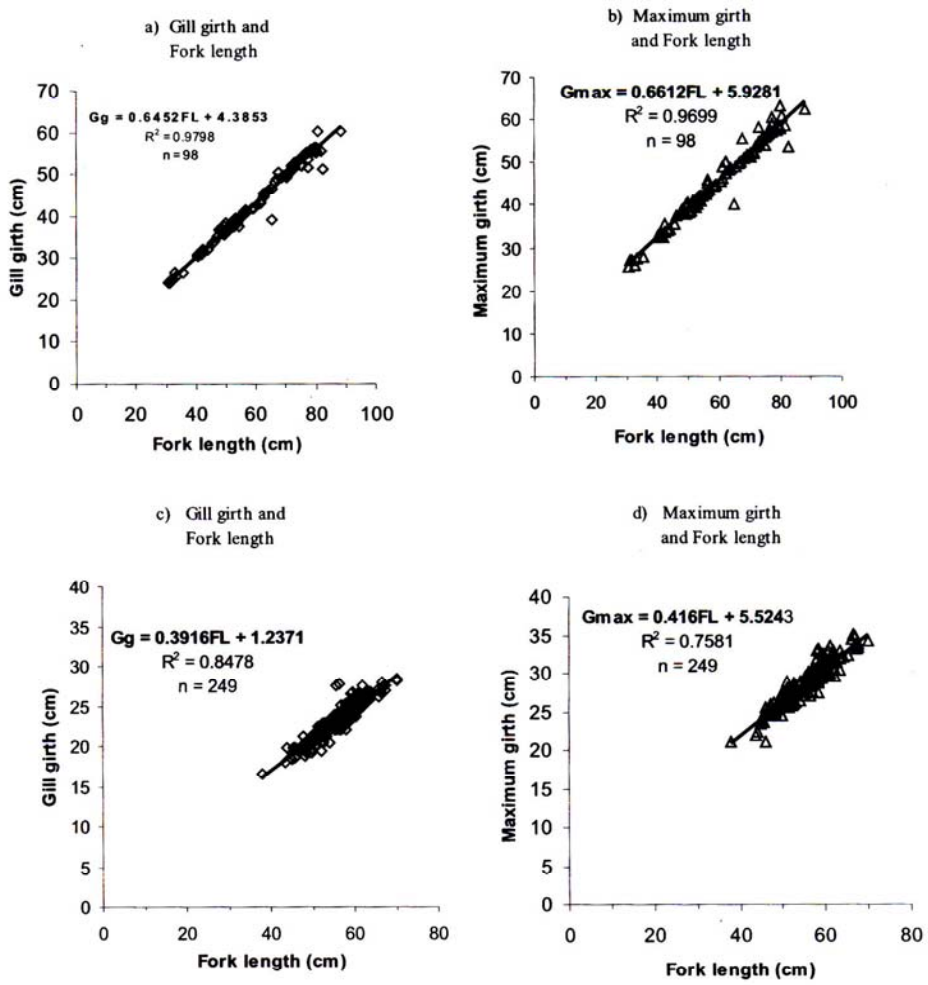

Fig. 2. Length-Girth relationship of *Carangoides ferdau* (a &b) *Scomberoides lysan* (c&d)

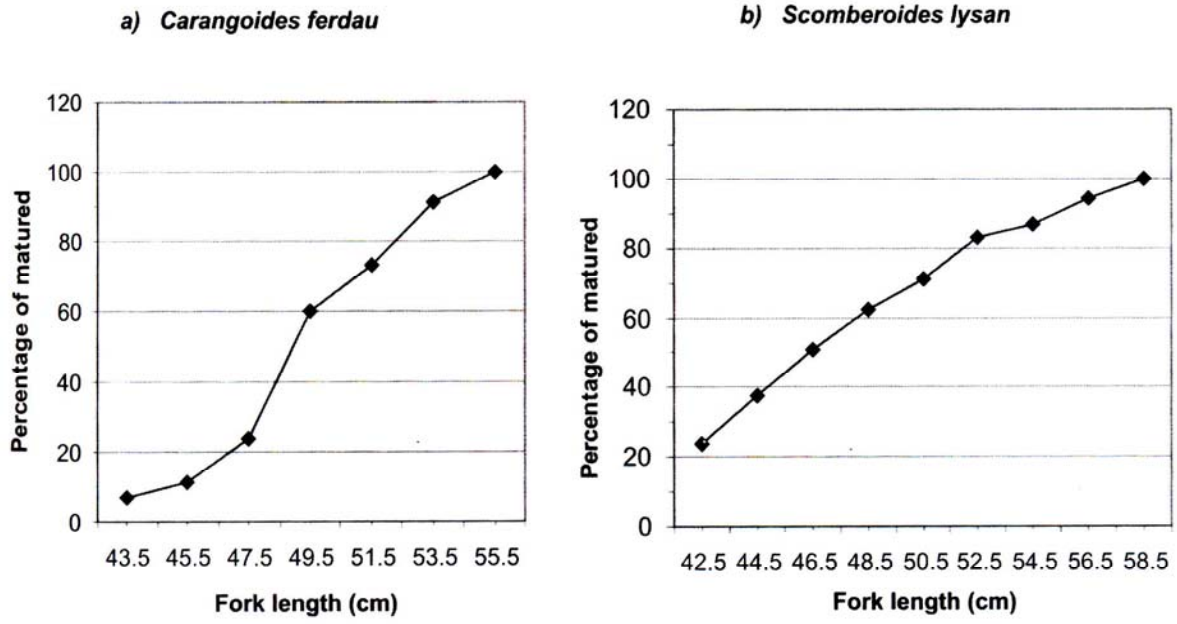

Fig. 3. Maturity ogives of carangid species

Fork length-gill girth and fork length-maximum girth relationship significantly differed from one and had high correlation as reported by Ehrhardt & Die (1988). It indicated a clear allometric growth in both the species studied. Length-girth relationships can be used to estimate mean girths per length class and mean coefficient of variation that is used to estimate standard deviation in the girth. These estimated mean and SD can be used as input data for estimating gill net selectivity using extended Sechin's model (Ehrhardt & Die, 1988 and Pet *et al.*, 1995). Variation in the maximum girths among the fish of the same length and species was also found. It might be due to different conditions of fish like sex, stage of maturity, amount of food and habitat as reported by many researchers (McCombie & Berst, 1969; Hamley, 1975, Van Densen, 1987 and Winter & Wheeler, 1990).

Fifteen numbers of females of *C. ferdau in* the length range of 40-56 cm were observed for finding length at first maturity. In the case of *S. lysan,* there were 79 specimens in the length group of 50 to 61.5 cm, of which cent percent maturity was observed at the fork length size of 55.5 cm in *C. ferdau* and at 61.5 cm in *S. lysan*. Both the species started spawning during July to November. *C. ferdau* and *S. lysan* attained length at first maturity (Lm) at the fork length of 48.6 cm and 53.4 cm respectively (Fig. 3). It was observed that males and females matured almost in same length size though a detailed study was not carried out to examine the maturity stages of males in both the species. Venkataramani & Natarajan (1984) reported that both males and females of *Carangoides malabaricus* and *Alepes kalla* in Portonova coast of Tamil nadu attained sexual maturity at the same length.

It is important to allow every fish to spawn atleast once in its life to sustain the resources. Knowledge on length at first maturity of each species is important in optimizing the mesh size in gill net (Kalawar *et al.*, 1985, Alagaraja *et al.*, 1986, Saly, 2001). This will help in setting the legal size of fish to be captured which aids in conserving the fishery resources.

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