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MORPHOMETRY AND LENGTH-WEIGHT RELATIONSHIP OF *COILIA DUSSUMIERI,* VALENCIENNES, 1848 FROM MUMBAI WATERS

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ABSTRACT

***Coilia dussumieri* Valenciennes, 1848 a component of 'dol' net fishery forms an important pelagic resource along northwest coast of India. The present communication deals with morphometry and length - weight relationship of this species along Mumbai coast. Morphometric study showed a positive correlation among the compared characters. The length-weight relationship for the species from Mumbai coast was found to be $W=0.017L^{2.423}$**

Keywords : Morphometry, length-weight relation, *Coilia dussumieri*

INTRODUCTION

Locally known as 'Mandeli' in Maharashtra and Gujarat, *Coilia dussumieri* is an important component of 'dol' net fishery. It is found in association with *Harpodon nehereus* and non-penaeid prawns. It is an important pelagic resource of these two states on the west coast and Orissa and West Bengal on the east coast of India. The species is landed in equal quantities by trawlers and 'dol' netters. Though the length-weight relationship was studied by Fernandez (1986), Kapadne (1986) and Isaac (1989) from Mumbai coast, so far no attempt has been made to study the morphometry of this species.

Identifying discrete unit stocks is a basic requirement for the fisheries science and management (Cushing, 1968). Morphometric study is a powerful tool for characterizing strains / stocks of the same species, which involves detection of subtle variation of shape, independent of size. The complete set of measurements used to describe a form is a morphometric character set (Strauss and Bond, 1990). The studies of morphological and meristic characters of a fish give substantial information with regard to exact identification key of the species and such data can be used to compare the same species of different geographical locations.

A mathematical representation of length-weight relationship derived from the study of different sexes and sizes from a particular area is a very useful tool for the study of biology, ecology, population dynamics, fisheries assessment, and general conditions of the studied population (Ricker, 1968). In general, the change in weight of fish can be described by the relationship $W = a L^{b}$, where L is the observed length, W observed weight of the fish and 'a' and 'b' are constants.

Condition factor represents the health of a fish during a certain period of time (Khanna and Singh, 2003). It is the ratio of the weight to the cube of the length of the fish. The cube of the length is taken because the growth in weight is proportional to the growth in volume (Nikolsky, 1963). By using Fulton's condition factor it is possible to define the seasonal changes in the conditions of fishes in relation to the age and sex of fish, and differences between the same species in different waters, which might also serve as an index of productivity of the water mass.

MATERIALS AND METHODS

For the morphometric study the samples were collected from Sassoon Docks, New Ferry Wharf and Versova landing centers weekly from September 2003 to April 2004. A total of 50 fishes were examined. Various morphometric characters were measured to the nearest mm using fish measuring board. Relationship among the various morphometric parameters were worked out using standard linear regression analysis technique. For the study of length-weight relationship 395 fishes comprising of 227 males and 168 females were measured. Total length was measured to the nearest of mm and weight nearest to gm for all the fishes individually. Method of Le Cren (1951) was used for the analysis. The curvilinear relation was transformed into linear one by taking ten based logarithms. Intercept (a) and slope or regression co-efficient (b) were calculated using the standard regression analysis.

$$Y = a + b X,$$

ANCOVA was conducted to test the significance of difference in 'b' values in male and female.

Condition factor was calculated using the formula

$$K = \frac{W \times 100}{L^3}$$

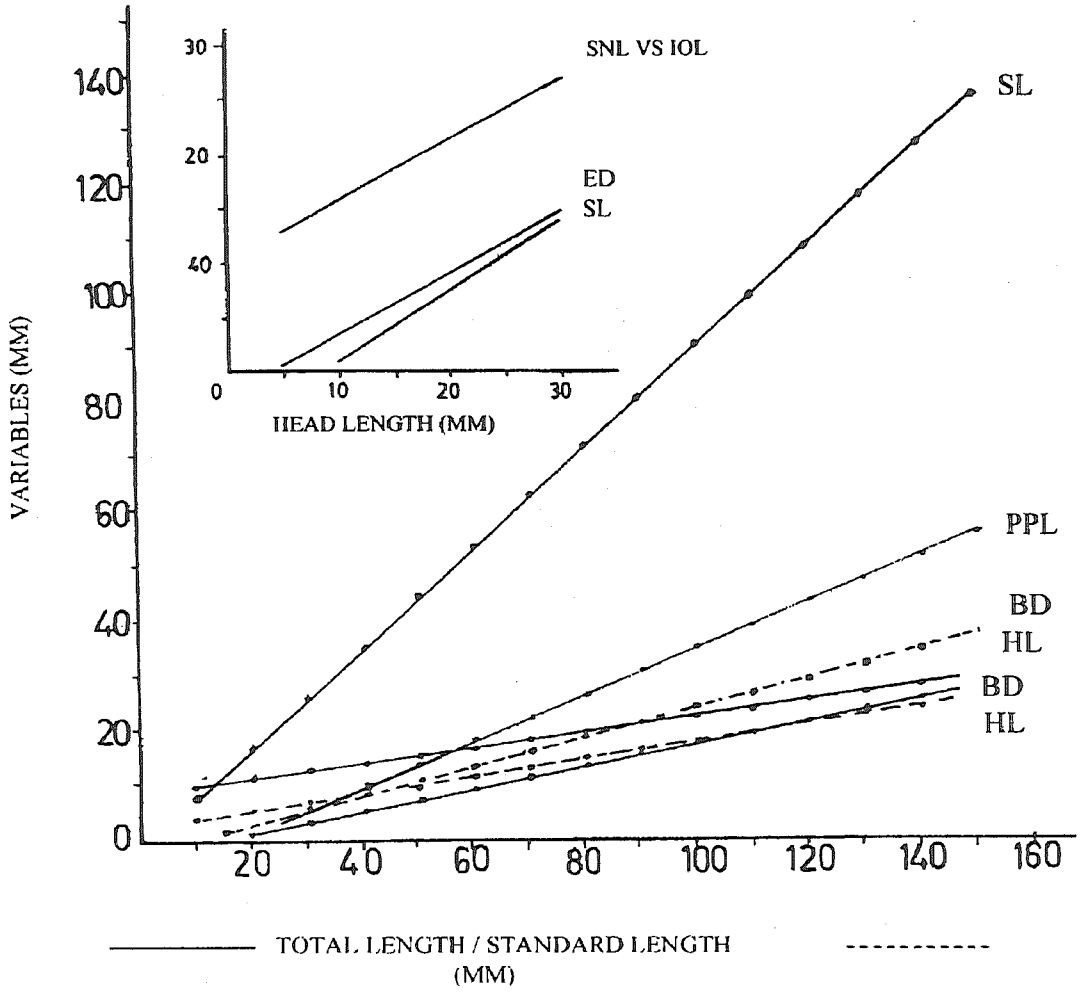
RESULTS

The study of morphometric characteristics of *C. dussumieri* revealed positive correlation with high values of correlation co-efficient (r) between the compared characteristics (Table 1). Total Length and Standard Length had the highest value of r (0.984). Body depth also

Table 1 : Statistical estimates for morphometric characters in *C. dussumieri*

X	Y	intercept	slope	r
TL	SL	-0.852989106	0.915253342	0.98433558
TL	BD	-4.710625585	0.205812234	0.947612817
SL	BD	-3.131195679	0.213310238	0.91320773
TL	HL	0.813576968	0.157143073	0.917526681
SL	HL	2.092865371	0.162256972	0.880896672
HL	ED	0.329861111	0.170138889	0.607957292
HL	PPL	4.247685185	0.752314815	0.596259015
HL	SNL	0.549382716	0.228395062	0.60670006
SNL	IOL	3.676950998	0.663339383	0.639417083

TL - total length, SL - standard length, BD - body depth, HL - head length, ED - eye diameter, PPL - pre-pectoral length, SNL - snout length, IOL - inter orbital length PFL - pectoral fin length



(TL - Total length, SL - standard length, BD - body depth, PPL - pre-pectoral length, HL - head length, ED - eye diameter, SNL - snout length, IOL - Inter orbital length)

Fig. 1 :Relationship of various morphometric measurements compared with total length and standard length.

seems to be highly correlated with total length (r=0.94). Value of regression co-efficient (b) shows that growth Standard Length (0.91) and Body Depth (0.94) in relation to Total Length are much faster than other compared characters. The regression of various morphometric characters compared is depicted in Fig.1. Co-efficient of regression 'b' (2.423) suggestes that *C. dussumieri* does not follow isometric pattern of growth. When observed values of weight were plotted against the length a curvilinear relationship was obtained (Fig.2).

Length-weight relationship for *C. dussumieri* can be represented as follows.

Log W= -2.17 + 2.692 Log L
r=0.884 (males)

Log W = -2.069 + 2.598 Log L
r=0.847 (females)

Log W = -1.78 + 2.423 Log L
r = 0.752 (combined)

The curvilinear function will be as follows

Males : $W = 0.00676L^{2.692}$
Females : $W = 0.00853L^{2.598}$
Combined : $W = 0.0165L^{2.423}$

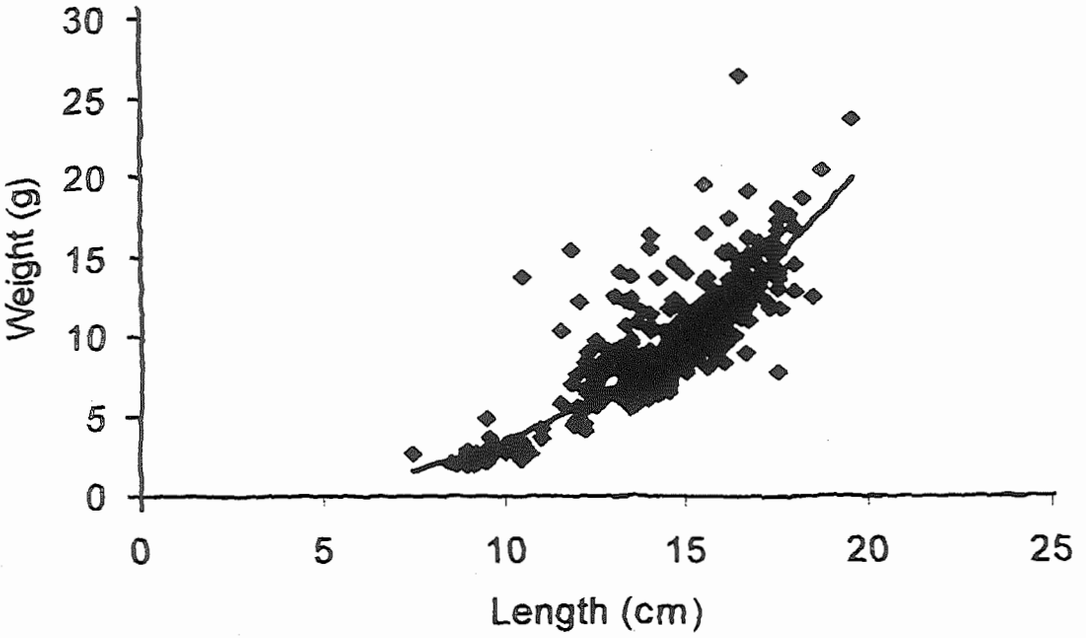


Fig. 2 : *Length-weight relationship in C.dussumieri*

Analysis of covariance (ANCOVA) revealed that the differences in 'b' values of males and females were not significant at 1 and 5% levels. Thus a common formula was arrived at after pooling the data of males and females together.

Condition factor varied from the lowest of 0.2789 in April to a maximum of 0.3277 in November. It showed an increasing trend from September to November. From December to January an decreasing trend and from February to April an increasing trend but the rates of increase or decrease were not the same through out the period of study (Fig.3).

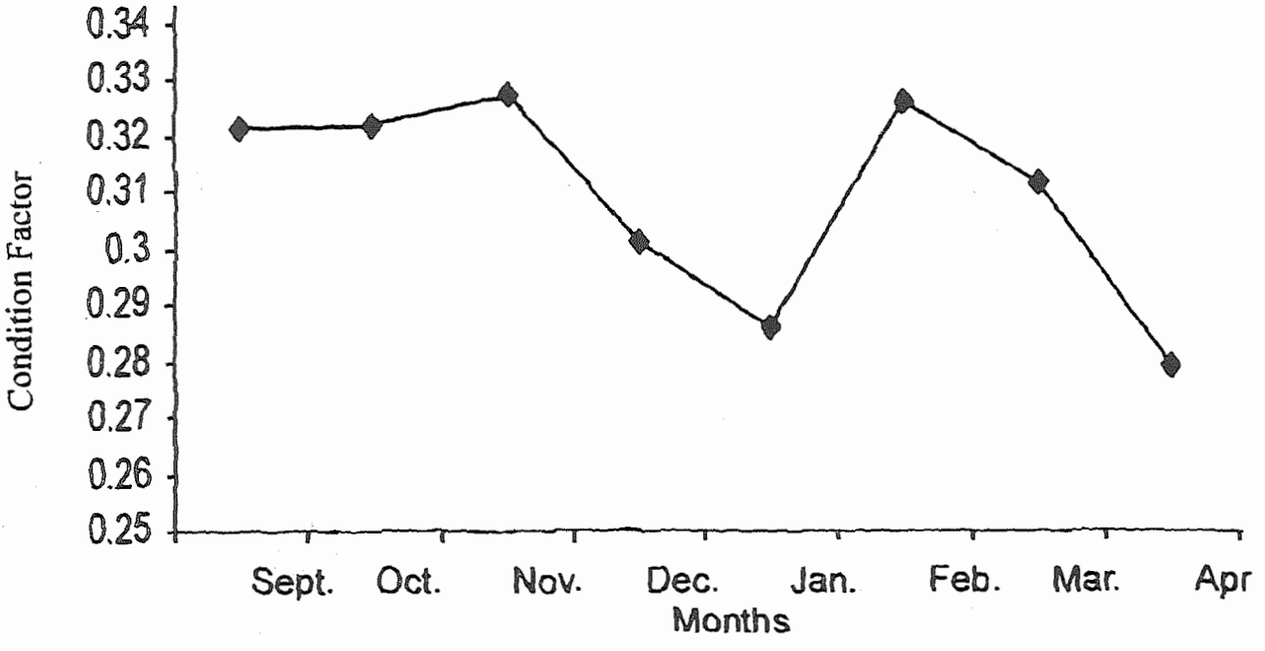


Fig. 3 : Monthly condition factor in C. dussumieri from Sept 2003 to April 2004

Table 2 : 'a' and 'b' values of length weight relationship for some other Engraulids

Species	Authors	a	b
Lysengraulis grossidens	Benedito *et. al.* (1997)	0.0388	2.62
Anchoa filifera	Muto (2000)	0.000002726	3.192
Anchoa lyoleps	Muto (2000)	0.000003565	3.101
Anchoviella lepidentostole	Muto (2000)	0.000001508	3.382
Engraulis enchrasicholus	Morey *et al.* (2003)	0.0048	3.0706

DISCUSSION

Fernandez (1986) reported the value of regression co-efficient 'b' (2.0231) indicating allometric growth, from Mumbai. Nearly isometric growth has been observed in *C. dussumieri* by Isaac (1989). Length-weight studies on other members of family *Engraulidae* by different authors like Benedito *et al.* (1997), Muto (2000) and Morey *et al.* (2003) indicated an isometric growth pattern except *Lysengraulis grossidens* (Table 2).

Fish grow very rapidly in terms of length before attaining maturity. Thereafter energy is rapidly diverted for the growth of gonadal tissues instead of somatic tissues. As a consequence, growth rates of mature fish are much slower than those of immature. This reflected in their higher condition factor towards the breeding season. Though the value of condition factor is highly dependant on the external factors around the fish, higher K values show that plenty of food is available to support both the somatic and gonadal development of fish resulting in better condition of this species. Thus the fluctuations recorded in the condition factor during the present investigation also may be associated with the fluctuations in food items in the surrounding environment of the species.

REFERENCES

Benedito-Cecillo, E.S., Agostinho, A.A., and Carnelos-Machado Velho, R.C., 1997. Length-weight relationship of fishes in the Itaipu Reservoir, Parana, Brazil. *Naga. The ICLARM quarterly,* **22**(1): 57-61.

Cushing, D.H., 1968. *Fisheries Biology: A study of population dynamics.* Univ. Wisconsin Press, Madison, Wisconsin., 200 pp.

Fernandez, I., 1986. *Stock assessment, dynamics and biology of the Coilia dussumieri (Cuv. & Val.) resource in the Indian Exclusive Economic Zone along the North West Coast of India.* M.Sc. Thesis submitted to Bombay University, 461 pp.

Isaac, A.V.A., 1989. *'Dol' net fishery of Versova with focus on the dynamics of the Bombay duck and Grenadier anchovy fisheries.* M.Sc. Thesis submitted to University of Bombay, 99 pp.

Kapadne, S., 1986. *Stock Assessment, dynamics and biology of Coilia dussumieri (Cuv. & Val.) along Bombay Coast with special reference to Versova Coast.* M.Sc. dissertation submitted to the Bombay University, 122 pp.

Khanna, S.S. and Singh, H.R., 2003. *A text book of fish biology and fisheries* Narendra publishing House, Delhi, 524 pp.

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.

Morey, G., Moranta, J., Massuti, E., Grau, A., Linde, M., Riera, F, and Morales-Nin, B., 2003. Weight-length relationships of littoral to lower slope fishes from the western Mediterranean. *Fisheries Research,* **62:** 89-96.

Muto, E. Y., Soares, L.S.H. and Wongtschowski, C.L.D.B.R., 2000. Length-weight relationship of Marine fish species off Sao Sebastiao System, Sao Paulo, Southeastern Brazil. *Naga. The ICLARM Quarterly,* **23**(4): 27-29.

Nikolsky, G.V., 1963. *The Ecology of Fishes,* Academic Press London, 352 pp.

Ricker, W.E., 1968. *Methods for assessment of fish production in fresh waters.* International Biological Programme No.3, Blackwell Scientific Publications, London. 313 pp.

Strauss, R.E. and Bond, C.E., 1990. Taxonomic methods: Morphology. In : Schreck, C. B. and Moyle (Eds.) *Methods for fish biology.* American Fisheries Society, Bethesda, Maryland, pp. 109-140.