

(the distribution of which along with that of *Metapenaeus monoceros* was the basis of Hall's hypothesis) points to the absence of such a barrier. However, Johnson³ studying the biogeography of Malaysian marine decapoda, and disagreeing with Hall's hypothesis suggests that there is an indication of a sub-regional boundary between the western Indian Ocean and the Central Indo-West Pacific with the west coast of India forming a transition zone between the two. According to Klausewitz⁴, the ichthyofauna of the Indian Ocean shows "the eastern part till India and the Maldives is different from the western part". Jones and Kumaran studying the ichthyofaunistic zoogeographic division of the Indian Ocean came to the same conclusion. Although the establishment of the existence of any boundary in the region of the west coast of India is difficult in the absence of a more detailed knowledge of water movements than we have at present, it is interesting to point out that the distribution pattern of the Indian Penaeidae also indicate the possibility of the presence of such a barrier along the west coast of India as envisaged by Johnson³.

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Analysis of Morphometric Characters of *Selar kalla* (Cuvier)

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Relationships between different morphometric characters of *S. kalla* are studied. The total length is found to vary linearly with other characters. Variations in different characters are proportional to the size of the characters.

THE relationship in the length of different parts of the body of a fish varies much in different species. So a separate investigation of such relationship is necessary for each species. Except for a study of the morphometric characters in *Selaroides leptolepis* (C & V), collected from different

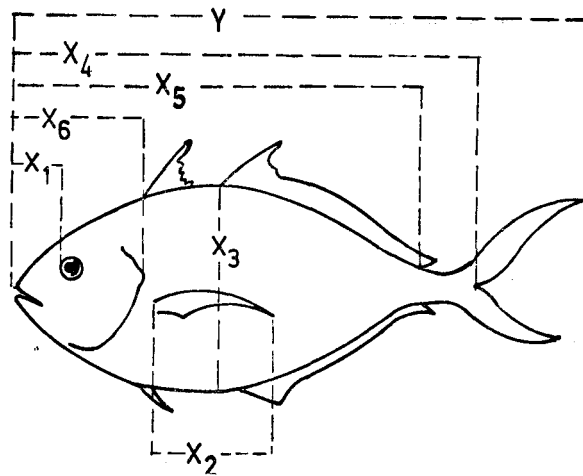


Fig. 1 — Morphometric characters of *S. kalla* [Details of characters are given in text]

stations along the west coast of India¹ no such effort is made on any species of Carangids which occur in the Indian waters. The present paper includes part of the results of an investigation to study the racial differences of *Selar kalla* (Cuvier) collected from different stations along the coast of Kerala.

Specimens of *S. kalla* collected from the catches of the Indo-Norwegian Project, Cochin, were preserved in 5% formalin. Using dividers the measurements were taken in centimetres correct to first decimal place. Those characters which showed conspicuous variations were utilized for this study. These included the total length (y), the lengths of snout (x_1), pectoral fin (x_2), and head (x_6), depth (x_3), fork length (x_4), and the distance between the tip of the snout and the base of the caudal peduncle (x_5) (Fig. 1).

These characters were defined following Pillai² except the distance between the tip of snout and base of the caudal peduncle which he has not considered. The total length is the distance between the tip of the snout when the mouth is kept closed and the tip of the longest ray of the caudal fin when stretched out. The distance between the tip of the upper jaw and the anterior border of the orbit is the length of the snout. The head length is the distance between the tip of the upper jaw when the mouth is closed to the posterior limit of the operculum. The maximum height of the body is taken to be its depth. The fork length is the distance between the caudal fork and the tip of the snout when the mouth is closed.

The total length is considered as the dependent variable and the remaining measurements as the independent variables. The relationships of the different independent variables with the dependent variable within a certain range (Table 1) were studied. A preliminary plot showed that the relationship between total length and other characters could very well be expressed by a straight line. Therefore for each relationship a linear regression represented by the equation $y = a + bx$ was fitted where y is the dependent variable, x is the independent variable, a and b are constants. The values of a and b were calculated using the least square method³. The regression values were tested for their significance using analysis of variance method³.

SHORT COMMUNICATIONS

TABLE 1—REGRESSION VALUES WITH THEIR STANDARD ERRORS

Independent variables	Range		a	b	SE (b)*	r†
	Min	Max				
x ₁	0.4	0.8	-1.4979	21.8100	1.5146	0.897
x ₂	1.3	3.7	1.6485	3.6410	0.1032	0.980
x ₃	1.9	4.3	-0.4282	3.6080	0.0715	0.990
x ₄	5.6	12.5	0.2050	1.1921	0.0094	0.998
x ₅	4.4	10.2	0.4249	1.4141	0.0138	0.998
x ₆	1.6	3.3	-1.7277	5.1163	0.1031	0.990

*Standard error of (b).

†Correlation coefficient between y and x.

TABLE 2—TEST OF SIGNIFICANCE OF REGRESSION COEFFICIENTS

Variables	Total S.S.	D.F.	S.S. due to regression	D.F.	MSS	Error S.S.	D.F.	E.M. S.S.	F	P
x ₁	432.81	51	348.72	1	348.72	84.09	50	1.6818	207.3	<0.001
x ₂	432.81	51	415.82	1	415.82	16.99	50	0.3398	1223.7	<0.001
x ₃	432.81	51	424.46	1	424.96	8.35	50	0.1670	2541.6	<0.001
x ₄	432.81	51	431.45	1	431.45	1.36	50	0.0272	15862.1	<0.001
x ₅	432.81	51	430.75	1	430.75	2.06	50	0.0412	7095.3	<0.001
x ₆	432.81	51	424.19	1	424.19	8.62	50	0.1724	2460.4	<0.001

Linearity is maintained in the relationships of the dependent variable with the different independent variables. The different regression values together with their standard errors are given in Table 1. The results of testing the significance of the regression coefficients are given in Table 2.

The different regression coefficients obtained (Table 2) show that the increase in the measurements of different parts of the body of the fish is in agreement with the proportionate size of the different parts. The fork length and the distance from the tip of the snout to the base of the caudal peduncle are having nearly the same rate of increase as that of the total length, as shown by the nearness of the respective regression values to unity. The remaining characters show very little varia-

tion among them in comparison with the total length as shown by their high regression values. This can be expected if the relative sizes of different characters are taken into consideration. Further, it can be said from the parallel nature of the lines that depth and length of the pectoral have got almost an equal rate of increase.

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