# MORPHOMETRIC RELATIONSHIPS OF THE INDIAN SCAD, *DECAPTERUS RUSELLI* (RUPPELL, 1830) FROM MARARASHTRA WATERS, NORTHWEST COAST OF INDIA

**Nalini Poojary[1]* and Sujit Sundaram[2]**

[1]ICAR - Central Institute of Fisheries Education, Off Yari road, Panch Marg, Andheri (W), 400 061.

[2]ICAR - Central Marine Fisheries Research Institute Mumbai Regional Center of CMFRI, CIFE Old Campus, 2nd floor, Seven Bungalows Andheri (W)

*Corresponding author: email: nalusiri@rediffmail.com

Received : 05.12.2013; Accepted : 19.06.2014

## ABSTRACT

**The relationships of various morphometric characters of *Decapterus russelli* from Maharashtra waters were studied. The coefficient of correlation (r) for various morphometric characters ranged from 0.880 to 0.983 indicating high degree of relationship among the characters compared. Analysis of 15 morphometric characters revealed that the fork length had the fastest growth rate with reference to total length while snout length had fastest growth rate with reference to head length. Fin formula for *D. russelli* from Mumbai waters could be written as: B. 6, D.8 | 1/27-31 + i, P.20 – 22, V.1/5, A.2 | 1/25–28+i,C.17–19, BS. 30-41, Ll. 37 – 61.**

**Key words: Morphometric relationships, meristic studies, *Decapterus russelli,* Carangids, Indian scad, Maharashtra.**

## INTRODUCTION

Carangid resources consist of horse mackerels, round scads, queen fishes, trevallies, jacks and attain large sizes whereas others are small and abundant in the form of big shoals (Reuben *et al.,* 1992). The Indian scad, *Decapterus russelli,* locally known as Tedi, Shitap or Sindhi Bangda, contributed 30-40% of the total carangid catches in the trawl fishery of Mumbai region (CMFRI, 1985-2008). It is caught through out the year along the north-west coast of India using mainly trawlers in the depth range of 55-90 m. In Mumbai, they are landed between December to February and there is no significant data available on the species from Mumbai coast.

Studies of morphological variation among fish population continue to play an important role in stock delineation despite the advent of many biochemical and molecular genetic techniques. It is therefore, imperative to have mathematical expressions, which define a particular relationship, so that measurements can be converted for better comparisons (Farmer, 1986). The present study deals with morphometric and meristic studies on a commercially

important carangid, *D. russelli* off Mumbai coast.

## MATERIAL AND METHODS

A total of 279 specimens of *D. russelli* ranging in length between 95 to 228 mm and the corresponding weight ranging from 6.8 to 118.4 g were collected randomly at weekly intervals during September 2004 to May 2006 from NFW, Sassoon Docks and Versova landing centres. Standard procedures adopted by Dwivedi and Menezes (1974) were followed to study morphometric features that include Total length (TL), Standard length (SL), Fork length (FL), Pre-dorsal length of first dorsal (PDL1) and Pre-dorsal length of second dorsal fin (PDL2), Pre-pectoral length (PPL), Pre-ventral length (PVL), Pre-anal length (PAL), Pectoral fin length (PFL), Head length (HL), Body depth (BD), Caudal depth (CD), Snout length (SL), Eye diameter (ED) and Inter- orbital space (IOS). Measurements of different parts of body were taken on a measuring board using divider to the nearest millimeter.

For the analysis of morphometric characters, linear regression equation was fitted using 'least square method' following Snedecor and Cochran (1967). The relationships were represented by equation: Y = a + bX, where 'Y' is a dependent variable, 'X' an independent variable, 'a' constant (intercept) and 'b' the regression coefficient (slope). The coefficient of correlation (r) was computed to know the degree of linear relationship between two variables. The curvilinear relation was transformed into linear one by taking common logarithms.

## RESULTS

Morphometric characters: Pelvic fin length showed a maximum co-efficient of variation (20.24%) while caudal depth showed minimum variation (12.35%). Regression anaylsis indicated high degree of correlation between characters under study as evident from the r values (Table 1 and table 2).

**Table 1. Relationship between different morphometric characters in *D. russelli***

| S.No. | X | Y | a | b | Y = a+bX | r |
|---|---|---|---|---|---|---|
| 1. | Total length | Fork length | 4.9863 | 0.8713 | Y= 4.9863 + 0.8713 X | 0.97904 |
| 2. | Total length | Standard length | 2.6136 | 0.8052 | Y= 2.6136 + 0.8052 X | 0.98313 |
| 3. | Total length | Body depth | -4.2108 | 0.2170 | Y= -4.2108 + 0.2170 X | 0.88066 |
| 4. | Total length | Caudal depth | 2.2588 | 0.0306 | Y= 2.2588 + 0.0306 X | 0.84486 |
| 5. | Total length | First pre-dorsal length | -0.8192 | 0.3173 | Y= -0.8192+ 0.3173 X | 0.96022 |
| 6. | Total length | Second pre dorsal length | 0.5590 | 0.4609 | Y= 0.5590 + 0.4609 X | 0.96564 |
| 7. | Total length | Pre-pectoral length | 0.3316 | 0.2584 | Y= 0.3316 + 0.2584 X | 0.93858 |
| 8. | Total length | Pre-ventral length | 0.0148 | 0.2830 | Y= 0.1482 + 0.2830 X | 0.93714 |
| 9. | Total length | Pre -anal length | -4.3259 | 0.5381 | Y= -4.3259 + 0.5381 X | 0.93331 |
| 10. | Total length | Pectoral fin length | -5.1585 | 0.2404 | Y= -5.1585 + 0.2404 X | 0.88627 |
| 11. | Total length | Ventral fin length | 0.2669 | 0.1150 | Y= 0.2669 + 0.1150 X | 0.85480 |
| 12. | Total length | Head length | -1.3568 | 0.2598 | Y= -1.3568 + 0.2598 X | 0.95577 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 13. | Head length | Eye diameter | 1.4304 | 0.2188 | Y= 1.4304 + 0.2188 X | 0.94857 |
| 14. | Head length | Inter orbital space | 1.4426 | 0.2603 | Y= 1.4426 + 0.2603 X | 0.84624 |
| 15. | Head length | Snout length | 0.5820 | 0.3438 | Y= 0 .5820 + 0.3438 X | 0.88198 |

The statistical analysis like range, mean, standard deviation and coefficient of correlation of various morphometric characters are presented in Table 2.

**Table 2. Descriptive measures of various morphometric characters in *D. russelli***

| S. No | Morphometric characters | Range (mm) | Mean (mm) | Standard Deviation | Coefficient of variation (%) |
|---|---|---|---|---|---|
| 1. | Total length | 95-228 | 162.04 | 26.49 | 16.35 |
| 2. | Fork length | 85-197 | 145.96 | 23.55 | 16.14 |
| 3. | Standard length | 78-186 | 132.89 | 21.72 | 16.34 |
| 4. | Body depth | 18-48 | 30.90 | 6.18 | 20.02 |
| 5. | Caudal depth | 3-10 | 7.21 | 0.89 | 12.35 |
| 6. | First pre-dorsal length | 30-73 | 50.52 | 8.66 | 17.14 |
| 7. | Second pre-dorsal length | 44-105 | 74.02 | 12.55 | 16.95 |
| 8. | Pre-pelvic Length | 25-58 | 42.15 | 7.13 | 16.93 |
| 9. | Pre-ventral length | 27-67 | 45.81 | 7.82 | 17.07 |
| 10. | Pre anal Length | 49-120 | 82.73 | 14.90 | 18.01 |
| 11. | Pelvic fin length | 18-53 | 33.74 | 6.83 | 20.24 |
| 12. | Ventral fin Length | 12-27 | 18.34 | 3.33 | 18.14 |
| 13. | Head length | 25-59 | 40.69 | 7.11 | 17.47 |
| 14. | Eye diameter | 6-14 | 10.34 | 1.59 | 15.36 |
| 15. | Inter orbital space | 6-16 | 12.05 | 2.01 | 16.65 |
| 16. | Snout length | 8-21 | 14.59 | 2.59 | 17.75 |

Meristic characters: The range of occurrence, mean, mode, median, standard deviation, standard error and co-efficient of variation of various meristic characters were calculated and they are presented in the Table 3.

From the above study, fin formula for *D. russelli* from Mumbai waters could be written as: B. 6, D.8 | 1/27-31 + i, P.20 – 22, V.1/5, A.2 | 1/25 – 28 + i, C.17 – 19, BS. 30-41, Ll. 37 – 61, where B stands for Branchiostegal rays, D – Dorsal fin, i- finlet, P – Pectoral fin, V – Ventral fin, A – Anal fin, C – Caudal fin, BS – Body scutes and Ll for lateral line scales.

## DISCUSSION

*D. russelli* forms a dominant species in the fishery of Mumbai waters, but there are very few reports available related to the study of *D. russelli.* Some workers have studied its biology and stock assessment but there is no concise report on its morphometric studies from Indian waters. During the present study, high values of correlation (0.84486-0.98313)

was obtained which indicated high degree of correlation among the various characters of *D. russelli.*

The present study showed that the second dorsal fin consisted of 27- 31 soft rays which were in conformity with Talwar and Kacker (1984). Regarding the first dorsal spines there is no difference with previous studies. The present study, showed 25-28 anal fin rays which was similar to Randall *et al.* (1990). Day (1878) reported 22 pectoral fin rays whereas in the present study it varied from 20-22. The number of Pelvic fin rays was found to be 5 for all specimens observed and which is similar to that reported by Day (1878), who recorded 17 caudal fin rays while the present study accounted for 17-19 caudal fin rays. So far no reports are found on the number of branchiostegal rays. The present study revealed 6 branchiostegal rays. Randall *et al.* (1990) documented 40-53 gill rakers while the present study, showed 41-48. In the present study, the body scutes were 30-41 which is in agreement with FAO report (1984). Reports on the scales on lateral line were 88 (Day, 1878), 42-62 (FAO, 1984), 77-102 (Randall *et al.,* 1990) and 37-61 in the present study. The variation in the number of lateral line scales is comparable to FAO report (1984).

In the present investigation, except for first dorsal spines, anal spines and pelvic fin rays, other meristic counts showed marginal variation from earlier reports. However, some difference in range may be indicative of different populations. The range, mean, mode, standard deviation (Table 3 & Table 4) indicate high degree of homogeneity within the population of *D. russelli.*

**Table 3. Descriptive measures of various meristic characters in *D. russelli***

| Statistical estimates | First dorsal spines | Second dorsal finrays | Anal fin rays | Pectoral fin rays | Pelvic fin rays | Caudal fin rays | Branchio - stegal rays | Gill rakers | Body scutes | Lateral line scales |
|---|---|---|---|---|---|---|---|---|---|---|
| Range | 8 | 27-31 | 25-28 | 20-22 | 5 | 17-19 | 6 | 41-48 | 30-41 | 37-61 |
| Mean | 8 | 29.301 | 26.505 | 20.882 | 5 | 17.351 | 6 | 45.473 | 35.559 | 50.176 |
| Mode | 8 | 28 | 27 | 21 | 5 | 17 | 6 | 47 | 35 | 52 |
| Median | 8 | 29 | 27 | 21 | 5 | 17 | 6 | 46 | 35 | 51 |
| Standard Deviation | 0 | 1.164 | 0.651 | 0.615 | 0 | 0.507 | 0 | 1.736 | 2.319 | 3.061 |
| Standard error | 0 | 0.070 | 0.039 | 0.037 | 0 | 0.090 | 0 | 0.104 | 0.139 | 0.183 |
| Coefficient of variance | 0 | 4.0 | 2.5 | 2.9 | 0 | 2.9 | 0 | 3.8 | 6.5 | 6.1 |

**Table 4. Comparison of meristic characters of *D. russelli* with other investigators**

| Author | First dorsal spines | Second dorsal fin rays | Anal fin rays | Pectoral fin rays | Pelvic fin rays | Caudal fin rays | Branchio - stegal rays | Gill rakers | Body scutes | Lateral line scales |
|---|---|---|---|---|---|---|---|---|---|---|
| Day, 1878 | 8 | 29-30 | 25-27 | 22 | 5 | 17 | - | - | 33 | 88 |
| FAO, 1984 | 8 | 28-33 | 25-29 | - | - | - | - | - | 30-40 | 42-62 |
| Talwar and Kacker, 1984 | 8 | 27-31 | 28-30 | - | - | - | - | - | 30-37 | - |
| Randal *et al.*, 1990 | 8 | 28-31 | 25-28 | - | - | - | - | 40-53 | 30-44 | 77-102 |
| Present study (2009) | 8 | 27-31 | 25-28 | 20-22 | 5 | 17-19 | 6 | 41-48 | 30-41 | 37-61 |

## ACKNOWLEDGEMENT

The authors are grateful to Dr. W.S. Lakra, Director CIFE, Mumbai, Dr. C.S. Purushothaman, Principal Scientist and Head, Aquatic Environment and Health Management Division, CIFE, Mumbai and Dr. S. K. Chakraborty, Principal Scientist and Head, Fisheries Resource Management, Post-harvest and Processing Technology Division for providing the facilities and their valuable guidance.

## REFERENCES

**CMFRI,** 1985-2008. Annual reports (1985 2008). Central Marine Fisheries Research Institute, Cochin.

**Day, F.,** 1878. The fishes of India, Vol. 1.2, Reprinted 1958, William Dawson and sons Ltd., London 211 pp.

**Dwivedi, S. N. and M. R. Menezes.,** 1974. A note on morphometry and ecology of *Brackionus orientalis* (Bloch & Schneider) in the esthary of Goa. Geobios 1:80-83.

**FAO,** 1984. Species Identification sheet for fishery purposes Western Indian Ocean. Fischer, W and G. Bianchi (eds.). Food and Agricultural Organization of the United Nations, Rome. Vol. 2.

**Farmer, A. S.,** 1986. Morphometric relationships of commercially important species of penaied shrimps from the Arabian Gulf. Kuwait Bull. of Mar. Sci., (7): 1-21.

**Randall, J. E., G. R. Allen and R. C. Steene.,** 1990. Fishes of the Great Barrier Reef and Coral Sea. University of Hawaii Press, Honolulu, H waii. 506 pp.

**Reuben, S., H. M. Kasim, S. Sivakami, P. N. Radhakrishnan, K. N. Kurup, M. Sivadas, A. Noble, K. V. S. Nair, and S. G. Raje.,** 1992. Fishery, biology and stock assessment of carangid resources from the Indian seas. Indian J. Fish., 39:195 234.

**Snedecor, G. W. and W. G. Cochran.,** 1967. Statistical methods. Sixth edition, Oxford and IBH Publ. Co., New Delhi, 53 pp.

**Talwar, P. K. and R. K. Kacker.,** 1984. Commercial sea fishes of India. Zoological Survey of India, Calcutta, 290-292.