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Morphological characters and morphometric relationship of pony fish, *Leiognathus splendens* (Cuvier, 1829) Off Ratnagiri coast, Maharashtra, India

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Abstract

Morphometric and meristic characters of *Leiognathus splendens* off Ratnagiri coast have been studied and the relationships of morphometric characters with standard length were established. The fishes ranged between 6.1 to 12.5 cm. in Total length (TL.) The morphometric equations for the samples collected along the Ratnagiri coast were FL = 0.4479 + 0.8354 TL, SL = 0.148767 + 0.765447 TL, UO = 0.2709 + 0.0579 TL, UG'= -0.0538 + 0.2562 TL, OO'= 0.2041 + 0.0767 TL, Eg = 0.1642 + 0.0337 TL, DD= 0.4677 + 0.4103 TL, Ph= 0.1559 + 0.1622 TL, Vh= 0.2566 + 0.0828 TL, AA = 0.2566 + 0.0828 TL, UD = 0.1082 + 0.3757 TL, UPh = -0. 0456 + 0.2691 TL, UVh = 0.0179 + 0.2976 TL, UA = -0.3444 + 0.4626 TL, h = 0.3595 + 0.3958TL, Ch = 0.6506 + 0.1656 TL, Dh = 0.1469 + 0.1600 TL, Ah= 0.4778 + 0.1015TL.

In the present study the various morphometric ratios of the fishes were studied and ratios are observed such as, The Fork length is 113.68-120 times in standard length, Snout length 11.57-13.33 times in standard length, Orbital diameter 10.52-11.11 times in standard length, Gretest pupil diameter is 6.31-8.88 in standard length, Head length is 34.0-37.77 in standard length, Dorsal fin base 57.89-62 in standard length, Ventral fin length is 13.33 -14.73 times in standard length, Anal fin base is 47.36-48.88 times in standard length, Pre dorsal length is 42.10-44.44 times in standard length, Pre pelvic length is 37.77-40 times in standard length, Pre anal length is 46.66-54.73 times in standard length, Pre pectoral length is 35.55-35.78 times in standard length, Dorsal height is 22.10-24.44 times in standard length, Anal height is 21.05-22.22 times in standard length, Body depth is 55.55-56.84 times in standard length, Pectoral fin length is 26.31-26.66 times in standard length and Caudal fin length is 31.57-33.33 times in standard length.

The meristic characters such as number of dorsal fin spine varied from 8,16 Anal fin vary from 3, 14. gill rakers are of lower limb 18 to 24, and upper limb 5 to 7 in numbers. Pyloric cacae is measured about 30 to 40 in numbers, ribs are 7 in numbers, scales on the lateral line is 45-65 in numbers, vertebrae 10+14=24 in numbers.

Keywords: *Leiognathus splendens*, morphometric characteristics, Maharashtra, India

Introduction

The pony fish, *Leiognathus splendens* (Cuvier, 1829) is widely distributed in the indo- Pacific region. Although it is commercially important and has wide distribution along the Indian coast, no

detailed information on the biology is available from Indian waters (Jayabalan, 1986). They are silvery in colour, generally small (<200mm SL.) and laterally compressed. They derive their common name ponyfish or slipmouth from their highly protractible mouth, which protract either dorsorostrally, rostrally, or ventrorostrally (Chakrabary and Sparks, 2010).The silverbelly or pony fish belonging to the Kingdom-Animalia, Phylum-Chordata, Class-Actinopterygii, Order-Perciformes, Family- *Leiognathidae*, The fishes of the family *Leiognathidae* (Silverbellies, pony fishes or slip mouths) commonly called as Splendid Silver-Belly: (English), Kaaral or KilliKaaral: (Tamil), Karah,:(Telgu), Kanai, Kuruchi: (Kannada), Thalimullan: (Malayalam), Karali, Tikata, Kap: (Marathi), Tunka Chandee: (Oriya*). Synonyms- Equula* splendens Cuvier; 1829; Day, 1878; *L. splendens* Munro, 1955; FAO. 1974. This species is distinguished by as follows the body of *L. splendens* is compressed and rather deep, its depth 1.7 to 2.0 times in standard length, profile of body slightly more convex than its ventral profile. Mouth small, pointing downwards when protracted, cleft of mouth below lower edge of eye, mandibular profile slightly concave. Preoperculum with its lower arm and ridge distinctly serrated. Bal & Rao (1984). Kimura *et al.*, (2005) described the character of this species by a single dorsal fin with usually 8, 16, anal fin usually 3, 14.

In view of the above, the present study focus on the pony fish which is an important demersal resource along Ratnagiri coast. This fish resource plays major role in the landing along the Ratnagiri coast of Maharashtra with wide annual fluctuation in landings. In the present paper an attempt has been made to define identification characteristic of *L. splendens* of Ratnagiri region through morphometric and meristic characters.

Materials and methods

Freshly procured fish were brought to the laboratory for morphometric measurements on a weekly basis from the fish landings of purse seine, and trawl, during the fishing season February 2012 to January 2013. The specimens of the different size groups were randomly collected from the catches for present study.

The total length (TL.) of each fish was measured from the tip of snout to the tip of the caudal fin to the nearest 1 mm using a divider and graduated measuring board. Nineteen morphometric and seven meristic characters were studied and relationships between the various body measurements to the standard length have been calculated. The relationship between the characters was worked out by the formula of simple linear regression equation: $Y = a + bX$.

Results

Morphometric characters of all the fish collected during present investigation have been recorded and compared. The various body part measurements of the fish are as given in Figure 1.

Table 1. Linear regression equations coefficients for the relationship of total length (TL) and various body parts for *Leiognathus splendens*

Sr. No.	Characteristics Compared with Total length (TL)	Regression parameters a	b	r
1.	Fork length (FL)	0.4479	0.8354	0.9430
2.	Standard length (SL)	0.1487	0.7654	0.8501
3.	Snout length (UO)	0.2709	0.0579	0.0186
4.	Head length (UG')	-0.0538	0.2562	0.7783
5	Orbital diameter (OO')	0.2041	0.0767	0.4396
6	Greatest pupil diameter (Eg)	0.1642	0.3377	0.3148
7	Dorsal fin base length (DD)	0.4677	0.4103	0.7757
8	Pectoral fin length (Ph)	0.1559	0.1622	0.4321
9	Ventral fin length (Vh)	0.2566	0.0828	0.3006
10	Anal fin base length (AA)	0.3756	0.3347	0.7447
11	Pre dorsal fin length (UD)	0.1082	0.3757	0.8227
12	Pre pectoral fin length (UPh)	-0.0456	0.2691	0.7975
13.	Pre pelvic fin length (UVh)	0.0179	0.2976	0.7519
14.	Pre anal length (UA)	-0.3444	0.4626	0.8770
15.	Body depth (h)	0.3595	0.3958	0.7794
16.	Caudal fin length (Ch)	0.6506	0.1687	0.5704
17.	Dorsal fin height (Dh)	0.1469	0.1600	0.3882
18.	Anal fin height (Ah)	0.4778	0.1015	0.3582

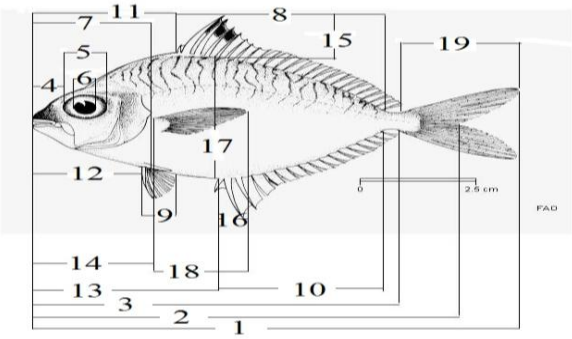

Fig. 1: Morphometric characters of *L. splendens.*

Keys: 1. Total length (TL); 2. Fork length (FL); 3. Standard length (SL); 4. Snout length (UO); 5. Orbital diameter (OO'); 6. Greatest pupil diameter (Eg);7. Head length (UG'); 8. Dorsal fin base length (DD); 9. Ventral fin length (Vh); 10. Anal fin base length (AA); 11. Pre dorsal fin length (UD); 12. Pre pectoral fin length (UPh); 13. Pre anal length (UA); 14. Pre pelvic fin length (UVh); 15. Dorsal fin height (Dh); 16. Anal fin height (Ah);17. Body depth (h);18.Pectoral fin length (Ph);19. Caudal fin length (Ch). The Fork length is 113.68-120 times in standard length, Snout length 11.57-13.33 times in standard length, Orbital diameter 10.52-11.11 times in standard length, Gretest pupil diameter is 6.31-8.88 in standard length, Head length is 34.0-37.77

in standard length, Dorsal fin base 57.89-62 in standard length, Ventral fin length is 13.33 -14.73 times in standard length, Anal fin base is 47.36-48.88 times in standard length, Pre dorsal length is 42.10-44.44 times in standard length, Pre pelvic length is 37.77-40 times in standard length, Pre anal length is 46.66-54.73 times in standard length, Pre pectoral length is 35.55-35.78 times in standard length, Dorsal height is 22.10-24.44 times in standard length, Anal height is 21.05-22.22 times in standard length, Body depth is 55.55-56.84 times in standard length, Pectoral fin length is 26.31-26.66 times in standard length and Caudal fin length is 31.57-33.33 times in standard length. The regression relationships between the various morphological characters with the standard length were studied (Table 1). The FL was directly proportional to the TL. The significant relationship was observed between FL and TL with value of 0.9430 ($P < 0.05$) and the estimated equation was FL = 0.4479 + 0.8354 TL. The SL was directly proportional to the TL. The significant relationship was observed between SL and TL with value of 0.8501 ($P < 0.05$) and the estimated equation was SL = 0.148767 + 0.765447 TL. The UO was directly proportional to the TL. The significant relationship was observed between UO and TL with value of 0.0186 ($P < 0.05$). The estimated equation for UO on TL was UO = 0.2709 + 0.0579. The UG' was directly proportional to the TL. The significant relationship was observed between UG' and TL with value of 0.7783 ($P < 0.05$). The estimated equation for UG' on TL was UG'= -0.0538 + 0.2562 TL. The OO' was directly proportional to the TL. The significant relationship was observed between OO' and TL with value of 0.4396 ($P < 0.05$). The estimated equation for OO' on TL was OO'= 0.2041 + 0.0767 TL. The Eg was directly proportional to the TL. The significant relationship was observed between Eg and TL with value of 0.3148 ($P < 0.05$). The estimated equation for Eg on TL was Eg = 0.1642 + 0.0337 TL. The DD was directly proportional to the TL. The significant relationship was observed between DD and TL with value of 0.7757 ($P < 0.05$). The estimated equation for DD on TL was DD= 0.4677 + 0.4103 TL. The Ph was directly proportional to the TL. The significant relationship was observed between Ph and TL with value of 0.4321 ($P < 0.05$). The estimated equation for Ph on TL was Ph= 0.1559 + 0.1622 TL. The Vh was directly proportional to the TL. The significant relationship was observed between Vh and TL with value of 0.3006 ($P < 0.05$). The estimated equation for Vh on TL was Vh= 0.2566 + 0.0828 TL. The AA was directly proportional to the TL. The significant relationship was observed between AA and TL with value of 0.7447 ($P < 0.05$). The estimated equation for AA on TL was AA = 0.2566 + 0.0828 TL. The UD was directly proportional to the TL. The significant relationship was observed between UD and TL with value of 0.8227 ($P < 0.05$). The estimated equation for UD on TL was UD = 0.1082 + 0.3757 TL. The UPh was directly proportional to the TL. The significant relationship was observed between UPh and TL with value of 0.7975 ($P < 0.05$). The estimated equation for UPh on TL was UPh = -0. 0456 + 0.2691 TL. The UVh was directly proportional to the TL. The significant relationship was observed between UVh and TL with value of 0.7519 ($P < 0.05$). The estimated equation for UVh on TL was UVh = 0.0179 + 0.2976 TL. The UA was directly proportional to the TL. The significant relationship was observed between UA and TL with value of 0.8770 ($P < 0.05$). The estimated equation for UA on TL was UA = -0.3444 + 0.4626

TL. The h was directly proportional to the TL. The significant relationship was observed between h and TL with value of 0.7794 ($P < 0.05$). The estimated equation for h on TL was h = 0.3595 + 0.3958 TL. The Ch was directly proportional to the TL. The significant relationship was observed between Ch and TL with value of 0.5704 ($P < 0.05$). The estimated equation for Ch on TL was Ch = 0.6506 + 0.1656 TL. The Dh was directly proportional to the TL. The significant relationship was observed between Dh and TL with value of 0.3882 ($P < 0.05$). The estimated equation for Dh on TL was Dh = 0.1469 + 0.1600 TL. The Ah was directly proportional to the TL. The significant relationship was observed between Ah and TL with value of 0.3582 ($P < 0.05$). The estimated equation for Ah on TL was Ah = 0.4778 + 0.1015 TL. The relationships are depicted in Figures 2 to 19. During present study the meristic characters such as number of dorsal fin spine varied from 8,16 Anal fin vary from 3, 14. gill rakers are of lower limb 18 to 24, and upper limb 5 to 7 in numbers. Pyloric cacae is measured about 30 to 40 in numbers, ribs are 7 in numbers, scales on the lateral line is 45-65 in numbers, vertebrae 10 + 14 = 24 in numbers. The morphometric relationships from the collected data have been analysed using regression analysis. The high values of correlation coefficient ('r' 0.0186- 0.9430) obtained for various morphometric characters compared with Total length indicate high degree of interdependence of these compared characters. The regression parameters of the fish were computed and are given in Table 1.

Relationship of various morphometric characters were compared with standard length to find out the degree of correlation. The comparative account of various relationships between different morphometric measurements have been indicated by Figures against Total length and Table 1. indicate values of their constants (a and b) and coefficient of correlation (r).

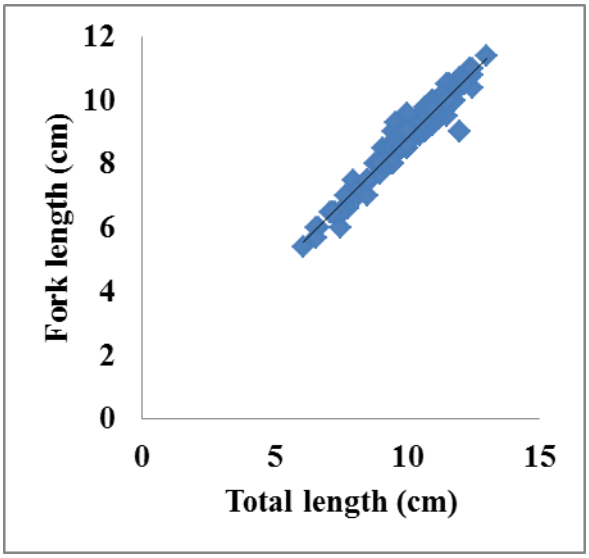

Fig.(2) Relationship between total length fork length (FL) in *L. splendens*
(FL = 0.4479 + 0.8354 TL)

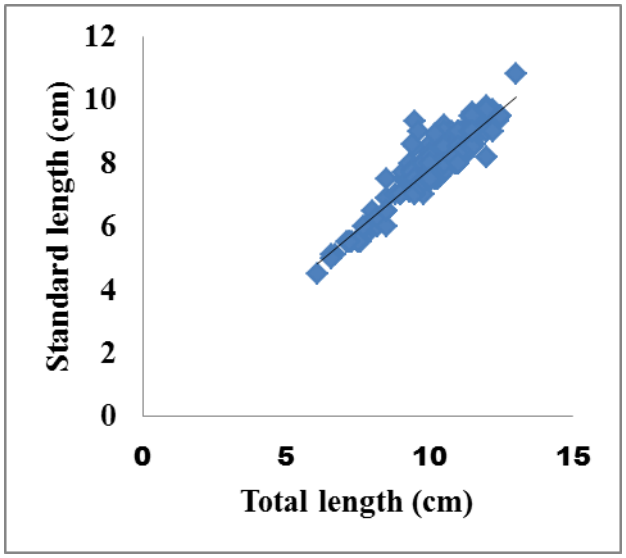

Fig.(3) Relationship between total length and and standard length (SL) in *L. splendens*
(SL = 0.148767 + 0.765447 TL)

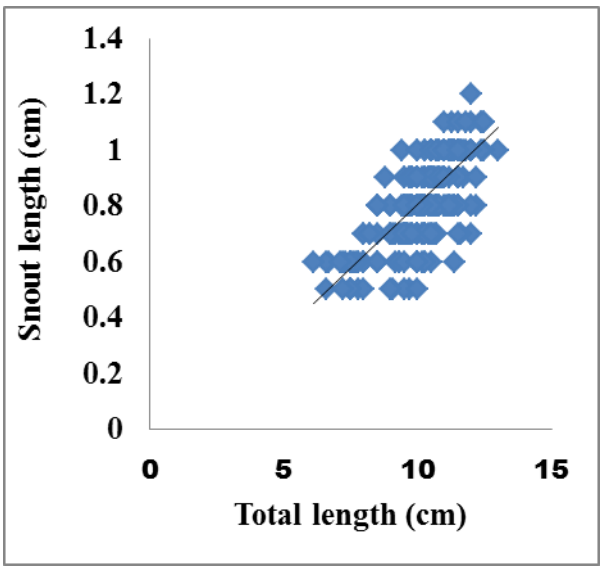

Fig.(4) Relationship between total length and snout length (UO) in *L. splendens* (UO = 0.2709 + 0.0579 TL)

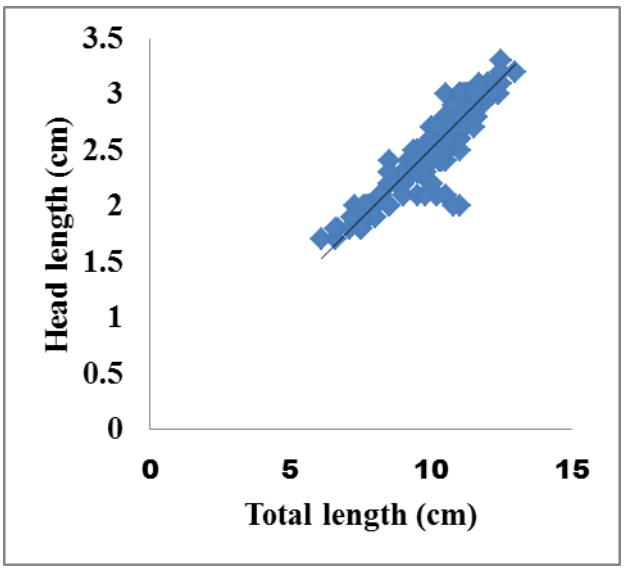

Fig.(5) Relationship between total length and head length (UG') in *L. splendens* (UG'= 0.0538 + 0.2562 TL)

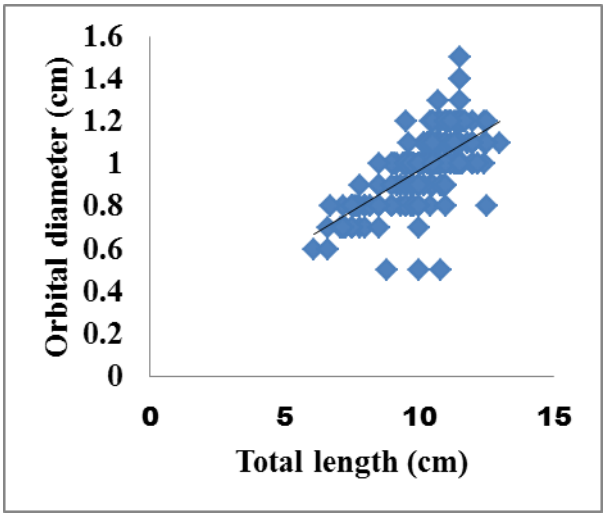

Fig.(6) Relationship between total length and orbital diameter (OO') in *L. splendens* (OO'= 0.2041 + 0.0767 TL)

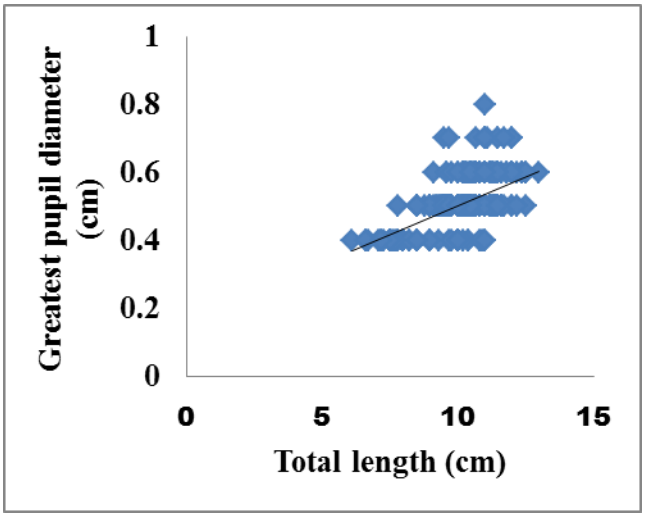

Fig.(7) Relationship between total length and greatest pupil diameter (Eg) in *L. splendens* (Eg = 0.1642 + 0.0337 TL)

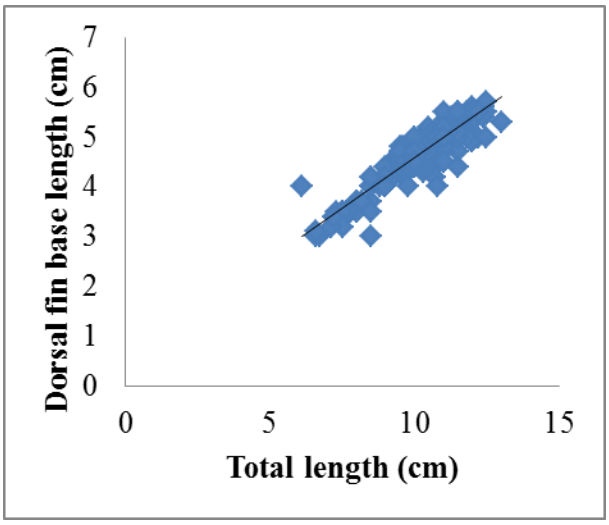

Fig.(8) Relationship between total length and dorsal fin base length (DD) in *L. splendens* (DD= 0.4677 + 0.4103 TL)

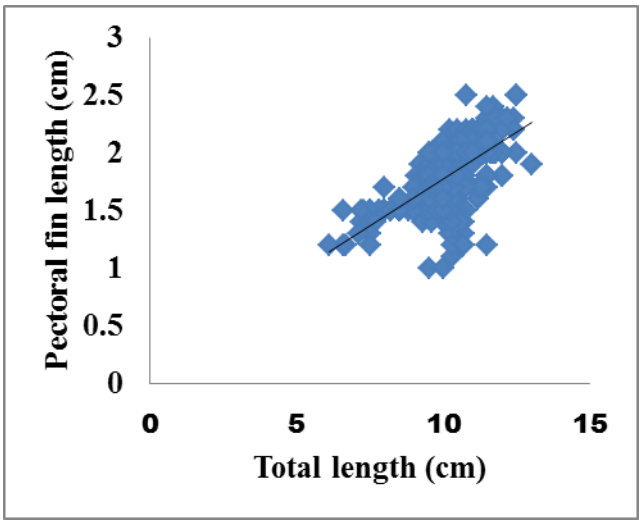

Fig.(9) Relationship between total length and pectoral fin length (Ph) in *L. splendens* (Ph= 0.1559 + 0.1622 TL)

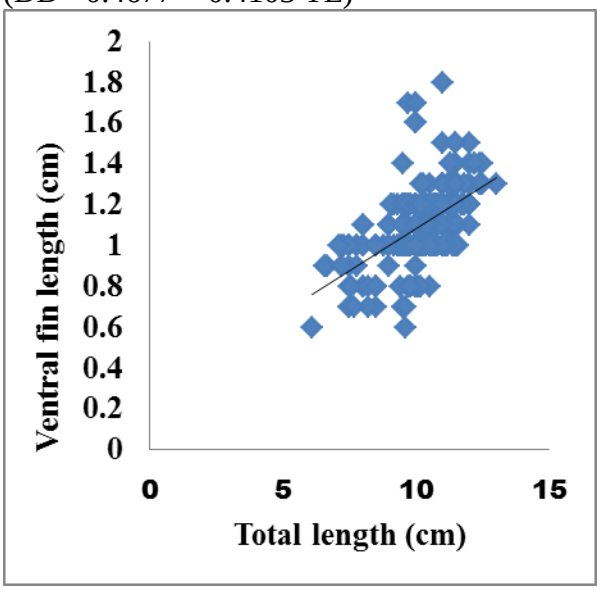

Fig.(10) Relationship between total length and ventral fin length (Vh) in *L. splendens* (Vh= 0.2566 + 0.0828 TL)

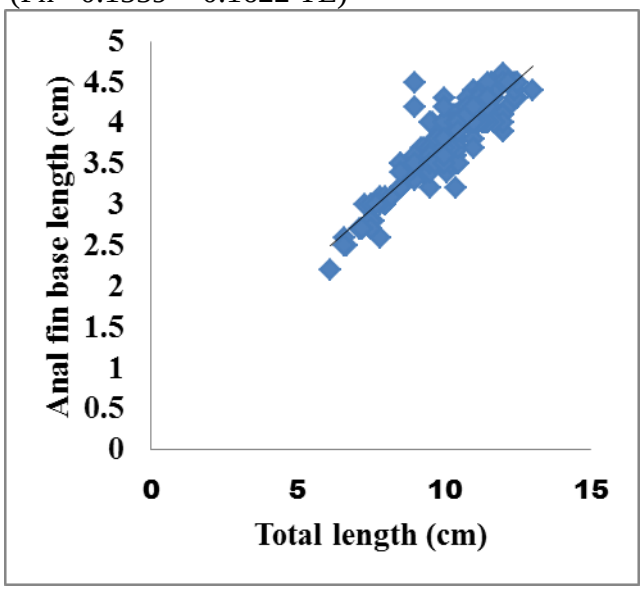

Fig.(11) Relationship between total length and anal fin base length (AA) in *L. splendens* (AA = 0.2566 + 0.0828 TL)

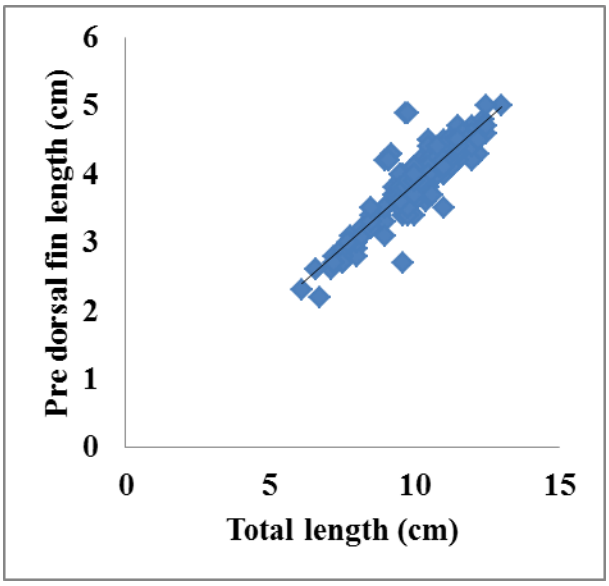

Fig.(12) Relationship between total length and pre dorsal fin length (UD) in *L. splendens*
(UD = 0.1082 + 0.3757 TL)

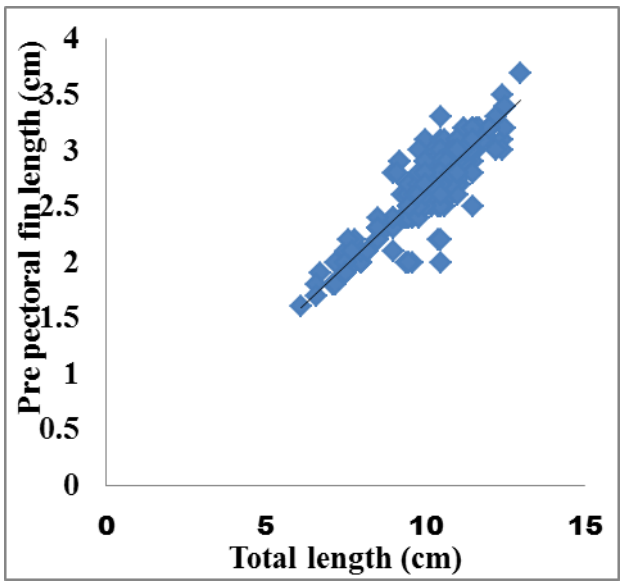

Fig.(13) Relationship between total length and pre pectoral fin length (UPh) in *L. splendens*
(UPh = -0. 0456 + 0.2691 TL)

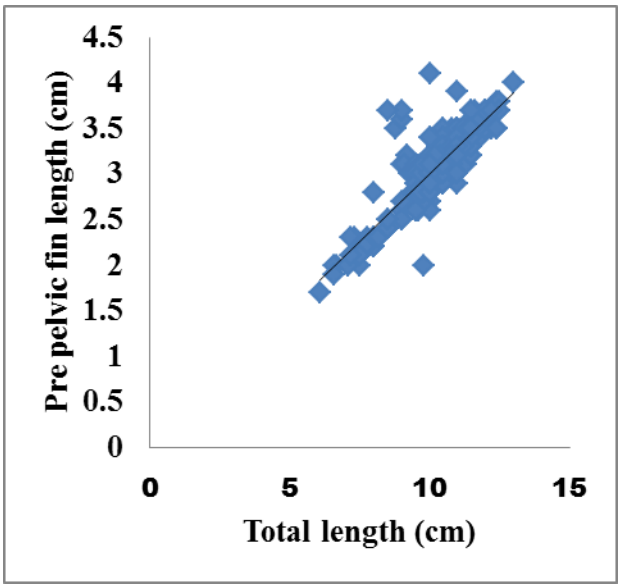

Fig.(14) Relationship between total length and pre pelvic fin length (UVh) in *L. splendens*
(UVh = 0.0179 + 0.2976 TL)

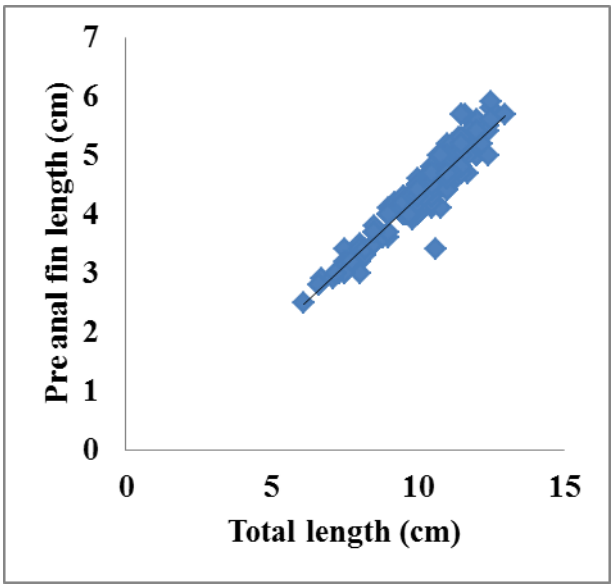

Fig.(15) Relationship between total length and pre anal fin length (UA) in *L. splendens*
(UA = -0.3444 + 0.4626 TL)

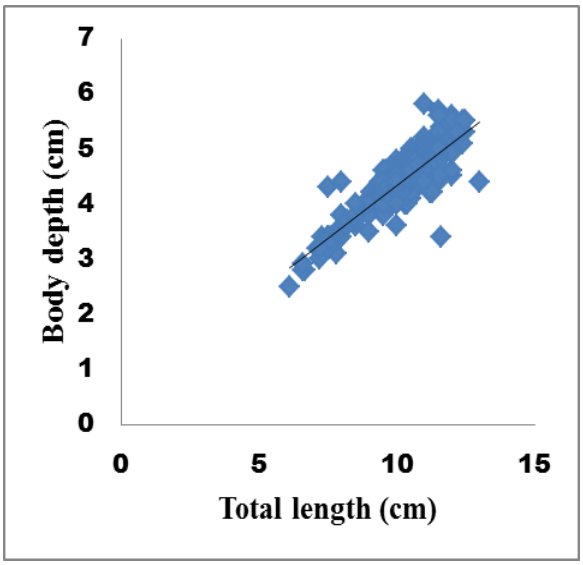

Fig.(16) Relationship between total length and body depth (h) in *L. splendens*
(h = 0.3595 + 0.3958 TL)

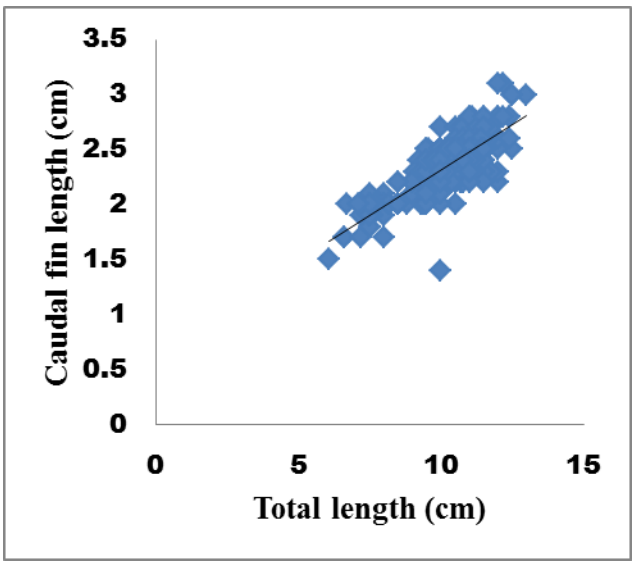

Fig.(17) Relationship between total length and caudal fin length (Ch) in *L. splendens*
(Ch = 0.6506 + 0.1656 TL)

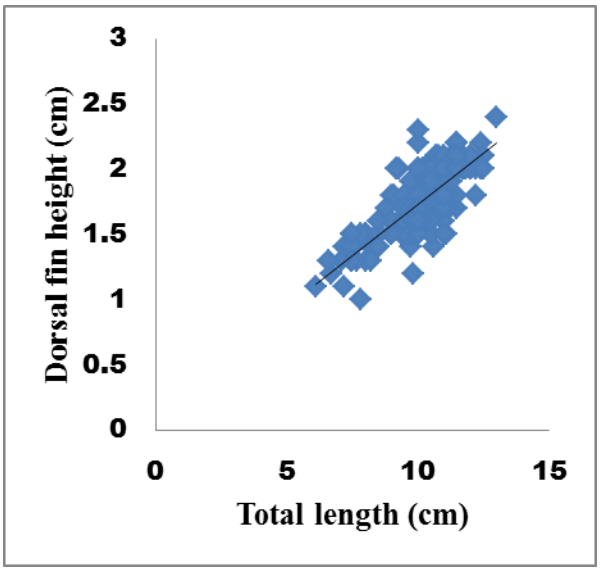

Fig.(18) Relationship between total length and dorsal fin height (Dh) in *L. splendens*
(Dh = 0.1469 + 0.1600 TL)

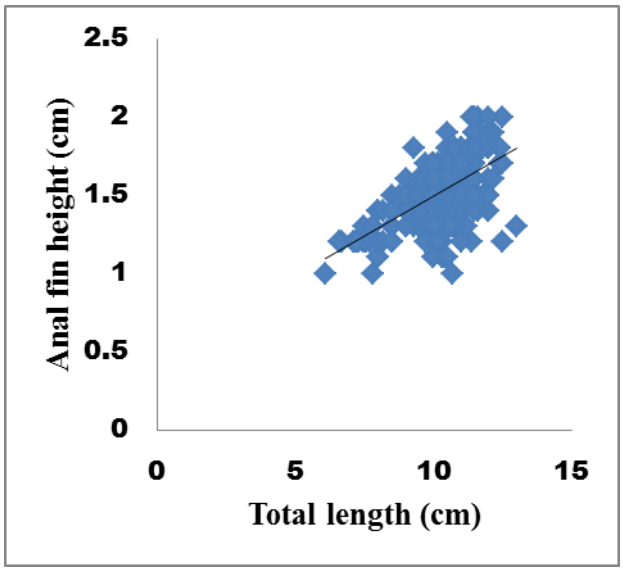

Fig.(19) Relationship between total length and anal fin height (Ah) in *L. splendens*
(Ah= 0.4778 + 0.1015TL)

Discussion

In the present study, the total length of *L. splendens* collected along the Ratnagiri coast ranged from 6.1 to 12.5 cm. The morphometric equations for the samples collected along the Ratnagiri coast were FL = 0.4479 + 0.8354 TL, SL = 0.148767 + 0.765447 TL,
UO = 0.2709 + 0.0579 TL, UG'= -0.0538 + 0.2562 TL, OO'= 0.2041 + 0.0767 TL, Eg = 0.1642 + 0.0337 TL, DD= 0.4677 + 0.4103 TL, Ph= 0.1559 + 0.1622 TL, Vh= 0.2566 + 0.0828 TL, AA = 0.2566 + 0.0828 TL, UD

= 0.1082 + 0.3757 TL, UPh = -0. 0456 + 0.2691 TL, UVh = 0.0179 + 0.2976 TL, UA = -0.3444 + 0.4626 TL, h = 0.3595 + 0.3958 TL, Ch = 0.6506 + 0.1656 TL, Dh = 0.1469 + 0.1600 TL, Ah= 0.4778 + 0.1015TL. In the present study the various morphometric ratios of the fishes were studied and ratios are observed such as, The Fork length is 113.68-120 times in standard length, Snout length 11.57-13.33 times in standard length, Orbital diameter 10.52-11.11 times in standard length, Gretest pupil diameter is 6.31-8.88 in standard length, Head length is 34.0-37.77 in standard length, Dorsal fin base 57.89-62 in standard length, Ventral fin length is 13.33 -14.73 times in standard length, Anal fin base is 47.36-48.88 times in standard length, Pre dorsal length is 42.10-44.44 times in standard length, Pre pelvic length is 37.77-40 times in standard length, Pre anal length is 46.66-54.73 times in standard length, Pre pectoral length is 35.55-35.78 times in standard length, Dorsal height is 22.10-24.44 times in standard length, Anal height is 21.05-22.22 times in standard length, Body depth is 55.55-56.84 times in standard length, Pectoral fin length is 26.31-26.66 times in standard length and Caudal fin length is 31.57-33.33 times in standard length. Abraham *et al.,* (2011) reported, as percent of standard length: Total length 135.06–142.86 (138.64); fork length 116.07–123.33 (118.85); pre dorsal 33.33–40.51 (36.35); preanal 44.44–54.55 (51.25); dorsal base 51.85–70.51 (58.63); anal base 40.00–48.15 (43.56); head 31.34–34.62 (33.21); dorsal height 18.18–24.64 (22.14); anal height 15.69–21.28 (18.74); pectoral 20.90–27.27 (23.66); depth 40.85–55.36 (52.29). Bal & Rao (1986) compile that, the body of *L. splendens* is compressed and rather deep, its depth 1.7 to 2.0 times in standard length, profile of body slightly more convex than its ventral profile. Mouth small, pointing downwords when protracted, cleft of mouth below lower edge of eye, mandibular profile slightly concave. Preoperculum with its lower arm and ridge distinctly serrated. Whereas the present study recorded that, body is compressed and deep, its depth 1.5 to 2.0 times in SL. dorsal profile convex, similar to or somewhat more strongly than ventral; mouth is subterminal, gape almost horizontal; snout blunt, anteroventral profile of lower jaw almost straight or weakly concave. FAO (1983) reported that gill rakers approximately equal in length to corresponding gill lamellae, total gill rakers on first gill arch 23 to 28. Kimura *et al.,* (2005) reported that the gill raker of *L. splendens* 5–7 + 18–24 in numbers, ribs are 7, vertebrae 10 + 14=24, scales on the lateral line is 46-66 in numbers.

In present study it is recorded that, gill rakers are of lower limb 18 to 24, and upper limb 5 to 7 in numbers. Pyloric cacae is measured about 30 to 40 in numbers, ribs are 7 in numbers, scales on the lateral line is 45-65 in numbers, vertebrae 10+14=24 in numbers. The meristic characters include dorsal fin spine may vary from VIII, 16 Anal fin vary from III, 14. Kimura *et al.,* (2005) described the character of this species by a single dorsal fin with usually VIII, 16, anal fin usually III, 14. In the present work, the growth of the fish was found to be allometric as the regression “b” value followed the cube law and did not significantly (P>0.05) differ from the cube. The weight of fish decreased at a rate lower than the cube of the length.

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