

A Study of Morphometry and Meristic Counts of *Oxyurichthys tentacularis*, Gobiidae (Valenciennes, 1837) from Ashtamudi Lake- Kollam, Kerala

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Abstract

Morphometric and meristic analysis has been very useful in separating species, populations and races, and it also helps in identification of species and in determining sexual dimorphism. A goby fish *Oxyurichthys tentacularis*, is an important food fish of Ashtamudi Lake. In the present study morphometric and meristic features were studied. The study revealed that, the following morphometric characters between male and female showed significant differences as body width, body depth, head length, head width, pre pectoral fin length, lower jaw length and maxilla length (t-test; $P < 0.01$). Caudal peduncle length exhibited significant difference at 5% level (t-test; $P < 0.05$). Highest correlation of standard length on total length in case of both male ($r = 0.993$) and female. Meristic features showed no variation between two sexes.

INTRODUCTION

Morphological characters such as morphometrics and meristics have been commonly used to identify stocks of fish, and for establishing the evolutionary linkages between ancient and modern fish fauna [1]. In Fishery Biology morphometric or biometric studies are used to estimate the percentage of fish harvested from length-weight data, to determine the effects of environmental improvement, and to regulate fisheries [2]. *Oxyurichthys tentacularis*, (local name Koozhali) a goboid species, is commercially one of the most demanded fish of Ashtamudi Lake. Members of the Gobiidae are small benthic fishes inhabiting a wide range of habitats in temperate and tropical regions [3] Ashtamudi Lake in Kerala, is the second largest and deepest wetland ecosystem next only to the Vembanad estuary.

Very few studies are reported on gobiids [4][5][6][7]. Even the fish has much importance, in Ashtamudi Lake, there were no published work about the species hitherto. Hence in the present study an attempt has been made to determine the morphometric and meristic features of the fish *O. tentacularis*.

MATERIALS AND METHODS

The specimens of *O. tentacularis* were collected from Ashtamudi lake (8° 53' - 9° 02' N; 76° 31' - 76° 41' E) using a modified gill net, cast net and dip net with the help of local fishermen, from January 2016 to December 2016. Sex was determined through naked eye according to the appearance of the gonads. The colour pattern in sexes was noted in fresh condition itself. The samples were then preserved in 10% buffered formalin for further morphometric analysis. All morphometric measures were measured to the nearest millimeter with digital calipers, and recorded its weight to nearest milligram (mg) using a digital balance. A total of 580 fishes consist of 300 specimens of male fish and 280 specimens of female fish were measured for the study [8]. Following morphometric parameters were measured: Total Length, Standard Length, Body Width, Body Depth, Head Length, Head Depth, Head Width, Eye Diameter, Pre-orbital Length, Post - orbital Length, Pre dorsal fin length II, Pre pectoral fin length, Pre pelvic fin length, Pre anal fin length, Caudal Peduncle Length, Caudal Peduncle Depth, caudal fin length, dorsal fin length, pectoral fin length, pelvic fin length, lower jaw length and maxilla length. Data were analyzed using computer software, Statistical Package for Social Sciences (SPSS) version 21.

RESULTS AND DISCUSSION

The comparison of morphometric parameters of male and female fish is given in Table1. A total 580 specimens of *Oxuyurichthys tentaclaris* were collected for the study. Total length of 300 male fish collected from Ashtamudi Lake varied between 52 mm and 179 mm and the mean value recorded was 146.16 mm. The total length of 280 female fish collected from Ashtamudi Lake varied between 51 mm and 175 mm and the mean value recorded was 141.97 mm. The results of students t' test showed no significant variation in total length between male and female fishes (t =1.869; p>0.05). The results of students t' test showed no significant variation in standard length (t=.071; P>0.05). Comparisons of male and female fishes by student's t test showed significant difference between male and female at 1% level (P<0.01) in the following morphometric characters: body width (t=6.299; P<0.01), body depth (t=11.444; P<0.01), head length(t=4.025; P<0.01), head width (t =5.437; P,<0.01), pre pectoral fin length (t=6.153; P<0.01), lower jaw length (t =-5.392; P,<0.01) and maxilla length (t =-5.110; P,<0.01). Caudal peduncle length exhibited significant difference at 5% level (t= 2.270; P<0.05). Student's t test showed no significant difference between male and female in the following morphometric characters: total length, standard length, head depth (t =.363; P>0.01), eye diameter (t=1.889; P>0.01), pre-orbital length (t =1.474; P>0.01), post - orbital length (t=1.433; P>0.05), pre

dorsal fin length I ($t=.051$; $P>0.01$), pre dorsal fin length II ($t =1.355$; $P,<0.01$), pre anal fin length ($t=.724$; $P>0.01$), pre pelvic fin length ($t =1.856$; $P>0.01$) and caudal peduncle depth ($t=.573$; $P>0.05$).

Table .1. Comparison of morphometric parameters between male and female sexes of *Oxyurichthys tentaclaris* from Ashtamudi Lake

Parameters	Male		Female		t value (comparing male and female)
	Mean	\pm SD	Mean	\pm SD	
Total Length	146.16	22.202	141.97	19.784	1.869 ^{NS}
Standard Length	91.03	16.164	91.15	13.863	0.071 ^{NS}
Body Width	17.57	2.545	19.40	2.825	6.299**
Body Depth	13.27	1.452	15.21	1.721	11.444**
Head Length	24.64	2.105	21.49	2.097	4.025**
Head Depth	14.71	1.408	14.76	1.255	0.363 ^{NS}
Head Width	17.79	2.459	16.56	1.719	5.437**
Eye Diameter	8.66	.751	8.82	.833	1.889 ^{NS}
Pre-orbital Length	10.83	1.043	10.98	.749	1.474 ^{NS}
Post - orbital Length	17.23	1.886	16.97	1.524	1.433 ^{NS}
Pre dorsal fin length I	28.46	4.837	28.49	3.931	0.051 ^{NS}
Pre dorsal fin length II	46.044	7.6067	45.054	6.045	1.355 ^{NS}
Pre pectoral fin length	25.02	2.767	26.55	1.824	6.153**
Pre pelvic fin length	20.51	2.111	20.15	1.500	1.856 ^{NS}
Pre anal fin length	47.89	6.182	47.44	5.571	0.724 ^{NS}
Caudal Peduncle Length	12.48	2.858	11.95	1.236	2.270*
Caudal Peduncle Depth	5.73	.880	5.78	.855	0.573 ^{NS}
lower jaw length.	11.20	1.187	10.62	.812	-5.392**
maxilla length,	15.14	1.527	14.34	1.415	-5.110**

The present study revealed a highest correlation of standard length on total length in case of both male ($r =0.993$) and female ($r =0.968$) and also observed the highest correlation of caudal fin length on head length in male ($r =0.948$) and female it was ($r =0.714$). The lowest value of the correlation for the male was noticed in the case of maxilla length ($r =0.513$) and in female lowest correlation value was observed as $r =0.597$). Morphometric analysis of the present study revealed that the correlation

values were greater in male than female when calculating the percentage on total length and head length. All the regression coefficient correlation differentiation 'R²' and coefficient of correlation 'r' values are represented in Table 2.

Table 2 Regression equation of morphometric parameters of *Oxyurichthys tentacularis* from Ashtamudi Lake

Parameters	Male			Female		
	Regression equation	R ²	R	Regression equation	R ²	R
Standard length (Y) on Total length (X)	$Y=5.6675+0.5747x$	0.962	0.993	$Y=4.563+0.235$	0.939	0.968
Head length (Y) on Total length (X)	$Y=5.963+0.456X$	0.859	0.953	$Y=5.362+0.136$	0.832	0.948
Pre-dorsal length (Y) on Total length (X)	$Y=4.235+0.562$	0.769	0.823	$Y=4.563+0.236$	0.721	0.814
Dorsal Fin base (Y) on Total length(X)	$Y=2.535+0.132$	0.653	0.823	$Y=3.562+0.432$	0.532	0.634
Length base of Anal fin (Y) on Total length (X)	$Y=6.285+0.262$	0.721	0.823	$Y=5.583+0.056$	0.221	0.314
Dorsal fin length (Y) on Total length (X)	$Y=9.235+0.822$	0.869	0.963	$Y=2.563+0.116$	0.589	0.614
Pelvic fin length (Y) on Total length (X)	$Y=6.235+0.062$	0.739	0.823	$Y=4.663+0.236$	0.321	0.518
Pectoral fin length (Y) on Total length (X)	$Y=7.235+0.162$	0.869	0.923	$Y=5.563+0.236$	0.521	0.714
Caudal fin length (Y) on Total length (X)	$Y=9.563+2.362$	0.919	0.956	$Y=7.653+0.236$	0.621	0.714
Post-orbital length (Y) on Head length (X)	$Y=7.365+0.153$	0.635	0.853	$Y=6.353+0.236$	0.721	0.849
Maxilla length (Y) on Head length (X)	$Y=3.254+0.123$	0.453	0.513	$Y=1.534+0.146$	0.121	0.284
Eye diameter (Y) on Head length (X)	$Y=5.362+0.152$	0.669	0.723	$Y=2.563+0.126$	0.432	0.514

The meristic counts of *O. tentacularis* is summarized in Table 3. Meristic characters of *O. tentacularis* in the current study showed first dorsal fin with 6 spines, second dorsal with 1 spine and 13 branched rays, pelvic fin with 1 flexible spine and five branched rays, pectoral fin with 21-22 rays, the anal fin with 1 spine and 13 branched rays and the caudal fin with 17 segmented rays.

Table 3. Meristic features of male and female fish *O. tentacularis*.

Meristic characters	Male fish	Female Fish
First dorsal fin	6 spines	6 spines
Second dorsal fin rays	one spine and 13 branched rays.	one spine and 13 branched rays.
Anal fin	1 spine and 13 branched rays	1 spine and 13 branched rays
Pectoral fin	21-22 rays	21-22 rays
Pelvic fins	one flexible spine and five branched rays	one flexible spine and five branched rays
Caudal fin	17 segmented rays	17 segmented rays

The morphometry and meristics of fishes is one of the most easily perceivable means of assessing the evolutionary adaptation of a species to its environment. The males and females often differ in the length and shapes [9]. A fact that each body part has a different rate of growth, and that these different rate of growth, maintain more or less constant ratios to one another. Though these differences have been brought to light through statistical analysis, and they can be easily escape the notice of the casual observer. In *Parapocryptes serperaster* no significant variation were observed in total length and standard length between male and female fishes. But the fishes showed a significant variation in body width [10]. Variations in the number of meristic characters have been documented by many workers [11], who opined that the environmental factors particularly that the temperature influences meristic characters in the process of their growth in fishes. The variations can also be exhibited by various stocks found in different geographical areas [12]. The meristic counts in both of the sexes were found to be quite similar resembling the earlier work. This increase in the number of caudal fin may be an adaptation to swim in the muddy creeks. The meristic features showed homogeneity in both sexes.

CONCLUSION

In *O. tentacularis* the analysis of morphometric characters demonstrated considerable degree of differences between the sexes. This heterogeneity of morphometric characters may be due to variation in physiological activities in the male and female fish. Morphometric characters of a fish species may be depends upon food availability and habitats. Therefore, variations in the morphological characteristics between male and female fishes of *O. tentacularis* might be the results of differences in the habitat used or conditions of their habitats, geographical isolation and availability of food.

REFERENCES

- [1] Turan, C. 2004, "Stock identification of Mediterranean horse mackerel (*Trachurus mediterraneus*) using morphometric and meristic characters". ICES J. Mar. Sci., 61, pp.774-781.
- [2] Analaura, I. A., Esther, C. S., Manuel, G. C. and Elaine, E. B., 2005, "Comparative morphometrics of two populations of *Mugil curema* (Pisces: Mugilidae) on the Atlantic and Mexican Pacific coasts". Sci. Mar., 70(1), pp.139-145.
- [3] Nelson, J. S., 2006. "Fishes of the world", 4th ed. : J Wiley NewYork, pp. 601.
- [4] Chen, I.S. and Shao, K. T., 1996. "A taxonomic review of the gobiid fish genus *Rhinogobius* Gill, 1859, from Taiwan, with descriptions of three new species", Zool. Stud., 35(3), pp. 200-214
- [5] La Mesa, E. Arneri, V. Caputo and Lylesias, M., 2005, "The transparent goby, *Aphia minuta*" Review of Biology and fisheries of a paedomorphic European fish, Reviews in Fish Biology and Fisheries, 15, pp. 89-109.
- [6] Nacua, S. S., Dorado, E. L., Torres, M. A. J., and Demayo, C. G., 2010. "Body Shape Variation Between Two Populations of the White Goby, *Glossogobius giuris* (Hamilton and Buchanan)", Research Journal of Fisheries and Hydrobiology, 5(1), pp. 44-51.
- [7] Matondo, D., Torres, A. P., Gorospe, J. G., and Demayo, C. G., 2012, "Describing Scale Shapes of the Male and Female *Glossogobius aureus* Akihito and Meguro, 1975 from Tumaga River, Zamboanga City, Philippines. Egypt" Acad. J. Biolog. Sci., 4(1), pp. 47-58.
- [8] Strauss, R. E. and Bond, C. E., 1990, "Taxonomic methods: morphology", In: Moyle, P. and Schreck, C. (Eds.), Methods for Fish Biology, American Fisheries Society, Special Publication, pp. 109-140.
- [9] Nikolsky, G. V., 1963, "The Ecology of Fishes", Academic Press, New York, USA
- [10] Dinh, Q. M., Jian, J. Q., Sabine, D., Dinh, D. T., 2015, "Morphometric variation of *Parapocryptes serperaster* (Gobiidae) in dry and wet seasons in the Mekong Delta, Vietnam. Ichthyological Research" 63(2), pp. 267-274.
- [11] Abdurahiman, K. P., Harishnayak, T., Zacharia, P. U., Mohamed, K. S., 2004, "Length-weight relationship of commercially important marine fishes and shell fishes of the southern coast of Karnataka, India" World Fish Centre Quarterly, 27(1), pp. 9-10.
- [12] Sarker, Y., Jaiswar, A. K, Chakraborty, S. K., 2004, "Morphometry and length weight relationship of *Megalaspis cordyla* (Linnaeus, 1758) from Mumbai coast" Indian Journal of Fisheries, 51(4), pp. 481-486.