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Morphometric differences between male and female fish *Oxyurichthys tentacularis*, Gobiidae (Valenciennes, 1837) from Ashtamudi lake, Kollam, Kerala.

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Abstract

The *Oxyurichthys tentacularis*, locally known as Koozhali, of the family Gobiidae is one of the important food fish of Ashtamudi lake. it is the first study, about morphometric differences between male and female fish species *O. tentacularis*, in Ashtamudi lake. Considering the commercial importance of this species, the objective of this study was to assess the morphometric features of male and female fish *Oxyurichthys tentacularis*. 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, dorsal fin length I, dorsal fin length II, dorsal fin base I, dorsal fin base II, pelvic fin length, pelvic fin base, pelvic fin width, caudal fin length, pectoral fin length, pectoral fin width, pectoral fin base, anal 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). Hence, these morphometric characters had been found to be helpful in observing the phenotypic variation among the male and female populations of this species.

Key words : Female fish, Morphometric differences, Koozhali

INTRODUCTION

The family Gobiidae, is one of the largest fish family which includes 2,000 species in more than 200 genera. *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 [1] Ashtamudi Lake in Kerala, is the second largest and deepest wetland ecosystem next only to the Vembanad estuary . In Fishery Biology morphometric or biometric studies are very helpful to estimate the percentage of fish harvested from length-weight data, to determine the effects of environmental improvement, and to regulate fisheries[2][3][4][5]. Studies of morphometry of gobiids are very few [6][7][8][9]. Even the fish has much importance, in Ashtamudi Lake, there were no published data about the species hitherto. In the present study an attempt has been made to determine the morphometric variation between male and female 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, locally known as "koozhalivala", cast net and dip net with the help of local fishermen, from January 2014 to December 2014. Total length, and weight were measured. 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 351 fishes consist of 181 specimens of male fish and 170 specimens of *female fish O. tentacularis* were measured for the study[10]. Thirty two morphometric characters were used: 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 I, pre dorsal fin length II, pre pectoral fin length, pre pelvic fin length, pre anal fin length, dorsal fin length I, dorsal fin length II, dorsal fin base I, dorsal fin base II, pelvic fin length, pelvic fin base, pelvic fin width, caudal fin length, pectoral fin length, pectoral fin width, pectoral fin base, anal fin length, anal fin base, caudal peduncle length ,caudal peduncle depth, lower jaw length and maxilla length. Data were analyzed using computer software, Statistical Package for Social Sciences (SPSS) version 21.

RESULTS

The comparison of morphometric parameters of male and female sexes of *Oxuyurichthys tentaclaris* from Ashtamudi Lake are given in Table 1 and 2. A total 458 specimens of *Oxuyurichthys tentaclaris* were collected for the study. Total length of 233 male fishes collected from Ashtamudi Lake varied between 52 mm and 179 mm and the mean value recorded was 146.16 mm. The total length of 225female fishes 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), dorsal fin length I(t=15.880; P<0.01mm), dorsal fin length II (t=11.804; P<0.01mm), dorsal fin base I, dorsal fin base II, pelvic fin length, pelvic fin base, pelvic fin width (t=9.417; P<0.01mm), caudal fin length (t= 2.270; P<0.01), pectoral fin length (t=-7.728; P<0.01mm), pectoral fin width (t= -4.767; P<0.01), pectoral fin

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	± SD	Mean	± 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**

** P<0.01; * P<0.05; ^{NS} Not significant

Table 2: Comparison of fin morphometric parameters between male and female sexes of *Oxuyurichthys tentaclaris* from Ashtamudi Lake

Parameters	Male		Female		t value (comparing male and female)
	Mean	± SD	Mean	± SD	
Dorsal Fin Length I	28.31	2.099	23.71	1.017	15.880**
Dorsal Fin Length II	55.83	2.265	51.19	1.647	11.804**
Dorsal Fin Base I	16.18	1.914	15.51	1.701	3.637**
Dorsal Fin Base II	40.22	2.989	37.45	2.486	9.417**
Pelvic Fin Length	33.45	1.306	23.71	1.299	10.063**
Pelvic Fin Base	7.31	.969	6.16	.780	12.728**
Pelvic Fin Width	17.45	1.304	15.80	1.137	-3.767**
Caudal Fin Length	55.01	7.390	50.75	7.161	5.557**
Pectoral fin length	43.23	2.484	34.35	1.863	-7.728**
Pectoral fin Width	16.49	1.486	15.75	1.467	-4.767**
Pectoral fin Base	13.20	1.481	12.71	1.211	-3.408**
Anal Fin length	56.33	5.219	50.58	4.018	11.604**
Anal Fin Base	35.03	3.275	34.75	2.346	-.927 ^{NS}

** P<0.01; * P<0.05; NS Not significant

Table 3: PCA of transformed morphometric variables for male and female sexes of *Oxuyurichthys tentaclaris* from Ashtamudi Lake

Parameter	Component		
	1	2	3
Total Length	0.812	-0.154	0.112
Standard Length	0.806	-0.121	0.045
Weight	0.853	0.155	0.184
Body Width	0.886	0.223	0.165
Head Length	0.875	-0.136	0.076
Head Depth	0.786	0.023	-0.301
Head Width	0.831	0.118	0.091
Pre dorsal fin length I	0.798	-0.061	0.099
Pre dorsal fin length II	0.812	0.027	-0.128
Pre pectoral fin length	0.864	0.015	0.119
Pre pelvic fin length	0.896	0.151	-0.379
Pre anal fin length	0.776	-0.088	0.094
Body Depth	0.812	0.077	0.074
Eye Diameter	0.789	-0.113	0.151
Pre-orbital Length	0.791	-0.124	-0.330
Post - orbital Length	0.766	-0.037	-0.423
Caudal Peduncle Length	0.856	0.275	-0.083
Caudal Peduncle Depth	0.846	0.213	-0.118
lower jaw length.	0.875	0.122	0.112
maxilla length,	0.836	0.104	0.140
Dorsal Fin Length I	0.941	**0.523**	0.268
Dorsal Fin Length II	0.937	0.511	0.274
Dorsal Fin Base I	0.812	0.066	-0.144
Dorsal Fin Base II	0.865	0.121	-0.200
Pelvic Fin Length	0.901	0.205	**0.283**
Pelvic Fin Base	0.846	0.286	-0.070
Pelvic Fin Width	0.866	-0.221	-0.060
Caudal Fin Length	**0.958**	0.386	0.213
Pectoral fin length	0.896	0.187	0.037
Pectoral fin Width	0.886	-0.109	0.133
Pectoral fin Base	0.798	0.143	0.134
Anal Fin length	0.914	0.527	0.142
Anal Fin Base	0.875	-0.231	-0.362
Cumulative % variance	**79.975**	**83.943**	**87.645**

base, anal fin length, 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 between populations (t=.724; P>0.01) and pre pelvic fin length (t =1.856; P>0.01) caudal peduncle depth (t=.573; P>0.05).

Principal component analysis

Principal component analysis showed that several morphometric parameters play important role in differentiating male and female sexes of *Oxuyurichthys tentaclaris* from Ashtamudi Lake. Principal component 1 (79.975%) coefficients were all positive, indicating no shape variation between male and female fishes (Table 3.). Caudal fin length, dorsal fin length (I and II) and anal fin length were the characteristics most highly correlated with PC1. Out of these, caudal fin length was found to be the most important character correlated with PC1. Principal component 2 (PC2) described 3.423% variance, dorsal fin length I, being most highly correlated with PC2, which differentiate the species. Both dorsal fin length I , anal fin length and were found to be higher in male fish *O. tentaclaris.* Principal component 3 (PC3) described 87.645% total variance.

DISCUSSION

The morphometry of fishes is one of the most easily perceivable means of assessing the evolutionary adaptation of a

species to its environment[11]. The males and females often differ in the length and shapes of fins[12]. The sexes of, *Oxyurichthys tentacularis*, are distinguished by the form of the urogenital papilla[13]. In the present study comparison of the morphometric characters between male and female showed significant differences in all the characters except for Total length, standard length, head depth, eye diameter, pre-orbital length, post - orbital length, pre dorsal fin length I, pre dorsal fin length II, pre pelvic fin length, anal fin base, pre anal fin length and caudal peduncle depth. In goby *Glossogobius giuris* the morphometric relationships were highly correlated and shows significant differences between male and female fish[14]. Studies of Goby, *Parachaeturichthys ocellatus* from Malad creek, Mumbai showed that the male and female fishes can be differentiate from the morphometric features[15].

The 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, they can easily escape the notice of the casual observer. Regression analysis on the morphometric characters of *Pagrus pagrus* revealed that standard length, post-orbital distance and pre-orbital distance were significantly different in males and females. The dimorphic characters in *Pagrus pagrus* may reflect the adaptation of males and females to different social or/ and reproductive roles rather than different niche utilization as both sexes were grown under the same artificial environment (rearing conditions)[16].

CONCLUSION

Comparison of the morphometric characters between male and female showed significant differences in all the characters except for Total length, standard length, head depth, eye diameter, pre-orbital length, post - orbital length, pre dorsal fin length I, pre dorsal fin length II, pre pelvic fin length, anal fin base, pre anal fin length and caudal peduncle depth . Hence, from the results of the present study, it was concluded that several morphometric characters had been found to helpful in diffrentiating the male and female populations of this species *Oxyurichthys tentacularis* in Ashtamudi Lake.

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