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Research Article

PHENOTYPIC EXAMINATION OF *ETROPLUS SURATENSIS* (BLOCH, 1790) IN LOWER ANICUT, TAMILNADU, SOUTH INDIA

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ABSTRACT

The present investigation was carried out to determine the morphometric and meristic counts of *Etroplus suratensis* in lower anicut. Samplings were done for one year period during November 2015 to October 2016. Totally 120 fish samples were examined in both sexes. The length ranges of male are 84 to 215 mm and 83mm to 196mm for female. There are twenty morphometric characters have been studied in percentage of total fish length from which five characters were genetically controlled, five characters were intermediate and ten characters were controlled environmentally. Three different categories of morphometric characters of male and female fishes were recognized medium viz. wide range, medium range and narrow range. Morphometric characters varied within the wide range of 101.61%, 100.60%, medium range of 17.36%, 17.12%, and 9.18% and 9.59% of narrow range of male and female respectively. Narrow range is less than 10% range characters were designated. The results showed that the relationship between the different morphometric characters (both dependent and independent variables) were found to be linear relationship highly significant ($p < 0.001$). The meristic characters were counted and draw a fin formula of this fish. The fin formula of *E. suratensis* - is D .F XVII-XX (10-14) Pec.F 11-15, Pel F I (4-5), AF ,XIII(9-12), B Sca.tr 24-26, Ltr Sca 26-58, G.rac 2+2.

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INTRODUCTION

The field of fishery biology has employed many tools such a genetics and morphometric to differentiate fish population (Sarkar, *et al.* 2013). The morphometric analysis of fish is an important key in the study of biology of fish. Green chromide, *Etroplus suratensis* belong to the family *Cichlidae* and an endemic *Cichlid* species to Asia, and widely distributed in the India (Ward and Wymann, 1977). It is euryhaline, occurring in riverine, estuaries and coastal lagoon, and in man-made freshwater habitats. Morphometric and meristic study are vigorous tools for measuring discreteness of the same species (Reily and Horn, 2004). Morphometric characters of fishes were found to be of taxonomic importance in sex, race, and species identification by many investigators (Khalil *et al.* 1984; Haug and fevolden 1986; Mekki 1987; Jawad 2015; Masood *et al.* 2015 and Zubia *et al.*, 2015). A number of morphological, physiological, behavioural and biochemical characteristics are used in identification and classification of fishes (Sokal *et al.* 2009) The analysis of phenotypic variation like morphometric characters or meristic count is the method most commonly used to delineate stock of fish.

Morphometric and meristic characters are commonly used to identify stocks of fish (Teugels 1982, Turan *et al.*, 2004; Suneetha and Damayanthi 2008) for establishing the evolutionary linkages between ancient and modern fish fauna (Deesri *et al.*, 2009). Morphometric measurements are widely used to identify differences between fish populations (Tzeng 2004; Cheng *et al.* 2005; Buj *et al.* 2008; Torres *et al.* 2010) and remaining the simplest and most direct method of species identification (Creech 1992; Mamuris *et al.*, 1998; Bronte *et al.*, 1999; Hockday *et al.* 2000). The morphometric characters are classified into three such as genetically (Narrow range), intermediate (Moderate range) and environmentally (vast range) controlled characters (Johal, Tandon 1994, and Sandhu 1994; Brraich and Akhter 2015). The present investigation gives information to fishery biologists about morphometric and meristic characters of the fish from Lower Anicut (Anakarai) at Tamilnadu. This will help to plan further conservation strategy for this species. The aim of the study to observe the intra specific variation of *Etroplus suratensis* through morphometric and meristic characters.

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MATERIALS AND METHODS

Study area

The Lower Anicut situated at the river named as Koandllidam river in kumbakonam to Chennai high road (Fig.1). It is one of the site for major freshwater fishery resources, where in the northern region of Tamil Nadu ($11^{\circ} 15' N$ latitude and $79^{\circ} 30' E$ longitude) which is selected for the present study. The river flows from west to east forming the northern boundry of this block. The total catchment area of this reservoir is 29, 693 square miles (sqm²) and capacity to store 150.13” MCFT of water to use agricultural irrigation and fishing activities (Pazhanisamy and Ebanesar, 2008). It is a main commercial landing centre for fish fauna where the Tamil Nadu State Fisheries Department (TNSFD) has a sole authority for landing and marketing of fishes through the year. They are landing different varieties of fishes; the Cyprinid is one of the dominant fisheries of this region. Generally, cast net, gill net, scoop and pole- lines are used for fishing activities in this region. This net could be operated either from the bank of the river or by employing in the craft. In addition, they are using four wheelers rubber tubes and thermacole raft teppam as craft.



Fig 1 Lower Anicut



Fig 2 Study area



Fig 3 Male *Etroplus suratensis*



Fig 4 Female *Etroplus suratensis*

Taxonomy

Phylum	:	Vertebrata
Sub phylum	:	Craniata
Super class	:	Gnathostomata
Serious	:	Pisces
Class	:	Teleostei
Sub class	:	Actinoptergii
Order	:	Perciformes
Sub order	:	Labroidei
Family	:	Cichlidae
Genus	:	<i>Etroplus</i>
Species	:	<i>suratensis</i>

Diagnostic features

Body is deep and laterally compressed, mouth small and with a small cleft, snout is spout – like, eyes large and lateral, lips thin and jaws equal. Teeth villiform, present on both jaws, scales are ctenoid. Body is light greenish with eight yellowish oblique bands, the first passing through the occipital part of head and last across base of the caudal. Dorsal fin single and united and posses xvii-xx spines 12-13 soft rays. Anal fin possesses x-xii spines and 10 -12 rays, the pelvic fin have one spine and 4-5 rays.

Body measurement of *Etroplus suratensis*

The total number of 120 specimens of *E.suratensis* were collected periodically (weekly) from Lower Anicut during November 2015 to October 2016. In fishes were kept in ice box on the spot. Then it brought to the laboratory for further study. Linear morphometric measurements were taken on the left side of fish by the same person to minimize artificial error. The total length and standard length of *E. suratensis* were taken by the measuring board with wooden ruler (cm) and other measurement were taken by Vernier calliper with the accuracy of ± 0.01 mm. The morphometric characters—taken into consideration were total length (TL) and head length (HL) as independent variables which standard length, body depth, pre dorsal length, dorsal fin base length, dorsal spine height, pre pectoral length, pectoral fin base length, pectoral fin length, pelvic fin base length, anal fin base length, caudal fin base length, Eye diameter, snout length, post orbital length, Inter orbital length, upper jaw and lower jaw as independent variable. Since males and females are identified morphologically each are weighed for electronic balance. A total of 27 body measurement were used, including 20 morphometric variables and 7 meristic variables analyzed (Fig.5). Then the fish dissected, identified and confirmed the sex. The most of the morphometric character were measured following the Jayram (1981) to explain the relationship

between the measurements, the regression equation ($y=a+bx$) was followed where 'X' stands for independent variables and 'y' for the dependent variables. Meristic characteristics were examined according to Froese and Pauly (2007).

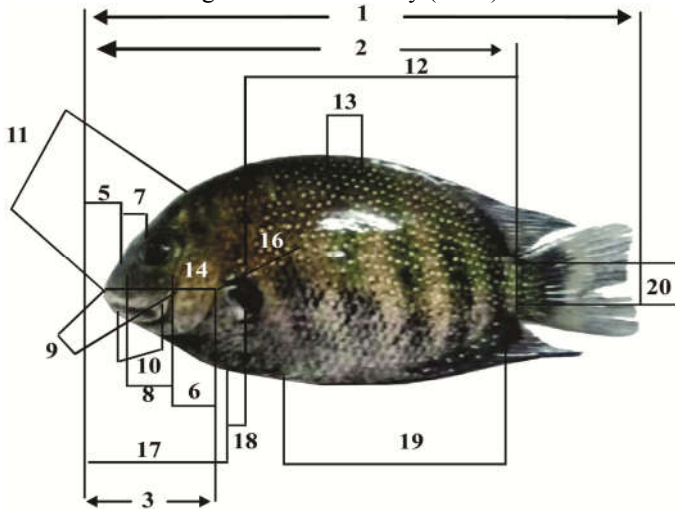


Fig 5 Body measurement 1.Total Length 2.Standard length 3.Head length 4.Body depth 5.Snout (or) pre orbital length 6.Post orbital length 7.Inter orbital length 8.Eye diameter 9.Upper jaw 10.Lower jaw 11.Pre dorsal length 12.Dorsal fin base length 13.Dorsal spine height 14.Pectoral length 15.Pectoral fin length 16.Pectoral fin length 17.Pre pelvic length 18 Pelvic fin length 19. Anal fin base length 20 .Caudal fin base length.

RESULT AND DISCUSSION

In the present study, twenty morphological characters and seven meristic characters were studied in both male and female *E.suratensis*. The results were expressed in total length Vs rest of the body characters have been taken for statistical analysis like Mean, SD, range, correlation Co-efficient and regression equation (Table 1 & 2). Morphometric and meristic characters of fishes were divided into three categories (Vladykor 1934) on the basis of range, hence they are genetically controlled (narrow range), Intermediate (moderate range) and environmentally (vast range) controlled characters. From the present study, the total length with standard length, head length, body depth, pre dorsal length, dorsal fin base length, pre pectoral length, pectoral fin length, pectoral fin base length, pre pelvic length, pelvic fin base length and anal fin base length of both male and female *E.suratensis* express the wide range of variations (27.26% to 101.6% in male and 27.72 % to 104% in females).

Total length with dorsal spine height, caudal fin base length, snout length, post orbital length and inter orbital length were belongs to the medium range of variations like 12.15 % to 17.36% in male and 13.03% to 17.71 % in female, while rest of the characters were belongs to narrow range (less than 10%). Majority of morphometric characters in *E.suratensis* shows environmentally controlled and five characters were genetically controlled and five characters were intermediate (Azadi *et al.*, 2008).

The result of meristic characters has given in the table 3 and 4 of both sexes of *E.suratensis*. The comparison between male and female meristic features such as dorsal fin rays , anal fin

rays, pectoral fin rays, pelvic fin rays, body scales lateral and transverse and gill rakers shows slight variation.

Table 1 Mean, S.D., Correlation coefficient (r), range difference and regression equation ($Y=a+bX$) between different morphometric character-of male *Etroplus suratensis*

S. No	Parameters Total Length (vs)	Mean (range) mm	S.D	r	Regression equation $Y=a+bx$
1	Standard length (SL)	101.61 (65.93-170)	23.26	0.971	$Y= 0.793+0.780x$
2	Head length(HL)	33.22 (24 -74)	9.57	0.793	$Y= -4.069+0.288x$
3	Body depth (BD)	58.15 (36.9-100)	13.97	0.821	$Y= 2.52+0.430x$
4	Pre dorsal length (PDL)	42.59 (20-76)	12.85	0.648	$Y=1.676+0.316x$
5	Dorsal fin base length (DFBL)	66.57 (30-112)	19.39	0.811	$Y=-10.69+0.597x$
6	Dorsal spine height (DspH)	13.10 (7-20.7)	2.95	0.648	$Y=1.882+0.086x$
7	Pre pectoral length (PPeCL)	32.90 (19.69-55)	7.31	0.594	$Y=10.77+0.171x$
8	Pectoral fin length (PFL)	27.26 (17.2-49)	10.17	0.886	$Y=0.872+0.204x$
9	Pectoral fin base length (PFBL)	9.18 (3.24-19)	6.53	0.349	$Y=2.967+0.048x$
10	Pre pelvic length (PPeL L)	39.87 (6.22-65)	11.29	0.831	$Y=-4.366+0.342x$
11	Pelvic fin base length (PelFBL)	5.11 (2-9)	2.52	0.331	$Y=1.440+0.028x$
12	Anal fin base length (AFBL)	48.16 (29.05-85)	41.85	0.401	$Y=22.76+0.196x$
13	Caudal fin base length (CFBL)	17.36 (9.87-33)	5.61	0.912	$Y=-0.800+0.140x$
Head length Vs					
14	Snout length (SnL)	12.68 (3-26)	6.64	0.171	$Y=3.889+0.264x$
15	Post orbital length (POL)	13.29 (5-22.2)	5.57	0.346	$Y=4.899 +0.252$
16	Inter orbital length (IOL)	12.15 (0.9-19.5)	3.67	0.318	$Y=5.857+0.189x$
17	Eye diameter (EyD)	8.63 (0.5-13)	3.93	0.129	$Y=5.916+0.082x$
18	Upper jaw (UJ)	6.59 (3-10.5)	3.25	0.355	$Y=2.818+0.113x$
19	Lower jaw(LJ)	5.15 (2.88-9)	5.22	0.628	$Y=1.553+0.108x$

Table 2 Mean, S.D., Correlation coefficient(r), range difference and regression equation($Y=a+ bX$). between different morphometric characters of female *Etroplus suratensis*

S. No	Parameters Total Length (Vs)	Mean (range) mm	SD	R	Regression equation $Y=a+bx$
1	Standard length (SL)	100.61 (68.2- 154)	22.98	0.784	$Y=21.05+0.623x$
2	Head length(HL)	33 (22.26-48.83)	7.04	0.571	$Y=14.95+0.143x$
3	Body depth (BD)	58.1 (37.1-90.38)	13.72	0.405	$Y=24.00+0.271x$
4	Pre dorsal length (PDL)	44.01 (30-68.9)	8.98	0.595	$Y=8.940+0.278x$
5	Dorsal fin base length (DFBL)	66.90 (11.3-109.08)	16.96	0.486	$Y=20.01+0.372x$
6	Dorsal spine height (DspH)	13.36 (6.28-21.17)	6.33	0.694	$Y=3.534+0.078x$
7	Pre pectoral length (PPeCL)	33.39 (21.98-45)	5.64	0.451	$Y=14.19+0.152x$
8	Pectoral fin length (PFL)	27.72 (17.2-43)	3.68	0.621	$Y=7.878+0.157x$
9	Pectoral fin base length (PFBL)	9.59(5.4-17)	5.27	0.588	$Y=2.154+0.059x$
10	Pre pelvic length (PPeL L)	38.7 (5.38-57.06)	8.39	0.739	$Y=7.649+0.246x$
11	Pelvic fin base length (Pel FBL)	5.06 (2.4-7.2)	1.37	0.145	$Y=3.267+0.014x$
12	Anal fin base length (AFBL)	48.73 (32.04-83.05)	10.05	0.611	$Y=11.90+0.292x$
13	Caudal fin base length (CFBL)	17.12 (10.55-29.5)	3.62	0.546	$Y=6.939+0.081x$
Head length Vs					
14	Snout length (SnL)	13.71 (3-26.8)	5.72	0.696	$Y=-14.72+0.860x$
15	Post orbital length(POL)	14.15 (6.81-28.86)	3.23	0.387	$Y=2.928+0.339x$
16	Inter orbital length (IOL)	13.03 (8.21-21)	2.73	0.599	$Y=2.912+0.306x$
17	Eye diameter (EyD)	9.43 (5-24.66)	3.82	0.098	$Y=3.765+0.171x$
18	Upper jaw (UJ)	6.78 (3.6-11.06)	2.83	0.242	$Y=1.190+0.169x$
19	Lower jaw(LJ)	5.57 (2-9)	2.11	0.379	$Y=0.084+0.166x$

Table 3 Meristic characters of male *E. suratensis* (Bloch, 1790)

No	Meristic Characters	Spine Range	Rays Range	Total Range
1	Dorsal fin rays	xvii-xx	10-14	28-34
2	Pectoral fin rays	-	11-15	11-15
3	Pelvic fin rays	i	4-5	5-6
4	Anal fin rays	x-xiii	9-12	21-25
5	Body scales Transverse	-	-	24-26
6	Body scales Lateral line	-	-	36-58
7	Gill Rackers	-	-	2+2

Table 4 Meristic characters of female *E.suratensis* (Bloch, 1790)

No.	Meristic Characters	Spine Range	Rays Range	Total Range
1	Dorsal fin rays	xvii-xx	10-13	28-34
2	Pectoral fin rays	-	12-15	12-15
3	Pelvic fin rays	i	4-5	5-6
4	Anal fin rays	xi-xx	9-12	21-25
5	Body scales Transverse	-	-	24-26
6	Body scales Lateral line	-	-	26-56
7	Gill Rackers	-	-	2+2

Fin Formula: D.F xvii-xx (10-14), Pec F 11-15, Pel F I(4-5), AF x-xiii (9-12), BSc.a.tr 24-26, Ltr.sca26 -58. , G. rac 2+2.

The variations found in the percentage values of various body measurements did not differ markedly with the finding made by (Whitehead 1965; Chonder, 1976). The comparative account of data presented on morphometric relationship of male and female *E. suratensis* in Lower Anicut gives a picture of little variation with the result obtained. The slight variation in the morphometric characters of the fish and their relationship observed by different authors may be due to the variations in the size range as well as in the number of specimens recorded by them from different water bodies located in the different geographical range which might different ecological conditions which exerted an influence on the proportionate growth of the various morphometric body parts.

The comparative meristic counts of male and female of showed some variation with the results of obtained by earlier workers (Day 1889; Chonder 1976; Shafi and Quddus 1982; Jayaraman 1981; Rahman 1989; Talwar and Jhingran 1991). In both male and female of *E. suratensis* dorsal fin rays anal fin rays, pectoral fin rays, body scales transverse, body scale lateral only little variation have been observed in the meristic characters. Landsey (1961) stated that counting of meristic series is a convenient technique in looking for evidence of population segregation.. Mc connel (1978) Stated that the information on morphometric measurements of the fishes and the study of statistical relationship could play an important role on the other hand, the morphometric characters of wide and medium range contribute in the indication of population of a species inhabiting the different water bodies or in different geographical regions. It is well known that ecological condition of a water body have great impact on morphometric characters. In *E.suratensis*, majority of morphometric characters show environmentally controlled. Its five characters are genetically controlled, five characters were intermediate and ten characters were environmentally controlled. In *E. suratensis*, standard length was found be most correlated part of the ten characters show high degree of correlation co-efficients. The regression

equation and correlation co-efficient between different body characters of male and female of *E.suratensis* did not show significant difference between the observed and calculated values indicating the practical applicability of these equation (Table 1 and 2). The values of “r” were highly positive and it is clear that most of the characters included in the present studies is directly proportional to each other. The standard length was most correlated with other parameters. From the present study, the morphometric and meristic characters of *E. suratensis* from Lower anicut reservoir were properly documented and stratified the data which compared with earlier works.

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