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Sexual Dimorphism in *Mystus Gulio* (Hamilton-Buchanan)

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Abstract: ***Understanding of sexual dimorphism in fish is an uphill task and the phenomenon is paradoxical in different species. Considering the importance, a study was carried out to identify the distinguishing morphological characters between the sexes of M. gulio. It is an edible fish with therapeutic qualities and is recommended by physicians as diet during convalescence. Statistical analysis of various morphological measurements of 383 numbers of freshly collected specimens was the tool of the study. Together, some morphological peculiarities have also been noted for the seasonal sexual dimorphism including, Males are usually smaller than females with a clear white spot in the tip of fork. In addition to this, in the case of males there is a protuberance with a free tapering end lying further back to the body on ventral side. Regarding females, there is an additional aperture behind the anal opening. The generative openings terminate to this aperture behind the anal opening and this probably represents the 'vagina'. In case of the female, the generative aperture is far behind the anal opening and is simple. During breeding season, in male, additionally there exists a spear shaped thickening on the base of the caudal fin ie, caudal thickening. These are absent in the case of females.***

Keywords: Sexual dimorphism, *M. Gulio*, Morphometry

1. Introduction

Morphometric analysis help to understand the relationship between body parts (Carpenter, 1996). Further, the morphometric study is a suitable technique for recognizing, comparing anatomical features and a primary source of information for taxonomic and evolutionary studies. Morphometric characters can be used to assess the influence of environmental factors on fish populations. In this regard, it is common to use measurements such as body length, body depth, head length, eye diameter, jaw length of fishes not only to assess fish habitat peculiarities and ecological criteria in water bodies, but also to measure discreteness and relationships among various taxonomic categories (Omoniyi *et al.*, 2010).

There are many well documented morphometric studies which provide information on growth patterns of many freshwater fish species of Ashtamudi lake. However, information on the morphometrics and characterization of *Mystus gulio* are scarce. Hence, the present study was undertaken to understand the relationship between the various morphological body parts of estuarine catfish and to find mathematical equations relating to the various morphometric relationships which could be utilized for the conversion of one measurement into another. Also the present study is an effort to investigate the probable variations in male and female of the species.

2. Materials and Methods

A total of 383 specimens of *Mystus gulio* were randomly collected from Vattakkayal lake. All morphometric measures were taken with digital calipers on the left side of the fish. The data on length was recorded in mm with an accuracy of 0.5, while weight was noted in milligram using a digital balance. The morphometric measurements were taken as suggested by Finney (1980) and Grant and Spain (2013). A total of twenty six morphometric parameters were studied, including twenty two body parameters and four head parameters. The following morphometric parameters were recorded during the study period. Total length, fork length, standard length, pre anal length, pre dorsal length, pre pelvic length, pre pectoral length, body depth, dorsal fin length, dorsal fin base, pectoral fin length, pectoral fin base, pelvic fin length, pelvic fin base, anal fin length, anal fin base, caudal fin length, caudal fin height , caudal peduncle length, caudal peduncle width, inter orbital length and caudal peduncle depth and four head parameters like head length, eye diameter, pre orbital length, snout length were measured.

3. Results and discussion

Sexual dimorphism in *M. gulio* is presented in **Fig 1 and 2.** In *M. gulio* sexes could be differentiated from the external appearance itself. Males are usually smaller than females with a clear white spot in the tip of fork. In addition to this, in the case of males there is a protuberance with a free tapering end lying further back to the body on ventral side. Regarding females, there is an additional aperture behind the anal opening. The generative openings terminate to this aperture behind the anal opening and this probably represents the 'vagina'. In case of the female, the generative aperture is far behind the anal opening and is simple. During breeding season, in male, additionally there exists a spear shaped thickening on the base of the caudal fin ie, caudal thickening.. These are absent in the case of females.

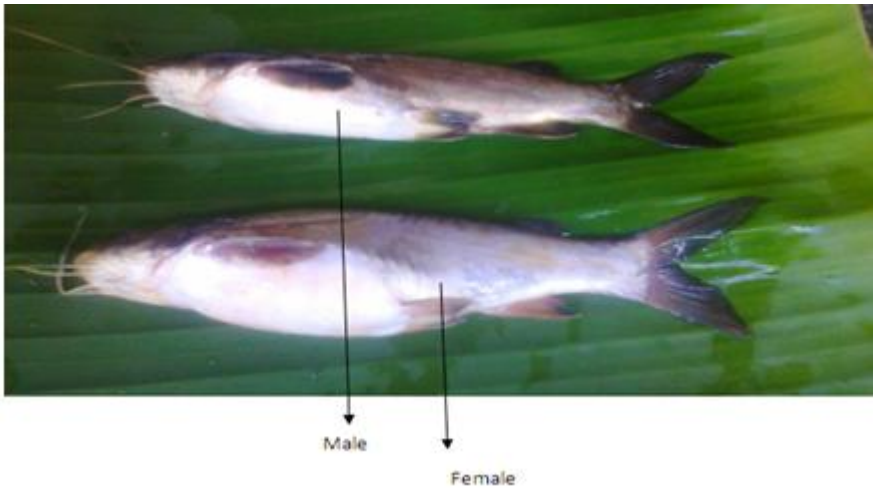

Figure 1: Sexual dimorphism in *Mystus guli*

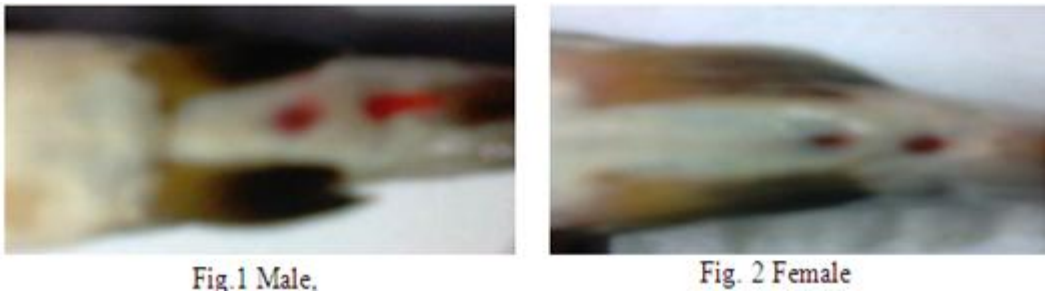

Figure 2: Ventral view of *M. gulio* (Ham. Buch) showing the anal and generative apertures

Total length of *Mystus gulio* was found to be 18.32 ± 4.06 cm in female, and 17.15 ± 3.99 cm in male. Statistical analysis showed that significant difference was found between male and female in terms of their total length (t (206) = 2.10, p = 0.003). Standard length of female fishes were 14.45 ± 3.14 cm, whereas in male it was 13.39 ± 3.15 cm. Statistical analysis showed that significant difference was found between male and female in terms of their standard length (t (206) = 2.42, p =0 .01).

The fork length of female and male were found to be 14.64 ± 3.12 cm and 14.18 ± 3.24 cm respectively. Statistical analysis showed that no significant difference was found between male and female in terms of their fork length (t (206) =1.03, p = 0.30). Pre anal length of female fishes were 10.1 ± 2.23 cm, whereas in male it was 9.37 ± 2.18 cm. Statistical analysis showed that significant difference was found between male and female in terms of their pre anal length(t (206) =2.30, p = 0.02).

Pre dorsal length for *M. gulio* was recorded as 5.05 ± 1.12 cm for female and 5.07 ± 1.18 cm for male. Statistical analysis showed that no significant difference was found between male and female in terms of their pre dorsal length (t (205) = -0.10, p = 0.91). Pre pelvic length for *M. gulio* was recorded as 8.02 ± 1.77 cm for female and 7.27 ± 1.69 cm for male, and significant difference was found between male and female in terms of their pre pelvic length (t (206) = 3.10, p = 0.002).

Mean value for pre pectoral length for *M. gulio* was recorded as 8.00 ± 1.77 cm for female and 3.24± .75 cm for male fishes, and significant difference (t (206) = 2.51, p = 0) was observed.Body depth for *M. gulio* was recorded as 2.99± .66 cm for female and 4.64 ± 1.08 cm for male, showed a significant difference (t (206) = -1.32, p = 0). Head length for *M. gulio* was recorded as 3.78 ± 0.83 cm for female and 3.78 ± 0.89 cm for male. Statistical analysis showed that no significant difference was found between male and female in terms of their pre dorsal length (t (205) = 0.001, p = 0.919).

Eye diameter of *M. gulio* was recorded as 0.64 ± 0.14 cm and 0.65 ± 0.15 cm for female and male respectively, and no significant difference was found (t (206) = -0.49, p = 0.61). Pre orbital length of *M gulio* was found to be 1.36± 0.32 cm and 1.38 ± 0.32 cm for female and male fishes respectively, and no significant difference were observed (t (206) = .17, p = .86).

Snout length of *M. gulio* was observed as 1.34± 0.31 cm and 1.36 ± 0.31 cm for female and male respectively, and no significant difference was found t (206) = -0.51, p = 0.60. The dorsal fin length was recorded as 3.59 ± .82 cm for female and 3.53 ± 0.85 cm for male, and no significant difference was found (t (206) = 0.52, p =0.59). Dorsal fin base was observed to be 1.82 ± .40 cm for female and 1.62± .37 cm for male and there was a significant difference (t (206) = 3.68, p = 0).

Pectoral fin length for *M. gulio* was recorded as 2.67 ± 0.59 cm for female and 2.50 ± .59 cm for male fishes, and significant difference was found (t (206) = 2.01, p = .04). Pectoral fin base of female and male was recorded as 0.61 ± 0.13 cm and 0.56±0.13 cm respectively, and significant difference was found (t (206) = 2.18, p = 0.02). The pelvic

fin length of female was recorded as 1.85 ± 0.41 cm and male as 1.73 ± 0.40 cm, there was significant difference found between male and female (t (206) = 2.11, p = 0.03). Pelvic fin base was recorded as 0.59± 0.14 cm for female and 0.62 ± 0.148 cm for male. There is no significant difference found (t (206) = -1.77, p = 0.07) between male and female.

The anal fin length for *M. gulio* was found to be 2.45 ± .59 cm for female and 2.48 ± 0.58 cm for male, with no significant difference (t (206) = -0.28, p = 0.77). Anal fin base was recorded as 2.09 ± 0.46 cm for female and 1.98± 0.46 cm for male, and significant difference was found (t (206) = 1.74, p = 0.08). Caudal fin length was recorded as 2.27 ± 0.52 cm for female and 3.71 ± 0.87 cm for male, and significant difference was found t (206) = -1.44, p = 0)

Caudal peduncle length was found to be 2.44 ± 0.55 cm for female and 2.28 ± 0.53 cm for male and no significant difference was found between sexes (t (206) = 2.09, p = 0.38). The caudal peduncle width of fishes recorded 2.18 ± 0.49 cm for female and 2.10 ± 0.50 cm for male and no significant difference was found between sexes (t (206) = 1.06, p = 0.28).

Caudal peduncle depth was observed to be of 0.81 ± 0.18 cm and 0.91 ± 0.21 cm for female and male respectively, and significant difference was found (t (206) = -3.68, p = 0). The inter orbital length of fishes recorded a value of 1.90 ± .41 cm for female and 1.16 ± 0.27 cm for male, and significant difference was found between male and female (t (206) = 1.50, p =0). The mentioned differences in the morphometric characters noted for males and females of the species *S. semiplotus* may be considered as sexually dimorphic feature. Understanding of secondary sexual dimorphism in fish is an uphill task and the phenomenon is paradoxical in different species. The linear relationship of various morphometric characters and total length have been reported by Chatterjee *et al*. (1977) in morphometric studies on *Labeo bata* (Ham.) from the different freshwater environments, Tariq *et al*. (1977) in the morphometric characters of a carp *Labeo calbasu* (Ham.), Khumar and Siddiqui (1991) in the carp *Puntius sarana* (Ham.) of a reservoir and three reverine ecosystems in North India and Tiwari and Qureshi (2003) in the morphometric characters of the catfish *Rita pavimentata* (Gunther) from the river Narmada.

4. Conclusion

Present study showed that M. *Gulio* exhibiting sexual dimorphism. Identification of the sex in fish through morphometric observation is very important tool to be used in fishery growth and management, like monosex culture and artificial spawning.

5. Acknowledgement

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