THE BLACKCHIN TILAPIA: BASIC CHARACTERISTIC FEATURES

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ABSTRACT
An investigation was conducted into the basic characteristic features of the blackchin tilapia, Sarotherodon melanotheron (Rüppell, 1852). Adult male S. melanotheron was caught from an artificial body of water (burrow-pit) at the experimental fish farm of Nigerian Institute for Oceanography and Marine Research (NIOMR) at Badore, Lagos State. The male fish released its fry from the mouth when it was introduced into a basin containing water. The released fry were transferred to an out-door hatchery and acclimatized for a week in fibre-glass tanks. Observations of changes in the external features of the fish as they grew were noted and recorded over a period of six months. The fry averaging 9.70 standard length and 11.70 total length in size were silvery in colour and possessed seven bars of darker coloration on the flanks. The black melanic pigmentation on or around the chin observed in the third month is an important aid in species identification. The initial difficulty in identifying the specific tilapia studied due to the adaptive powers of colour change of the parent fish and the variable pigmentations that increased in number as the young grew necessitated this paper.
Keywords: sub-species, taxonomic classification, brackish water fish, blackjaw tilapia

INTRODUCTION

One of the most basic requirements for any form of scientific study of fish obtained from the wild is the ability to identify correctly the specimen using laid down procedure. Essentially, identification keys are used to know the classification of the specimen. Also, knowing the current generic and specific types available, and the features to look out for, aid in the taxonomic classification of the organism.

Sarotherodon belongs to the family Cichlidae and its distribution is widespread in coastal regions of Africa, including Mauritania, Senegal, Gambia, Guinea-Bissau, Guinea, Sierra Leone, Liberia, Côte d'Ivoire, Ghana, Togo, Benin, Nigeria, Cameroon, Democratic Republic of Congo, and Ethiopia (Froese and Pauly, 2011). According to Trewavas (1983), it is a species that is indigenous to West Africa and inhabits brackish estuaries and lagoons from Senegal to Zaire (now Democratic Republic of Congo). Pauly (1976), Prunet and Borancin (1989), Teugels and Thys van den Audenaerde (1992) all reported that the species is a paternal mouthbrooding tilapia, which inhabits salt, brackish and freshwater habitats in West Africa.

Trewavas (1983) reported that, *Sarotherodon melanotheron* (Rüppell, 1852) otherwise known as the blackchin tilapia has five sub-species. These include: *S. melanotheron heudelotii* (Duméril, 1861); *S. melanotheron nigripinnis* (Guichenot, 1861); *S. melanotheron leonensis* (Thys van den Audenaerde, 1971); *S. melanotheron paludinosus* (Trewavas, 1983) *and S. melanotheron melanotheron* (Rüppell, 1852).

The species can tolerate salinities of up to 100 ppt for brief periods and will spawn in waters of up to 35 ppt (Jennings and Williams, 1992). Female blackchin tilapia take the initiative in courting males and each female begins to dig a pit for eggs before a male has been chosen. If the male is stimulated to react to the female's advances, he forms a pair bond with her. This bond remains firm and the male begins to take an active part in digging and defending the pit that the female has started.

The females lay from 200 to 900 orange eggs measuring 1.5 - 4.5 mm in diameter depending on the size of the female. The eggs are fertilized externally and incubated within the buccal cavity of the male (Trewavas, 1983). The number of eggs that can be incubated by the male ranges from less than 20 to over 700, depending also on the size of the male.

Mouth-brooding is a common practice in tilapia, however *S. melanotheron* is unique in the fact that the male of the species, rather than the female, is the mouth-brooder. However, some sub-species are maternal mouthbrooders (Seriously Fish, 2010). Male blackchin tilapia scoop fertilized eggs into the mouth and the eggs may hatch inside the mouth within 4 to 6 days depending on temperature. The young are then kept in the mouth from 14 to 19 days (Trewavas, 1983).

Females aggressively defend nest sites only during the period the male mouthbroods (Jennings and Williams, 1992). Once the young are released, the males, for a brief period, may re-scoop them into the mouth if danger approaches. In a matter of days, the fry are left to fend for themselves (Pullin and Lowe-McConnell, 1982; Eyeson, 1979). Fry range from 2 – 11 mm at the time of hatching. After release, the young no longer have contact with the parents but are quick to form schools with each other in order to avoid potential danger (Trewavas, 1983).

S. melanotheron has been introduced to several countries for aquaculture purposes and thriving populations now exist in areas of Asia, Europe and the

USA (Wohlfarth and Hulata, 1983). Masterson (2007), indicated that *S. melanotheron* is a potentially misidentified species as it is similar in appearance to other tilapine fish species (including the genera *Tilapia*, *Oreochromis*, and *Cichlosoma*) and to many cichlids in general. Several of these species can be found as co-occurring in locations where *S. melanotheron* has become established. This study investigated the basic characteristic features that were observed from fry to adult stage.

MATERIALS AND METHODS

Adult male *S. melanotheron* was caught from an artificial body of water (burrow-pit) at the experimental fish farm of Nigerian Institute for Oceanography and Marine Research (NIOMR) at Badore, Lagos State. The male fish released its fry from the mouth when it was introduced into a basin containing water. The released fry numbering one hundred were transferred to an out-door hatchery and reared in a water volume of 1.5 m^3 in three fibre-glass tanks with centrally located outlets using flow-through system. Observations of changes in the external features of the fish as they grew were noted and recorded over a period of six months. Throughout the study period the experimental fish were fed an extruded floating fish feed. Water quality parameters, especially temperature, pH and ammonia were monitored during the study period.

RESULTS

The depth of the water body from which the adult was caught ranged from 60 cm at the shallow end to 220 cm at the deep end. The parent fish used for this study was caught at a depth of 150 cm. The temperature of the water body on the day of capture was 24 $^{\circ}$C, the pH was 6.8 and the salinity was 0 ppt. The features of the adult fish were that of a male tilapia with standard length – 209 mm, total length – 257 mm, body weight – 265 g while the main body colouration was light brown.

The fry that were released from the male fish averaged 9.70 mm standard length and 11.70 total length. The average weight was 0.04 g. The fry were silvery in colour and possessed seven faint bars of darker coloration on the flanks. In the second month, all the specimens had one or two tilapia-spots on their soft dorsal fins. The upper and lower apices of the caudal fins of the juveniles adopted a black colour in the third month. In the fourth month, all fish samples developed a black colouration on the chin. During the fifth month, a decrease in weight gain was observed and territorial behavior was displayed by 7 – 10% of the fish specimens. At termination of the experiment, in the sixth month, the standard length of the experimental fish averaged 113 mm, while total length was 152.5 mm. The average body weight was 33.86 g. The opercula of the male *S. melanotheron* (Plate I) was distinct in colouration from that of the female (Plate II). It was also observed that the adult male in Plate I was mouthbrooding its fry and later released them into the sampling container (Plate III).

Plate I: Adult male *Sarotherodon melanotheron* with characteristic gold coloured operculum and black chin at maturity (Photo courtesy Anwa-Udondiah, E.P.)

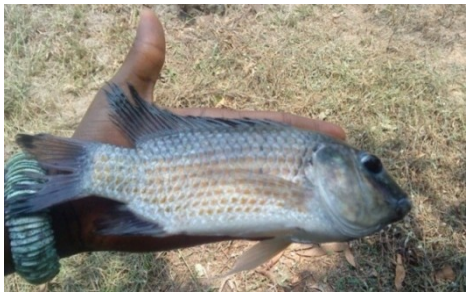

Plate II: Adult female *S. melanotheron* with transparent operculum and black chin at maturity. (Photo courtesy Ikoyo-Eweto, O.G.)

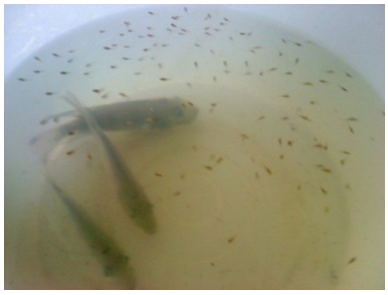

Plate III: Adult male parent of *S. melanotheron* (marked X) releasing its young fry from its mouth at six months of age. (Photo courtesy Anwa-Udondiah, E.P.)

DISCUSSION

The species *S. melanotheron* according to (Trewavas, 1983) has a strong preference for brackish water. However, the specimen used for this study was found in a closed freshwater body situated within the experimental fish farm of NIOMR which is located close to the Lagos lagoon. This is in line with the findings of Pauly (1976) who stated that the fish occurs rarely in freshwater, except when brackish water is nearby, as was the case in this study. Pauly (1976) also found the blackchin tilapia to be the predominant fish in a closed lagoon where the salinity fluctuated from 0 to over 45 ppt. This therefore agrees with the salinity level of 0 ppt of the burrow-pit from which the adult fish was caught.

The temperature of the water body on the day of capture which was 24 °C and the observation that fry were present in the buccal cavity of the captured fish was in agreement with the findings of Trewavas (1983) that no breeding occurs below 20 to 23°C. Campbell (1987) also found that the blackchin tilapia grew well and reproduced at pH values ranging from 3.5 to 5.2 in ponds constructed in acid sulfate soils. The pH value of the burrow-pit which was 6.8 at the time of study was within the tolerable range (6.5 – 8.5) of most fish species, according to Boyd (1990).

The main body colouration of the adult which caused an initial confusion agreed with the findings of Masterson (2007) who indicated that *S. melanotheron* is a potentially misidentified species. As a result of the parental disguise, the fry from the captured blackchin adult were reared to sexual maturity in an out-door hatchery and at different life stages they were compared with internet downloads (Plates IV - VIII) which were used to compare the similarities or otherwise of the fish under study.

Plate IV: ***Sarotherodon melanotheron***
© Neil Hepworthhttp://www.practicalfishkeeping.co.uk/custom.

Plate V: ***Sarotherodon melanotheron melanotheron***
© JJ Photo http://www.seriouslyfish.com.

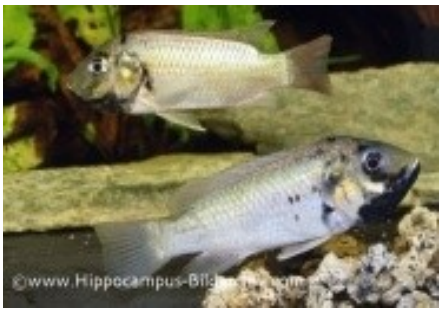

Plate VI: ***Sarotherodon melanotheron melanotheron***
© Hippocampus-Bildarchiv http://www.seriouslyfish.com

Plate VII: ***Sarotherodon melanotheron melanotheron***
© Hippocampus-Bildarchiv

Plate VIII: ***S. melanotheron***
Photo courtesy USGS (U.S. Geol. Surv.)

The parent fish of the specimens studied had a light brown colour, much as in Plate VIII while the young were silvery in colour with faint dark bars at their dorsal flanks at the early stage of their development. This resulted in an initial difficulty in the proper identification and naming of the specific tilapia studied. At the conclusion of the study, it was deduced that the colouration of the parent was a camouflage to match its habitat. This agrees with Campbell (1987) who stated that colouration varies with location, sexual activity, and environmental background with a protective chameleon effect.

As stated earlier, the young were differently coloured from their parent. It may be hypothesized that this was as a result of their age. As they grew, they added on other colours which in comparison to identification keys and many downloads of tilapia fitted best with the blackchin tilapia, *Sarotherodon melanotheron*. In the fourth week, the tilapia spot had become distinct and some of the population had in addition to this a smaller spot. This observation is shown in Plate V. Comparisons of the specimens with Plate IV also verify the seven bars of bright yellow dots at the side flanks which were observed at maturity.

Plates VI and VII, both taken by Hippocampus-Bildarchiv, show the differences in the sexes from their opercula, of *Sarotherodon melanotheron melanotheron* which according to Clarke (2010) is the most commonly seen sub-species. These plates agree with Plates I and II of this study that also show sexual differences via the opercula. The slight colour variations observed in Plates IV to VIII photographed in different localities and from various water bodies agree with the observations that *Sarotherodon melanotheron* are able to vary the intensity of their skin pigmentations to reflect the surrounding ambience. Bright lighting as in Plate VI may make them appear lighter in colour while dark surroundings as in Plate VIII may make it take on a dull appearance.

Clarke (2010) stated that even though sexual differences in *S. melanotheron* are not marked thereby resulting in a difficulty to differentiate the sexes, the males have more black colouration around the head area and when mature have a gold-coloured operculum (Plate I). For the females (Plate II), the operculum is transparent, thereby allowing the underlying red coloured gill to be seen. From this description therefore, Plates IV, V, VII and VIII may probably depict female species of the blackchin tilapia while Plate VI may be two males with gold coloured opercula.

The male adult in Plate I is the broodfish in Plate III. Three adults were retrieved for sampling and one of them (marked indicating the parent and direction of spew of its young) released its young into the water in the sampling container. The fry were the progeny of the experimental fish studied. This agreed with observations of many authors that the blackchin tilapia is a paternal mouthbrooder (Trewavas, 1983; Campbell, 1987; Seriously Fish, 2010).

CONCLUSION

The basic characteristic features of the blackchin tilapia, *Sarotherodon melanotheron* in this study were found to be variable for different life stages. For the fry stage, the feature would be the silvery colour and possession of seven bars of darker colouration on the flanks. The juvenile stage had two identifying features; one of which is the presence of one or two black tilapia-spots on the soft dorsal fin which did not appear to persist into adult life stages. The other feature was the adoption of black colouration at the upper and lower apices of the caudal fin. At the adult life stage, all fish samples possessed a black colouration on the chin. Finally, at sexual maturity, the golden yellow gill cover and black chin provided a better field identification characteristic for the male while for the female the basic feature was a transparent operculum showing the reddish gills in addition to the black chin. The body of both sexes had seven bands of conspicuous bright yellow spots on the flanks. When the identifying features of a fish is known, despite the "chameleonic" tendencies probably for the purposes of camouflage, the characteristic features may stand out clearly, and for the blackchin tilapia it is basically the melanic pigmentation on or around the chin and on attainment of maturity, the opercula.

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