International Journal of ChemTech Research
CODEN (USA): IJCRGG, ISSN: 0974-4290, ISSN(Online):2455-9555
Vol.10 No.9, pp 589-593, 2017

A Study of Some Morphological Changes Associated with Sex during the Reproduction Season for *Tilapia zilli*

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Abstract : This study was conducted to reveal some morphological changes associated with sex for males and females of the Tilapia zilli in some of the Iraqi provinces for 4 months (from April 2016 to July 2016) according to the several standard and descriptive morphological features which showed the standard body weights and length in the females in comparison with the males. While the appeared coloration is different from the coloration of the body in the non-reproduction season especially in the males. This difference has been represented by a dark red color at the bottom of the head area. The change of eye color for both genders was clear during the reproduction season. So these features have been considered as variable features appear on Tilapia zilli during the reproduction season in all of Iraq.
Key words : Morphological Changes, Tilapia Zilli, Standard features and Descriptive features.

Introduction

Sexual dimorphism represents a wide spread phenomenon in the nature and it subjects to a variation within the animal kingdom. The males and females are not different only in their sexual organs, but also in morphological features which have no direct relation with the reproduction (1 and2). There is a wide range of patterns and forms of sexual dimorphism that evolved significantly in bony fish compared to the other vertebrates.

The subject of macro distinguish between the two genders without autopsy is one of the important subjects in the life studies related to fish especially the programs concerning the reproduction and breeding and research programs which require fish to be live during the study(4). The additional information provided by the study of this phenomena are necessary to understand the environment, behavior, date of life for the two kinds and comparing the groups according to the morphology (5). The studies explain that water pollution has an impact not limited to the physiology of fish and their reproduction (4), but also leads to sex reversal (6). The morphological differences between males and females either permanent or temporary are related to reproduction season (7,8) or with the stages of growth and environment(9 and 10).

Many studies have revealed differences between males and females in terms of size and form of the fins , jaws ,snout and coloring and noting an additional permanent physical structures as well as the temporary features in reproduction season such as sexual blisters , the shape of fin actins and certain forms or colors patterns ,coloring certain parts of the body (11,12,13,14,15,16) and sexual dimorphism in nutrition mechanism by the difference of jaw size and the extent of its prominence (2) .

Methods and Materials of work

In order to conduct the current study, 200 Tilapia zilli have been used , 50 from each one of the four provinces including Baghdad, Nasiriyah, Amarah and Basra . The rates of the total length, standard length, head length and weight for both males and females in addition to numbers of fish are shown in the table (1).

Table (1) illustrates rates of some vital measurements of Tilapia Zilli for four months

Gender	Wight g	No. of fish	Head length/Cen	standard length	Total length	Months of study
♂	89.6	22	4.02	12.44	15.7	April
♀	71.6	28	3.43	11.88	14.89	
♂	85	30	4.18	12.24	15.68	May
♀	73.2	20	3.72	11.54	14.62	
♂	85.4	20	3.92	12.34	15.76	June
♀	74.89	30	3.74	11.48	14.96	
♂	85.65	21	4.16	12.62	15.92	July
♀	75.55	29	3.82	11.86	15.50	

The comparison between males and females of Tilapia zilli has showed that in the current study of some physical measurements represented in the total length, standard length, head length and weight in addition to the numbers of fish, clear differences between the two genders during the study period have been raised. These differences appeared especially when the rates of female weight were increased as a result of existence of the eggs while the males weights were kept relatively close to each other during the study period for four months.

The current study also showed appearance of certain features only in reproduction season and they disappeared during the rest of study months. These features are the red cornea in the male in comparison with light golden color of the cornea in the female and red lips in the male while the bodies of female colored with bright blue in the front of the head at the forehead, so these two features are considered as temporary sexual dimorphism as it is shown in the figures (1) and (2).

Figure(1) male of Tilapia zilli, the red color is clear at the bottom of the lower jaw toward the front of abdomen and chest

Figure (2) female of Tilapia zilli, the bright golden olivaceaous with blue color in front of the head at the forehead.

The analysis of water values in this study is shown in Table (2)

Table (2) illustrates the studied values and analyses during the study period

Studied measures	**April**	**May**	**June**	**July**
Temperature	25	26	26.5	28
PH	7	7.2	7.8	8.2
Transparency CM	142	350	540	150
Total of Soluble solid objects ppm	520	550	320	450
Soluble Oxygem Ml/L	18	20	22	225

Table (3) shows the analysis of Tilapia zilli 's stomach contents for the study purposes

Contents of stomach for both genders	**Fish no.**	**Percentage of nutrition in the stomach%**
Determined & informed nutrition	370	88
Empty Stomach	20	4.75
Parts of insects' bodies	100	24.87
Parts of Fish bodies	57	14.17
Algae	140	34.23
Bad & dissolved food	30	7.46
Not distinguished & unknown food	23	5.66

As shown in Table (3) the analysis of the fish stomach contents during the four-month period, it is noted that the percentage of algae in the Tilapia food was the highest (34.23%), followed by the presence of parts of insects' bodies(24.87%), then parts of fish bodies (14.17%), bad food and dissolved food in stomach(7.46%), not distinguished or unknown food (5.66%) to reach the lowest ratio which is the empty stomach (4. 75%), the results are close to the expected ones (17).

The current study shows a group of additional features which some of them have been referred to in the previous local studies for other kinds of fish which concentrated on shapes and length of the fins and the distance between the pelvic and anal fins as they were considered to be permanent features of sexual dimorphism in the Barbel fish (11). The difference in the shape of sexual hole between the males and females of Asian Silurid fish(12). The whole shape of the body, the head, the fins and noting sexual blisters as they were considered to be temporary features in the varicorhinus damascinus(13). The distance from the head front to the dorsal fin in addition to the fins color, coloration certain parts of the body and head were considered to be permanent features, while the color of whole body and color of cornea were considered to be temporary features of the Barbus luteus. The distance from the head front to anus, color of the anal and caudal fins were considered to be permanent features and coloration of gill cover as temporary features in the big mouth Barbel fish(15).

It has been stated that the difference between the two genders in several secondary sexual features which are necessary and important to complete the copulation, ovulation and incubation despite these features are not involved directly with the reproductive mechanism (18).It has been mentioned that the sexual dimorphism had resulted from variety of factors such as natural selection and its effect on the fertility which leads to difference between the two genders' size. It is known that the female is bigger than the male which will increase its fertility then accomplish a great success in the reproduction operation due to its ability for producing a larger amount of eggs and it is favorable by males (18). The effect of natural selection on their competition for getting food whereas the bigger the fish, the greater amount of food it gets. The effect of the sexual selection that promotes the ability of attracting the spouse where males of animals compete in order to attract females by showing certain sexual color or shape pattern during the competition (16). In this paper, it has been mentioned that the body size will be largely affected by the reproduction environment (19) even though this feature can be relatively controlled genetically (20). Also, the behavior of parental care has an effect on the increase of the male body size because of its role in guarding the nest, in spite of the small males can grow and start the reproduction earlier than the big ones (1).

The female fish is considered more accurate in choosing the suitable spouse than the male. In addition to the competition among the males to achieve mating with the females which is done either by fighting or by coloration whereas the female can mating only once during the reproduction season while the male can produce a huge number of sperms that are enough for fertilizing eggs of several females (21). The secondary sexual features represented by sexual signs appeared in the gender of which shows its ability for reproduction not the gender which makes the selection (22), for that reason the female in the Aspius vorax heckel is the gender that choses the suitable spouse for mating and the male is the gender that shows himself by coloration of the eye cornea and lips redness in comparison with the female in the reproduction season.

It has been mentioned previously that the difference in the distances noticed among the fins and their lengths, colors and shapes between the two genders is resulted from the sexual hormones effect on these features (11). Therefore, this effect can be explained for the differences recorded in the body measures and fins colors in the males and females of the aspius vorax heckel fish. As for the difference between the two genders according to the shape of the head and the existence of a bony prominence in the head, it maybe resulted from the adaptation occurred in order to get food and certain strategies that followed by these populations in searching for food (23). Regarding the appearance of temporary sexual dimorphism features in the aspius vorax heckel only during the reproduction season, while the appearance of the secondary sexual features in the fish is related with the sexual steroid hormones (10) (24). So the appearance of these temporary features can be explained by the environmental factors effect which are usually different according to the season then this will have an effect on the sexual hormones that are responsible for the appearance of the secondary sexual features in the fish (25) (26).

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