

## EVALUATION OF THE GENDER DIFFERENCES AND REPRODUCTIVE PHYSIOLOGY OF CATFISH (ANCISTRUS CIRRHOSUS)

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**Abstract:** *Ancistrus cirrhosis* is a catfish which used for removing algae from aquariums. It is known that it's the largest genus in the *Ancistrus* family and is represented by 64 species. It feeds by herbal supplement and can tolerate a wide range of water condition. In general, all kinds of algae containing foods and also vegetables such as peas, carrots, spirulina are included in their diet.

The male fishes are larger than female fishes. Although female fishes have tentacles in the upper of the head, this structure is not available in females. The inside of the slot is cleaned by male fishes for reproduction. The male fish that cleans the area attracts the female to the breeding zone with their behavior. The female fishes adhere the eggs to clusters with adhesive properties. After pouring the eggs, the male fish looks at the eggs for 7 to 10 days. During this period, the male does not leave the nest even if the fish is to be fed.

In our study, it's aimed to observe the sex differences and reproductive physiology of *Ancistrus cirrhosis* fishes. 7 male and 7 female fishes were studied and took their pictures and recorded the videos during the behavioral process. All this process were also staged graphically. As a result, these fishes are being important in aquarium sector with its gender differences and nutrition.

**Key words:** *Ancistrus cirrhosis*, catfish, aquarium

### Introduction

The *Ancistrus* is firstly specified by Kner at 1854 (Bifi et al., 2009). However, 59 various types were observed by the times and have been involved in the aquarium since the early 1900s. (Regan 1904; Isbrücker 1980). These fishes show the typical features of the Loricariidae family (Sabaj et al 1999). *Ancistrus* species are found in the high Andean rivers and white, clear and black waters. As a general rule, species from white and clear waters have colors ranging from light gray to medium brown and are usually either dark or light. However, almost all species encountered in territorial waters exhibit a dark brown color to black with a pattern of small to medium-sized white to yellow dots. *Ancistrus* can also swallow atmospheric air to help them breathe in environments with low oxygen content.

*Ancistrus cirrhosus* (Catfish) is a type of small stingray which also a great tank cleaner (Regan 1904). They have become a preferred fish due to their smaller structure, and a good algae eater than other pleco species. They can live and reproduce in a wide pH range in tanks with different water characteristics. Also they are more active at night like other types and live in a harmony with many peaceful fish species. Herbal feeds are important for these fishes. They can eat vegetable protein such as spirulina, boiled spinach, boiled carrot or cucumber. Their gender distinction is quite difficult since they're in small offspring. There are thorny extensions at front and the trunks are both of wide and long in males. On the other hand, in the females, the thorny appendages can not be seen or very small. Also, their bodies and structures are thinner than male ones. The males are polygamy which means mating with more than one female in the same tank and make offspring. Then, the male cleans the region and attracts the female to the breeding area with courtship behavior, and also they look at the eggs and protects them. They protect the eggs for 7 to 10 days (Sabaj et al., 1999).

There is not much interest in breeding fishes which are not famous in domestic market. On the other hand, the production of this type of fish is a difficult, laborious and demanding job. However, they are most popular in aquarium trade. Nico et al (2018) observed that “Aquarium release; bristlenosed catfish (along with many other species of the armored catfish family Loricariidae) are highly popular in the aquarium trade.” Besides that, in Turkey, the amount of these fishes produced by domestic producers can not meet the demand sufficiently. In this study, it’s aimed to observe the sex differences and reproductive physiology of *Ancistrus cirrhosis* (Catfish) to clarify and detect the importance of this genus.

**Material and Methods**

*Animals and Experiment:* The research was carried out in the Tekirdag Namik Kemal University, Faculty of Veterinary Medicine, Fisheries and Diseases Laboratory. In the trial, 7 male and 7 female fishes were studied. The animals were housed under standard laboratory conditions (average 27.06±0.49 C; 59.27±13.58% humidity). Also the salinity (312.61±17.89) and TDS (dissolved solids; 500.89±29.17) were in normal range (Table 1). 12 hours light and 12 hours dark photoperiod was applied in aquariums with a height of 80 \* 35 \* 45 cm. One side open and the other side closed test were used for reproduction (Figure 1).

**Table 1.** Water quality parameters.

Water Quality Parameters	Mean ± SD
Salinity (g/kg)	312.61±17.98
TDS (mg/l)	500.89±29.17
Aquarium temperature (°C)	27.66±0.49
Environmental temperature (°C)	28.27±0.35
Humidity (%)	59.27±13.58
pH	8.08±0.10
Oxygen concentration (mg/l)	9.00±1.41
Conductivity (µs)	620.39±37.16

The daily pH, salinity, TDS, conductivity and aquarium temperature were measured by the Extech Instrument. Environmental temperature and humidity was measured by Thermo Hygro and oxygen concentration was detected by commercial JBL kits. A pipe filter was used for filter system. During trial, it siphoned the waste accumulated in the aquariums every two days and exchanged water with the same temperature as the aquarium.



**Figure 1.** Reproduction cube

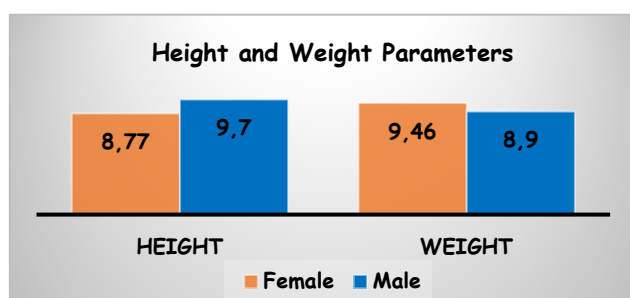
Fishes fed a standard diet. Some morphological parameters such as weight and height, were measured in all ages. Gender discrimination was separated according to the extensions formed by looking at the head structure of the adult fish (Figure 2). Also, their photos were taken and videos were recorded during all ages and behavioral process.

*Statistical analysis:* Statistical analyses performed with SPSS (Version 20.0). All the values were grouped and calculated as means ± standard deviation. One-way ANOVA was applied to all parameters to examine the

difference between groups. Differences were considered significant at  $p < 0.05$ . Tukey's test (Dowdy & Wearden, 1981) evaluated if the difference between groups was provided to be significant ( $p < 0.05$ ). On the other hand, in non-homogenous groups, differences between means were analyzed by Kruskal Wallis and following Mann Whitney U test between groups one by one (Dawson and Trapp 2001). Also, The correlation analysis were identified by Pearson Correlation method.

## Result and Discussion

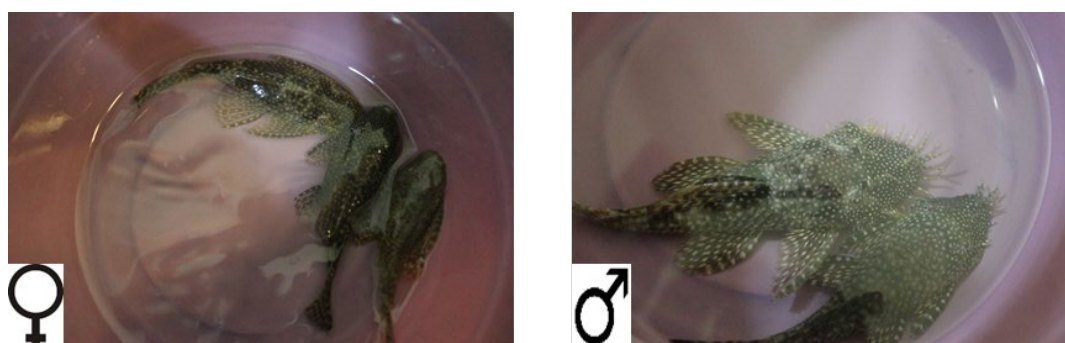
The height and weight of all fishes were figured in Grapic 1. Also, some female reproductive parameters (larvae and egg counts) are shown in Table 2. The mean live weights of female and male fishes were  $9.46 \pm 0.63$  and  $8.90 \pm 0.79$ , and the height of males and females were  $8.77 \pm 0.27$  and  $9.70 \pm 0.43$ , respectively. The larvae and egg counts were  $49.00 \pm 16.63$  and  $53.00 \pm 16.91$ , respectively. There were no statistical differences between either groups or parameters ( $p > 0.05$ ). However, there positively and statistically corelations were observed, especially among female weight, larvae and egg counts. There are positive and statistical correlations between weights and egg counts ( $r^2:0,977$   $p:0,001$ ) which means that if weight being higher egg counts are more than normal. The positive and statistical correlation was found in weights and larvae counts ( $r^2:0,958$   $p:0,001$ ), and egg and larvae counts ( $r^2:0,994$   $p < 0,001$ ). It means that if weight being higher larvae counts are more than normal. Also, if have more egg, it means that larvae counts are getting more than normal.



**Grapic 1.** The height and weight parameters of males and females

**Table 2.** The female reproductive parameters.

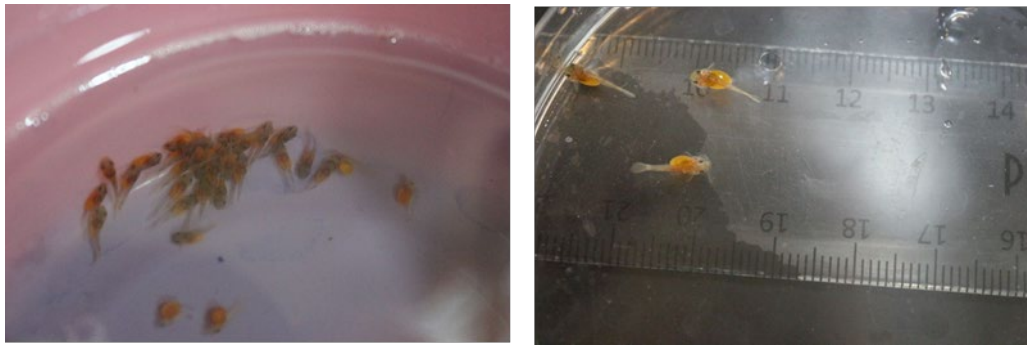
Female	Minimum	Maximum	Mean $\pm$ SD
Height (cm)	7.80	10.00	$8.77 \pm 0.72$
Weight (g)	6.02	11.35	$9.46 \pm 1.67$
Egg counts (piece)	21.00	74.00	$53.00 \pm 16.91$
Larvae counts (piece)	19.00	72.00	$49.00 \pm 16.63$



**Figure 2.** Male and Female Catfish (*Ancistrus cirrhosus*)

Male and female were fed three times a day with two Spirulina tablets. Reproduction began within a week in all separated fishes. It was observed that adopting and swimming around the cube of the male fish are the breeding behaviors. On the other hand, the female one came close to the cube after egg maturing, and also laying eggs

was reported. After laying eggs, female left the cube and the male fish cared the eggs for about 7 to 10 days with ventilation by his fins.



**Figure 3.** Puppies with egg sacs and 1 cm puppies of Catfish (*Ancistrus cirrhosus*)

At the end of the 7 or 10 days, the puppies, 1 cm height, left from cube and started to feed after the egg sacs consumption period were detected (Figure 3).



**Figure 4.** One month puppies of Catfish (*Ancistrus cirrhosus*)

After eggs consumption period, it was determined that the puppies growth rapidly with either 2 or 3 cm height after approximately 1 month (Figure 4).

There is limited study about this species of fish for nutrition and reproductivity. Researchers reported that the tentacles of catfish like as an olfactory organ which for detecting the odors (Burgess 1989; Sabaj et al., 1999). Also, this organ can be used to attach the eggs. Sabaj et al (1999) hypothesised that the snout tentacles are related to reproductivity. The male protects the eggs and cavity-nest which has a preference for females. Also they indicated that eggs and juveniles are guarded by males after hatching.

## Conclusion

The aquarium industry has become an important sector in the world and has been a source of livelihood for thousands of people, especially in countries where fish are collected from nature. According to United Nations Commodity Trade Statistics Database in 2016 the ornamental fish industry included 128 countries in the collection, breeding, import and export of ornamental fish, with a total value of \$333 million. The number of fish traded is estimated to be approximately 1.11 billion (EU Statistics 2017; Raja et al., 2019). In Turkey, these fishes are import from other countries, and belong this, it's being more expensive. The nutrition and growth of these fishes are approximately difficult and requires experience. Identifying the problems encountered in the production of this species, suggesting solutions and introduction biotic and abiotic factors are important for professional procuters. Therefore, it's being more important to support the demand for this species with production.

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