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Some behavior and morphological changes that you may "or may not!" see in breeding nile tilapia

Abstract

Observation of the behavior of fish stocks can reveal very important information that may greatly improve the efficiency and accordingly, the economy of the production operations. Knowledge and information regarding these points are not regularly found in most of the available literature. Farmers, technicians and growers, compared to scientists, have usually better opportunities to observe fish behavior and its changes during the whole production cycle (egg-egg). These observations are not usually recorded or published and the useful knowledge usually kept by farmers as own special production information. Observing and considering the behavior and the associated morphological changes can very much help improving production efficiency in tilapia hatcheries and maximizes production of fry per unit space and number of breeding stocks.

Keywords: Ttilapia, Breeding, Fish, Aggressive, Egg, Hapa

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Introduction

In aquaculture, observation of the behavior of fish stocks can reveal very important information that may greatly improve the efficiency and accordingly, the economy of the production operations. Knowledge and information regarding these points are not regularly found in most of the available literature. Farmers, technicians and growers, compared to scientists, have usually better opportunities to observe fish behavior and its changes during the whole production cycle (egg-egg). These observations are not usually recorded or published and the useful knowledge usually kept by farmers as own special production information. Exposing of accumulated information and results of observation of behavior and morphological changes of tilapia kept in different aquaculture production systems (hatcheries and grow-out units) can greatly assist producers with shorter periods of experience. Accordingly it was found that summarizing some of these changes in this short paper can encourage other experts to expose; on our website (TLS) some of what they may have to help improving the overall knowledge of fish farmers in developing countries.

Dominance and hierarchy of Male Tilapias in breeding units

Breeding tilapia are aggressive territorial creatures, especially males. Breeding males select a nesting site and its surrounding territory and protect it; fiercely attacking other males. Selected females are pushed to the breeding zone and kept from moving away. This was seen in different tilapia breeding facilities that allow direct visual observation (aquarium, tanks and hapas). This behavior results usually in production problems in hatchery units that do not facilitate suitable space that can separate defended territory of each male in the breeding unit. Cutting of the premaxilla of males can reduce the attack physical trauma; still the psychological effect of dominance reduces greatly the activity of lower hierarchy males in the group. In a breeding unit where more than one male is found, a dominant male usually prevail. This male will be the only one that can show the typical breeding coloration, free fast movement and extended dorsal, pelvic and tail fins. Dominant breeding male Nile tilapia shows bright pinkish red color on the head and anterior parts of the back, clear milky- whitish color on the abdomen and metallic faint blues- olive green color on the sides and a dark brown-black color line along the upper rim of the dorsal fin. Less dominant and beaten males keeps darker color (brownish-blackish tinge) especially over the head and dorsal region, kept in a corner or near the surface (away from the substratum) with head going little down and tail peduncle bending up and all fins are retracted to the body. Such males usually succumb within few days if not moved to other places (Figure 1).

Figure 1 Male Nile tilapia.

Breeding male Nile Tilapia with typical coloration

Male aggression and dominance was not usually a function of size. Smaller more aggressive males can dominate larger ones. This can leave us with an important question regarding selection of industrial hatcheries males. Should we go on a line of selection that ends up with the production of non aggressive males? Still, on the other hand, it is not known that less aggressive males are as good brooder as the aggressive ones; especially if we consider that aggression is a function of the effect of male sex hormone in most animals. Considering the above stated points, hatchery units design must be based on proper understanding of these behavioral sides of breeding tilapia. Neglecting some or all these points can result in great losses in production compared to potential capacity. Designing hatchery unit that allow at least one square meter free area for each male was found to be a good solution in hapa and tank based hatcheries. Using a single male in each aquarium is another well-known concept.

Fear effects on breeding stocks

Among the negative effects of many hatchery systems, is the reduced fry production per breeding stocks if compared to the theoretical averages calculated on the average fecundity per fish. It was observed in many aquarium, hapa and small tanks hatchery systems that fry production per female may decline to 60-65% of the expected fecundity based on size, age and body weight as calculated depending on published literature. This was not surprising if we consider the observed high rate of egg loss as a reflex of fright. Incubating females, especially those originated from a wild stock or of the first and may be the second generation of hatchery produced stocks, are observed to have strong reflexes to human contact. The routine inspection of the stocks by close looking through the side of aquarium or, putting a hand to check the nets of a hapa or even the movement of staff (sudden or fast) near the units, results usually in spitting of eggs as a reflex. Spitted eggs are usually recollected by the mother, but it was observed that other females join the operation in frenzy. At the beginning, one may think that those eggs are consumed; and some are, but it was found that many of the females went on in the incubation and mouth brooding process. This simply means that those females are not going to lay eggs. And this may explain the reduction in stock fecundity compared to the calculated one. It was found that covering the sides of aquaria and regulating, organizing and limiting movement of staff near the hapas can greatly improve the situation. Using of hatchery produced (tamed and domesticated) stocks rather than using stocks collected from the wild or culture ponds, was found to be of high effect.

Mouth incubation associated morphological changes

Incubating females usually stay separated from other fish in the breeding stocks. Fish usually keep near the substrate and their movement around in the space is usually very limited. Males usually guard the incubating females and its surrounding area preventing other fish from disturbing it. Incubating females shows different coloration patterns during this period. Identifying and understanding the change in the patterns can very much help in improving fry production especially in hatchery systems adopting egg extraction and artificial incubation approach. In other systems where early-swim up fry is the target product, the changes also indicate the exact onset of egg hatching and presence of yolk-sacked fry in the buccal cavity. Females incubating un-hatched eggs in the buccal cavity acquire a fainter color pattern with a generalized olive green tinge. Those females show a deep black color over the skin of the intermandibular pouch. The pouch appears distended and curved down especially at its middle to some millimeters below the normal line of the mandible (Figure 2).

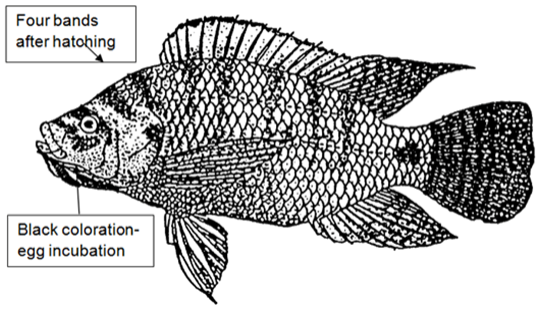

Figure 2 Pattern changes of incubating Nile tilapia.

Once eggs hatch to yolk sacked fry, the black color of the intermandibular pouch turns light gray. The pouch is still extended and the female starts to show the special opercular movement extending the branchiostegal membrane and the buccal cavity to a large extent. Body color is still faint but four to five transverse strips crossing the head region starting from above the nostrils to the front and the supra-orbital region (Figure 2). At this stage, collection of hatched fry can be tricky as it was observed that detachment of the yolk sac can occur even with very delicate handling. Accordingly, it can be much better to avoid any handling of such females until the swim up fry starts to come out of the mouth.

Conclusion

Observing and considering the behavior and the associated morphological changes can very much help improving production efficiency in tilapia hatcheries and maximizes production of fry per unit space and number of breeding stocks.

Acknowledgments

None.

Conflicts of interest

None.

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