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Behavior of Feeding in Guppy: *Poecilia reticulata*.

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ABSTRACT:

The culture of maintenance ornamental fish among Iranian people is developing every day. One of the most important factors in selection aquarium fish is behavior of feeding. The feeding behavior of Guppy is poorly documented. In this experiment we study feeding behavior in *P. reticulata* by six treatments. Six aquariums with the same dimension were used and two points A & B with the maximum distance from each other were selected in each aquarium. In aquarium No.1 hand move with feeding in point A, in aquarium No.2 hand move without feeding in point A, in aquarium No.3 hand moves in point A and feeding in point B, in aquarium No.4 feeding without hand move in point B, in aquarium No.5 in semi dark conditions hand move with feeding in point A and finally in aquarium No.6 in darkness conditions hand move with feeding in point A were done. In aquarium No.1, 94% of fish moved to point A and in aquarium No.2 it was about 92%. In aquarium No.3, 95.5% of fish moved to point A and in Aquarium No.4, 74.5% of fish moved to point B. In aquarium No 5 and 6, 96% and 99.5% of fish moved and didn't move to point A, respectively. Our results showed that this species is a visual feeder and a good aquarium fish for their feeding behavior.

Keywords:
Behavior, Ornamental fish, *Poecilia reticulata*, Visual feeding.

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INTRODUCTION

The annual value of the world's wholesale trade in ornamental fish (including commodities) was estimated 1 billion dollars in 2001 (Olivier, 2001). The Free- On-Board export value of freshwater and saltwater fish was estimated 264 million US dollars in 2005, an increase of 50% with respect to 2001 (FAO, 2007). Ornamental fish farming is a relatively new branch of the agricultural industry in Iran. The culture of maintenance ornamental fish among Iranian people is developing every day.

Fish visual census is the identification and counting of fish observed within a defined area. Vision is the dominant sense of many fishes. This can often be predicted by the large size of the eyes of species in which vision dominates (Schwassmann & Kruger, 1968). Indirect evidence for the importance of visual signaling in fishes is their conspicuous color or marking patterns, which are often species or sex specific and subject to change (William, 1999). Among vertebrates, fishes have a remarkable ability for color change, surpassing even the chameleon in this regard (Young, 1962). Male Guppies are brightly coloured and vary greatly in their colour patterns, whereas females do not have conspicuous colour patterns.

Guppies are small poeciliid fishes of northeastern South America (*Endler, J. A.*, 1987). Males are brightly coloured and vary greatly in their colour patterns within and populations, whereas females do not have conspicuous colour patterns. Their biology, ecology, behaviour and genetics have been reviewed previously (Endler 1978, 1983). Briefly, guppies live in tropical forests, in clear streams with clean gravel or sand bottoms, and occasional patches of leaf litter.

The larvivorous fish, *Poecilia reticulata* is an effective biological control agent of mosquitoes in different habitats in Iran. This specie regulates the populations of different species of pest and vector mosquitoes. *P. reticulata* can consume a good number of mosquito larvae, with the consumption rate varying with the body size (Manna *et al*., 2008). Hora & Mukherjee classified the gender *Poecilia* in surface feeder which is less efficient owing to their mode of life (Chakraborty et al., 2008). How they recognize feed especially immature mosquitoes is unknown yet.

The history of domestication and artificial selection of colour-pattern and tail-shape and feeding varieties of guppy from wild populations is poorly documented, although it was reported to have started in the early 1930's in the United States (Whitem, 1962). One of the most important factors in selection the aquarium fish is the behavior of feeding. It is an interesting entertainment to observe how fish take the food. Furthermore, one of the most important factors in fisheries biology is food consumption of species since it may contribute to limit production. This factor has previously been estimated in several ways, including laboratory experiments under conditions simulating those in the field as closely as possible, studies of the growth rates and energy budgets of species to determine this figure indirectly and quantitative analysis of the stomach contents over time in conjunction with knowledge on the gut evacuation rates of the species concerned (Richter, 1999). The feeding behavior of Guppy is rarely documented.

The problem of describing visual feeding may be greatly reduced if a theoretical model can be developed (Dag L. Aksnes and Jarl Giske, 1993). The aim of this study was to determine feeding behavior in *P. reticulata* and report that is this species a visual feeder?

MATERIAL AND METHODS

Six aquariums by dimension of 30×40×75 were made for doing this experiment and were inundation until 20 cm depth. The useful volume of the aquariums was 45lit.

At first a Disinfectants elixir with the amount of 1 drop in 2lit water and anti chlorine elixir with the amount of 1 drop in 2lit water for disinfection of water were used. Six air stones and aeration pumps (142×70×95mm, 3.5w, 3.2lit/min) were used for aeration and the level of o_2 was stable during the experiment and it was kept at about 7ppt. The temperature of the water by using a heater with the power of 250w was set at 27˚c in the experiment. Six filters with the power of 20w and flow of 1000lit/h were used for elimination of suspended and waste particles.

For this experiment, 120 samples of guppy *Poecilia reticulata* were used. The lengths of all samples were the same and they had 5cm length. The samples were all 60_days old. All of the samples were female. Biomar by diameter of 0.3mm was used for feeding the fish and in each meal 1gr of it was feed in specified place.

The fish were affecting by 6 treatments that each one was 5 days. Two points (A, B) far in a maximum distance were selected for feeding. In aquarium No.1 hand move by feeding was done in point A and in 10 meals the fish were affected by

this treatment. Feeding was done at 8:00 and 16:00 o'clock and the numbers of fish that moved and did not move to point A were counted. In aquarium No.2 in 5 days and 10 meals hand move without feeding in point A was done. The numbers of fish that moved and did not move to point A were counted. In aquarium No.3 hand move in point A and feeding in point B were done. Feeding in point B was done by a 2m distance tube. At first the biomar was poured at the beginning of the tube and then from 2m distance by 25% gradient for tube the fish was feed. In this treatment the number of fish that moved to points A and B were counted. In aquarium No.4 feeding was done without hand move in point B. The feeding method which was used in aquarium No.3 was used in this aquarium too and the numbers of fish that moved and did not move to point B were counted. In all of the treatments the feeding was done at 8:00 and 16:00 o'clock.

Furthermore, these treatments feeding were done in dark and semi dark conditions. In semi dark conditions hand move was done by feeding in point A in aquarium No.5 and the numbers of fish that moved and did not move to point A were counted. The light intensity was 50µmolphotons-1. In dark conditions the feeding was the same with as aquarium No.1 and it was done in aquarium No.6. In this condition the light intensity was 5µmolphotons-1.

The number of fish that moved to points A and B were counted after 3s after the treatment.

RESULTS AND DISCUSSION

RESULTS:

The number of fish that moved to points A and B were counted in 1-3 seconds in each aquarium. In aquarium No.1, 2, 5 and 6, the numbers of fish that moved and did not move to point A were counted. In aquarium No.1, in 5 replications all of the fish moved to point A and in 9 replications more than 90% of fish moved to this point. Only in R6 six fish did not move to this point (**Figure 1**).

In aquarium No.2 like aquarium No.1, the numbers of fish that moved to point A were more than the numbers that did not move. In 9 replications more than 90% of fish by hand move in point A without feeding moved to this point and in R4 four samples of fish did not move to this point. In 6 Replication 95% of fish moved to this point (**Figure 2**).

In aquarium No.3 the numbers of fish that by hand move in point A moved to this point and by feeding in point B moved to this point were counted. In all of the replications more than 90% of fish without any attention to feeding moved to hand move and in 4 Replication all of fish moved to this point (**Figure 3**).

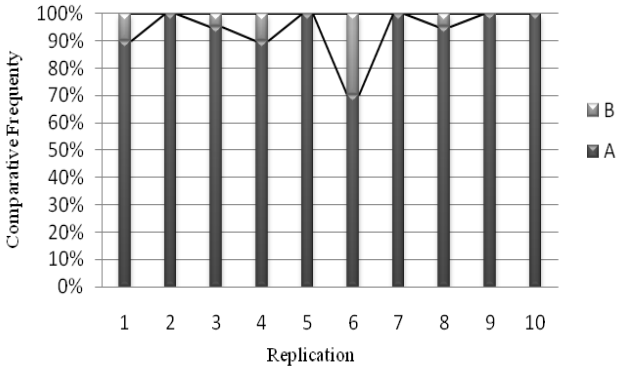


Figure 1: Comparative Frequenty of the fish that by hand move with feeding moved (A) and didn't move (B) to the point A in aquarium No.1.

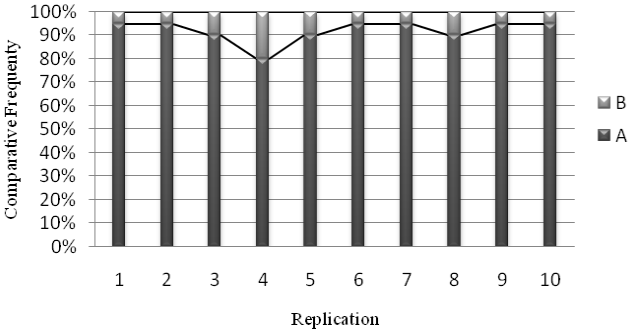
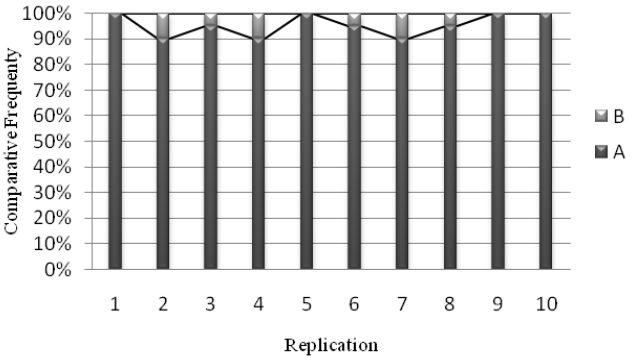


Figure 2: Comparative Frequenty of the fish that by hand move without feeding moved (A) and didn't move (B) to the point A in aquarium No.2.



Figue 3: Comparative Frequenty of the fish that by hand move in point A moved to this point (A) and by feeding in point B moved to this point (B) in aquarium No.3.

In aquarium No.4 only feeding in point B was done and the numbers of fish that moved and did not move to this point were counted. The numbers of fish increased in each replication. In R1 and R2 the fish did not move to this point and only 20% and 5% of fish moved to these points, respectively. After R2 in three replications more than 80% of fish moved to this point and in R6 & R7, 90% of Guppies moved to the target point. in R8 & R9, 95% and in R10, all of the fish moved to point B (**Figure 4**).

In aquarium No.5 feeding were like aquarium No.1 but it was done in semi dark condition. Like aquarium No.1 most of fish moved to point A. In 3 replications 90% of fish, 2 replication 95% of fish and in 5 replication all of the fish moved to point A (**Figure 5**).

In aquarium No.6 feeding were like aquarium No.1 and 5 and it was done in dark conditions. Despite aquarium No.1 and 5 the fish did not move to point A and only in R4 one fish moved to this point and in the other replication none of the fish moved to this point.(**Figure 6**).

DISCUSSION

In aquarium No.1, 94% of fish moved to hand move by feeding and in aquarium No.2 it was about 92%. Comparison of these two treatments show that this fish prefer power vision than power of smell for feeding. Also in aquarium No.3 hand move and feeding were done simultaneously to show the fish preference to move. The results show these species without any attention to feeding moves to hand move. Nicol (1989) examines several aspects of the visual capabilities of fish. Perception of movement, colour vision and adaptation to photoenvironment are the most important factors. Confirmation of using power vision hand move with feeding in darkness and semi darkness conditions were also done. In semi darkness conditions, 96% of fish moved to hand move with feeding, this was similar in lighting conditions and in darkness conditions, 99.5% of fish did not move to hand move with feeding (**Figure 7**). These two treatments show that *P. reticulata* use power vision while feeding.

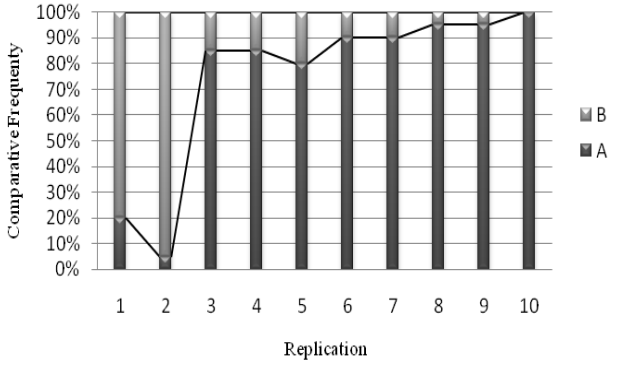


Figure 4: Comparative Frequenty of the fish that without hand move in point A and feeding in point B moved (A) and didn't move (B) to the point B in aquarium No.4.

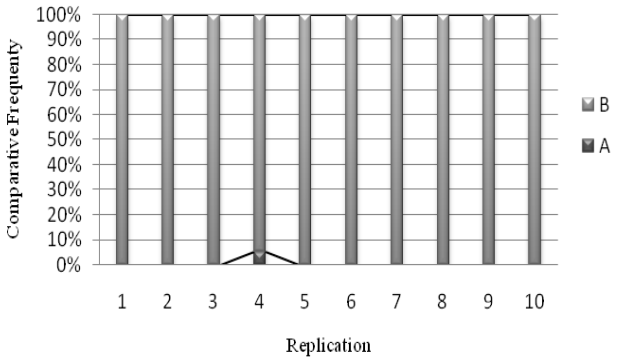


Figure 6: Comparative Frequenty of the fish that by hand move and feeding in darkness condition moved(A) and didn't move (B) to the point A in aquarium No.6.

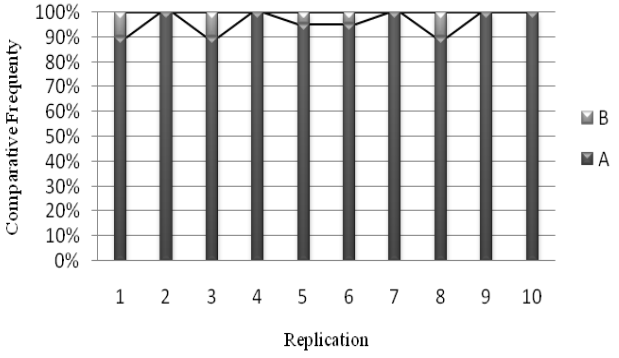


Figure 5: Comparative Frequenty of the fish that by hand move and feeding in semi darkness condition moved (A) and didn't move (B) to the point A in aquarium No.5.

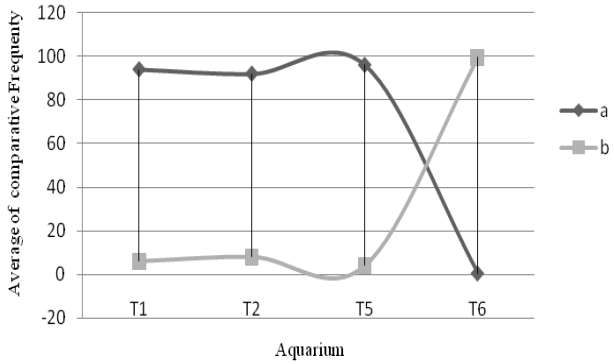


Figure 7: Average of comparative Frequenty of the fish that in aquarium No.1,2,5 & 6 moved (a) and didn't move (b) to point A.

Munz and McFarland 1977 suggested that characteristic fluctuations in light regime may be more important for a visual feeder than characteristic variations in food abundance that was similar to our results.

Munz and McFarland (1977) listed two conditions that must be met for an animal to see a target: (1) enough light must come from the target to activate the visual receptors, i.e. the visual system must be sufficiently sensitive; (2) there must be enough visual contrast so that the target can be distinguished from the background against which it is viewed. This experiment showed that the fish see the target in both lighting and semi darkness conditions but in darkness conditions visual receptor does not receive enough light and therefore does not react to them. The results of aquarium No.4 showed that this specie uses power of smell instead of power vision (**Figure 8**).

According to the classification of Hora & Mukherjee (1938) *P. reticulata* is a surface feeder fish which we also resulted. Furthermore, this specie consumes mosquito larvae in surface of water like our examination that shows they use visual system in order to see larvae and consume them. Our results showed that this specie is a good aquarium fish for their feeding behavior. One of the most important factors in selection aquarium fish is the behavior of feeding and moving with hand move which can be interesting for those who feed the fish.

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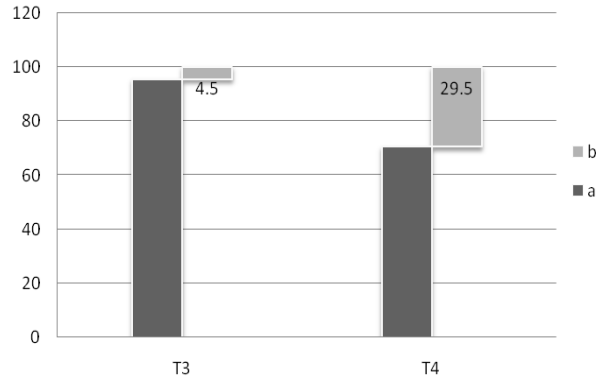

Figure 8: T3: Average of comparative Frequenty of the fish that moved to point A (a) and moved to point B (b) T4: Average of comparative Frequenty of the fish that moved (a) and didn't move (b) to point B

REFERENCES

Chakraborty S, Bhattacharya SW, Bhattacharya SA. 2008. Control of mosquitoes by the use of fish in Asia with special reference to India: Retrospects anr prospects. *J. Manusia Dan Lingkungan* 15:147-156.

Dag LA, Jarl G. 1993. A theoretical model of aquatic visual feeding. *Ecological Modelling* 67:233-250.

Endler JA. 1978. A predator's view of animal color patterns. *Evol Biol*., 11:319-364.

Endler JA. 1983. Natural and sexual selection on color patterns in poeciliid fishes. *Environ. Biol. Fishes* 9:173-190.

Endler JA. 1987. Predation, light intensity and courtship behaviour in *Poecilia reticulata* (Pisces: Poeciliidae). *Anita. Behav*., 35:1376-1385.

Food and Agriculture Organization (FAO). 2007. http://www.fao.org;

Hora SL, Mukherjee DD. 1938. The absence of millions, Lebistes reticulates (Peters) in India. *Malaria Bureau*., 4:1-49.

Manna B, Aditya G, Banerjee S. 2008. Vulnerability of the mosquito larvae to the guppies (*Poecilia reticulata*) in the presence of alternative preys. *J Vector Borne*. 4:200–206.

Munz FW, McFarland WN. 1977. Evolutionary adaptations in fishes to the photic environment. In: F. Crescitelli (Editor), The Visual System of the Vertebrates. Handbook of Sensory Physiology 5:193-274.

Nicol JAC. The Eyes of Fishes. Clarendon Press, Oxford, 1989;308.

Olivier K. 2001. The Ornamental Fish Market. FAO/Globefish Research Programme, 67, FAO, Rome. 99.

Richter H. 1999 A review of the fish feeding model MAXIMS. *Ecological Modelling* 120:47–64.

Schwassmann HO, Kruger L. 1968. Anatomy of visual centers in teleosts. *In*: D. Ingle (ed.) The

Central Nervous System and Fish Behavior, University of Chicago Press, Chicago 3-16.

Whitern WL. 1962. Hybrid guppies. T.F.H. Publications, Jersey City 32.

Young JZ. 1962. The life of vertebrates. Clarendon Press, Oxford. 820.