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A STUDY ABOUT SOME BIOLOGICAL ASPECTS OF INVASIVE MOLLY FISH "*POECILIA LATIPINNA*" (LESUEUR, 1821) IN SOUTHERN IRAQ

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Abstract

This study attempts to highlight some aspects and vital traits of the invasive Molly fish "*Poecilia latipinna"* in Southern Iraq. These vital traits include: some behavior traits in captivity and nutrition pattern; some phenotypic traits, as the relationship of Total length to weight, sexual maturity, and sex; and especially some of the traits that characterize this particular type such as the shape of some body bones. This species of fish was registered for the first time in Iraq in 2006 as an exotic fish in the Iraqi aquatic environment, specifically in waters southern of Iraq.
Keywords **:** livebearer fish, exotic fish, ornamental fish, dorsal sailfin, Iraqi Marshes.

Introduction

Molly fish (*Poecilia latipinna*) is classified as a fish belonging to the Cyprinodontiformes, and the livebearer family of the Poecilidae. It is native to the whole area between North America and Mexico. It lives in fresh and brackish water, but prefers the latter over the former. It is widespread almost all over the world because it is considered an ornamental fish with high economic importance due to its easy reproduction. *Poecilia sphenops* are the most common species in the world, and there are many hybrids that have descended and mixed amongst themselves from the free or wild species such as *P. latipinna, P. mexicana, P. sphenops velifera* as confirmed by (USGS NAS, 2014). The species was first named as *Mollienesia latipinna* by the scientist Lesueur in the year 1821, and was called the molly fish in relation to the Molezenia genus as was defined (Lesueur, 1821); however, these fish were reclassified by the scientists Rosen and Bailey, as they published for the first time a systematic study of the livebearer family Poeciliidae, in order to correct the genus from the Molezenia to the Pusilia. *P. latipinna* is characterized by a different body than the first species *P. sphenops*; the different colors and shape of the dorsal fins in males resemble a sail, hence why it is known in some studies as Sailfin molly. It was registered for the first time as small fish gatherings in Europe, specifically in Greece in 2016, as indicated by (Koutsikos, 2017). The pollination is internal and hatch larvae of these fish inside the mother's body and then goes out in a similar way to the birth process, and that is why it was called a livebearer fish, as explained by (Brian, 2010). It was registered for the first time in Iraq in East of Hor Al-Hammar region in southern Iraq (Hussain *et al.*, 2009), and it was also seen in areas extending from Shatt al-Arab and Abu Al-Khaseeb to Qurna. It is possible it reached these natural areas in Iraq due to a flood or an error in one of the ornamental fish farms, which led to its escape into the Iraqi natural waters. It had an economic importance for Iraqi fish farmers, since they were exporting it as ornamental fish to Jordan and Syria (Brian, 2010).

This type of fish does not prefer deep water due to the fact that it is a fish originally from waters of semi-coastal areas with relatively shallow depths. It likes water with pH (7.5- 8.2) and temperature (18-24C), as mentioned by (Riehl and Baensch, 1996). The total length of Molly fish reaches 7.5 cm for adult fish, while its total length in the internal waters of Iraq is 15 cm for adult females and 10-12 cm for adult males as explained by (Brian, 2010). These fish feed on worms, crustaceans and small-sized aquatic insects and some aquatic plants; they are considered to be very fond of eating green algae and lichens in waters as indicated by (Welcomme, 1988) and (Riehl and Baensch, 1996). In normal environmental conditions, it gives birth to about 20-120 larvae after a 28-32-day pregnancy period. The number may increase or decrease in indoor ponds used for raising these fish in ornamental fish farms or regular glass Tanks, and this is related to the age, general health status, and nutrition with the ideal temperature for the breeding of these fish.

Materials and Methods

A sample consisting of 50 molly fish (*P. latipinna*) was collected from Al-Qurna area in Basra Governorate, southern Iraq. The males were isolated from females in 100-liter plastic tanks—each separately, to perform some biometrics on the collected sample.

In this sample of males, the fish were stained to highlight the shape of their body bones, according to the two methods of (Potthoff, 1984) and (Taylor and Dyke, 1985).

The substances used in preparation for staining were:

1. Formaldehyde 10%
2. Ethanol (30%, 70%, 95%)
3. Hydrogen peroxide 15% + 0.1 Potassium hydroxide 85%
4. Acetic acid 30% + Ethanol 70% + Alcian blue stain
5. Sodium perborate (borax) 30%
6. Sodium perborate 30% + Trypsin enzyme
7. Potassium hydroxide 40% + Glycerine 60%
8. Potassium hydroxide 40% + Glycerine 60%

The Process:

1. If the fish are not preserved, they will be preserved in a formalin solution with a concentration of 10% for five days, after which the samples are washed with running

water and are kept for two days in pure water to get rid of the effects of formalin; then they are washed a second time and stored in ethanol alcohol at a concentration of 30% for a period of 2-5 days, depending on the size of the fish—if they are 15 cm or longer, they are kept for two days. Finally, they are kept in ethanol alcohol at a concentration of 70% for another two days, depending on the size of the samples.

2. Removing the internal organs of fish.
3. The fish samples are then kept in ethanol alcohol at a concentration of 95% for another two days, and as for fish that are more than 15 cm in length, they are kept for a week.
4. The samples are placed in a solution consisting of 30% acetic acid + 70% ethanol alcohol + a few grams of Alcian blue stain so that the solution color is dark blue. The samples are left for one day if their length is less than 8 cm, and a day and a half if their length ranges between 8 to10 cm.
5. Samples are placed in a saturated borax solution for one day, if their length is longer than 10 cm, and the solution is changed whenever it acquires a blue color.
6. Samples are placed in a solution consisting of 15% hydrogen peroxide + 85% potassium hydroxide for no more than an hour, until the bleaching process is complete.
7. Samples are placed back in the saturated borax solution plus trypsin enzyme, with the solution being changed when it turns blue. It is better to change the solution every 7 days until the ratio of clarity in the samples is more than 60%, when the spine can be observed with a blue color, and taking into account putting the samples in this solution with light to accelerate the staining process.
8. The samples are placed in a solution consisting of 1% potassium hydroxide with an addition of an alizarin red stain, so that the solution's color is a very dark pink, and keeping them for no more than 1-3 days until the bones appear to be pink.
9. The samples are placed again in saturated borax and trypsin solution as in step 7 and are left for another week.
10. The samples are placed in a solution consisting of 70% potassium hydroxide + 30% glycerine) for a period ranging from two to seven days, then another solution of (40% potassium hydroxide + 60% glycerine for another two to seven days—the duration follows the size and length of the fish samples.

Results and Discussion

The number of females collected for this sample was 15, while the total number of males for this sample was 35. The females were all adults and sexually mature, while the number of sexually mature males from the total sample number was 11 adult males, and the number of sexually immature males was 23 of the total number of males of this sample. Figure (1) shows the male and female ratio of molly fish collected in this study, and the female ratio exceeded the male ratio in terms of the total number of fish in this sample.

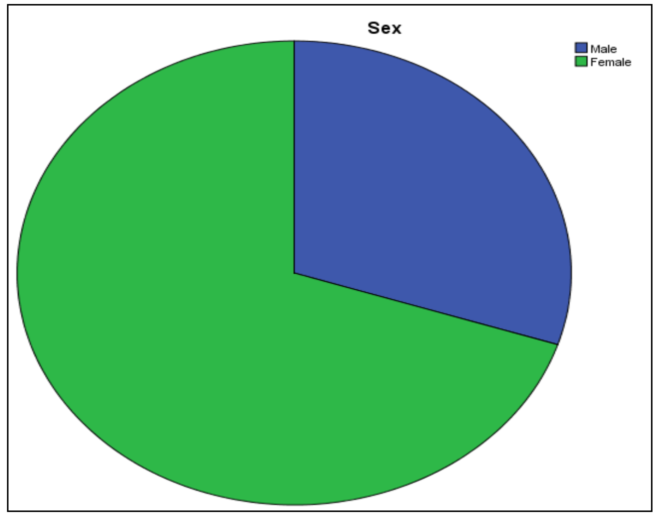

Fig. 1 : Males to females ratio in the fish sample of the study.

As for Figure (2), it shows the ratio of sexual maturity between males and females of the *P. latipinna* fish in this study, and we notice that the number of sexually mature males exceed the females which most of them were not sexually mature in the fish sample collected for this study.

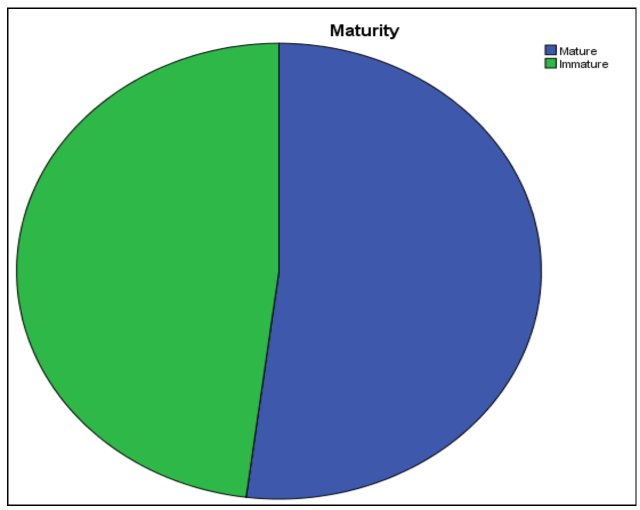

Fig. 2 : The ratio of sexual maturity between males and females in the fish sample of the study.

To study the relationship between the total length and weight of the collected fish sample, we notice in Table (1) the following analysis of variance: significant differences are found between males and females length (male superiority), and significant differences also between the length of mature and immature samples (the superiority goes to the mature samples), As for weight, no significant differences were observed between the samples, whether in terms of sex or sexual maturity. As for the analysis between sex and sexual maturity, no results were found due to the absence of completely sexually immature males. This is compatible with (Divya, 2018) in terms of the total length of sexually mature fish. He explained that the total length ranges between (5-10) for sexually mature fish raised in ponds outside their real environment. He emphasizes in his study the approximate total length in the sample of this study, which amounted to (5.2) cm for the total sample of both males and females.

Table 1 : The relationship between total length and weight of fish in this study.

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	Total_Length	16.036[a]	2	8.018	45.353	.000
	Weight	.115[b]	2	.058	.823	.445
Intercept	Total_Length	1389.969	1	1389.969	7862.063	.000
	Weight	748.669	1	748.669	10696.554	.000
Sex	Total_Length	3.772	1	3.772	21.333	.000
	Weight	.027	1	.027	.388	.536
Maturity	Total_Length	2.254	1	2.254	12.747	.001
	Weight	.016	1	.016	.230	.634
Sex * Maturity	Total_Length	.000	0	.	.	.
	Weight	.000	0	.	.	.
Error	Total_Length	8.309	47	.177		
	Weight	3.290	47	.070		
Total	Total_Length	1417.210	50			
	Weight	784.320	50			
Corrected Total	Total_Length	24.346	49			
	Weight	3.405	49			

a. R Squared = .659 (Adjusted R Squared = .644)
b. R Squared = .034 (Adjusted R Squared = -.007)

In figures (3) and (4), the linear relationship between total length and gender of the study fish sample, and the linear relationship between total length and sexual maturity, shows that no significant differences were found between these relationships for the fish sample collected in this study. The results here are similar to those of (Ahmed, 2012), as there was no significant correlation between the relationship of the total length of fish and the sex of those fish. Here, the relationship of the total length with weight and sexual maturity that are affected seasonally in fish, especially the maturity of the genital organs in each of the males and females, which are clear when studying the differences between the weights of gonads in different seasons of the year, according to the type and temperatures in the season in which the samples are collected, as it explained by (Le Cren, 1951). It was pointed out that an increase in the size and weight of gonads in both sexes in general, and an increase in the size of ovaries in females in particular, was for the purpose of increasing the accommodation of the largest number of new embryos.

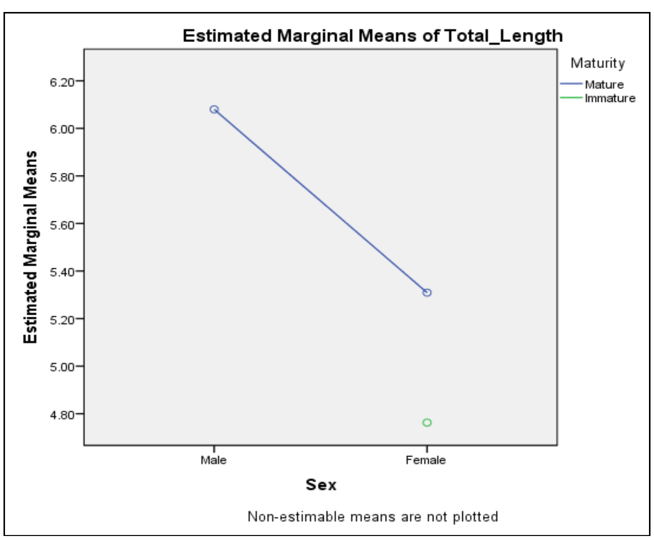

Fig. 3 : The linear relationship between the total length and sex of the fish in the study.

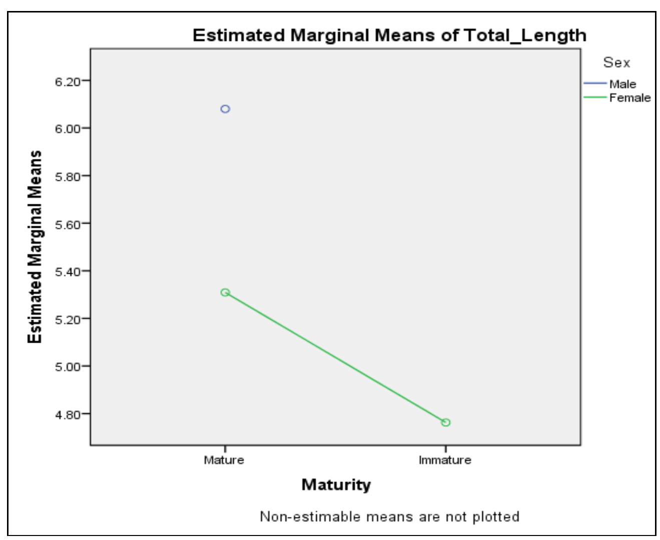

Fig. 4 : The relationship between total length and sexual maturity of the fish sample in the study.

Table (3) shows the presence of a significant medium-strong positive correlation between the total fish length and weight with a correlation factor of R = 0.397. This relationship is close to what (Hossain, 2010) came up with when studying the relationship between different lengths and weight of four species of fish that belong to Cyprinidae. It demonstrates the positive direct relationship between the total length of fish and the increase in body weight rates.

Table 3 : Shows the relationship between total fish length and weight of fish sample.

		Total_Length	Weight
Total_Length	Pearson Correlation	1	.397**
	Sig. (2-tailed)		.004
	N	50	50
Weight	Pearson Correlation	.397**	1
	Sig. (2-tailed)	.004	
	N	50	50
**. Correlation is significant at the 0.01 level (2-tailed).			

As for the study of the body shape and the shape of the molly fish skeleton in this study sample, a complete bone staining process was performed according to the two methods (Potthoff, 1984) and (Taylor and Dyke, 1985) for pigmentation of small vertebrates. Two different modes of lighting intensities were used. We observe from Figure (5) an image of a male adult molly (*P. latipinna*), which was photographed with spotlight only from the front, while the details of the skeleton differed and the percentage of clarity increased when the light from the front and back was shed on a transparent board as in Figure (6), which gave more clarity on the shape of the bones and their subtle details.

Fig. 5 : Shows adult molly (*P. latipinna*) with only front lighting.

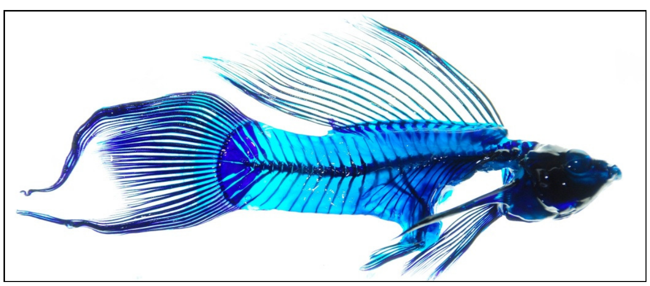

Fig. 6 : Shows the adult molly (*P. latipinna*) with back and front bright lightening.

We notice from Figures (5) and (6) that the *P. latipinna*'s body is oblong and the head is dorsally flattened, with a small, upturned mouth suited for surface feeding. The caudal peduncle is approximately as deep as the body and the caudal fin is large and round. The dorsal fin is greatly enlarged in mature males; the fin opens like a sail, and that is why it is known as Sailfin Molly (Dawes, 1995). The mouth of these fish contains many rows of very small teeth. The males are distinguished by their gonopodium penis, which is in fact a modified anal fin into a male reproductive organ that distinguishes the fish of this family in general, as indicated by (Robins, 2014). The males also have a skeleton that is different in bone shape than the skeleton of females—males have a wider body and the front of the head bones are more tapered than the female. Moreover, the distribution of the bones of the fins is completely different from the female fins. These characteristics are associated with the sex of the species studied here, and for the whole family of livebearer fish. The chromosome number for this species has been registered 48/24 (Froese and Pauly, 2014).

When raising the fish sample in captivity, it was observed that they do not prefer common industrial foods used to feed ornamental fish, whether local or foreign, but rather prefer algae and lichens formed on the walls of the ponds due to the stillness of the water and the intensity of illumination from the sunlight shed on the ponds, and they feed on it is voraciously. They also consumed and devoured pieces of steam boiled chard; however, it was observed that they can adapt to the available industrial food provided in the captive. They prefer food with live plant origin, since *P. latipinna* fish are mainly vegetarians, feeding voraciously on algae, lichens and Periphyton (including natural components of Periphyton, such as diatoms and detritus), as indicated by Al-Kahem *et al*., 2007; Scharnweber *et al*., 2011; Barbiano *et al*., 2014; Jaffe, 2014; Robins, 2014).

The water measurements studied in this experiment were close to the water measurements mentioned by (Robins, 2014) in their real habitat in America, which shows the suitability of the Iraqi aquatic environment for this species and the speed of its adaptation to the new water, as shown in Table (4) which illustrates the water measurements from The gathering area in Al-Qurna, from Basra Governorate, and the water of the breeding ponds at the place of study in Baghdad.

Table 4 : The studied water measurements

Water Measurements	Temperature	pH	KH	GH	NH3 NH4	TDS
Basra	26 C	8.2	143.2 PPM	451 PPM	0.25 ML / L	417 PPM.
Baghdad	25C	7.9	143.2 PPM	451 PPM	0. MG / L	406 PPM

Females of *P. latipinna* fish are quick to abort their fetuses when exposed to inappropriate environmental conditions or physical and psychological stress on these females. This trait is found in the species of *P. latipinna, P. mexicana, P. sphenops velifera* without the rest of the species that belong to the livebearer family of Poecilidae. This is what happened when females were transported for a long distance from Basra Governorate to Baghdad Governorate, and no new births have been obtained when the fish that are raised in captivity under different conditions from their real environment in southern Iraq. This stress may cause dysfunction in the endocrine glands of females, especially one that could lead to an imbalance in the physiological functions that are led by these glands, such as the ovaries and their effect on the miscarriage of fetuses, which is illustrated by (Gray, 2003), when there is an imbalance in the endocrine function, gonads for female livebearer mosquitofish (*Gambusia affinis*) will be affected.

Conclusion

In this study, we were able to partly identify some of the vital traits of the invasive Molly fish (*P. latipinna*) in southern Iraq. These traits are related to some phenotypic characteristics, especially the shape of the skeleton of the males in these fish by using the method of staining the bones of small vertebrates. We were also able to identify the food preferred by these fish when they are raised in captivity ponds, isolated from their real environment. Moreover, we learned about some different behaviors of these fish, in addition to studying some linear relationships between some vital traits that were positively related with each other, such as the relationship of total height, sex, weight, and sexual maturity of these fish. We recommend conducting some analyses to find out the chromosome number of the invasive species (*P. latipinna*) in southern Iraq in particular, and learn whether there is a possibility that new hybrids kinds like this could manifest in the Iraqi waters.

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