

Stress Tolerance of Ornamental Fishes

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Abstract - Fish and other aquatic animals are subject to a broad variety of stressors because their homeostatic mechanisms are highly dependent on prevailing conditions in their immediate surroundings. Common stressors encountered by captive fish include physical and mental trauma associated with capture, transport, handling, and crowding; malnutrition; variations in water temperature, oxygen, and salinity; and peripheral effects of contaminant exposure or infectious disease. Ambiguity exists in part because the word can be used to indicate one of three different components of what is essentially a cause-and-effect relationship: (1) a physical or mental stimulus, (2) an individual's physical or mental awareness of that stimulus, or (3) the individual's physical or behavioral response to the stimulus. The fishes can be tolerated to stress in *Poeciliasphenops* for 2 days, *Puntigrus tetrazona* for 4 days, *Danio rerio* for 3 days, *Poecilia reticulata* for 5 days, *Betta splendens* 6 days.

Index Terms - Aquarium tank, Ornamental fish, Stress tolerance .

INTRODUCTION

According to Hans Selye, a renowned physician, a stressed organism passes through three stages that make up the General Adaptation Syndrome (GAS). The first stage is an alarm reaction in which the neuroendocrine system is activated and stress hormones are produced. The second stage, adaptation, which generally occurs within 24-48 hours, involves the organism's return to the pre-stress state or an altered resting state through physiological changes (i.e., increased respiration, decreased metabolism, and decreased immune response). If the stress is too severe or chronic, adaptation may not be possible and the organism enters the third stage, exhaustion, which affects the entire organism. During the third stage, consequences such as poor growth, poor reproduction, and increased susceptibility to diseases may be observed (Barton and Iwama, 1991). Stressed organisms usually require more oxygen to carry out their metabolic processes. In order to compensate for

the increased oxygen requirement during stress, hyperventilation may occur. Blood glucose is another indicator of metabolic stress, and functions to provide the caloric energy needed for a fight-or-flight response. Almost all environmental factors tested can influence the degree to which fish respond to stressors. External factors include acclimation temperature (Strange, 1980; Davis et al., 1984; Barton and Schreck, 1987; Davis and Parker, 1990), salinity (Strange and Schreck, 1980; Mazik et al., 1991; Barton and Zitzow, 1995), time of day (Davis et al., 1984; Barton et al., 1986), wavelength of light (Volpato and Barreto, 2001) and even background color of the tanks (Gilham and Baker, 1985). Internal environmental factors, including the fish's nutritional state (Barton et al., 1988) and presence of disease (Barton et al., 1986), may also affect the magnitude of the stress response. Several authors have already been published their books and research works about behavioural phases of different fishes. but there was some lacking too on such information regarding stress of ornamental fishes. Thus the Present study was performed for describing the different stresses of ornamental fishes.

OBJECTIVES OF THE STUDY

- To analyze the ornamental fish species.
- To analyze the stress tolerance of ornamental fishes

MATERIALS AND METHODS

The entire research work was conducted for a period of six months (May 2020 to October 2020) to observe the different stresses of ornamental fishes. In this experiment, all the five species of ornamental fishes were introduced into the tank and is keenly noticed for the common stress factors that suffers the fish. We have analysed the surviving ability of the fish

irrespective of the stress factors. We noticed with our naked eye.

RESULT AND DISCUSSION

In the present study the five types of ornamental fishes are *Poecilia sphenops*, *Puntigrus tetrazona*, *Danio rerio*, *Poecilia reticulata* and *Betta splendens*. In this study the fishes are observed for stress tolerance of all the fishes are noticed and tabulated (Table I.).

Stress is any condition that causes physical or psychological discomfort which results in the release of stress-related hormones or specific physiological responses (Foster and Smith, 2007). There are various direct and indirect quantitative parameters used as indicators of stress in fish (Barton and Iwama, 1991). Each fish have different types of stress factors for poor water quality, large amount of fishes introduced in the tank, swimming disturbance etc.

In this study we had analysed the stress of fish by introducing the fishes into the tank. Based on the common stress factors including water quality, malnutrition, crowding, over dump, tank space, we have identified the ability of fish to tolerate the stress. Crown tail fish tolerates the stress at its best stress and survives for 6 days. Following crown tail fish, Guppy fish survives for 5 days and zebra fish tolerates for 3 days whereas black molly survives for two days (Figure I). The reason for which the fish dies is a rapid decrease in the oxygen level of water. It affects both lungs and gills.

In the life of subordinate fish is that they seem to be more stressed. Stress probably develops because of the fear of being chased and chastised by bullies, and from having to worry more about where the next meal is going to come from. Stress reactions are often characterized by a rise in the production of certain hormones and metabolic products, and indeed the blood of subordinate fish often contains higher amounts of these substances. (Erickson J G 1967).

TableI. Stress tolerance of ornamental fishes

S.no	Name of the fish	Fish tolerated to stress (in days)
1	<i>Poecilia sphenops</i> (Black molly fish)	2
2	<i>Puntigrus tetrazona</i> (Tiger barb fish)	4
3	<i>Danio rerio</i> (Zebra danio fish)	3
	<i>Poecilia reticulata</i>	

4	(Guppy fish)	5
	<i>Betta splendens</i>	
5	(Crowntail fish)	6

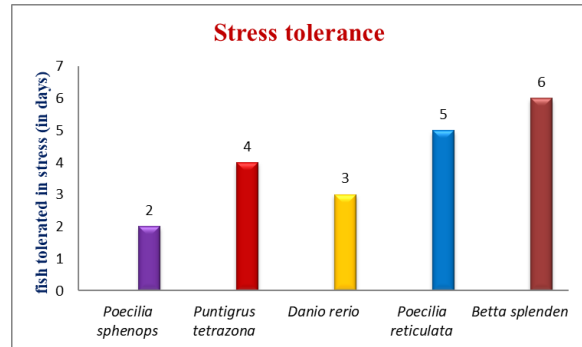


FIGURE : 1 Ornamental fishes tolerated in stress

CONCLUSION

The indices of fish responses to stimuli varied in their responsiveness to various types of stressors in aquaculture. This is because the effect of different stimuli can occur in an organism through different physiological systems. Different stressor when affecting fish separately cause responses, which can be reversible when appropriate steps are taken to ameliorate the trend. However, it must be well understood that the response of fish to a stressor is a dynamic process that need to be seriously looked into by fish biologists and aquacultures. If this is done properly, it will undoubtedly increase production and leads to sustainability of aquaculture industries in the world.

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