



**Biotica  
Research  
Today**  
Vol 3:9 <sup>737</sup>/<sub>740</sub>  
2021

## Fish Behavioral Indicators in Aquarium/ Aqua Farms

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 Open Access

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### Keywords

Behavioral Indicators, Fish, Fish Health, Stress

### Article History

Received in 04<sup>th</sup> September 2021  
Received in revised form 08<sup>th</sup> September 2021  
Accepted in final form 09<sup>th</sup> September 2021

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### How to cite this article?

Kamalakannan *et al.*, 2021. Fish Behavioral Indicators in Aquarium/ Aqua Farms. *Biotica Research Today* 3(9): 737-740.

### Abstract

It is most important to understand behavior of fish just like any other pet. The fish acts and behaves are confers clear idea about the health and environment of fish is living in like maintenance of aquarium water and many more things. Fish behavior monitoring technology mainly refers to the use of machine vision or acoustic technology to obtain fish behavior (speed, fish population fluctuations, exercise cycle, feeding behavior, stress, etc.). Therefore, the assessment of welfare in a few individuals may not represent the average welfare of a group and vice versa. This underlines the need to develop on-farm, operational behavioural welfare indicators that can be easily used to assess not only the individual welfare but also the welfare of the whole group.

### Introduction

If the fish farmer wants to improve or document fish welfare, they need methods to assess animal welfare that can be feasible on a farm. A welfare assessment system should describe the welfare of farmed fish and allow the farmer to assess the development over time and to respond appropriately. Welfare indicators that are relevant for inclusion in an operational welfare assessment system should be science-based, should measure welfare over extended time periods, should be measurable on a commercial farm within a realistic framework and should be relevant as a decision support system for the farmer. To fulfill these requirements, the welfare indicators must provide information on potential welfare problems and the causes of impaired welfare. Most animal welfare definitions can be loosely categorized into 'function-based' or 'feeling-based' definitions. 'Function-based' definitions have the fundamental assumption that welfare is correlated with biological functioning including physiological stress responses (Duncan 2005), while in the 'Feeling-based' definitions, welfare more or less equals the current emotional state of the animal (Duncan and Dawkins 1983) and in the longer term, it represents the balance between positive and negative subjective experiences (Spruijt *et al.*, 2001).

### 6 Signs of Happy and Healthy Fish

Fishes are happy and healthy when they:

- Swim actively throughout the entire tank, not just hanging out or laying at the bottom, floating near the top or hiding behind plants and ornaments.
- Eat regularly and swim to the surface quickly at feeding time.
- Do not have white spots or blemishes on their body; do not have fins that are torn or ragged, and do not eyes that are bulging (unless have a Bubble Eye Goldfish).

- Are expanding their gills regularly - but not rapidly - to take in water and oxygen.
- Are brightly colored with vibrant scales.
- Swim in clear, clean, odorless water.

## Fish Behaviour

Some most common fish behaviours are explained as follows.

### 1. Gasping for Air

**F**ish may see gasping for air at top of the aquarium and it can be due to improper water quality or due to insufficient dissolved oxygen in the water. Testing water and considering an aerator for water tank will solve the problem.

#### Temperature

**T**he warmer the water gets, the less oxygen it holds. The temperature is about 24-28 °C/ 75-82 °F for a tropical freshwater tank. In hot weather the tank may be overheating naturally, so it can be cool and boost aeration. No need to culpability temperature as sudden gasping problems is often related to pollution or disease.

#### Heating

**I**f the tank is very warm and heater light on this could be to culpability and may need replacement. If this is the case, temperature may be very high-usually well over **30 °C/ 86 °F**. Heaters are generally reliable, but when they go wrong the consequences are usually devastating.

#### Water Quality

**B**oth ammonia and nitrite affect gills and can cause gasping, so test the water at the first sign of trouble. When ammonia is present fish produce extra mucus, which reduces the surface area of the gills, making them less effective at extracting oxygen.

Nitrite affects the blood by changing the hemoglobin bit that carries the oxygen, so fish gasp in trying to extract the oxygen they need from the water. Any signs of ammonia or nitrite are worrying and immediately 50% water need to change.

#### Diseases

**V**arious diseases that affect the gills can also cause gasping. Look for signs of infection such as spots, clamped fins, and secondary infections such as fungus or bacterial diseases.

#### Dissolved Gases

**T**oo much carbon dioxide (CO<sub>2</sub>) or too low oxygen will also cause gasping. If measuring CO<sub>2</sub> on a planted tank. If CO<sub>2</sub> unit has been broken and released too much gas, boost aeration to drive it off. If a planted tank or pond and fish are gasping first thing in the morning, the plants or algae probably have depleted oxygen levels at night and increased CO<sub>2</sub> levels.

Boosting aeration during the night usually solves this.

### 2. Hiding

**W**hen fish are introduced to new aquarium, most of fishes hiding as their natural and most common behaviour.

#### Reason for Hiding Fish

**T**here are many different reasons why even the boldest aquarium residents may suddenly start hiding, including Newcomers, Bullies, Loneliness, Open Space, Environmental Changes, Overcrowding, Illness.

#### Avoid Fish Hide (Solution)

**H**iding is a natural instinct for fish, offering more hiding places in aquarium can help fish feel more secure and at ease. Extra hiding places can even help shy fish feel bolder as they come out to explore and additional obstacles in the tank provide enrichment to keep fish active and entertained. Consider adding extra plants, driftwood, rocks, caves, tunnels, and structures to give fish more places to hide.

### 3. Fighting

**M**any fish shows aggression as their natural behaviour and always defend their territorial space till death. Some fish are not compatible to fit and house in the same aquarium and therefore they are almost seen fighting with other fishes. Reasons given below for why some fish species are aggressive.

#### Fighting for Food

**S**ome fishes always compete for food. An aggressive fish will fight off other fish that are perceived to be threat during feeding sessions. To minimize fighting over food, make sure the spread food evenly throughout the aquarium. Also, offer different varieties of food to fish. This action will reduce fish fighting over one type of food.

#### Province Marking

**C**ertain types of fish want to create and keep their own territory. Once introduce an aggressive fish to aquarium, it will attach itself to a particular section of the fish tank and not allow other near.

#### Solutions

**I**f notice a fish create a province and begin to fight other fish, there are several ways to help limit this behaviour.

- Rearrange the landscape of aquarium before adding more fish. It will eliminate any claims to province for fish that add to the aquarium.

- Make sure there are plenty of hiding places in aquarium. This will encourage aggressive fish to create their province in one of these places, and it will give the less aggressive fish space in the aquarium to swim freely.

- Don't overstock tank. An aggressive fish can get out of control if it feels crowded.

#### **Fish Size**

**L**arger fish may take advantage of their size and fight smaller ones. When picking fish, consider species that are likely to grow at the same rate.

#### **Illness in the Aquarium**

**S**ome fish can become aggressive when they are sick. Other fish can become aggressive towards sick and weak fish. Always check fish for moans of sickness to avoid aggressive behavior.

### **4. Swimming Erratically**

**F**ish generally swims erratically while playing or exercising but a consistent act of play or exercise will mean a stage where fish can be unhealthy because of bad quality water.

#### **What will do?**

**I**f fishes are difficult to swim, it is most likely due to an illness or injury. Take a moment to observe fish for physical signs of injury or illness to determine the cause of their abnormal swimming behavior. Examine the fins of fish - if they appear torn or ragged, it is possible that fish is suffering from a bacterial or fungal infection or that one of the other fish in tank has been aggressive.

#### **Solutions**

**I**n most cases, increasing the water quality in tank will be enough to solve this kind of problem. Perform a large water change to improve water quality and then maintain regular water changes to keep the water quality in tank high.

### **5. Rearranging Tank Objects**

**S**ome fish simply make a habit of digging around in the substrate and rearranging tank objects. Certain species of fish, particularly loaches and other bottom feeders, sift their food from tank substrate so it may look like they are just digging around when they are actually looking for food. Other species, particularly cichlids, have a tendency to rearrange their tank, shoving decorations around and uprooting live plants.

#### **Causes**

**T**his kind of behavior is natural and it should not concern or unless it poses a danger to fish. If fish begin to exhibit this type of behavior make sure to remove any objects from the tank that have sharp or pointed edges that could injure fish.

#### **Solutions**

**I**f fish suddenly develop this kind of behavior it may be an indication of stress and should check tank parameters to make sure they are in balance.

### **6. Lethargic or No Energy**

**I**f one or more of fish that are usually active in the tank becomes lethargic, it is probably a sign that the fish is sick.

#### **Causes**

**T**he fish spending more time at the bottom of the tank or rolling against the wall rather than swimming in the middle of the tank. Ammonia poisoning, for example, can cause aquarium fish to become lethargic - so can parasitic infections and nutritional deficiencies.

#### **Solutions**

**B**y checking the pH balance as well as ammonia and nitrite levels and also checking the temperature because if the water in the tank gets too cold, fish might be suffering from low temperature. Keep in mind that lethargic fish do not always spend time at the bottom of the tank - they could be floating near the tank surface or hiding among live plants as well.

### **7. Sitting on the Bottom**

**F**ish behaves normally when they are seen spending lots of time at the bottom of the tank and also often sleep at the bottom of their water tank. If fish activity does not fit any of these reasons, it may be a signal of any disease. A disease that is a cause of this behaviour is a swim bladder infection, which is a result of a poor diet or improper water quality.

#### **Solutions**

- When fish lay at the bottom of the tank, it's a good idea to monitor them closely, especially if this is a new behavior.
- If fishes are just content to hang out near the bottom of the tank, there's no reason to worry.
- Consider adding a few additional decoration items or live plants to setup. The fish will use them to rest without feeling exposed or vulnerable.
- Resting without being on high alert will help the fish feel safe, and be confident and active the rest of the time.

### **8. Stress**

**P**hysiological stress and physical injury are the primary contributing factors of fish disease and mortality in aquaculture. Stress is defined as physical or chemical factors that cause bodily reactions that may contribute to disease and death to the fishes. Many potential fish disease pathogens are continually present in the water, soil, air. In nature fishes are often resistant to these pathogens, and they are able to seek the best living conditions available.

#### **Causes for Stress**

- Stress is a condition in which an animal is unable to maintain a normal physiologic state because of various factors adversely affecting its well-being.

• Stress is caused by placing a fish in a situation that is beyond its normal level of tolerance. Specific examples of things that can cause stress (stressors) are listed below.

#### **Chemical Stressors**

- Poor Water Quality - low dissolved oxygen, improper pH.
- Pollution - intentional pollution: chemical treatments - accidental pollution: insect spray, spills.
- Diet composition - type of protein, amino acids.
- Nitrogenous and other metabolic wastes - accumulation of ammonia or nitrite.

#### **Biological Stressors**

- Population density - crowding.
- Other species of fish - aggression, territoriality, lateral swimming space requirements.
- Microorganisms - pathogenic and nonpathogenic.
- Microorganisms - internal and external parasites.

#### **Physical Stressors**

- Temperature: This is one of the most important influences on the immune system of fish.
- Light
- Sounds
- Dissolved Gases

## **Stress in Fish: Symptoms and Solutions**

In an aquarium sometimes fish get to swim around all day in a beautiful tank and get fed. Though it seems odd, the truth is that fish can get stressed in much the same way as humans do. Whether it's a chaotic home, strained relationships with friends and family, or just general business, can sympathize with a stressed out fish. Just like humans, though, stress in fish can lead to serious health complications, so it's important to be able to recognize when fish is stressed.

#### **Symptoms**

Should observe fish often for any of these signs of stress.

- Gasping at the Surface
- Appetite
- Disease
- Strange Swimming

#### **Causes**

Stress in fish is caused by many different factors. Most situations that can result in a change of habitat or a disturbance in routine and behavior are able to cause stress. Some examples are given below.

- Improper water conditions
- Troubles with other fish
- Other factors

#### **Solutions**

If determine that the fish is suffering from stress, and should act quickly to treat him. If left alone, stress can lead to serious and possibly fatal diseases like Dropsy and Fin Rot. First, should try to determine what is stressing fish, and eliminate that cause. By testing the water and examining fish's behavior. If this doesn't improve fish's condition, and should talk to the veterinarian about possible solutions.

## **Conclusion**

Behaviour represents a reaction to the environment as fish perceive it and therefore is a key element of fish welfare. In a developing and increasingly competitive aquaculture industry, it is of paramount importance that both farmers and researchers use species-specific behavioural signals for an early assessment of poor fish welfare. Furthermore, when considering the potential dichotomy of how behaviour can be interpreted as either good or poor (e.g., individual swimming activity) depending on the fish species, it is essential to develop an a priori understanding of the species-specific biology before drawing any conclusions in relation to welfare.

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