Spatial Effects on Betta Splendens

Siamese Fighting Fish

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Introduction and Background

Aggressive behavior – nips and gill flares

Confining fish to an aquarium is a rewarding hobby. There are certain guidelines for which species can cohabitate and which cannot. Among the species of tropical fishes, Betta splendens also called Siamese fighting fish are among the most aggressive species. Most of the aggressive species can cohabitate if an appropriate amount of space is provided; they just pick and claim territories in the confined space provided. From a water quality standpoint, the rule of thumb is one inch of fish per gallon of water. For example a 10 gallon tank can hold a maximum of five (two inch) fish, any more would not be ideal for good water quality. To relate this information to aggressive fish, there should not be overcrowding where a territorial fish cannot find a territory to claim.

Previous experiments have been conducted showing the aggressive behaviors and interactions of (inter & intra) male-male with and male-male without the presence (audience) of a female (Matos and McGregor, 2002). Beta males are not social and cannot be kept together with their own species; however, they can cohabitate with other non-colorful fish. Female betas on the other hand can be kept together. Males can be kept together with females in a spawning event, when the time spent is limited before the female has to be taken out (Braddock and Braddock, 1955). The female has better chances of survival and is capable of more time spent with the male if adequate covering/hiding spaces are provided (Itzkowitz, 1971). In this experiment, females will not be introduced into the environments and therefore will not be a factor in determining aggression per available space.

In nature, rice paddies are a Betta splendens primary habitat. In an aquarium habitat rice paddies are inundated with approximately 12 inches of water over a vast area. This (observation in nature) poses the question that, “If Bettas cohabitate in the wild, then why do they battle until the end when confined?” Bettas are aggressive in the wild and exhibit aggressive behavior, but for shorter lengths of time than when placed in captivity (Goldstein, 1975). Therefore, space seems to be a changing variable.

The predicted outcome is that if space is increased (representing rice paddy), then one should observe less aggressive behavior in male-male interactions as opposed to a more confined space (representing Bettas in captivity). The null hypothesis is that there is no difference in aggressive behavior (no increase in nips or flares) if space is increased. The alternative hypothesis (Figure 1) is that there is a difference in aggressive behavior as space is increased. If there is a difference it means that space is a variable to their aggressive behavior and if there is no difference that means that space is not a factor in male-male Betta aggression.

Figure 1
Predicted outcome

<table>
<thead>
<tr>
<th>Tank size (gal)</th>
<th>Total # of aggressive behaviors displayed</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.875</td>
<td>27.5</td>
</tr>
<tr>
<td>13.75</td>
<td>13.75</td>
</tr>
<tr>
<td>27.5</td>
<td>41.25</td>
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<tr>
<td>41.25</td>
<td></td>
</tr>
</tbody>
</table>

Figure 1 General prediction stating that as the tank size increases the display of the aggressive behaviors will decrease.
*If space is increased and aggressive behaviors continue then maybe adding hiding places/complexity would decrease the aggressive behaviors and allow two male betas to cohabitate like in the wild. Rice paddies have a lot of vegetation and therefore have a lot of hiding places. **This additional variable will be tested, if time allows, after our initial hypotheses are tested.**

**Methodology**

Lab experiment

Time table for research:
Several increments of 5 minutes (too long and the betas might kill or seriously injure each other).

Each day (of 5 days) 2 *Betta splendens* (of 10) will be selected at random and 1 tank size (of 5) will be selected at random to be tested. The random selection will be done using the website [www.random.org](http://www.random.org). After the first two fish have been tested in the first tank size, the two fish and tank size will be eliminated from the randomized selection for that day, as well as the two fish used in the testing for each tank. The randomized selection of fish and tank size will continue until all have been used in that day.

In order to tell the fish apart for the randomized selections, they will be numbered in their individual containers with a brief description of color, length size (mm), and any other defining traits; so as to not confuse them when they are combined in the tanks and they can be returned to their respective containers.

This process will be repeated for four more days; and, all the data collected will be accumulated in order to determine the overall behaviors of the *Betta splendens*. This will hopefully verify the alternative hypothesis that, “there is a difference in aggressive behavior as space is increased”. In order to eliminate all possible biases (along with randomized selections of fish and tanks) these precautions will also be made: the fish will be fed at the same time increments each day, the tank water temperature will be regulated with an electric tank heater, and oxygen contents will be regulated using a tank aerator, hose and pump.

The tank sizes (in gallons) that will be uses are as follows (Figure 2):

1. 55
2. 41.25
3. 27.5
4. 13.75
5. 6.875
Figure 2  Tank sizes created using a 55 gallon tank with a divider.
Works Cited


Further Readings


