

General Behavior of the Male Bluehead Wrasse, *Thalassoma  
bifasciatum*, at Champagne Bay and Scott's Head, Dominica

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## Abstract

A three week long study was conducted on the comparison of behavior of the male bluehead wrasse (*Thalassoma bifasciatum*) in the morning and afternoon. Locality of the study is on the small island of Dominica located in the Caribbean. Data were collected from Champagne Bay and Scott's Head. Champagne Bay is located on the western coast of the island. Scott's Head is located on the southern tip of Dominica. Two samples of data were taken from Champagne Bay, and four samples of data were taken from Scott's Head. A list of behaviors was categorized to quantify the data. The results from the morning were compared to the results from the afternoon. These results were then tested for significance using a T-test. The results indicated differences in morning and afternoon behavior of the male *T. bifasciatum*.

## Introduction

In the oceans coral reefs, the dynamics and locality of many of the fish species has been extensively mapped by many researchers. These researchers have discovered the consistency with timing and locations of each organism spawning activities.

The bluehead wrasse (*Thalassoma bifasciatum*) is a small reef fish found very commonly throughout the wider Caribbean. Scientists have studied these fish for decades because of their common occurrence and their interesting social dynamics.

The species is a protogynous hermaphrodite, meaning that as the individuals mature, the females will change sex and color to become a male (beautifuloceans.com). There are a variety of color changes associated with the growth and development in this species. The coloration of the small males and all of the females is called the initial color phase (IP) (Swearer, 1991). The initial phase coloration is a yellow dorsal stripe that surmounts to a lateral series of green blotches that are separated by white bars (Figure 2A) (Swearer, 1991). The larger *T. bifasciatum*

has a coloration called the terminal color phase (TP) (Swearer, 1991). The terminal phase coloration is a blue head separated from the green body by a white bar in between two black bars (Figure 2B) (Swearer, 1991). Those individuals that are in transition from IP to TP, change colors to the intermediate phase (INT) (Swearer, 1991). The INT coloration is a blue head with a green body, but has remaining posterior blotches (Figure 2C) (Swearer, 1991). There have been observations of the large females changing sex, coloration, and behavior when the large dominant males are absent (Swearer, 1991). I will be studying the large terminal color phase males and what their typical behavior is in the morning and in the afternoon. I hypothesize that the males will exhibit a greater amount of interspecies social interaction in the afternoon than in the morning. I base my theory on the fact that the *T. bifasciatum* has been recorded to spawn in the early afternoon (Swearer, 1991).



Figure 2A. (IP) Female Initial Phase, *Thalassoma bifasciatum*



Figure 2B. (TP) Male Terminal Phase, *Thalassoma bifasciatum*



Figure 2C. (INT) Intermediate Phase, *Thalassoma bifasciatum*

## Materials and Methods

To perform this study on the typical male behavior of the *T. bifasciatum*, I used the following materials: snorkel, mask, wet suit, and fins. To record the data I used underwater slates for writing observations, and an underwater camera to record behaviors for later observations.

In this project, I studied the typical male behavior of *T. bifasciatum*. First, I spent two days becoming familiar with and outlining TP behaviors. I recorded those behaviors on an underwater slate. Then, the various behaviors were classified for quantitative analysis. I was able to classify eight different behaviors of the TP. The eight behaviors include: pursuit of female *T. bifasciatum*, pursuit of juvenile *T. bifasciatum*, feeding, pursuit of other fish species, traveling away from home territory, circling around home territory, pursued by other fish species, and interaction with other TP *T. bifasciatum* males. The first behavior was pursuit of female *T. bifasciatum* by the TP male. This behavior is described as the TP male briskly swimming after the female *T. bifasciatum* with minimal contact between the two. The next behavior consists of pursuit of juvenile *T. bifasciatum* by the TP male. This behavior is described as the TP *T. bifasciatum* briskly swimming after the juvenile *T. bifasciatum* with minimal contact between the two. The third behavior quantified was feeding. Feeding is described as the TP *T. bifasciatum* touching its mouth to a rock or coral with algae growth on it to intake food. The fourth behavior was the TP pursued other fish species. The TP would briskly swim behind or feed under a fish of a different species than its own when in or near its home territory. The next behavior quantified was traveling by the TP. Traveling was described as when the TP would swim several meters away from the home territory. The sixth behavior was the TP circled around their home territory. The TP would swim around the home territory staying within one meter. The next behavior was other fish species pursued the TP. The other fish species would briskly swim behind the TP with occasional contact. The final behavior quantified was interaction with other TPs. This behavior consists of the observed TP swimming within a few centimeters of another TP.

To compare behaviors in the morning to behaviors in the afternoon, a chart was constructed to tally the amount of times a male performed each one of the behaviors described in

Table 1, during in a span of fifteen minutes. Three replicate morning 15 minute intervals and three evening intervals were recorded by observing different males for each interval. I recorded video and pictures taken in between the chart observations for further reference when analyzing data. Data were analyzed to determine the statistical difference between morning and afternoon interactions that will confirm or reject my hypothesis.

## Results

The results of my data collection can be seen in Tables 1 and 2. The data were tested for statistical significance by using a T-test. The T-test data can be seen in Table 3. Pursuit of females, juveniles and other fishes was combined into pursuit when performing the t-test due to some of the categories having zero data entries. Also, pursued by other fish was excluded from the t-test due to its little significance towards the related topic.

After performing the t-test, I was able to determine the statistical differences between the morning and evening activities of the TP male. In table 3, the p-values for travel, circle around home, and interact with other males are below 0.05 which shows that the difference between morning and night is statistically significant. The average for travel is higher in the morning than it is in the afternoon. The average for circling around home is higher in the afternoon than it is in the morning. Then the average for interaction with males is higher in the afternoon than in the morning. Thus, the TP males are traveling around in the morning and are circling around their home territories while interacting with other TP males in the afternoon.

Table 1: TP behavior recorded in the morning.

Morning	Champagne Bay		Scott's Head	Average	St. dev.
	6/1/2010 9:58-10:12 AM	6/1/2010 10:43-10:58 AM	6/31/2010 11:00-11:15 AM		
Pursue Female	4	12	12	9.3	4.6
Pursue Juvenile	1	10	11	7.3	5.5
Feed	10	9	0	6.3	5.5
Pursue other Fish Species	9	13	8	10.0	2.6
Travel	15	24	21	20.0	4.6
Circle Around Home	9	8	11	9.3	1.5
Pursued by other Fish Species	4	2	0	2.0	2.0
Interact with other Males	1	0	5	2.0	2.6

Table 2: TP behavior recorded in the afternoon.

Afternoon	Scott's Head			Average	St. dev.
	6/5/2010 3:15-3:30 PM	6/5/2010 3:45-4:00 PM	6/5/2010 4:45-5:00 PM		
Pursue Female	9	11	20	13.3	5.9
Pursue Juvenile	0	0	0	0.0	0.0
Feed	12	17	7	12.0	5.0
Pursue other Fish Species	0	0	0	0.0	0.0
Travel	3	10	9	7.3	3.8
Circle Around Home	16	14	16	15.3	1.2
Pursued by other Fish Species	0	0	4	1.3	2.3
Interact with other Males	18	19	26	21.0	4.4

Table 3: T-test data used to determine statistical significance.

Behavior	Time	Average	t-Test
Pursue	AM PM	26.67 13.33	t= 1.833, df= 4, p= 0.141
Feed	AM PM	6.33 12.00	t= 1.319, df= 4, p= 0.257
Travel	AM PM	20.00 7.33	t= 3.691, df= 4, p= 0.021
Circle around Home	AM PM	9.33 15.33	t= 5.427, df= 4, p= 0.006
Interact with other Males	AM PM	2.00 21.00	t= 6.454, df= 4, p= 0.003

## Conclusion and Discussion

The analyses indicate that my hypothesis is supported, but proves to have more significance than my general hypothesis. The data indicated that the TP males are traveling in the morning and circling around while interacting with other TP males in the afternoon.

There is one major influencing factor that determines the TP males' behavior at different times of the day. The most important factor is the species spawning activities. *T. bifasciatum* has been recorded to spawn a short time after high tide to allow the eggs and sperm to spread with the outgoing tide (Nemeth, 2009). Since *T. bifasciatum* is also observed to be spawning in the afternoon and not in the morning, this indicates that they spawn after the second high tide (Swearer, 1991). In my results, the TP males spent more time concentrating on their territories and other TP males in the afternoon. The afternoon has been indicated to be in or close to their spawning time. Therefore, in the morning, the males were concentrating on traveling away from their home territory with less interaction with other TP males.

There are two things I would do differently to improve this project. The first change would be to observe the spawning of *T. bifasciatum* to get a better idea of the time that the males are spawning. This would allow me to analyze my observations in relation to how much time passes until the males are going to spawn. The second aspect of my project I would change is to make sure that the time of day I did my observations was more organized. This means that the data for the morning would be collected at 9am, 10am, and 11am. Therefore, the data would be a better overview of the morning and afternoon hours.



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