

Age Distribution of Bluehead Wrasse, *Thalassoma bifasciatum*, at Tarou  
Point and Champagne

Michele Felix  
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Texas A&M University

## **Abstract**

A three week long study was conducted on the age distribution of *Thalassoma bifasciatum*. Samples were taken at two locations, Tarou Point and Champagne. Both are coral reefs located on Dominica's Caribbean coast. Ten counts were taken at each site and the depths of each of these groups of fish were measured. The numbers of terminal phase fish were compared to the numbers of intermediate and juvenile phase fish in each group. The results from the two locations were then compared. Percentage of non-terminal phase fish at various depths was also measured. A large disproportion of terminal and no-terminal fish was found within the groups of *T. bifasciatum*.

## **Introduction**

While snorkeling at Tarou Point in July of 2004 I noticed a significant disproportion between adult Bluehead Wrasse and their young. I decided to do a study that would determine the approximate proportions of these fish and possibly find a reason for this uneven distribution.

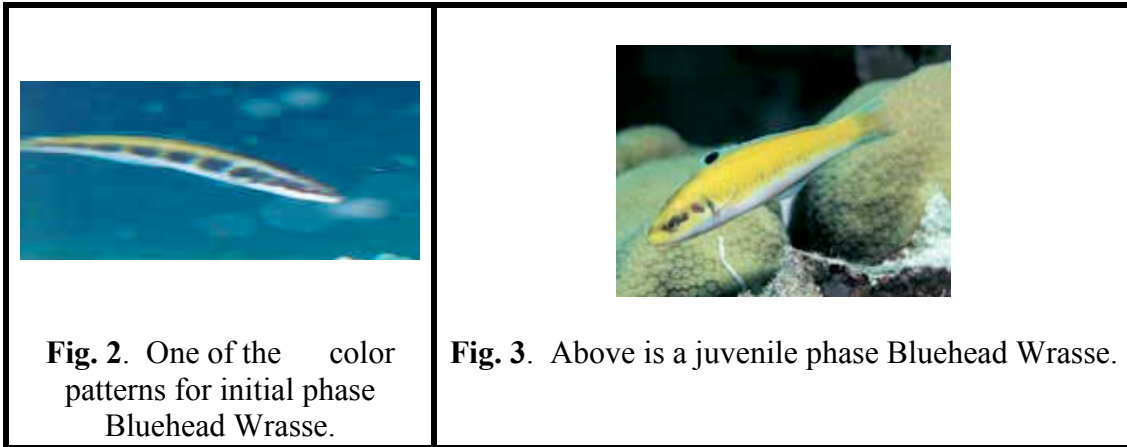
*Thalassoma bifasciatum*, commonly known as the Bluehead Wrasse, is a tropical reef fish frequently found in the Caribbean Sea. These marine fish are often seen swimming in shallow reefs close to shore as well as in seagrass beds and coastal bays. They can be found at depths of 0 – 40 meters (FishBase, 2004). They are easily recognized by their unique markings (Humann, 1999). The terminal phase (always male) have a blue head and a yellow-green posterior region. Their mid-section consists of two vertical black bars, separated by a vertical white bar (see Fig. 1).



**Fig. 1.** The photo above shows a terminal phase Bluehead Wrasse. Notice the black and white vertical bars separating the colored anterior and posterior regions.

Initial and juvenile phase fish can be found in several different color patterns. One of these is a dull yellowish-green dorsal surface above a white belly. White vertical bars extend across the length of the body, breaking up the dorsal surface into dark rectangles

(see Fig. 2). Juveniles can be identified by their yellow dorsal surface and white ventral surface. A dark, horizontal stripe may or may not be present. In both initial and juvenile phase fish, a black spot can be seen on the dorsal fin behind the second dorsal ray.



*T. bifasciatum* exhibit a unique type of reproduction in that they are protogynous hermaphrodites. This means that if, for some reason, there is a shortage or absence of males, a larger female can change sex and take on the role of the male. This transformation takes about 3-4 weeks. Their diet consists mainly of plankton and benthos such as copepods, polychaetes, isopods, small crustaceans and their larvae, and gastropods and their larvae. They also behave as cleaner fish at times, feeding on the ectoparasites of larger fish (Rock & Wreck, 2004).

The two sample sites, Tarou Point and Champagne Bay are marine bodies of water located on the West side of the island of Dominica which faces the Caribbean Sea. The Commonwealth of Dominica is located in the Lesser Antilles between Guadeloupe and Martinique. The island has a tropical climate.

## **Materials and Methods**

At each location, numbers of terminal phase and non-terminal phase fish were recorded for ten different groups of fish. At Tarou Point, five measurements were taken from the North side of the rock and five from the South side. Measurements at Champagne were distributed evenly throughout the Bay. I used snorkel gear to observe the fish from above water and an underwater writing tablet to record the numbers of fish in each phase. I also took pictures with an underwater camera. A makeshift measuring tape was made out of rope, a weight, and an empty bottle. The weight rested on the bottom and the empty bottle floated, keeping the line straight. The rope was marked off at every meter. This was used to measure depth.

“Phase” is simply a term to describe a specific coloration that most wrasse display at some point in their lives. Transformation from one phase into the next is a gradual process making it difficult to distinguish between them at times. For this reason, juvenile and intermediate phases and their transitional color patterns were counted together.

Terminal phase fish were considered on their own.

## Results

### Tarou Point (Rodney's Rock)

Group	Term. Phase	Initial / Juvenile Phase	Total	% Initial / Juvenile
1	1	6	7	85.7 %
2	4	21	25	84.0 %
3	2	8	10	80.0 %
4	3	17	20	85.0 %
5	3	11	14	78.6 %
6	2	14	16	87.5 %
7	2	13	15	86.7 %
8	0	8	8	100 %
9	4	15	19	78.9 %
10	3	10	13	76.9 %
<b>Total</b>	24	123	147	83.7 %

**Table 1.** The table above shows the number of terminal and non-terminal phase fish present in each group counted at Tarou Point. The column labeled “Total” represents the total number of fish in each group. The column on the right represents the percent of fish in each group that were not in terminal phase. The bottom row gives results for all fish counted at Tarou Point.

### Champagne

Group	Term. Phase	Initial / Juvenile Phase	Total	% Initial / Juvenile
1	0	9	9	100
2	1	~ 30	~ 31	>95%
3	2	~ 50	~ 52	>95%
4	1	~ 35	~ 36	>95%
5	1	~ 20	~ 21	>95%
6	5	~ 70	~ 75	>90%
7	1	~ 15	~ 16	>90%
8	0	~ 25	~ 25	>95%
9	2	~ 40	~ 42	>95%
10	3	~ 30	~ 33	>90%
<b>Total</b>	16	204	~ 220	>90%

**Table 2.** The table above shows the number of terminal and non-terminal phase fish present in each group counted at Champagne. The column labeled “Total” represents the total number of fish in each group. The column on the right represents the percent of fish in each group that were not in terminal phase. The bottom row gives results for all fish counted at Champagne.

### Tarou Point

Depth (m)	Terminal Phase	Initial / Juvenile Phase	% Initial/Juvenile
1	1	6	85.7 %
	4	21	84.0 %
	2	13	86.7 %
Total	7	40	85.1 %

Depth (m)	Terminal Phase	Initial / Juvenile Phase	% Initial/Juvenile
2	2	8	80.0 %
	3	17	85.0 %
	3	11	78.6 %
	2	14	87.5 %
	0	8	100 %
Total	10	58	85.3 %

Depth (m)	Terminal Phase	Initial / Juvenile Phase	% Initial/Juvenile
3	4	15	78.9 %
	3	10	76.9 %
Total	7	25	78.1 %

**Table 3.** This table shows the number of fish, terminal and non-terminal, that were counted at Tarou Point, along with the depths at which they were counted. Also included are the percents that initial and juvenile fish represent within each group. The bottom rows show the totals for all groups measured at the given depth.

### Champagne

Depth (m)	Terminal Phase	Initial/Juvenile Phase	%Initial/Juvenile
1	0	9	100 %
	1	~ 20	> 95 %
	1	~ 15	> 90 %
	0	~ 25	> 95 %
Total	2	~ 69	> 95 %

Depth (m)	Terminal Phase	Initial/Juvenile Phase	%Initial/Juvenile
2	1	~ 30	> 95 %
	2	~ 50	> 95 %
	1	~ 35	> 95 %
	2	~ 40	> 95 %
Total	6	~ 155	> 95 %

Depth (m)	Terminal Phase	Initial/Juvenile Phase	% Initial/Juvenile
3	5	70	> 90 %
	3	30	> 90 %
Total	8	100	> 90 %

**Table 4.** This table shows the number of fish, terminal and non-terminal, that were counted at Champagne, along with the depths at which they were counted. Also included are the percents that initial and juvenile fish represent within each group. The bottom rows show the totals for all groups measured at the given depth.

### **Discussion**

The results from this study show that there is indeed a major disproportion in the ages of the fish (see tables 1 &2). In most cases, less than 30% of the fish present in a group were terminal phase fish. There is also an indication that depth may have an effect on this number but this may be due to sampling error. It would appear that the number of terminal phase fish present increases along with depth (tables 3&4) although more testing is required to determine if this is the case.

Champagne showed a larger variance between terminal and non-terminal phases. There were many more intermediate and juvenile phase fish at Champagne, however the number of terminal phase fish was lower than at Tarou Point. This could be due to a number of factors including greater area of Champagne compared to Tarou Point, Champagne's more spread-out reef system, or some type of environmental factor.

One possibility for the inequality in the numbers of terminal and non-terminal fish is the *T. bifasciatum* life span. Once a male reaches his last phase he may not live for very much longer. Terminal phase may be a brief period of time in which growth has ceased and the only objective is to reproduce and defend the young. Another possibility for this finding is their social system. It is possible that only one male is required for breeding,



defending young/territory etc. and that the other males either never enter terminal phase or are forced out as a consequence. It is also a possibility that there is a shortage of males in my sampling areas and that some females have had to undergo sex changes. Also, if the correlation between depth and terminal phase fish is accurate, then the difference may be due to their preference for deeper water.

Possible sources of error include small sampling number. Due to time and equipment constraints, only a limited number of measurements could be made. More measurements would produce more accurate results. My lack of snorkeling experience also kept me from obtaining additional measurements at 3 meters as well as measurements beyond that depth. This study would benefit from deeper measurements. Also, the fish covered a large area of the reef, making it difficult to tell where one group ended and another began. For this reason, I tried to choose different sections of reef for each count. Another possible source of error was my estimations. There were such a great number of juvenile phase fish at Champagne that it was almost impossible to correctly count them although I estimated as best I could. Counting was also affected by the fact that the fish were not stationary. Fish swimming around were possibly counted twice.

### **Conclusion**

The Bluehead Wrasse, *Thalassoma bifasciatum*, exhibits a great unevenness in age distribution in favor of the younger fish. Juvenile and intermediate phase fish outweigh the terminal phase by approximately 80%. It is also possible that the number of terminal phase fish increases with depth which might explain their small numbers at shallow

depths. Champagne has a much larger disproportion of terminal and non-terminal fish for reasons not discovered during this study. A follow up study for determining the causes could be helpful. Another possible study involving *T. bifasciatum* is their sex reversal process. Determining the environmental pressures that initiate this transformation would be interesting.

### **Works Cited**

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### **Photo Credits**

Figs. 1 & 3 ... Taken by Paul Humann. Found in his book, Reef Fish Identification.

Fig. 2 ... <http://www.magnificentrelief.com/index.html>