

Territorial Behavior of The Dusky damselfish, *Stegastes fuscus*, At Champagne Reef

Michael A. Wachter

Texas A&M University, Department of Wildlife and Fisheries Sciences, College Station, TX
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Dr. Thomas Lacher and Dr. Jim Woolley

Abstract

The territorial behavior of the dusky damselfish, *Stegastes fuscus*, was observed at Champagne Reef by recording the numbers and species of fish that they chased away during ten minute observations. Major algal feeding fish such as the parrotfish, bicolor damsel and other dusky damselfish were recorded as the most chased fish, as they were competing for the same food source. Of the three sites selected, the site with the most algae present was the site where dusky damselfish were most aggressive.

Introduction

The dusky damselfish, *Stegastes fuscus*, is a reef fish that is found in the Caribbean, and commonly found at Rodney's Rock and Champagne Reef on the island of Dominica. Both of these reefs are located on the western coast of the small island and provide good habitats for the dusky damselfish, as well as suitable conditions for observing them.

The dusky damselfish is a dark olive-brown to almost black fish with faint dark bands running vertically down the side of its body (Humann 1999). Sometimes the fish will have a thin line of blue running along the edges of the dorsal and anal fins. They generally grow to be 7.6-

12.7cm in length but can reach a maximum of 15cm. Dusky damselfish typically live in depths ranging from 1.5m to 12m. They live in rocky areas, feeding on algae, and are considered very territorial. They can also be commonly misidentified as the similar looking longfin damselfish. The distinguishing characteristic between the two is that the dusky damselfish have shorter, more rounded dorsal and anal fins (Humann 1999).

The purpose of this project is to observe the territorial behaviors of *S. fuscus* at Champagne Reef by recording which species of fish they are chasing and how often they are chasing them. Using this information I hope to determine why they are being so territorial. Additionally, these observations can be compared to Pugh's (2005) study, "Territorial Habits of *Stegastes fuscus*", which was conducted at Rodney's Rock.

Methods and Materials

On May 29th I went to Champagne Reef and surveyed the area for a suitable site to observe Dusky damselfish. The territory I chose was established at the bottom of a cylindrical crater that was situated on top of a large section of coral reef. The crater itself sat roughly 2.7m under the surface of the water, and extended another 2.1m in depth and stretched 1.5m in diameter. At the bottom of this crater was a toaster-sized stone that sat in the middle of the dusky damselfish's territory. The walls of the crater served somewhat as a protective barrier to the territory, making it a fairly secluded and easily observable study site. There were two dusky damselfish that lived within the boundaries of this crater, and I decided that I would record the behavior of both of them during my observations. The observation itself consisted of watching the fish for ten minutes, recording the number of times they chased an intruder away and what type of fish it was. I also took note of the types of fish that they did not chase away. All of the information that I recorded was written onsite with an underwater writing slate.

On the second day of the study I chose two new sites to observe in conjunction with the first site (Site 1). I was now watching three sites for ten minutes each, recording the same sets of data for each site.

Site 2 was located near several small thermal vents which produced bubbles and heated the surrounding waters. At a depth of 1.8m, the substratum was composed of many varying sizes of rocks that were densely covered in algae and there was very little coral present. There was a large population of dusky damselfish in the area which made it difficult to determine where one fish's territory ended and another's began. I selected two dusky damselfish that had territories within 0.9-

1.5m of each other and made my observations on those two fish alone. This would represent somewhat similar conditions to that of Site 1, apart from the depth and substratum.

Site 3 was a small cluster of rocks, one with a large yellow tube sponge growing on it, located on a fairly sandy bottom. I chose this spot because the bottom type was different than those of the first two sites, and I was curious as to whether that would produce a difference in the type of species the dusky damselfish chased off. Again, I selected two damselfish located very near each other and carried out my observations on them for ten minutes.

On June 3rd and June 6th I went back to Champagne Reef to complete two more observations. On June 3rd I observed all three of the sites. However, on June 6th I was only able to observe Site 2 because we were on a snorkeling tour and I was not allowed to leave the group. Overall I was able to observe Site 1 and 2 a total of three times and Site 3 only twice.

Results

Table 1: This table shows 1) the type and amount of fish that were chased at each site; 2) the total number of fish chased at each site; 3) the total number of species chased at each site; 4) the average number of chases per observation, at each site and overall; 5) the average number of chases per minute at each site, and overall.

Fish Chased	Site 1	Site 2	Site 3	Total
Parrotfish (Family-Scaridae)	1	18	2	21
Bluehead Wrasse (<i>Thalassoma bifasciatum</i>)	1	4	1	6
Juvenile Bluehead Wrasse (<i>Thalassoma bifasciatum</i>)	6	6	5	17
Bicolor Damselfish (<i>Stegastes partitus</i>)	4	6	7	17
Yellowtail Damselfish (<i>Microspathodon chrysurus</i>)	1	0	1	2
Dusky damselfish (<i>Stegastes fuscus</i>)	3	6	1	10
Ocean Surgeonfish (<i>Acanthurus bahianus</i>)	3	2	0	5
Sergeant Major (<i>Abudefduf saxatilis</i>)	1	0	0	1
Juvenile Puddingwife (<i>Halichoeres radiatus</i>)	0	2	0	2
Spotted Goatfish (<i>Pseudupeneus maculatus</i>)	0	0	1	1
Unknown	0	0	2	2
Individual # of Species	8	7	8	11
Average # Chases Per Observation	6.67	14.67	10.00	10.44
Average # Chases Per Minute Per Fish	0.33	0.73	0.50	0.52

Table 1: Comparison of Counts/Site Over 30 Minutes of Observation

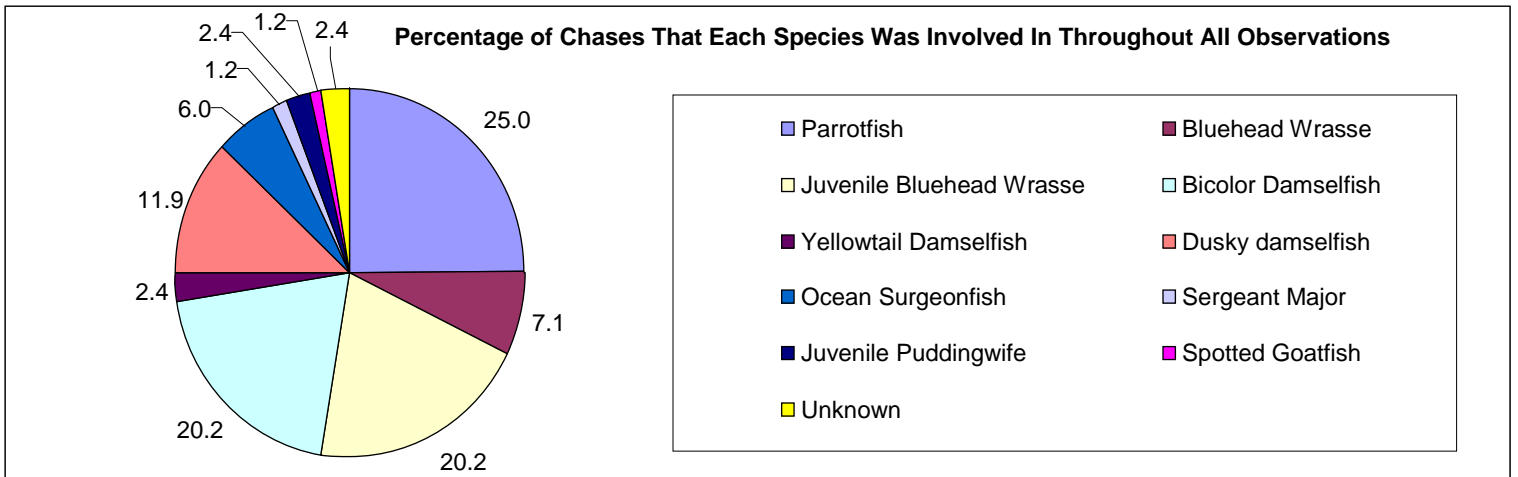


Figure 1: This figure depicts the overall percentage of total chases that each species was involved in during the four days of observation, for example parrotfish chases made up 25% of all 84 chases that I observed.

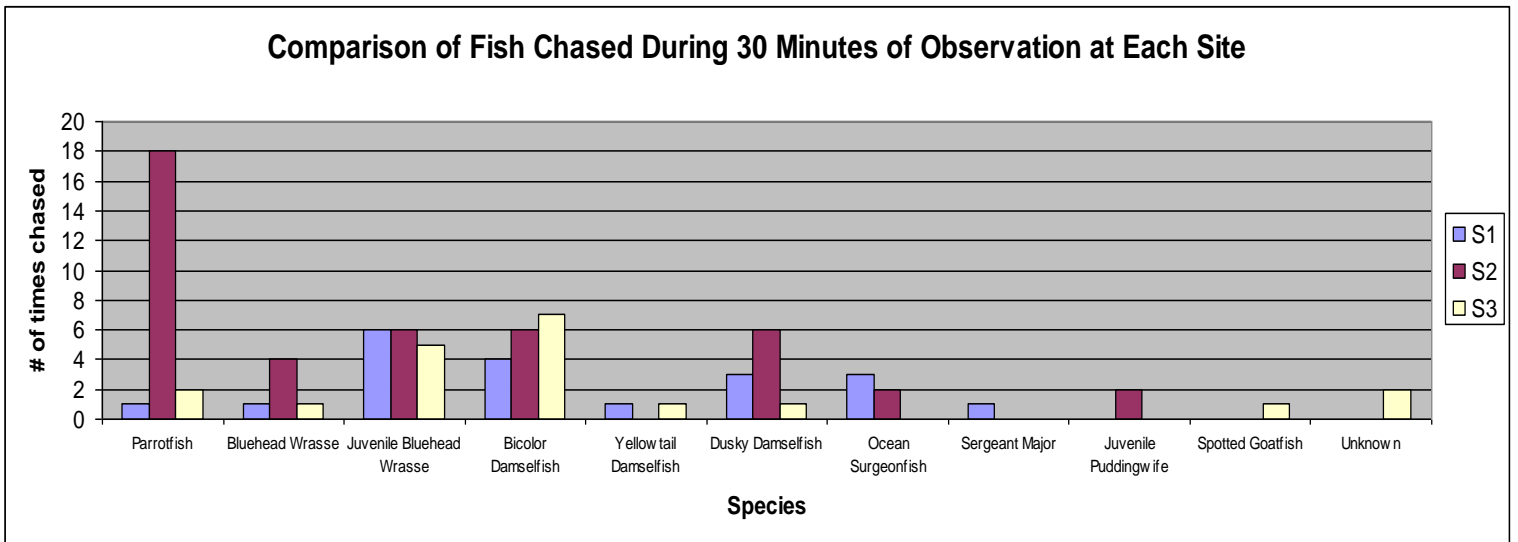


Figure 2: This chart compares the number and type of fish chased away by the dusky damselfish at each site.

Discussion

The dusky damselfish displayed frequent territorial behavior during my observations. A total of 84 chases were recorded during the entire study, and an average of 0.52 chases occurred

every minute across all of the sites (Table 1). Several different species of fishes were recorded being chased, sometimes only a short distance and sometimes several meters away. They seemed to be most aggressive toward parrotfish, juvenile bluehead wrasses, bicolor damselfish, and dusky damselfish (Figure 1). Each of these fishes, apart from the bluehead wrasse, feeds primarily on soft algae, making them direct competitors for food sources (Froese and Pauly 2009). Site 2, the algal covered rock site, had large densities of these four species of fish, so the amount of chases involving them was substantially higher here than at the other two sites (Figure 2). The juvenile bluehead wrasses tended to hang around in groups near rock structures adjacent to the territories being observed. Whenever a group got too close to the dusky damselfish's territory several would be chased away at a time, accounting for the high number of counts recorded for that species. However, I do not believe that they were of any threat to the dusky damselfish.

At Site 1 there were two dusky damselfish and one yellowtail damselfish that lived with in the vicinity of the crater and they never showed aggressiveness toward each other. Each of them chased away the few intruding dusky damselfish that came into the area as well as other species that posed any threat to them. It appeared as if they were working together to protect the one large territory. One possible way to test this observation would be to remove one of the damselfish and see if the remaining one allowed a new damselfish to move into the territory. However, I found this observation to be in great contrast with the behavior of the dusky damselfish observed at Site 2. Here the territories were much smaller and the abundance of algal feeding fish was much larger, so competition for the algal covered rocks was fiercer. The close proximity of the fishes created more opportunities for the dusky damselfish to intrude in each other's territory, thus provoking more aggressiveness and less cooperativeness. It is through this observation that I am confident to say that these dusky damselfish are very territorial in order to protect food sources rather than breeding grounds or sites of shelter.

Several graysby and smooth trunkfish were recorded roaming into the territory of the dusky damselfish without being chased away. This is probably because these fish feed on small invertebrates and fishes and were of no threat to their food source. However, species such as the spotted goatfish, bluehead wrasse, and puddingwife, which do not feed on algae, were observed being chased out of territories. It is possible that the damselfish did not chase the graysby or the smooth trunkfish because they benefit from them in some way, such as extra protection or keeping small invertebrates off of their algae.

Several of the same species were recorded being chased in Pugh's 2005 study at Rodney's Rock including the bluehead wrasse, yellowtail damselfish, bicolor damselfish, ocean surgeonfish, sergeant major, and dusky damselfish. In her study the bluehead wrasse juveniles were representative of a large portion of her chases, similar to the observations that I made at Champagne Reef. However, she recorded no interactions with parrotfish, which made up the largest portion of chases observed in my study. This could be because there are no parrotfish present in the location she selected. We each observed different species of fish that were ignored by the dusky damselfish and had none in common. If I was able to observe more often and for longer periods of time, I believe some of the same species would have shown up. Unfortunately the counts she observed cannot be quantitatively compared to mine because the duration of her observations are unknown.

I would have like to been able to do a least a few more observations to get a more accurate representation of the territorial behavior of these fish. However due to time constraints this was not possible. Also, I lost valuable time to observe them at the beginning of our stay in Dominica, as I was a part of a marine group project that consumed a lot of time to get started.

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