

**Mating Behavior of
Caribbean Reef Squid, *Sepioteuthis sepioidea***

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Abstract:

Sepioteuthis sepioidea, Caribbean Reef Squid, use chromatophores and iridiphores to change their color and patterns. These changes are used as part of a complex communication system. The complexity of this mating system has been mentioned in previous studies but rarely explained in more detail. This paper attempts to identify and describe the color and pattern changes seen in everyday behavior, but most importantly focuses on describing the complex courting behavior and male-male competition.

Introduction

The focus of my study was *Sepioteuthis sepioidea*, Caribbean Reef Squid. Reef squid are a favorite among snorkelers and scuba divers because they are commonly found among shallow reefs and can display a variety of colors and patterns that can change in less than a second (Byrne et al. 2003). Not only are these color and pattern changes fascinating to observe, but also they play a great role in reproductive behavior. Reef squid have a very short life span of about 1 to 2 years, and the majority of their mature lives are spent competing to maximize their reproductive success (Hanlon et al. 2002). Since reef squid are *semelparous*; that is, they die after reproducing, they are not monogamous. Males can fertilize many females in the short time before they die, while females lay their eggs and die immediately after (MarineBio 2008). Because of the difficulty of studying reef squid by direct underwater observation, there is not much information on their complex mating systems. Previous studies by Moynihan and Rodaniche (1982) and Moynihan (1985) (as cited by Hanlon et al. 2002) offer basic descriptions of the

complexity of the mating system for *S. sepioidea*, but little subsequent information has been published. Since these studies are about 25 years old, I was interested to see if my observations are consistent with these early descriptions and if I can describe in more detail the components of the mating system.

Materials and Methods

Study organism

Reef squid are a member of the 10-arm cephalopods and can be identified by their torpedo shape and fins that span almost the entire length of their body. All ten of their arms are attached to the head, with eight short arms close to the mouth and two large tentacles for capturing prey (MarineBio 2008). The coloration and pattern change is due to pigmented organs called chromatophores and reflecting cells called iridiphores. The chromatophores cells are in the dermal layer of the skin and display reds, yellows, brown and black and up close are small patches and dots. The iridiphores produce the green and blue colorations (Figure 1)(Marine Biological Laboratory 2008). These cells allow the squid to communicate one message to the squid to their right, while displaying a completely different message to the squid to their left (Byrne et al. 2003). Reef squid are commonly found in small schools of about 4 - 30 individuals and range from about 8-20 cm in length (MarineBio 2008).

Study area

The Caribbean Sea is a tropical sea located adjacent to the Atlantic Ocean at 9-22°N and 89-60°W. The Caribbean Sea is home to many coral reefs, which allow for great ecological diversity. Dominica is part of the Lesser Antilles between the

islands of Martinique and Guadeloupe, and helps make up the eastern boundary of the Caribbean Sea. This “nature island”, has coral reefs surrounding it making it a great place to do my study. I took data at two different locations, Champagne Bay and Scott’s head. Both locations are located at the southwestern end of Dominica and are separated by approximately 4.9 km (Figure 2).

Study Materials

To do my observational study I used snorkeling gear consisting of a mask, snorkel, fins, and a wet suit. I also took still photos and video of the reef squid with an Olympus Stylist Tough 8010 camera.

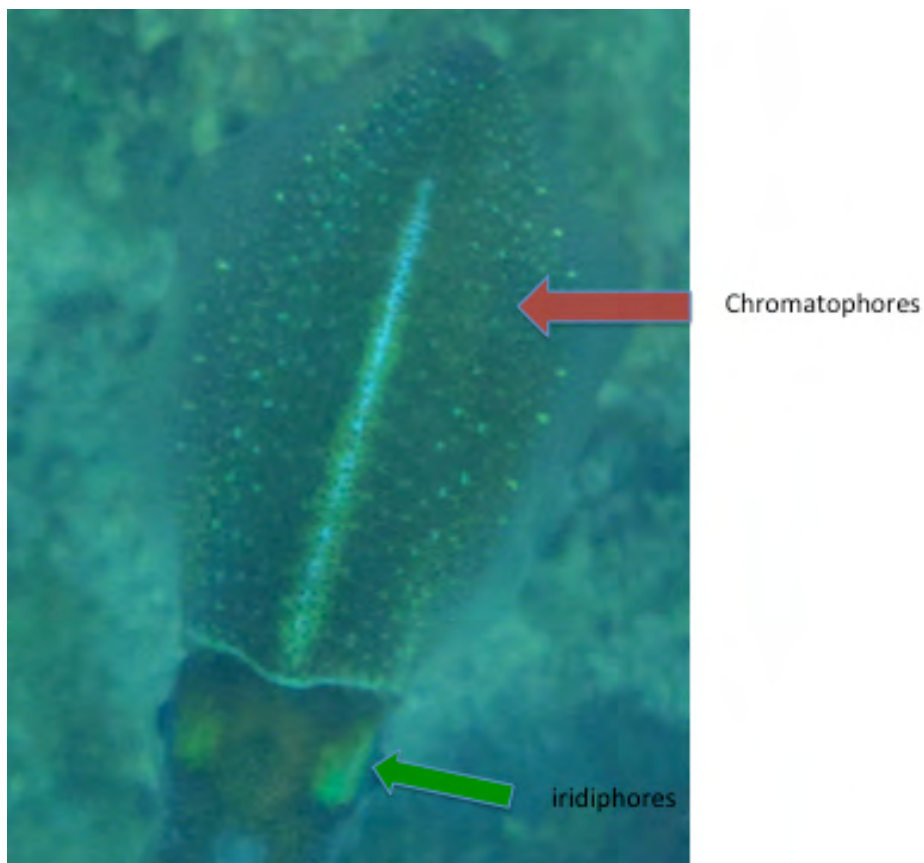


Figure 1: Female Caribbean reef squid in basic brown color phase showing the difference between chromatophore and iridiphore coloration. Photograph by Jamie Morris

consists of a pale background, with reflective green on the eyebrows and mantle midline. The basic intermediate is the in-between stage of pale and basic brown (Byrne et al. 2003).

A)

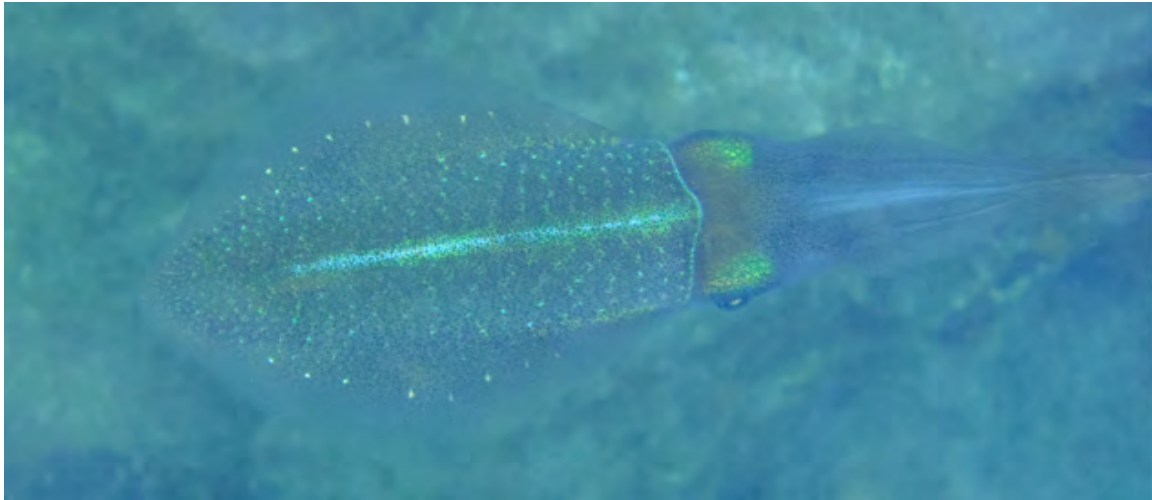


B)



Figure 3: A) A female Caribbean reef squid in the basic brown phase B) A male in the basic brown phase
Photograph by Jamie Morris

A)



B)



Figure 4: A and B) Caribbean reef squid in their basic pale phase of coloration. Photographs by: Jamie Morris and Dr. Heyman

Reef squid spend the majority of the day casually swimming in shoals (groups) and changing their color periodically for camouflage purposes. The adult reef squid changed to pale or would blend in with their environment, while the juvenile reef squid display a plaid pattern to hide themselves (Figure 5). The shoals I observed were very small, only 2 - 4 squid per shoal. Interestingly, I observed the squid swimming with only their own sex when not courting each other.



Figure 5: Juvenile Caribbean reef squid showing typical plaid coloration display.

Courtship behavior was observed at Champagne Bay on 5/30/2010 from about 2:15 PM- 2:25 PM. Courtship between males and females involved a slow parallel swimming type of dance between a male and female squid with some interruption by competing males. The primary male flickered brightly usually on the side facing away from the female, while the side toward the female showed a stripe display (Figure 6a and 6b). The male periodically exhibited a full body flicker. The female occasionally “answered” back with a partial saddle display (her bottom

end turned lighter leaving the rest of the mantle dark)(Figure 7). The courtship dance lasted about 1.5 minutes before another male competing for the female interrupted the courtship behavior. The male- male competition quickly heated up with dynamic zebra displays from both males. The males rose up completely vertical in the water column to challenge each other (Figure 8). To intensify their displays the males spread their tentacles and spread their fins around the mantle to make themselves look larger (Figure 9).

A)

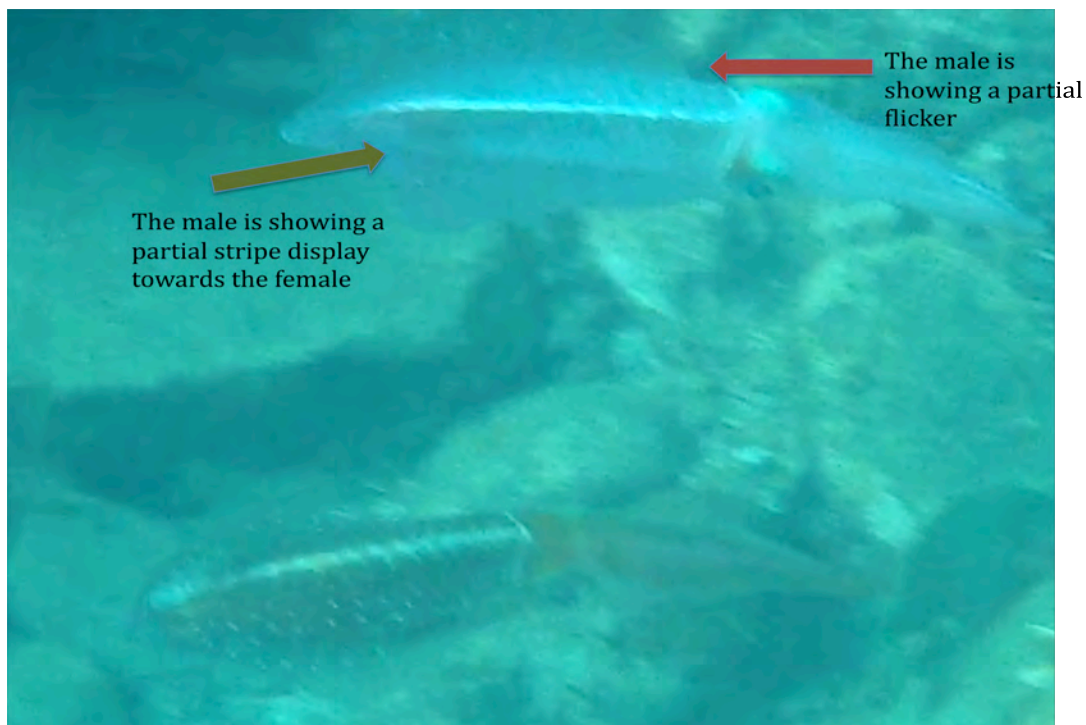


Figure 6: A) A male reef squid is shown hovering over and to the left of a female and he is showing a partial stripe display and a partial flicker.

B) A male shows a clear flicker on the side of his body that is away from the female.

Still shot from a video by Ariel Sklar

B)

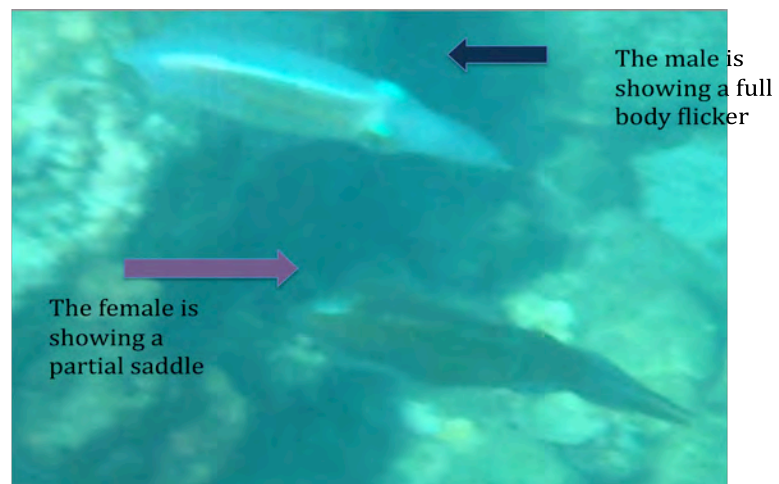


Figure 7: A male squid shows a full body flicker, while the female (below) responds with a saddle display. Still shot extracted from video by Ariel Sklar



Figure 8: Two male squid are swim vertically in an elaborate display of male- male competition. Note also the spread of their tentacles to intensify the display. Still shot from a video by Dr. Heyman

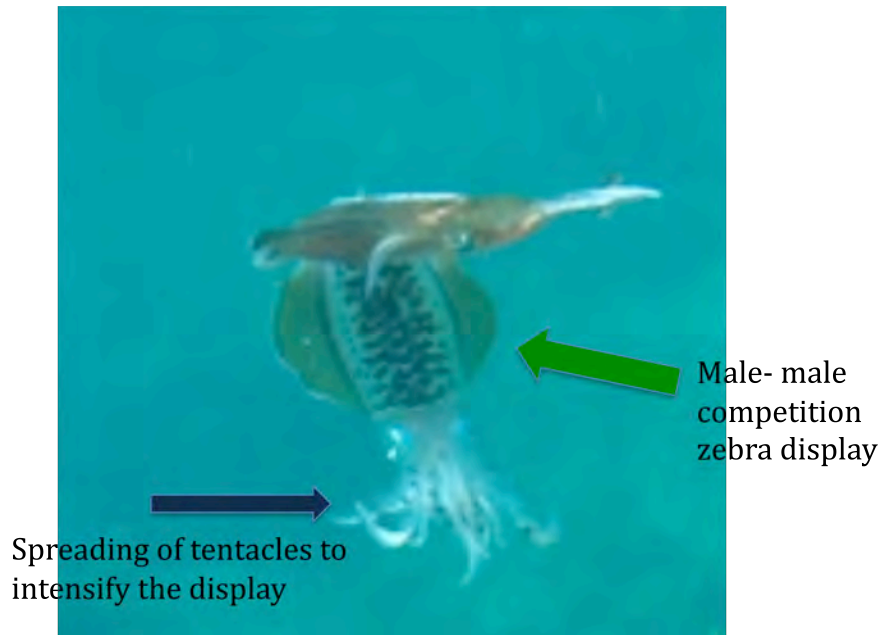


Figure 9: The male exhibits elaborate zebra pattern as part of an intense display of male-male competition. The spreading of their tentacles intensifies the display. Still shot from a video by Dr. Heyman

Discussion:

My observations of the reef squid courtship and non-courtship displays follow very closely to those of Burke et al. (2003). Those authors described well the different displays seen during courtship and, male-male competition. While taking video it was hard to tell if what we were seeing was courtship behavior or male-male competition. It was not until I watched the video several times that I found that the video we had captured was indeed mostly male-male competition. The Marinebio.org website stated that there could be competition between “2-5 other males” for the female, but the intensity of the competition was not clear. The male-male competition that I observed was about two full minutes of non-stop displays and competition.

Through direct observation, I was able to not only see the dynamic displays that accompany courtship behavior but also the length of time and effort spent on each component of the mating system. The actual act of mating is so quick that “if you blink you missed it” but with the time spent courting and competing, it is easy to see how they spend the majority of their short lives trying to maximize their reproductive success (McKay 2008; Hanlon et al. 2002).

If I were to do this project again, I would have a much better idea of what the male- male competition verses the courtship behavior, so that I would know what I was filming. Because of this lack of knowledge, I did not know to stay and keep recording to hopefully catch the mating of the squid. Also, because squid tend to come back to the same mating area, I would plan to return to the Champagne Bay at about 15.24°N and -61.38°W where the courtship took place instead of changing

locations. Extra practice with an underwater camera would also be beneficial to capture clearer video of the courtship process.

Acknowledgments:

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