Protein Content in Relationship to the Prey Selection of the Aeolid Nudibranch *Aeolidia papillosa*

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Introduction

Aeolidia papillosa, known as the shaggy rug nudibranch, is a common intertidal animal along the Pacific coast (Sept, 1999). *A. papillosa* is an aeolid nudibranch, meaning it has cerata on its dorsal surface. These cerata often have nematocysts that have been sequestered from its prey. Prey for aeolid nudibranchs most often consists of hydroids and anemones (Sept 1999). In the case of *A. papillosa,* their diet consists almost exclusively on anemones (Greenwood et al., 2004). While most nudibranch species are able to feed multiple prey species (Greenwood et al., 2004), Hall and Todd (1984) found during laboratory studies that *A. papillosa* will selectively choose one prey item over another. The question that then remains is why does *A. papillosa* selectively choose one prey item over another? The hypothesis is that *A. papillosa* selectively preys on anemone species with a higher nutrient content in the form of proteins.

Methods

Anemones were taken from three different locations along the Oregon coast. *Anthopleura elegantissima* was taken from Sunset Bay, Cape Arago. *Metridium senile* was taken from the North Spit, Charleston, and *Epiactis prolifera* was taken from Middle Cove, Cape Arago. *Aeolidia papillosa* were taken from both Middle Cove, Cape Arago, Oregon, and from Fossil Point, Charleston, Oregon. In both cases *A. papillosa* were found either on or near *Anthopleura elegantissima.*

A Y-maze experiment was conducted to show what preference, if any, the nudibranch had towards prey items. Each nudibranch was used only once for each set of options. After the Y-maze was completed the nudibranchs were placed in a large bowl with *Anthopleura elegantissima, Medtridium senile,* and *Epiactis prolifera.* The bowl was checked periodically to note which if any anemones had been eaten and in which order.

Samples of tentacle and column flesh from each species of anemone were taken. These samples which were approximately the same size were then minced up and placed in a centrifuge tube with 1ml of methanol. The samples were then allowed to sit for 20 minutes at which point they were centrifuged and the supernatant was extracted and placed in a cuvette. Another 1ml of methanol was placed in the centrifuge tubes and this process was repeated again. After the supernatant had been removed a standard BCA protein assay kit was preformed to find the amount of protein at a wavelength of 546 nm.

Results

It was found that the *Aeolidia papillosa* prefers *Anthopleura elegantissima* over both *Metridium senile* and *Epiactis prolifera* (Table 1). This was also confirmed when *A.papillosa* was placed in a large bowl with the prey species and it only ate the *Anthopleura elegantissima*. *A. papillosa* preferred to eat the tentacles of the anemones over the column. The protein assay confirmed that the amount of protein in different species was indeed different (Figure 1). The amount of protein in the tentacles (Figure 2) and the column tissues (Figure 3) was found to be highest in *Anthopleura elegantissima*.

Discussion/Conclusion

The data collected supported the hypothesis that *Aeolidia papillosa* selectively preys on anemone species with a higher nutrient content in the form of proteins. The fact that *A. papillosa* chooses to eat the lower protein tentacles over the higher protein column tissue can be explained easily. Aeolid dorids like *A.papillosa* rely on nematocysts that are sequestered in their cerata for protection. Nematocysts however can only be made by cnidarians, thus the nudibranch must get the nematocysts from its food. As the nematocysts are only found in the tentacles of anemones, it is understandable that *A.*

papillosa might for go the extra protein in the column in return for the protection of the tentacles' nematocysts.

The results for this experiment however can not be taken at face value. This is because *A. papillosa* exhibited what is called "ingestive conditioning", which is a preference for anemones that they have a past history of eating (Hall and Todd, 1984). As all the nudibranchs that had been collected had been in the presence of *Anthopleura elegantissima,* and had most likely been eating these anemones, it is unclear whether the preference for *Anthopleura elegantissima* stems from injestive conditioning or a true preference. In order to get more conclusive results a study must be done in which *A. papillosa* is allowed to be raised from a larva in an environment in which multiple species of anemones are available, as well as an environment in which only certain anemones are present. It would then be possible to determine if the nudibranch has a preference for a particular anemone or if it develops a preference based on what it is most often exposed to.

Results of Y-maze selection

Trial	Prey Option	Prey Chosen
1	*A. elegantissima/ M. Senile*	*A. elegantissima*
2	*A. elegantissima/ M. Senile*	*A. elegantissima*
3	*A. elegantissima/ M. Senile*	*A. elegantissima*
4	*A. elegantissima/ M. Senile*	*A. elegantissima*
5	*A. elegantissima/ E. prolifera*	*A. elegantissima*
6	*A. elegantissima/ E. prolifera*	*A. elegantissima*
7	*A. elegantissima/ E. prolifera*	*A. elegantissima*
8	*A. elegantissima/ E. prolifera*	*A. elegantissima*

Table 1

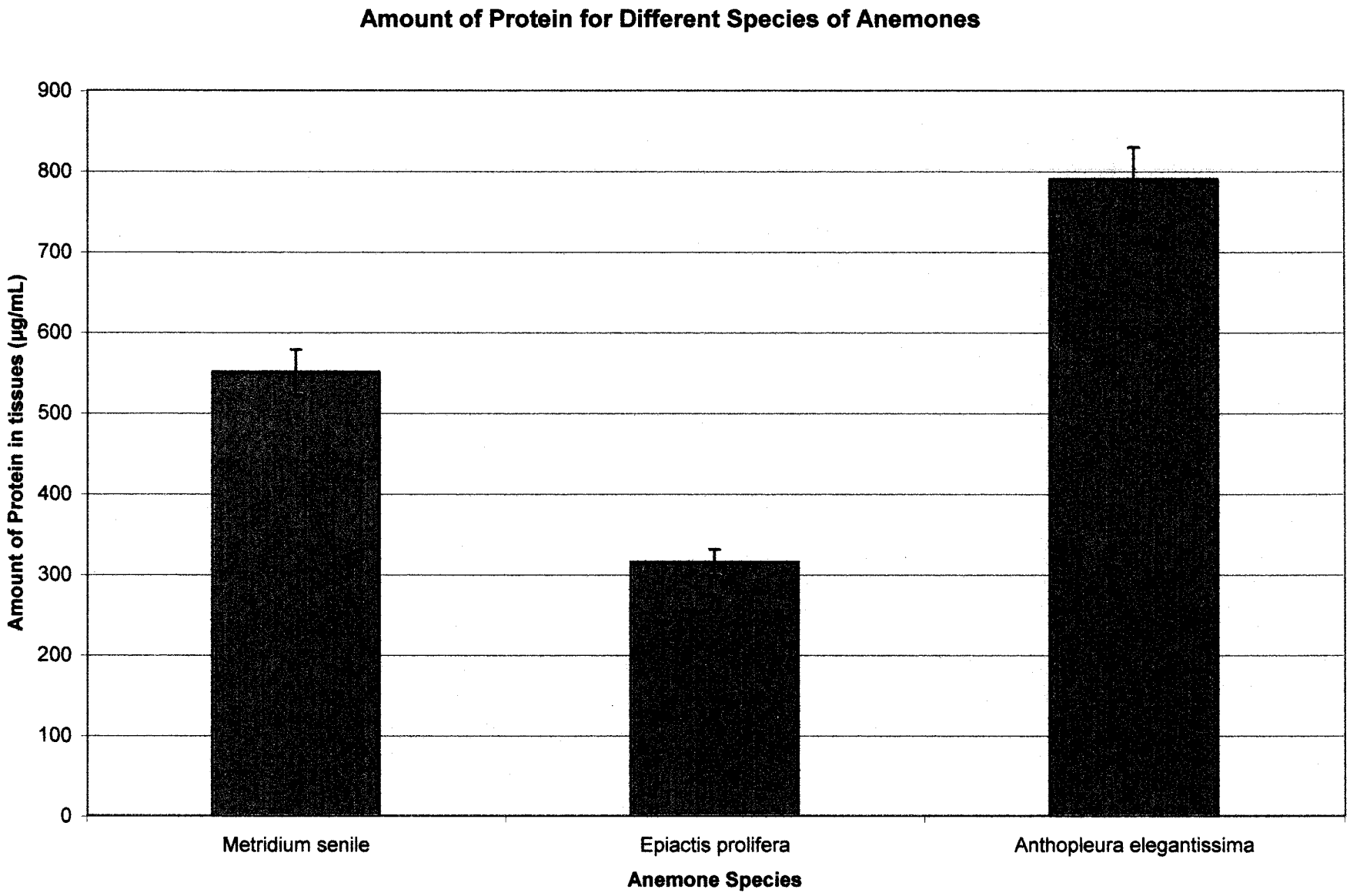
Amount of Protein for Different Species of Anemones
900
800
700
600
500
400
300
200
100
0
Amount of Protein in tissues (µg/mL)
Metridium senile
Epiactis prolifera
Anthopleura elegantissima
Anemone Species

Figure 1

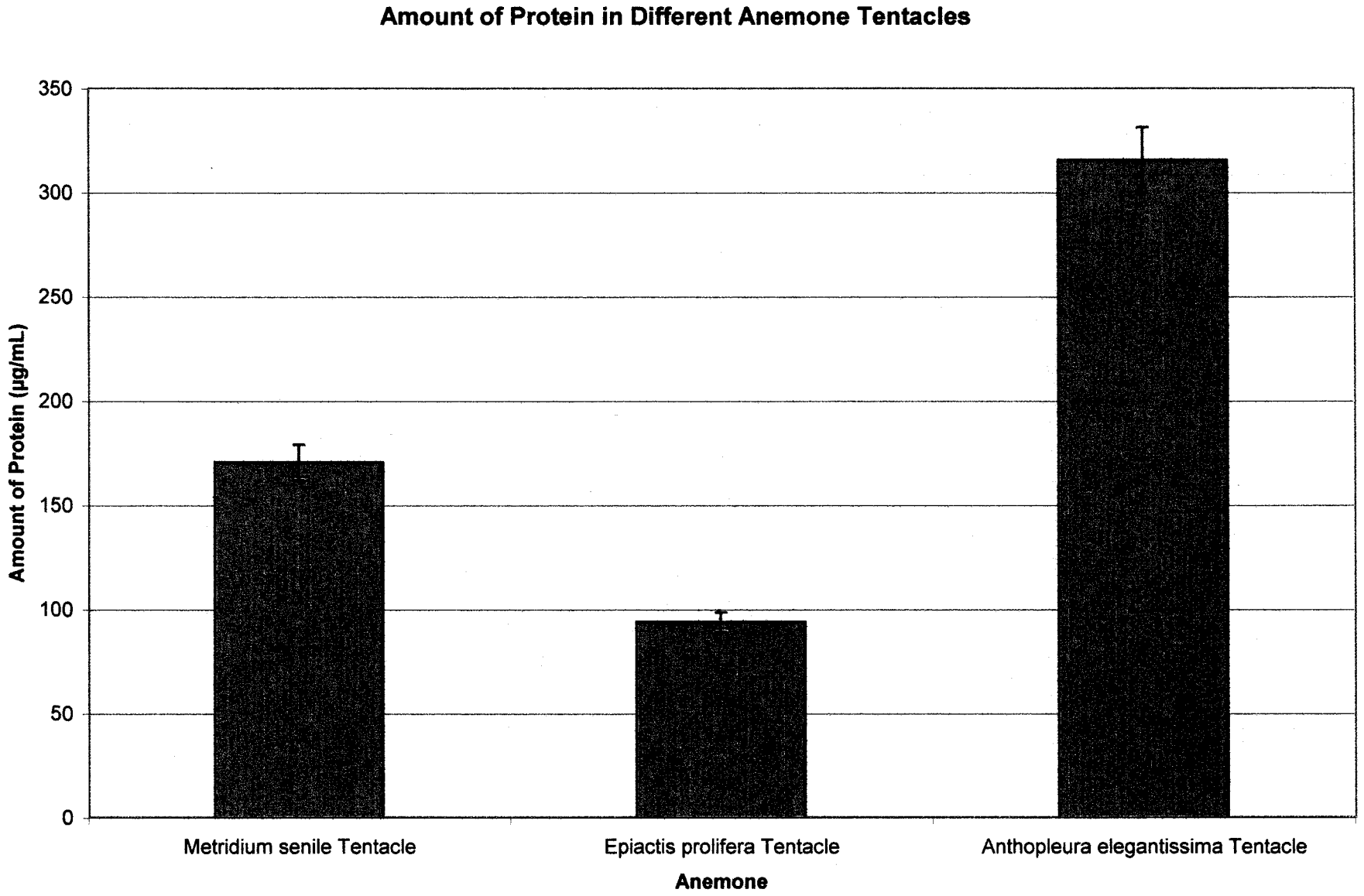
Amount of Protein in Different Anemone Tentacles
350
300
250
200
150
100
50
0
Amount of Protein (µg/mL)
Metridium senile Tentacle
Epiactis prolifera Tentacle
Anthopleura elegantissima Tentacle
Anemone

Figure 2

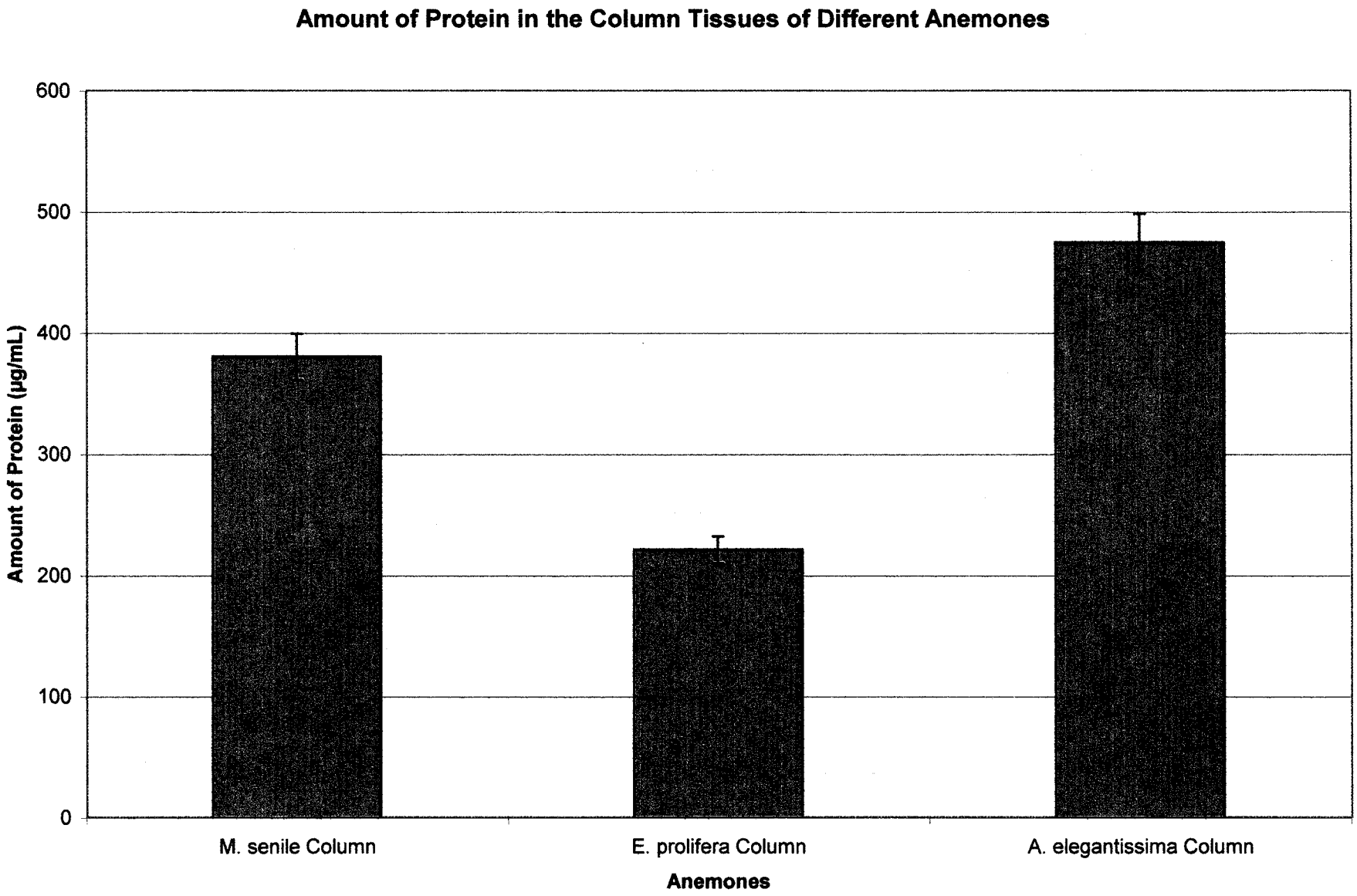
Amount of Protein in the Column Tissues of Different Anemones
600
500
400
300
200
100
0
Amount of Protein (µg/mL)
M. senile Column
E. prolifera Column
A. elegantissima Column
Anemones

Figure 3

Works Cited

Greenwood, Paul G., Kyle Garry, April Hunter, and Miranda Jennings. "Adaptable Defense: A Nudibranch Mucus Inhibits Nematocyst Discharge and Changes with Prey Type." Biol. Bull. 206 (2004): 113-120.

Hall, Stephen J., Christopher D. Todd, and Allan D. Gordon. "Prey-Species Selection by the Anemone Predator Aeolidia papillosa (L): The Influence ofIngestive Conditioning and Previous Dietary History, and a Test for Switching Behaviour." J. Exp. Mar. Biol. Ecol. 82 (1984): 11-33.

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