Analyzing the Relationship Between Gut Content and Venom Apparatus

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Introduction

Venom is a form of toxin secreted by an animal used to induce harmful effects in a given target. Members of the Conoidean superfamily of venomous marine snails, including the family Terebridae, possess the ability to secrete extremely potent and specific venom peptides. The venom is used for both the capture of prey and for defense, and is therefore under strong selection pressures. Each venom is made of about 200 toxins, which can be very useful in the creation of pharmaceuticals. Because of the affinity of the peptide for its target and the stability found in natural peptides, these peptide toxins can be used to influence and inhibit cell communication in humans for the purpose of improving the treatment of a wide variety of diseases and disorders.

In this study, a correlation between the gut contents of these snails and their ability to produce venom was examined. In the Terebridae family, there are three different foregut anatomies that produce and store venom within the snail. The diet of a venomous snail is thought to be related to these foregut anatomies and could therefore provide more insight as to how and what kind of venom is able to be produced.

More specifically, the gut contents of two species from the Terebridae family, one with a venom apparatus and one without, were analyzed. The species of snail without the venom apparatus is *Myurella nebulosa*, part of clade E1 and collected from Kavieng, Papua New Guinea. The species with a venom apparatus is *Hastula strigilata*, part of the D clade and also collected from Kavieng

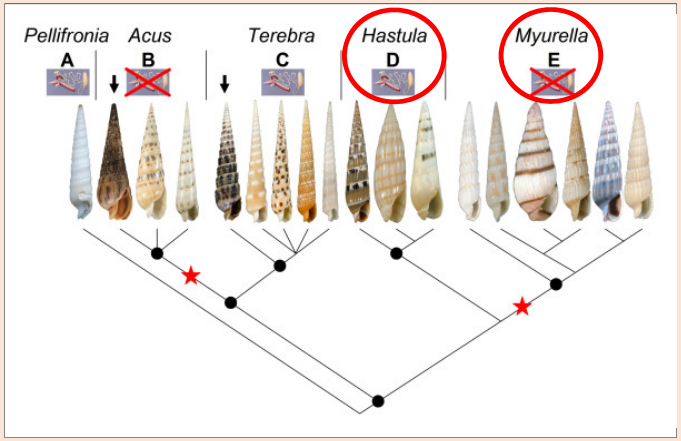
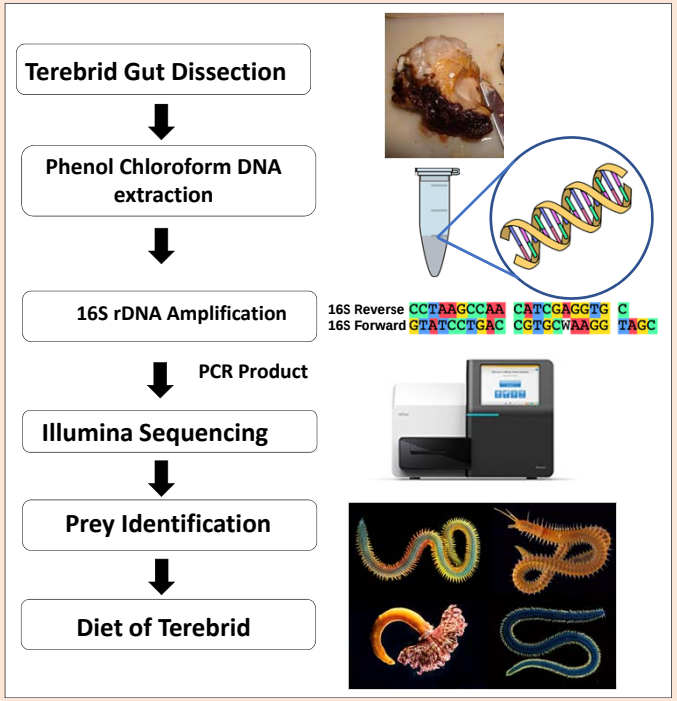


Figure 1. Molecular phylogeny of Terebrid snails showing the different clades A through E. The black dots represent highly supported clades. The red stars indicate the disappearance of the venom apparatus.

Experimental Strategy



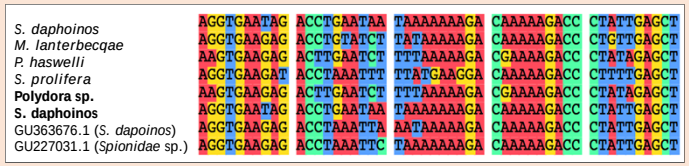
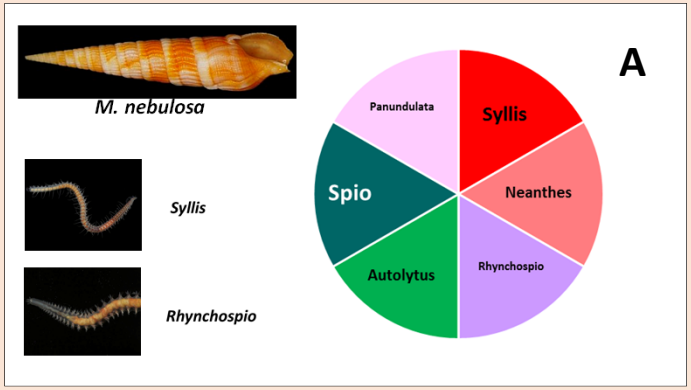


Figure 2. Partial sequence alignment of polychaete sequences resulting from gut DNA extraction.

Experimental Results



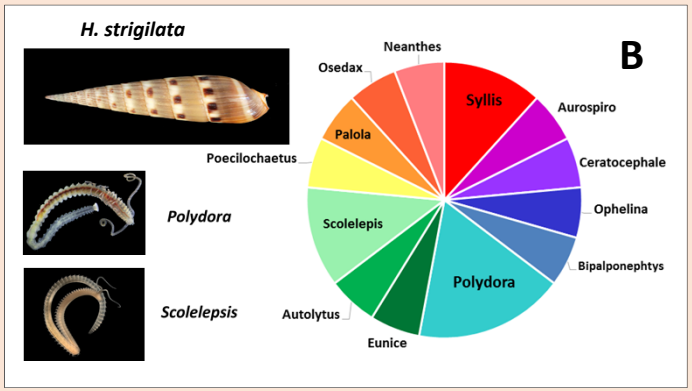


Figure 3. Genera of polychaete worms found in the gut contents of Terebridae snails from species (A) *M. nebulosa* **(B)** *H. strigilata*. Quantifying the amount of each genus in the gut content was done by counting each of the species belonging to each genus.

Conclusion

There seems to be no correlation between species and diet, or the possession of a venom apparatus and diet of each *H. strigilata* and *M. nebulosa* sample. However, there were three exceptions: *Syllis*, *Neanthes*, and *Autolytus* were all found in the gut contents of both snails with and without a venom apparatus. This leads to the question of how the snails without a venom apparatus kill their prey. There can be two possible conclusions that can be used to explain this. The first is that venom is not necessary to kill prey. This could explain the overlaps in the diet of both species, if venom is not needed for hunting prey. The second is that snails lacking a venom apparatus may still be able to produce and disseminate venom to their prey without a clear envenomation. Venom could be produced in a different organ, the salivary glands for example. In this situation, snails lacking a venom apparatus would still be able to deliver venom to their prey by releasing it into the water and could therefore eat prey similar to that eaten by snails with a venom apparatus.

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