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## Diet Analysis of Gastrotricha

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## Abstract

The phylum Gastrotricha is comprised of small aquatic organisms that live in between sand grains. It has been shown that meiofauna communities can play valuable roles in ecosystems and serve as a food source for animals higher up the trophic levels. However, little is known about their own feeding behavior which this study is concerned about. Over the summer developments were made in the methodical sections for diet diagnostic PCR for marine bacterial strains, unicellular marine eukaryotes, and investigating different types of immunofluorescence for marine bacteria. Data of the number of sarcomeres present at the genera and species level was collected for gastrotrichs that have been identified in North Carolina. We hypothesize that if a gastrotrich is multisarcomeral then it will feed on eukaryotes and if the organism is monosarcomeral then it will prey on biofilms.

## Introduction

Meiofauna play important ecological roles such as, nutrient recycling, dispersal and degradation of pollutants, food web interactions, burial and thus storage of organic matter, and mineralization. Their importance is further magnified when taking into consideration that marine sediments are the largest habit by surface which are inhabited by a wide diversity of organisms. Further roles of meiofauna in benthic ecosystems are, trophic processes, energy flow through food webs, production, consumption, and nutrient regeneration.

Goods and services that emerge from marine biodiversity fall into four categories. These categories are, products derived from the ecosystem, benefits from the regulation of the ecosystem, cultural services, and services that support the production of other ecosystems. One example of goods and service derived from these categories starting with production services then going down the list in the same order as previously presented: Food provisions, gas and climate regulation, Cultural heritage and identity, and the nutrient cycle (Beaumont et al., 2007). Similar benefits are also derived from freshwater biodiversity.

As demonstrated above, meiofauna play an important role in the ecosystem and deserve the attention of policy makers in ecosystem management settings. However, meiofauna research published between 2007 and 2011 failed to elucidate ecosystem management and conservation practices (Schratzberger 2012). As pointed out by Schratzberger, this may be due to the assumption that because they are small, they play a small role in the ecosystem.

The goal of this study is to further illuminate the feeding behavior of gastrotrichs. Little is presently known about their food web interactions and feeding preferences. We plan to test the hypothesis made by Blasamo and her colleagues in 2020 that gastrotrichs that have monosarcomeral pharynges will feed on biofilms and species that have multisarcomeral pharynges will mainly feed on eukaryotes. To do this we need to both analyze the gut content of gastrotrichs and the number of sarcomeres in their pharyngeal muscles. What follows are the findings of this summer's research to figure out the methodology that will need to be used to test this hypothesis.

## Current Findings: Sarcomeres

Over the summer, a literature review revealed that little information has been collected on the number of sarcomeres within pharyngeal muscles of gastrotrichs. In fact, the only studies that showed pharyngeal sarcomeres were papers published by Ruppert and Hochberg in 1982 and 2015 respectively. Figure 1 shows the phalloidin stain used by Hochberg that shows pharyngeal sarcomeres. Tables one and two show the known genera and species that occur in North Carolina along with their sarcomere types. The literature suggests that most organisms within Macrotrichida are multisarcomeral while organisms within Chaetonotida are monosarcomeral.



Figure 1: Z-projection of the anterior end of *Neodasyis cirritus* showing the pharynx and mouth using phalloidin staining with 0.05  $\mu\text{m} \times 10$  optical sections (Hochberg 2015)

Genera in NC	Sarcomere Type
Cephalodasys	Multisarcomeral
Chaetonotus	Monosarcomeral
Crasiella	Multisarcomeral
Dactylopodola	Multisarcomeral
Dolichodasys	Multisarcomeral
Halichaetonotus	Multisarcomeral
Dactylopodola	Multisarcomeral
Lepidodermella	Monosarcomeral
Macrotrichia	Multisarcomeral
Mesodasys	Multisarcomeral
Neodasys	Multisarcomeral
Turbanella	Multisarcomeral
Paratubanella	Multisarcomeral
Xenotrichula	Monosarcomeral

Table 1. List of known amounts of sarcomeres in pharynx musculature of genera that have been reported in North Carolina. Information obtained of sarcomere type from Ruppert's 1982 paper.

Species in NC	Sarcomere Type
Dolichodasys carolinensis	Multisarcomeral
Cephalodasys littoralis	Multisarcomeral
Lepidodermella squamata	Monosarcomeral
Xenotrichula carolinensis	Monosarcomeral

Table 2. List of known amounts of sarcomeres in pharynx musculature of species that have been reported in North Carolina. Information obtained of sarcomere type from Ruppert's 1982 paper.

## Current Findings: Prey Analysis

During the summer, 3 different methods for investigating gut contents were investigated. These methods include, diagnostic q-PCR for marine bacterial strains, q-PCR of unicellular marine eukaryotes, such as diatoms, and immunofluorescence staining. For both marine bacteria q-PCR and q-PCR for diatoms typical methodologies for respective types of PCR will be used. Different types of primers may be needed to carry out q-PCR on marine bacteria. However, the q-PCR that targets the group Actinobacteria may be the most important as more than 60% of gram-positive species found in sediments belong to this phylum. The SSU rRNA primers used for testing the presence of Actinobacteria should be Act920F3 and Act1200R (De Gregoris et al., 2011). The primers for diatoms will be the SSU rRNA primers 528F/650R and GlcD-F and Glc-R for glycolate oxidase homologue (Nguyen et al., 2011). Further investigation of immunofluorescence staining techniques may be needed as no universal staining method for marine bacteria was found. This suggests that different methodologies may be needed to stain different phylum or taxonomic groups as some studies have found there to be 19 phyla of bacteria within certain sea sediments (Zeng et al., 2011).

## Discussion

As there is only limited evidence of sarcomere types within the phylum gastrotrichs, more will need to be generated. Data on only 14 genera of gastrotrichs found in North Carolina has been collected as can be seen by table 1. Furthermore, only 4 species of gastrotrichs that can be found in North Carolina have been analyzed for pharyngeal sarcomeres. More data in this domain may need to be collected to test our hypothesis. It is possible that many different gut sampling techniques may need to be used in differing situations whether it be a q-PCR or immunofluorescence staining.

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