# Ctenophore Ingestion Rates and Characterization of Flow Fields in the Presence of Microplastics

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**Location**
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**Abstract**
Microplastics are rising pollutants of concern due to high residence times and the potential for bioaccumulation. Estuaries often experience high pollutant loads due to considerable population density and land use. How these pollutants affect different trophic levels including zooplankton remains unknown, especially gelatinous zooplankton such as jellies and comb jellies. This project aims to determine the effect of microplastics in a gelatinous zooplankton species present in high abundance in Narragansett Bay, the comb jelly *Mnemiopsis leidyi*. This project will collect, house, expose and record how this local comb jelly interacts with food and microplastics using high-speed video and particle image velocimetry (PIV), which allows to visualize microplastic transport and flow around the organism. Understanding how gelatinous zooplankton interacts with microplastics can provide information for bioremediation as some of these organisms are able to egest microplastics.

**Project Objectives**
Gelatinous zooplankton, including salps, cnidarians, and ctenophores are vital to coastal food webs. They can exhibit top-down control of ecosystem dynamics and their secretions can transport carbon to the bottom of coastal environments. However, gelatinous zooplankton are unevenly studied, with more research focused on cnidarians. When it comes to microplastics, researchers have found that adults of several jellyfish species are relatively unimpacted by microplastic ingestions and can rapidly egest the plastics in mucous within a day. However, ctenophores have recently been found incorporating microplastics, yet their feeding behavior on plastics has not been documented despite a potentially role as bioindicators for pollution in local systems and their possible use in bioremediation.

The lobate ctenophore *Mnemiopsis leidyi* (A. Agassiz 1865) is a generalist predator that can have significant impacts on zooplankton communities including trophic cascades. In Narragansett Bay, they overwinter in the upper bay and have been expanding their seasonal range, steadily increasing in abundance with blooms coinciding with peak fish spawning seasons. Their impacts on the environment make it vital to understand their ecology and feeding changes in response to external factors like climate change and microplastic pollution. *M. leidyi* uses the cilia along its lobes to generate flow fields to entrap prey between its auricles making particle image velocimetry (PIV) an effective strategy for observing their feeding. PIV uses lasers to observe and track beads or other particles in a fluid field around the animal, allowing us to see how the water moves as the animal swims, feeds, or otherwise interacts with its environment.

We hypothesize that ctenophores will have (1) decreased feeding rates when exposed to high concentrations of microplastics and will (2) change their flow fields to avoid consuming non-prey items. Lastly, (3) I expect that *M. leidyi* will be able to expel plastic accidentally ingested similar to what has been described in jellyfish. The main objectives of this project are 1) to determine if varying concentrations of microplastics impact overall feeding rates of *M. leidyi* on *Acartia*; 2) to determine if varying concentrations of microplastics impact feeding flow fields of *M. leidyi* and feeding preference using PIV, and 3) to determine if ctenophores egest accidentally ingested microplastics in mucous as has been previously observed in jellyfish.A better understanding of the impact of microplastic on zooplanktonic organisms like ctenophores can provide valuable information to bioaccumulation of microplastics throughout estuarine food webs as microplastics load increases in coastal environments. Additionally, ctenophores have been suggested to be great potential bioindicators of pollution levels in the pelagic environment of estuarine environments. Another application of this research could relate to clearing Narragansett Bay of increasing microplastic levels. Jellyfish mucus has been found as a potential substance to capture plastics and treat waters which may apply to ctenophore mucus.