

# UNDER THE SCOPE:

## ZOOPLANKTON

*Distribution and Abundance in the Delaware Bay*

### WHO

University of Delaware (UD) researcher Jonathan Cohen is using a new technology to analyze and quantify zooplankton in the Delaware Bay.

He is collaborating with Delaware Sea Grant education specialist Chris Petrone to provide K-12 teacher workshops and web tools for teachers to learn how to effectively use zooplankton in their classrooms.

### WHAT

Cohen's research team is using a technology called Zooscan, an optical scanning system that resembles a flatbed scanner used to scan papers—only waterproof—to rapidly image the zooplankton species present in the Delaware Bay. Pattern-recognition software is then used to identify and characterize the species present.



Graduate student Adam Wickline demonstrates the Zooscan equipment at a workshop.

### WHEN

2014–2018\*  
\* This project is funded through 2014–2016 and 2016–2018 Delaware Sea Grant Omnibus cycles.

### WHERE

In the Delaware Bay, zooplankton contain the larvae of commercially important species, including oysters, crabs, shrimp and various finfish, and are considered an important measure of fishery sustainability. They are also a key food source in the marine food web.

### WHY

Ultimately, this research addresses fundamental questions on the ecology of zooplankton in the Delaware Bay in the context of seasonal and climate change, while also establishing a suite of lasting educational resources for incorporating zooplankton into education and citizen science efforts.

### HOW

This work builds on an early zooplankton study in the Delaware Bay conducted in the 1950s by Joanne Daiber, UD's first female marine biologist. Cohen is comparing his results to Daiber's original data in order to understand the biological changes that have occurred in the Delaware Bay over the past half-century. He also is looking at the physical and chemical properties of the water column.

So far, the researcher's findings suggest that aspects of water quality (such as increased dissolved oxygen in upper bay waters since the 1950s) have changed the distribution of zooplankton in the Delaware Bay. While the research team is seeing the same species, and the most dominant ones (like the copepod *Acartia tonsa*) are present in roughly the same abundance, when and where they are found has changed.

### AUDIENCES

- K-12 Educators
- K-12 Students
- Citizen Scientists
- Academic Peers

### OUTREACH COMPONENTS

#### Workshops

Hands-on learning aboard the R/V Joanne Daiber and in the laboratory setting provided teacher's professional development opportunities.

July 2015

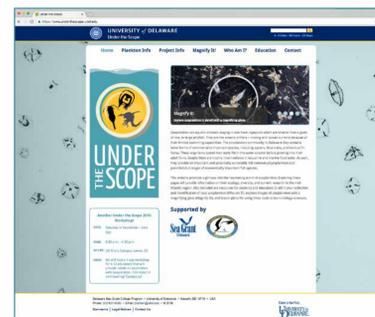
- 7 classroom teachers (2 elementary, 3 middle, 2 high school)
- 1 administrator (Delaware Department of Education)

August 2016

- 7 classroom teachers (2 elementary, 3 middle, 2 high school)

#### Educational modules developed for teachers

- Lesson plans
- Vocabulary
- Activities
- Tools: Used a magnifying glass to explore images of different zooplankton, from copepods to baby horseshoe crabs to jellyfish and more!



#### Website resource

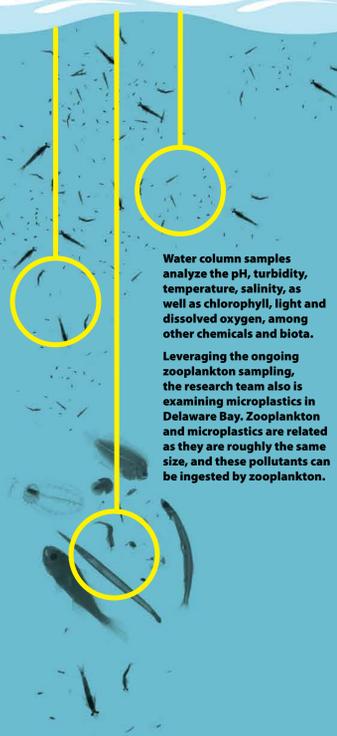
- [www.underthescope.udel.edu](http://www.underthescope.udel.edu)



#### Citizen science

- Developed and tested methods for citizen scientists to quantitatively sample zooplankton.
- Volunteers collected samples using Cohen's method in summer 2015 and 2016, which the research team later processed with Zooscan and reported to UD's Citizen Monitoring Program, to complement their harmful algal bloom data.

Most zooplankton are millimeter to centimeter scale organisms that live in water. A diverse and ecologically significant group of animals, zooplankton range in size from small copepods, the size of a grain of rice to large jellyfish.



### THEN DelZoop I (1951–1953)



Research team (left to right): Joanne Daiber, Mac Hulbert, Eugene Cronin.



R/V Acartia



Illustration of Zoea specimen



Delaware Bay sample locations

### NOW

### DelZoop II (2014–2018)



Research team (left to right): Jonathan Cohen and Adam Wickline, among others.



R/V Daiber

Photograph of Zoea specimen



Delaware Bay sample locations

