



Tracking Zombie Crabs

The Chesapeake Bay Parasite Project
Annual Newsletter by Monaca Noble

December 10, 2018

Accomplishments in 2018

What you've made possible

This year, 127 volunteers participated in the project, contributing 1,208 hours. This included both long and short-term volunteers.

Together we accomplish a huge amount. During June and August, we collected crabs from 130 collectors from sites in five rivers: Rhode River, West River, Patuxent River, Tred Avon River, and Rockhold Creek. Plus we increased the number of sites sampled seasonally (bimonthly) from three to six, by adding three new sites, two in the West River and one in the Rhode River. Between our summer and bimonthly surveys, we collected crabs from a total of 151 collectors for the year!

Our team of lab sorters finished all of the samples collected in 2016 and are making great progress on the 2017 samples.

We also completed a second year of larval (plankton) surveys in the Rhode River, allowing us to measure larval crab and shrimp abundance and distribution.

You make all of this possible with your generous support. Here's a huge thank you to our many volunteers, the marina and dock owners who have hosted our research, and the Cooperative Oxford Laboratory and Patuxent Environmental & Aquatic Research Laboratory for providing us with a local space to work.

Thank you Collot Guerard and Royal Bank of Canada Wealth Management for your generous financial support. The intern support and numerous supplies you provided were invaluable!

This is a fantastic project, producing an impressive amount of high-quality data and generating many novel insights. The success of the parasite project is driven by citizen scientists. We deeply appreciate the dedicated work and enthusiastic support from our volunteers, neighbors, and local communities.

Dr. Gregory M. Ruiz, Senior Scientist



Assessing Data Quality



We're great at pulling crabs out of the collectors. Since 2014 we have been collecting data on our error rate, meaning the percentage of crabs missed.

We've been checking each other's work. One group sorts the collector, then another group checks it to see what was missed.

To keep things simple, I'm presenting a subset of the data collected from 2014-2016, 173 collectors. I've selected collectors with at least 50 crabs and those sorted using the double sort method. A double sort means that the sorting team looked at the collector twice before it was checked for missed crabs.

On average only 3.4% of the crabs were missed. Most of the time (61%) we missed less than 5%

We're proud of these results and the great job that you've done. We hope that you are too.

Our Project

and a little history



The Smithsonian Environmental Research Center has a long history with Maryland's most abundant mud crab, the white-fingered mud crab (*Rhithropanopeus harrisi*), starting with our first research projects in the early 1990s. This species, as well as four species of black-fingered mud crabs, are native to Chesapeake Bay and play an important role in the ecology of the Bay. Mud crabs are important both as predators and prey. They are abundant on oysters' reefs and in course woody debris in shallow habitats along the shore.

In the 1960s when oyster stocks in the lower Chesapeake Bay were reduced, in part by MSX-induced disease, live oysters were imported from the Gulf of Mexico. The many shipments of oysters were delivered in refrigerated trucks. Hiding in these oysters were mud crabs infected with a parasite native to the Gulf coast called *Loxothylacus panopaei* (Loxo).

Researchers at the Virginia Institute of Marine Science (VIMS) discovered the parasite in local mud crabs in 1964 and made the link back to the oyster shipments in a paper by Van Engel et. al, 1966. In the paper, Van Engel said "It will be interesting to observe whether *Loxothylacus panopaei* survives the winter and becomes established." Loxo spread widely and is well-established throughout much of the Chesapeake.

The Marine Invasions Lab has been studying mud crab populations in Maryland since the 1990s to understand what controls their abundance and distribution. One aim of our research is to understand the effect of Loxo on mud crabs and how this changes through time.

This year we measured mud crab and Loxo prevalence in five waterways in Maryland - the Rhode River, West River, Tred Avon River, Patuxent River (near Broomes Island), and Rockhold Creek. We caught the crabs using small plastic crates filled with dead oyster shells called crab collectors. The crates provide an attractive habitat for mud crabs, fish, and more. Each crate is set out for two months allowing adequate time for crabs to colonize. The majority of our sites are surveyed in June and August, but a few are sampled bimonthly throughout the year. These surveys have revealed large fluctuations in Loxo infection rates by season and year, and they are providing new and interesting insights for many other shallow-water crab, shrimp, and fish species. One example was the discovery of grass shrimp in winter collectors.

Van Engel, D., William A., Zwerner, D.; Eldridge, D. 1966. *Loxothylacus panopaei* (Cirripedia, Sacculinidae) an introduced parasite on a xanthid crab in Chesapeake Bay, U.S.A. *Crustaceana* 10: 110-112

New to the project?



If you would like more information about how the parasite infects the crab, read "The Making of a Zombie" in our [2017 newsletter](#). More general information is on our [project website](#).

Larval Crab and Shrimp Survey

Project aim: To collect information on abundance of mud crab and grass shrimp larvae, to better understand temporal changes in reproductive success and recruitment in the Rhode River.

Methods: From May through September we collect plankton from five sites in the Rhode River. At each site we take three replicate plankton tows, meaning we pull a plankton net behind the boat along a standard transect and speed three separate times. We do this survey twice a month on the full and new moon. We sort through the plankton samples and pull out all the larval-stage crabs and shrimp, which are called zoea.

Results: We discovered two peaks in recruitment in 2017. For mud crabs, we saw a large peak in early June and a smaller one in early August. For grass shrimp, we saw a large peak in late June and a second smaller peak in early August.



Larval Mud crab, called a zoea.



George Smith, Monaca Noble, Gee Gee Lang, Cosette Larash, Alison Cawood, Jasmine Mirfatah, and Kara Ogburn.

Meet Our Team

We have a great team of people that make the project run smoothly. Greg Ruiz is the lead scientist on the project. Monaca Noble is the project manager. Alison Cawood is the citizen science coordinator. Our field support team includes George Smith (Invasions lab), Cosette Larash (citizen science), Gee Gee Lang (volunteer), Clinton Arriola (Invasions lab), Kara Ogburn (Invasions intern, summer), Molly Cahill (Invasions intern, fall) and citizen science interns Jasmine Mirfatah, Laura Gurial, and Mackenzie Carter. Our lab analysis team is Gee Gee Lang, Carlo and Janet Echiverri, Steve Myers, Erin Bowling, Emily Speciale, Adriana Pena, Samatha Hasselhoff, and Sara Addis. But that's not all, our team also includes over 100 volunteers, dock and marina owners, and several offsite research collaborators.

In the interest of brevity, the bios of our new staff and 2018 interns are included here. Bios of many other collaborators and long-term staff and volunteers can be found in the 2016 newsletter.

Cosette Larash

[Cosette Larash](#) is from the Annapolis area in Maryland. She went to the Johns Hopkins University for her undergraduate degree in Environmental Science and went to the University of Miami Rosenstiel School of Marine and Atmospheric Science and received her Master's degree in Marine Affairs and Policy, specifically

Marine Conservation. Cosette joined the SERC Public Engagement team as a full time staff member in March 2018 and assists in all aspects of the Chesapeake Bay Parasite Project --- from coordinating volunteers to collecting mud crabs.

Kara Ogburn



Kara was the Invasions Lab summer intern on the project. She is from Crownsville, MD and is starting her senior year at Salisbury University, where she is a Biology major. Before her internship, she volunteered with the project, helping in the field and the lab. She

was a real asset to the team and earned a reputation for finding the smallest crabs. For her independent project, she provided the first-ever analysis of our fish data.

"This past summer has been an amazing and unique experience at SERC. I value every skill learned, each relationship that I formed and all of the opportunities that this internship provided me."

Kara was supported through a generous donation by Collot Guerard.

Laura Gurial



Laura was a citizen science summer intern, joining our team on many field surveys. Laura is from Stamford, CT. She is in her junior year at St. Lawrence University studying Environmental Studies/Engineering.

She plans to go to Kenya in the spring of 2019 to participate in an environmental engineering project.

Laura was supported through the Research Experiences for Undergraduates (REU) program.

Jasmine Mirfattah



Jasmine was a citizen science intern this summer. She is from La Habra, CA. She is in her senior year at Bryn Mawr College working on a degree in Biology and Philosophy. For her intern project, she helped us combine the survey data

with data about the collected crabs, including the number and sizes of crabs and error rates based on the number of crabs that were missed. When these data sets are combined, we can measure both individual and group performance, to understand whether there are correlations between participant demographics and data quality. She plans to present the results at the 2019 Citizen Science Conference.

Jasmine was supported by Bryn Mawr College.

Molly Cahill



Molly is our Invasions Lab fall intern working on the project. She is from Medway, MA and completed her Bachelor's Degree in Biology, Environmental Studies at Brandeis University this spring. Molly is an adventurer

and spent her summer hiking the Appalachian Trail. This fall she has been surveying grass shrimp in and around the crab collectors to see when and at what depth they are using this type of structured habitat as refuge.

Molly is supported by the Smithsonian Intuition.

Mackenzie Carter

Mackenzie is a citizen science fall intern. Originally from the deserts of Arizona, Mackenzie received her Bachelor's degree in Biomedical Engineering from the University of Arizona, and her Master's degree in Comparative Biomedical Science from

the University of Georgia. Mackenzie enjoys hands on activities from cooking, to ceramics and glassblowing, to sewing and making jewelry. Now Mackenzie is using her scientific background to start a career in science communication and outreach.



Mackenzie was supported through SERC's citizen science program.

Results

Patchiness in the Rhode River

Since 2004, we have surveyed mud crabs and *Loxo* at two sites in the Rhode River, the SERC Dock and Corn Island. What we found was years of moderate parasite abundance, followed by a few years with little or no parasitized crabs (Figure 1). In 2015, we expanded our sampling sites in the Rhode River to look for *Loxo* in the low years and see how patchy the distribution of crabs and parasites were within the river.

When we mapped the overall averages for each site and year, we found that in 2015 the percentage of parasitized adult crabs (>4mm in size) was never more than 1% at any of the sites we surveyed (Figure 2). This meant that 2015 was a low year for the parasite in the Rhode River generally, not just at the SERC dock and Corn Island sites.

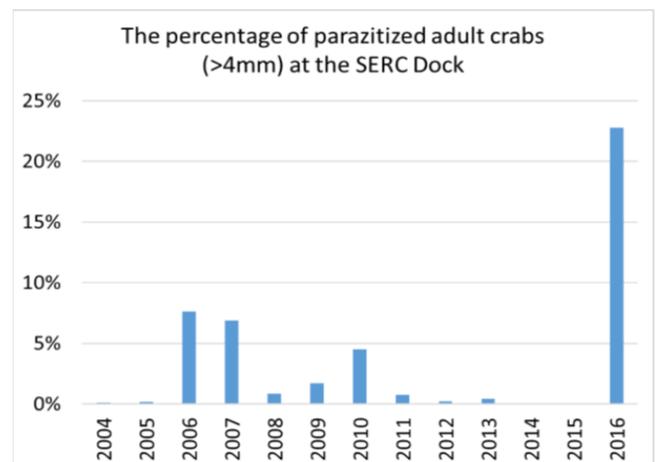


Figure 1: The percentage of parasitized adult crabs (>4mm) collected at the SERC dock from 2004 through 2016

Join our Team

There will be many opportunities to join our team in 2019. Please get in touch with Alison Cawood at cawooda@si.edu or watch for updates in Alison's weekly citizen science newsletter. We occasionally take new volunteers in the lab. Mention your interest to Alison, and she'll let you know when we have an opening.

If you are interested in providing financial support for our project, please send a check payable to the Smithsonian Environmental Research Center, with "For Chesapeake Bay Parasite Project" in the memo line, to:

Christine Buckley
Smithsonian Environmental Research Center
647 Contees Wharf Road
Edgewater, MD 21037

If you prefer to donate online, go to <https://serc.si.edu/> and click the DONATE button in the upper right of the page. In order for your gift to go directly to the Chesapeake Bay Parasite Project, send an email to BuckleyC@si.edu to let her know you would like the funds used in support of the Chesapeake Bay Parasite Project.



Thank You!