



COALITION Quarterly

What Lies Beneath



Dying Sea Sponge

Healthy Sea Sponge

A Note from The Helm

The beautiful summer of 2019 brought several reminders that all is not well with what lies beneath the water's surface. A rainy start to the season was followed by many sunny warm days. These conditions provided the perfect formula for increased algae growth: nutrients + heat + sunlight. Our ponds and lakes experienced record levels of cyanobacteria and our estuaries were loaded with algae for most of the summer.

In August, we experienced a mass die-off of sea sponges (cover photo) in the Three Bays estuary. This occurred around the same time we logged record low levels of dissolved oxygen (DO) in North Bay. These low DO levels could be a result of warmer water temperatures or excess algae growth caused by an increase in nutrients such as nitrogen and phosphorous. Was the sponge die-off and corresponding DO levels a coincidence? I can't help but wonder if the healthy sponge pictured on the cover is our version of a "canary in the coal mine".

Low levels of dissolved oxygen are an increasing risk in our local waters. And not just in the estuaries. Just weeks ago, a zone of severe hypoxia (virtually no oxygen) in Cape Cod Bay led to a significant die-off of lobsters and fish. We need to do more work to understand the roots of this troubling condition!

Our partners at the Environmental Protection Agency's Atlantic Ecology Division have begun a benthic mapping and sampling study in the Three Bays estuary (article pages 4 and 5). Their research will tie in with our fresh and saltwater monitoring to help us better understand the impact of nutrient overload in our waters.

We are not alone in this effort on Cape Cod. The Center for Coastal Studies is doing similar benthic mapping in



Pleasant Bay and elsewhere, so our work can be tied into a bigger picture of other local estuaries. Benthic sampling is also critical to understanding the health of our marine ecosystem. Estuaries and salt marshes are nurseries for striped bass, oysters, quahogs, lobsters and many other marine organisms important to the local economy and lifestyle. Knowing more about the benthos, including macroinvertebrates, that live in and on the bottom of our estuary is important.

Stay tuned for what we discover on the bottom of the bays in a future issue of Coalition Quarterly. In addition, we will update you on our various pilot projects designed to remove nitrogen, as well as the town of Barnstable's recent proposal to expand municipal sewerage. These efforts will allow us to finally take meaningful steps toward the restoration of our waters!

Handwritten signature of the author.

Comprehensive Plan and Devastating Loss

As we go to press, the town of Barnstable is sending in its Comprehensive Wastewater Management Plan (CWMP) to the State's Department of Environmental Protection (DEP) for certification. The plan spans 30 years and covers 9,800 parcels at a cost of over one billion dollars. This plan is designed to be reviewed and modified every 5 years and the alternatives BCWC is working on are expected to play a major role. This is an important step forward, but many challenges lie ahead.

Town Council President Jimmy Crocker played a major role in advancing this plan and sadly, his leadership ended when he passed away suddenly on October 18th. BCWC will miss Jimmy's passion and drive, and we will work tirelessly to achieve his vision of clean water for all.



Another Great Summer of BCWC Events!

This summer, we had two amazing and successful fundraisers that had perfect weather and were hosted by our friends and supporters at the Oyster Harbors Club in Osterville.

The **2nd annual Clean Water Challenge** golf tournament on August 26th brought more than 100 golfers and friends together for a gorgeous day of golf that raised \$65,000 for BCWC. At the post-tournament luncheon, those in attendance learned about the water quality challenges facing the town of Barnstable and the nitrogen removal pilot projects BCWC is working on with the Environmental Protection Agency and The Nature Conservancy.

On September 14th, more than 75 paddlers and spectators took part in our **9th annual Paddle for the Bays: RACE Cape Cod**. It was an amazing day filled with competitive paddle racing, costumed relay teams, food, music and fun. Congratulations to all the paddlers who faced the challenge of an extremely windy day around the course, while raising over \$19,000 in support of clean water.

THANK YOU to all our event sponsors, donors, supporters and volunteers. A special thank you to Amy Hotchkiss, owner of Stand Up & Paddle Cape Cod, for nine years of leadership at the helm of the paddle race.

August was National Water Quality Month

Summer is a perfect time on Cape Cod to educate residents and tourists on local and global water issues.

We launched the **#WhiteSockChallenge**, a fun social media campaign to raise awareness on the importance of clean water on Cape Cod and elsewhere. Participants put on a white sock, dipped it into a nearby body of water, visually recorded the sock in the water, and posted it on social media.

What better partners for the **#WhiteSockChallenge** than Cape Cod Beer, who continue to help us spread the word about clean water. They are hosting Clean Water Wednesdays (CWW), a free monthly educational series on various water-related topics at Cape Cod Beer. The August CWW focused on cyanobacteria, followed by the September CWW on oysters and shellfishing. Check our website for upcoming CWW talks this fall.

Thank you to Cape Cod Beer, our informative speakers, and everyone who participated in the **#WhiteSockChallenge**. Remember, it's not too late to take the challenge for clean water!



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Audrey Starbard takes the **#WhiteSockChallenge** at Shallow Pond in Centerville.

Benthic Study of the Three Bays Estuary

For a few weeks in September, scientists from the Environmental Protection Agency (EPA) Office of Research and Development conducted a benthic (bottom) study of the Three Bays (North, West and Cotuit) estuary. The purpose of this study was twofold: evaluate benthic macroinvertebrates and create an underwater map of the estuary.

Benthic Macroinvertebrates

During this study, EPA scientists looked at the number and variety of benthic macroinvertebrates at 33 different sites within the bays. Why? Not all species of benthic macroinvertebrates can tolerate poor water quality conditions. When the water quality is good, a wide variety of benthic macroinvertebrates can thrive. Not only are there many species, but they live in considerable populations. In unhealthy waters, less species can survive and the ones that do survive have much smaller populations.

The scientists collected sediment samples throughout the estuary using a grab sampler. Every time sediments were brought to the surface, they were run through a sieve, leaving behind only macroinvertebrates and any other creatures that may have accidentally ended up in the grab. The results of this survey will be helpful both now and in the future. First and foremost, it allows us to further understand current water quality conditions. In addition, the results from this survey can be compared to the results of future surveys to see how the water quality in Three Bays is changing over time.

Although the results of the EPA study are not yet available, here are three examples of common benthic macroinvertebrates that are likely to be found in the Three Bays estuary.

What is a benthic macroinvertebrate?

Macroinvertebrates are organisms that lack a spine and are large enough to be seen with the naked eye. A benthic macroinvertebrate is one that lives in the benthic zone, which is at the bottom of a body of water and extends into the sediments beneath.

Examples of benthic macroinvertebrates include worms, snails, and clams.

Polychaetes – These segmented marine worms are the most common benthic macroinvertebrate found globally. Polychaete populations thrive when water quality is poor.



Skeleton Shrimp (*Caprella linearis*) – Skeleton shrimp have translucent bodies and can grow up to 3cm in length. Their populations increase in degraded waters.



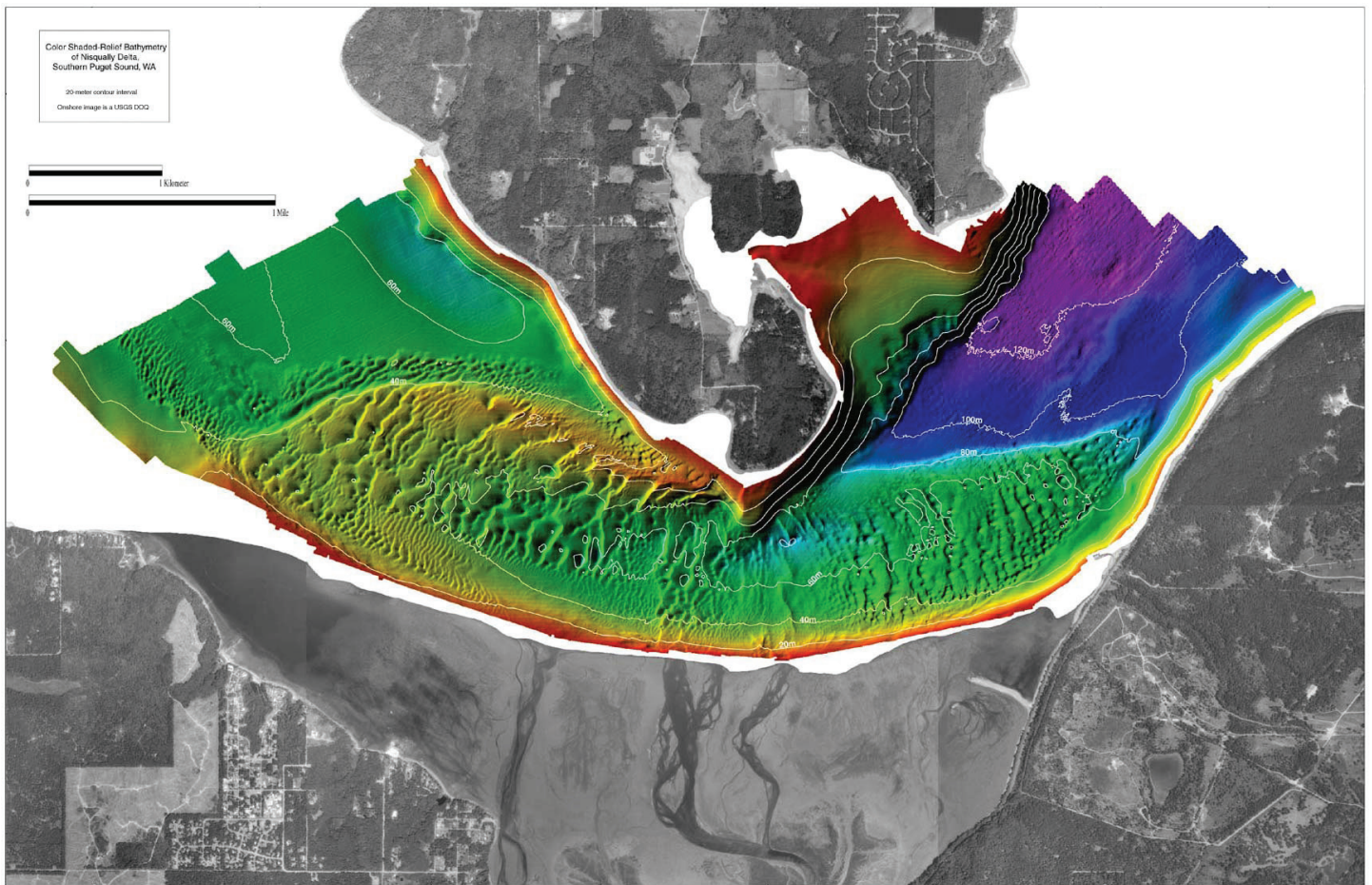
Eastern mud whelk (*Ilyanassa obsoleta*) – Eastern mud whelks are a species of gastropod (single-shelled organisms) with a 2-3cm long shell. Unlike polychaetes and skeleton shrimp, Eastern mud whelks are adversely affected by declining water quality.



Underwater Mapping

EPA scientists also collected data that will be used to create an underwater map of the Three Bays estuary using a piece of equipment called a side-scan sonar. Side-scan sonars emit pulses of sound from each side of the device and then measure how strong the returning signal is and how long it takes to return. This sound data will be used to generate a detailed bathymetric (underwater) map of the entire estuary, including submerged terrain and features.

When looking at a bathymetric map, we can identify hills and valleys in the seafloor. From this, we can gain a better understanding of how water within the bays flows with the tides, which, in turn, helps us understand how nitrogen laden water flows into Nantucket Sound. While flushing everything out to Nantucket Sound is not a solution to our problem, understanding tidal flow is a critical piece of the puzzle to solving the complicated water quality problems facing our region.



Bathymetric Map

This sample of a bathymetric map from Puget Sound in Washington gives a glimpse of what the Three Bays estuary map may look like. The different colors denote varying water depths, ranging from red for shallow to purple for deep. The map also shows geographic features of the bottom. Photo credit: USGS

Field Notes from Meg

Summer by the Numbers at BCWC

This summer raced by and was over in the blink of an eye. BCWC staff and volunteers were busy on the water and on land. Here's what we accomplished:

Who:

- 7 Staff (5 full-time and 2 part-time)
- 4 Water Stewards
- 1 Aquaculture Intern

Dead Neck Sampson's Island (DNSI):

- Approximately 3,000 visitors from May through August
- More than 1,200 boats landed on DNSI from May through August
- 9 pairs of breeding piping plovers
- 15 piping plover fledglings
- 2 pairs of American oystercatchers



Hyannis Oyster Upweller:

- Over 1,700 people visited the upweller at Gateway Marina on Hyannis Harbor and learned about the importance of oysters for improving water quality and the local economy
- 120,000 oysters raised from spat – more than double what we grew last year
- Less than 2 months – the time it took the oysters to grow from Imm spat to 25mm
- 3 staff and 3 volunteers who helped the aquaculture intern clean the upweller, care for the growing oysters, and educate the general public



Marine Invader Monitoring and Information Collaborative (MIMIC) Monitoring:

- 7 stations monitored 4 times throughout the summer in 3 villages in Barnstable
- 11 marine invasive species observed
- 1 new invasive, European Rock Shrimp, found at Millway Marina in Barnstable
- 2 volunteers searched for marine invasive species with BCWC staff



Marstons Mills River (MMR)

Streamflow and Cranberry Bog Monitoring:

- 260 water samples collected from MMR
- 170 water samples from cranberry bogs
- 19 total sampling/monitoring stations
- 1 volunteer from Portugal helped staff with sample and data collection

Pond and Lake Stewardship (PALS) Sampling:

- 75 water samples collected using two kayaks
- 31 ponds sampled with depths ranging from 1 foot to 60 feet
- 4 volunteers collected samples and associated data with staff
- 2 ponds found to have cyanobacteria

In the Bogs with Casey Dannhauser

BCWC has recently begun an in-depth study of the cranberry bogs at the headwaters of the Marston's Mills River. This effort is driven by the need to understand where in the bog system groundwater comes to the surface. Groundwater in this area is high in nitrogen due to the collection of homes north of the bogs. These homes have septic systems, which remove harmful bacteria, but only minimal amounts of nitrogen and phosphorous, before releasing wastewater into the ground. As described in previous newsletters, nitrogen and phosphorous act as fertilizer for algae when they reach ponds, lakes and bays. Knowing more about where the nutrient rich groundwater is coming to the surface within the bog system will drive where alternative nutrient reduction strategies should be installed.

Weekly sampling in the bogs is a major part of this effort. Each week, I measure the water flow, dissolved oxygen, temperature, pH, and collect a nitrate sample at eight stations throughout the bogs. This work is in tandem with weekly sampling conducted by one of our partners, UMass Dartmouth's School for Marine Science and Technology. Looking at this data on a station by station basis can indicate where there are large sources of groundwater.

In addition to weekly sampling, BCWC partnered with the EPA and Airborne Works to conduct an aerial survey of a portion of the cranberry bogs in July. Using an unmanned

aerial vehicle, commonly referred to as a drone, high definition aerial photographs and thermal photographs were taken. The photographs taken were used to identify spots in the stream with unusually cold water. Groundwater is usually quite cold, heating up only after coming up towards the surface. As a result, an area with abnormally cold water is potentially an area where groundwater is coming to the surface. BCWC will continue to use this strategy to study the rest of the cranberry bog system.



School for Marine and Science Technology (SMAST) Estuary Sampling:

- 250 water samples collected using 1 canoe and 2 boats
- 13 stations sampled 4 times
- 9 volunteers collected water samples and associated data with staff



Community Outreach:

- BCWC connected with over 400 people at various events throughout the summer
- Staff talked to 110 people about clean water issues at the Quahog Festival in Hyannis
- 120 people attended Clean Water Wednesday talks on cyanobacteria and shellfishing at Cape Cod Beer in August and September
- 72 golfers at our 2nd annual Clean Water Challenge golf tournament
- Over 75 racers at the 9th annual Paddle for the Bays: RACE Cape Cod





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Mission Statement

Barnstable Clean Water Coalition works to restore and preserve clean water in Barnstable. BCWC utilizes science as its foundation to educate, monitor, mitigate and advocate for clean water.

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BCWC is excited to host two students from Barnstable High School (BHS) during the 2019-2020 academic year. Sofia Hailu and Graham Hempstead will be working with us through BHS's Senior Internship Program. They will conduct weekly water sampling at Long Pond, Bearse Pond, and Lake Wequaquet in Centerville and from their results, they will build a database. Given the cyanobacteria blooms in several ponds this summer, this work is more important than ever. Welcome aboard!

We Are Always in the Race for Clean Water! Please support BCWC today with a donation online at

BCleanWater.org



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