

Examining Water Quality in Two Coastal Communities

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and

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Above (left to right): Abigail Ramnarine and Natalia Sands in Eleuthera, Bahamas



Above: Erin Dooley in Blue Hill, Maine; USA

Introduction

Eleuthera, Bahamas

The fishing industry in The Bahamas is critical to the nation's economy, employing 9,300 Bahamians at present (bahamas.gov). Annual fisheries production is 12 thousand tons per year, with an export value of 70 million USD (bahamas.gov). Major products include spiny lobster (*Panuliris argus*), queen conch (*Lobatus gigas*), stone crab (*Menippe mercenaria*) and grouper (*Epinephilus spp*). On the Family Islands of The Bahamas, including Eleuthera, subsistence fishing plays an important role in the lives of many Bahamians.

Because of our appreciation of marine life, and the importance of the ocean to our economy, the eighth grade class at Deep Creek Middle School in Eleuthera, Bahamas was curious about what the waters of our school's settlement held. We decided to do something that, to our knowledge, nobody had done before in two sites near our school

in southern Eleuthera. Throughout the month of November 2019, we went to two different local spots to test the water quality. These spots are referred to as The Jetty, and Gully Hole.

Blue Hill, Maine

Blue Hill, Maine is similar to Eleuthera in the sense that fishing is a critical industry. According to Governor Janet Mills, the fishing industry in Maine is the cornerstone of the state's coastal economy and exceeds 600 million USD per year (maine.gov). In recent years, Maine's lobster (*Homarus americanus*) harvest alone has been roughly 55,000 tons annually (maine.gov). Other important fisheries in Maine include fish like menhaden (*Brevoortia tyrannus*) and Atlantic herring (*Clupea harengus*), as well as shellfish including mussels (*Mytilus edulis*), clams (*Mya arenaria*) and scallops (*Plactopectin magellanicus*).

Students from Blue Hill Consolidated School have been monitoring water quality for over twenty years in our small, coastal town. During the 2020-2021 academic year, the Covid-19 pandemic made school field trips impossible. Although we weren't able to study water quality as a class, individual students sampled and tested water in and around our coastal community. Data was collected from Blue Hill Bay and Curtis Cove, a popular swimming spot in the village of East Blue Hill.

Materials and Methods

At our respective sites, we both used LaMotte Estuary Monitoring kits and tested for coliform bacteria, dissolved oxygen, biochemical oxygen demand, nitrate, pH, phosphate, salinity, and turbidity. Our results are below.

Results

The Jetty; Deep Creek Eleuthera, Bahamas

Test	Result	Ranking (Meaning)
Coliform Bacteria	Negative	good
Dissolved Oxygen	4 ppm 38% saturation	poor
Biochemical Oxygen Demand (BOD)	0 ppm 4BOD	good

Nitrate	6.5 ppm	good
pH	7	excellent
Phosphate	2 ppm	good
Salinity	14 ppt	good
Turbidity	0 JTU	excellent

Gully Hole; Deep Creek Eleuthera, Bahamas

Test	Result	Ranking (Meaning)
Coliform Bacteria	Negative	good
Dissolved Oxygen	4 ppm 37% saturation	poor
Biochemical Oxygen Demand (BOD)	0 ppm 4 BOD	good
Nitrate	5 ppm	fair
pH	7	excellent
Phosphate	1 ppm	excellent
Salinity	14 ppt	good
Turbidity	20 JTU	excellent

Blue Hill Bay; Blue Hill, Maine USA

Test	Result	Ranking (Meaning)
Coliform Bacteria	Negative	good
Dissolved Oxygen	4 ppm 39% saturation	poor
Biochemical Oxygen Demand (BOD)	4 ppm 0 BOD	good

Nitrate	5 ppm	fair
pH	7	excellent
Phosphate	1 ppm	excellent
Salinity	35 ppt	good
Turbidity	40 JTU	good

Curtis Cove; Blue Hill, Maine USA

Test	Result	Ranking (Meaning)
Coliform Bacteria	~	~
Dissolved Oxygen	4 ppm 35% saturation	poor
BOD	0 ppm 4 BOD	good
Nitrate	5ppm	fair
pH	6	good
Phosphate	0 ppm	excellent
Salinity	35 ppt	good
Turbidity	0 JTU	excellent

Conclusion

Interestingly, we both had results that indicate good water quality overall. Neither of us found coliform bacteria, which would come from sewage or fecal contamination. We both found low levels of dissolved oxygen, which could be a problem for aquatic organisms. It would be interesting to test this aspect of water quality again, as it can be affected by time of day and water temperature. We both found levels of biochemical oxygen demand in the good or excellent category, which indicates not much decomposition is happening in the water. In Eleuthera, nitrate levels were fair at Gully

Hole and good at The Jetty. Levels were fair at both locations in Maine. This may indicate that fertilizers have gotten into water as the result of runoff (U.S. Geological Survey). Our phosphate levels were low in Eleuthera and in Maine. This is a good sign, as high levels of phosphate can cause algae blooms. Levels of acidity/alkalinity (pH) were excellent or good at all study sites. We also both had good levels of salinity (salt), and low turbidity which means the water is clear and not cloudy with sediment.

There was some visible garbage at The Jetty in Eleuthera. We observed old clothes, bait packaging, and beer cans at this location, which is where many fishermen launch their boats. We also observed a dead lemon shark and dried dog feces close to shore. The Gully Hole location also had some bottles and other trash close to the water. Similarly, there was some visible garbage at beaches in Blue Hill, Maine. Students conduct beach clean ups at Curtis Cove annually, and find things like fishing buoys, rope, cigarette butts, cups, bottles and other plastic garbage.

It will be interesting and important to continue testing water quality at both locations. Things look good now, but monitoring the water closely will help us to be aware of any sudden changes. The ocean is an important part of our communities and our world. It needs to be protected.