

Water Sampling in Shediac Bay 2015-2016
by the Shediac Bay Watershed Association



By: Jim Weldon, Consultant
Rémi Donelle

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INTRODUCTION

Water quality monitoring programs are often designed to determine if water is of acceptable quality for drinking, swimming, irrigation, or aquatic habitat. This can be assessed using guidelines such as those published through the CCME (1999). Monitoring programs may also be designed to determine if water quality is improving or deteriorating over time, and to identify what is causing the impact and/or deterioration or improvement of the waters of Shediac Bay.

The Shediac Bay Watershed Association is interested in the water quality in the bay. In 2015, got some water samples analyzed for the presence of fecal coliforms. As this was a pilot project that had not been specifically funded, it was decided that these samples would be taken once a month during invasive species monitoring of green crabs.

In 2016 the Association received an Environmental Trust Fund grant to expand the monitoring and educate on different aspects around Shediac Bay. We continued our monthly samplings and added a special sample to determine sources of coliform and E.coli with DNA. We also started collecting data from other organizations.

The sampling program was a pilot project. The SBWA will re-evaluate the results and methods to determine what information is useful to the association and its partners.

This report is a summary on water testing methods and results obtained.

Water quality monitoring considerations

The following are guidelines and recommendations that have been collected from different sources for monitoring water quality

Importance of proper sample collection to achieve reliable results

When gathering ambient water quality samples, it is crucial that samples be collected in a consistent and proper manner with the appropriate equipment, so the analytical results or field measurements will reflect the environmental conditions at the time of sampling. There is the potential during any sampling effort, to inadvertently generate sampling errors. They may be themselves minute in nature. However, several errors can combine into one significant error from any one sample collection. This can lead to poor samples collected, money wasted to test the poor samples, erroneous results generated, and lead to poor conclusions derived.

The sample temperature should be collected immediately from a standalone sample; no other variables should be tested from this sample. It is usual for the laboratory to measure the temperature of a sample upon arrival. Temperature is an excellent indicator to identify if the samples have been shipped correctly (i.e. with enough ice for ambient air conditions).

Each parameter has a specific hold time that ensures the results generated are accurate. If this maximum time frame (i.e. hours or days) has passed, the data generated through sample analysis should not be used since its accuracy cannot be confirmed. Some variables must be analyzed within 48 or 72 hours from the time of collection or as in the case with our chosen laboratory, less than 24 hours and preferable 8 hours. It is therefore essential that samples be shipped to the laboratory as soon as possible. It is important to avoid a lengthy time delay before laboratory analysis. It may be necessary to ship the sample on the same day as collection to preserve the variables. It is the responsibility of the sampler to determine which variables are time sensitive and ensure the hold times are met. When shipping samples, aim to maintain the shipment temperature between 10° C and 4° C, temperature ranges may require adjustment with specific sample parameters.

Temperature control for shipping during warmer months can be through ice packs placed in the coolers. The physical measurements taken at the time of collection will be recorded on site at the same time as the water sample was taken. Instruments designed for this purpose will measure dissolved oxygen, pH, salinity, conductivity and water temperature. Timing of taking the sample in salt water is best after the tide begins to drop as source waters are now flowing into the bay.

Quality Assurance/Control in Sampling

Improper sampling techniques can lead to non-representative test results, which do not represent the media/matrix being sampled. Improper sampling techniques can lead to erroneous conclusions and management actions. A field quality assurance program is a systematic process, and together with a laboratory and data storage quality assurance program, ensures a specified degree of confidence in the data collected for an environmental survey. The first step in ensuring proper sampling techniques is to provide staff with training for the sampling conditions they encounter. A sampling plan should also be established for each program or investigation. The sampling plan should outline such items as:

- When samples are to be collected (weekly, bi-weekly, monthly, quarterly, etc.)
- where samples are to be collected
- types of sample collection devices and containers to be used
- what types of samples are to be collected at each site
- which method to use
- how these samples should be preserved
- which field measurements (and notes) are to be made
- which laboratories the samples are to be shipped to.

Hard copies of sampling plans should be carried into the field with the contact name and information of the principal investigator to be contacted should questions arise in the field. A sampling plan ensures that all data are collected to the same standard using the same protocols. A sampling plan should contain enough detail for substitute field personnel to carry out the program/survey/investigation. Sample bottles should be kept in a clean environment, away from dust, dirt, fumes and grime. As well, bottles must be capped at all times and stored in clean shipping containers (coolers) both before and after the collection of the sample. Vehicle cleanliness is an important factor in eliminating contamination problems (RISC 1994). As stated previously samples must never be permitted to get warm and should be stored in a cool, dark place. Most samples must be cooled to 4 to 10°C during transit to the laboratory; ensure copious quantities of ice packs or dry ice are used to keep samples cool. Samples should be cooled as quickly as possible in order to reduce biological and chemical activity in the sample. Sample collectors should keep their hands clean, wear gloves when sampling and refrain from eating or smoking while working with water samples. Exhaust fumes and cigarette smoke can contaminate samples with lead and other heavy metals. Van Dorn bottles, dissolved oxygen samplers for grab samples and composite samplers need to be properly washed and rinsed.

Storage and Shipment of Samples

Water samples must remain in a prescribed chain of events that prevents contamination and possibly making the sample unusable. Our plan calls for collecting and delivery on the same day. If this becomes impossible, then refrigeration overnight and delivery early next day will occur. This would allow us to remain in a 12-18 hour window that is within the acceptable 24 hour guideline.

Safety in Sampling

It is crucial that samples are collected in a safe manner. This includes having first aid equipment, communication equipment, survival gear, wearing proper footwear, gloves, life jackets or flotation devices, and personal safety devices for confined entry situations. It also means that samples are usually collected by teams of two individuals, one of whom is the support person who can provide help to the other should the sampler encounter an unsafe situation from which they cannot remove themselves. The field crew must be trained for the situations to be encountered; experienced with the proposed program and the potential hazards; a detailed job safety analysis must be prepared, this should include very specific emergency response plans; and the crew must be aware of any special safety considerations.

Safety in Sampling from Boats

When sampling from a boat, the captain has final say regarding operational details such as loading of equipment, weather conditions under which the trip can be performed safely, safety information and other boating related procedures. A personal flotation device (PFD) should always be used. When sampling from a boat, you should perform a visual inspection of the surroundings paying close attention

to wave height and direction. Individuals should move within the boat using slow, calculating motions, thereby minimizing risk and should not stand in the boat to obtain the water sample. The boat must be maintained in a safe condition. Prior to collecting a sample, it must be ensured that the anchor is secure and the boat is pointed into the wind. When sampling from a boat, be aware of other boat traffic and natural hazards. All power-driven vessels must yield the right-of-way to those not operating under power such as canoes. Two paddles, a bailer and an anchor must be on board. All Transport Canada regulations regarding equipment required relative to the type/size of boat being used should be adhered to. Samplers should position themselves securely on the floor of the boat or on one of the seats. Move within the boat using slow, calculating motions, thereby minimizing risk to oneself as well as others in the boat. Do not stand in the boat to obtain the water sample. Position yourself securely on the floor of the boat or on one of the seats. Prior to collecting a sample, the other crew members in the boat should be informed that a sample is going to be collected and they should counter balance the boat by positioning themselves on the opposite side to which the sample will be collected.

Bacteriological Sampling

Samples are typically analyzed for a combination of the following bacterial parameters: total (rarely) and fecal coliforms, *Escherichia coli* (*E. coli*), fecal streptococci, and enterococci. Due to the high risk of potential contamination of the sample during collection, care must be taken when collecting bacteriological samples to ensure sterile conditions. Sample containers should be filled as per laboratory instructions and samples should be kept out of the light and chilled on ice (do not allow to freeze). Always collect bacteriological samples first, if sampling from a boat, obtain the sample from the upstream side of the boat.

Sample from the bow of the boat to prevent potential contamination from the boat or the outboard motor. Keep sample bottle closed until needed. Take a sample at arm's length from the boat and sample facing towards the current (the direction the boat is facing). Always hold bottle upright and by the base. In one continuous motion submerge till the bottle opening is approximately 30 cm below the water surface or other specified depth. Uncap and fill the sample bottle as required by the laboratory, cap and bring to the surface. Immediately place the bottle in a closed cooler with ice packs or hot-water bottles, depending on the season. Ensure that the person in the stern is providing counterbalance (working over the opposite side of the boat). Do not rinse the bottle or touch the inside of the bottle or cap, and always hold bottle upright and by the base. Keep sample bottle closed until needed. Fill the sample bottle as required by the laboratory and immediately cap the bottle securely. Immediately place the bottle in a closed cooler with ice packs or hot-water bottles, depending on the season.

METHODS

Materials

The following is a complete list of materials that will be needed to collect the water samples from Shediac Bay. Some anecdotal information is supplied as to where these items are or can be secured.

- Boat with motor to include anchor, bailer, oars or paddles, flare gun, life jackets, securing ropes, gas can, spare gas can, battery, possible spare battery or portable charger, tool kit, first aid kit,
- YSI meter (our own or borrowed) to measure dissolved oxygen in mg/l, temperature and salinity(ppt), a pH meter, GPS to return to original sample locations
- Data sheet, waterproof book, pen/pencil back-up
- 8 bottles for 7 (2015) 11 bottles for 10 (2016)sampling locations and one for temperature control supplied from the department of Environment office on University of Moncton campus
- An elbow glove can be used or if not available sterile plastic gloves
- 7 locations (2015) 10 locations (2016) identified later in map and table
- Cooler bag with empty sample bottles, cooler bag with crushed ice

Sampling methods

Water samples will be taken from a boat during a July to September time frame. Samples are collected for later analysis in a laboratory. When possible, samples are taken from the same location. The use of a global positioning system (GPS) to identify geographic co-ordinates will ensure that the sampling site is precisely located. If necessary, document the change from the original sampling location, and the particular reason for the location change. Drive boat to each sample site and anchor. Remove sample bottle coded for the sample location from the carrying cooler bag. Put the glove(s) on, rinse in surface water, shake and twist off cap being careful not to touch the rim of the bottle or the inside of the cap. Samples near the surface can be taken by holding the collection bottle and lowering it into the water inverted to an elbow depth, then rotating upright until almost full. Always face the mouth of the collection bottle upstream or into the direction of the current. Put cap on sample bottle and ensure it is tight.

Collected sample is then placed in cooler bag with crushed ice. Samples in cooler with crushed ice (or ice packs) must arrive at the laboratory as close as possible to the 4°C ideal temperature. Once sampling has been completed on site, meters should be returned to their carrying cases, additional sampling and safety gear collected and stored in the vehicle for transit to the next site.

A sampler's responsibility is to:

- collect samples as directed in the study design,
- note unusual conditions at a site where he/she repeatedly sample,
- minimize field error to the greatest amount possible, and
- ensure that the best possible sample is collected to produce the most representative results.

During the warmer summer months, shipping coolers must be kept out of the sun and away from any other heat sources. Samples must arrive at the laboratory as close as possible to the ideal temperature of 4°C, and within the 24-hour time limit. The preferred delivery time is immediately after collection on the same day

Laboratory Methods

Fecal coliform levels in water samples were determined by the multiple tube fermentation technique as described in the APHA Laboratory Procedures for the Examination of Sea Water and Shellfish (1985). The culture medium used was the A-1 medium, as described by Andrews and Presnell (1972). This medium and the method described below were accepted by the U.S. National Shellfish Sanitation Program (NSSP) in 1978 as the method of choice for the enumeration of fecal coliforms in shellfish growing areas. The A-1 medium contained 5.0 g lactose, 20.0 g tryptone, 5.0 g sodium chloride, 0.5 g salicin, and 1mL triton X-100 in 1 litre of distilled water. The pH of the medium was adjusted to 6.9 ± 0.1 before autoclaving for 10 minutes at 121 EC (Centigrade).

The modified A-1 technique involves the inoculation of a series of dilutions of the water sample into A-1 medium. Ten millilitre volumes of water samples were inoculated into five fermentation tubes containing 10 mL of double strength A-1 medium, and sample volumes of 1mL and 0.1 mL were inoculated into five tubes each of single strength medium. The tubes were incubated at 35 ± 0.5 Deg. C in an air incubator or water bath for 3 ± 0.5 hours and then transferred to a water bath at 44.5 ± 0.2 Deg. C and incubated for a further 21 ± 2 hours. All gassing tubes with growth were considered to be positive. The most probable number (MPN) of fecal coliforms for each water sample was computed using the MPN Table in Standard Methods (APHA, 1985).

Air and water temperatures were recorded using a calibrated field thermometer specified by the National Bureau of Standards (NBS). Salinity is measured in the laboratory using a hand-held refractometer. Precipitation was obtained from Meteorological Service Branch of Environment Canada.

Abbreviated sampling summary and checklist

1. when samples are to be collected

Mid July, early August, 3rd week August, mid September (2015)

2016 : 3rd week June, 3rd week July, 3rd week August, 4th week August, 3rd week September, 2nd week October

2. where samples are to be collected

(see map)

3. types of sample collection devices and containers to be used

30 cm depth with sterile bottles supplied by lab

4. what types of samples are to be collected at each site

Water samples and physical parameters

5. which method to use

Modified submerged grab sample

6. how these samples should be preserved

Stored in crushed ice in cooler out of sunlight

7. which field measurements (and notes) are to be made

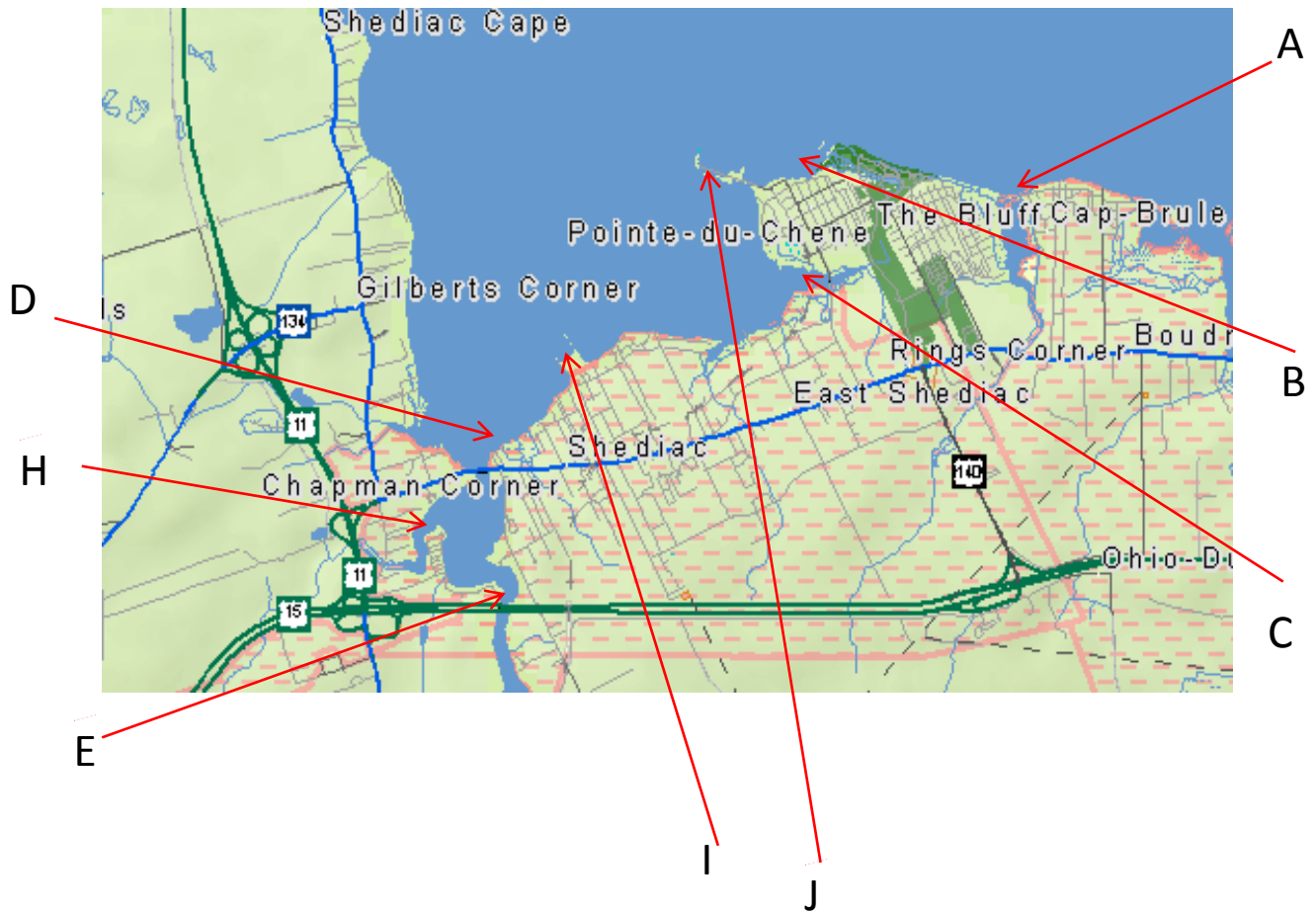
Temperature, dissolved oxygen, salinity, alkalinity (pH)

8. which laboratories the samples are to be shipped to:

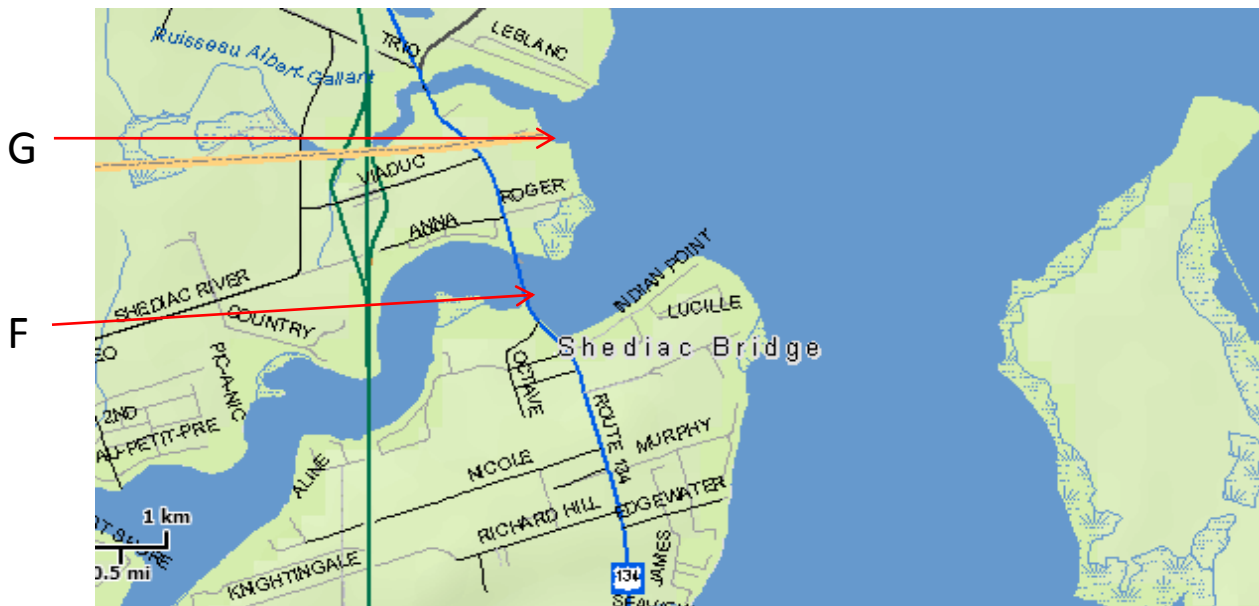
RPC Moncton or other

Sampling site maps

Scoudouc River and Pointe-du-Chêne locations



Shédiac River locations



Site Locations 2015-2016 with Sample Code (SBWA “A” to” J”)

SBWA “A” 2015-6 – end of Parlee Beach at mouth of lagoon outlet, Cape Bimet end

Easting 615372.7	Northing 5121556.2
N 46° 14’ 16.0”	W 64° 29’ 47.08”
N 46.237788	W 64.496411

SBWA “B” 2015-6 – other end of Parlee Beach closer to marina, where small drainage stream exits near curve of Pt. du Chene Rd., corner of parking lot

Easting 617408.5	Northing 5121998.2
N 46° 14’ 29.1”	W 64° 31’ 22.5”
N 46.241416	W 64.522916

SBWA “C” 2015-6 – mouth of lagoon where walking bridge is adjacent to Pt. du Chene Rd

Easting 617257	Northing 51209579.
N 46° 13’ 55.5”	W 64° 31’ 14.5”
N 46.232083	W 64.520694

SBWA “D” 2015-6 – roughly in front of city hall bit left towards marina

Easting 619056.7	Northing 5120084.9
N 46° 13’ 26.1”	W 64° 32’ 37.7”
N 46.223916	W 64.543805

SBWA “E” 2015-6 – where Scoudouc River is crossed by 4 lane route 133

Easting 619703	Northing 5118485.8
N 46° 12’ 33.9”	W 64° 33’ 6.4”
N 46.209416	W 64.551777

SBWA “F” 2015-6 – mouth of Shediak River by Chez Leo

Easting 621378.3	Northing 5125549.3
N 46° 16’ 21.6”	W 64° 34’ 31.1”
N 46.272666	W 64.575305

SBWA “G” 2015-6 – in front of first cove just north of Chez Leo close to LeBlanc Street

Easting 621090.9	Northing 5126226
N 46° 16’ 43.7”	W 64° 34’ 18.3”
N 46.278805	W 64.571749

New additional sites in 2016

SBWA "H" 2016 – mouth of outlet of Cornwall brook around big lobster to right

Easting 620361.3	Northing 5119131.7
N 46° 12' 54.4"	W 64° 33' 37.7"
N 46.215111	W 64.560472

SBWA "I" 2016 – mouth of Shediak Bay Marina

Easting 619188.2	Northing 5120592.3
N 46° 13' 42.45"	W 64° 32' 44.30"
N 46.228458	W 64.545638

SBWA "J" 2016 – mouth of Pointe du Chene Marina

Easting 617850.3	Northing 5121970.0
N 46° 14' 27.91"	W 64° 31' 43.10"
N 46.241086	W 64.528638

SBWA "E/H" 2016 – mouth of Scoudouc River by big lobster, plant, bridge into Shediak

Easting 619828.8	Northing 5119592.7
N 46° 13' 9.67"	W 64° 33' 13.28"
N 46.219353	W 64.553689

Results

A summary of the results will be posted on our website or can be made available to individuals on request. The results are presented as MPN/100 ml of water.

MPN: The most probable number (MPN) of coliform or fecal coliform bacteria per unit volume of a sample. It is expressed as the number of organisms which are most likely to have produced the laboratory results noted in a particular test.

+Most Probable Number (MPN) is used interchangeably with Colony Forming Units (CFU)

In 1992, Health Canada recommended microbiological guideline values for recreational water quality. The values are based on the presence of fecal indicator bacteria, namely, enterococci for marine water, and *Escherichia coli* or fecal coliforms for fresh water. In marine water, the guideline value is set at **35 enterococci/100 mL**, while for shellfish closures, the standard is 200 *E coli*/100 mL or **200 fecal coliforms/100 mL**. Notwithstanding certain variances, many Canadian provinces apply these guidelines.

Environment Canada is regularly taking *E. coli* samples for shellfish harvesting closures in the Shediac Bay. The Association wanted to get some idea areas with contamination and started using the same standards and tests. We continued this sampling in 2016 as well.

However, in Ontario, the guideline is 100 *E coli*/100 mL. Over the past several years, many epidemiological studies, including randomized clinical trials, have examined the relationship between bathing in polluted water and ensuing health problems. On a review of this literature, the Canadian guideline value for marine water seems appropriate, but scientific evidence argues toward lowering the Canadian guideline values for fresh water to 100 *E coli*/100 mL, in line with the standard currently in effect in Ontario.

2015 sampling results

Any values over 35 MPN/100ml are highlighted in yellow, over 200 MPN/100ml in red.

	<u>19-07-2015</u>	<u>11-08-2015</u>	<u>25-08-2015</u>	<u>14-09-2015</u>
A	2	7	2	79
B	11	8	350	33
C	11	130	17	8
D	4	2	4	5
E	49	33	49	23
F	2	7	7	110
G	240	23	280	13
H	<i>added center Parlee beach inside buoys</i>		5	2

2016 sampling results

	<u>20-06-2016</u>	<u>19-07-2016</u>	<u>18-08-2016</u>	<u>30-08-2016</u>	<u>19-09-2016</u>	<u>11-10-2016</u>
A	0	4	23	240	19	1700
B	2	8	23	46	0	1700
C	13	79	130	350	49	
D	0	49	49	23	49	E/H 350
E	23	17	240	79	49	
F	22	11	79	22	4	79
G	33	17	17	23	13	920
H	33	79	79	31	170	
I	0	350	46	33	11	
J	0	27	13	39	22	

E/H– mouth of Scoudouc River by big lobster, plant, bridge into Shediac

Collection and sample analysis was roughly scheduled for July 19th, sample August 11th, August 25th, and September 14th in 2015.

Similar dates in 2016 included June 20th, July 19th, August 18th, August 30th, and September 19th.

The collection on October 11 2016 was a special extra that coincided with the 5 DNA sample sites.

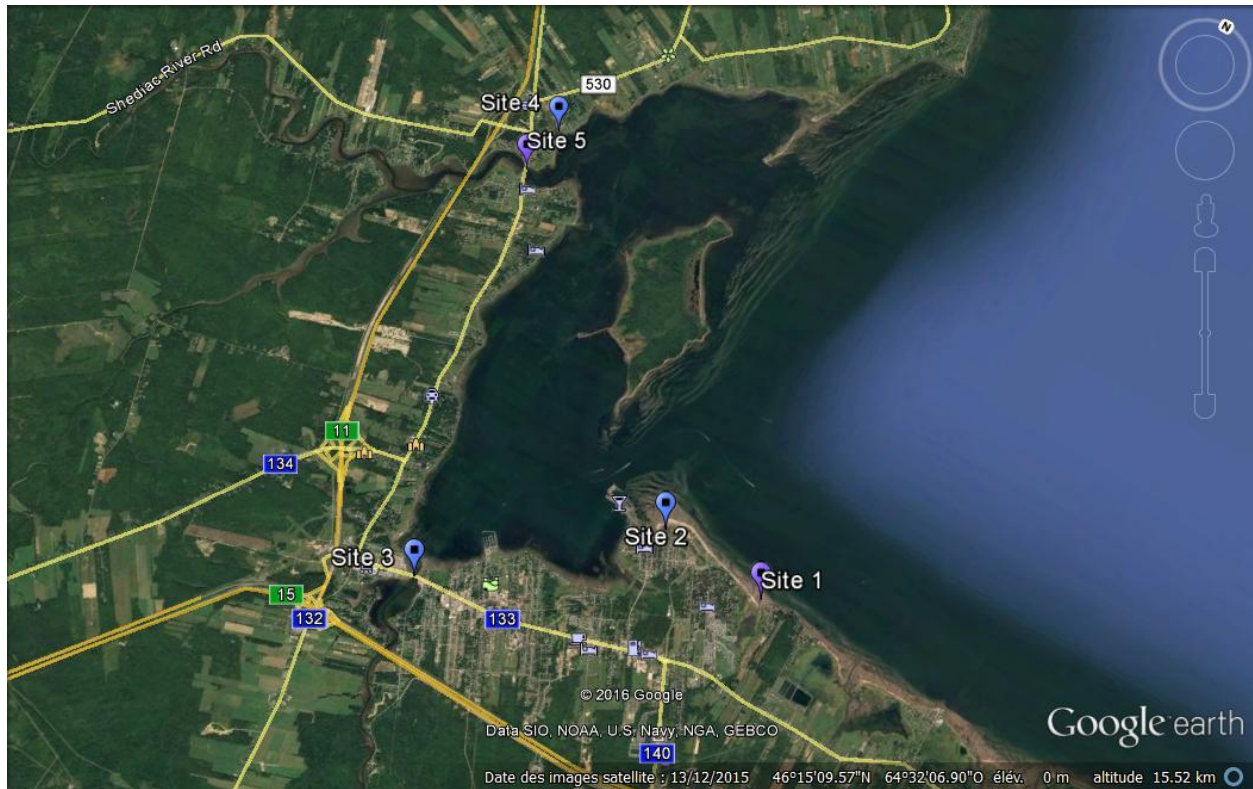
DNA sampling Results

In late season 2016, we collected water samples for DNA analysis. This occurred later in the season that we had hoped as we needed a major rain event to get the run-off at levels that were most favourable for better analysis. These tests are very expensive and must be shipped same day delivery to British Columbia for analysis.

There were no adequate rain events in August –September, but on October 9th and 10th there was a continuous rain event that resulted in accumulation of 49 mm. The run-off from this made the 11th an ideal collection day. We also collected a water sample for MPN fecal coliform taken to the local lab.

The Greater Shediac Sewage Commission was contacted for possible lift station discharges of sewage due to the heavy rain event. A electrical power outage did happen in the area in the evening of oct 10th. However, no overflow was reported for this date as generators were used for affected lift stations. However, the UltraViolet light disinfection system was not functional at the Cap Brulé lagoon for 4 hours in the night from Oct 10th to 11th. The UV light serves as a secondary treatment.

DNA sampling sites



Results from Water and DNA sites

	Fecal coliform MPN/100ml	General Bacteroides*	Human	Ruminants	Pig	Horse	Dog	Gull
1	1700	+	+	-	-	-	+	-
2	1700	+	+	-	-	-	+	+
3	350	+	-	+	+	-	+	-
4	920	+	+	+	-	-	+	-
5	79	+	-	+	-	-	?	-

Legend: + = detected; - = not detected; ? = uncertain (potential presence; cannot be ruled out)

***BACTEROIDE mini primer**

CHARACTERISTICS: The gram-negative *Bacteroides* spp. or closely related genera are capsulated obligatory anaerobic bacilli that are non-spore forming, pale-staining, and some are motile by flagella, while other taxa are non-motile. They are normally commensal, found in the intestinal tract of humans (mouth, colon, urogenital tract) and other animals.

EPIDEMIOLOGY: Worldwide - *Bacteroides* spp. or closely related genera are part of the normal flora of the gastrointestinal and respiratory tract and the mouth

HOST RANGE: Humans, dogs, cats and other animals.

MODE OF TRANSMISSION: Infection results from displacement of *Bacteroides* spp. or closely related genera from normal mucosal location as a result of trauma such as animal/human bites, burns, cuts, or penetration of foreign objects, including those involved in surgery. There is no evidence that organisms are invasive on their own.

COMMUNICABILITY: Low; human-to-human transmission is possible through clenched-fist wounds and skin penetrating human bites.

RESERVOIR: Present as part of normal flora in of the gastrointestinal tract, the mouth, and other animals.

ZOONOSIS: Yes, skin penetrating animal bites could lead to infection.

SURVIVAL OUTSIDE HOST: *Bacteroides* and like genera have been detected in feces infected water by PCR for at least 2 weeks at 4°C; 4 to 5 days at 14°C; 1 to 2 days at 24°C; and 1 day at 30°C.

DISCUSSION

The first disclaimer is that SBWA does not by any means proclaim to be water quality experts. We can point out trends from our limited sampling results, but changes occur so quickly that general patterns are not really evident. Our sampling is simply a snapshot of the results on that collection day. It would be very expensive to monitor water quality changes on a daily or even weekly basis. We do not have the resources for this. Even government agencies only monitor on an irregular basis. Our goal is to look for gross abnormalities in general patterns and hope to identify possible causes.

In 2015, we started a monitoring program in the salt water of Shediak Bay, starting with 7 sites around the whole bay, choosing obvious discharge locations such as the Scoudouc and Shediak rivers. We have been collecting freshwater samples at sites in the two rivers for almost 2 decades but have not been regularly monitoring salt water.

Fecal coliform results

Site A had an above normal reading in September only (79). Site B had a very high reading of 350 in August. Site C had a high reading (130) in early August. Site D had low readings all season. Water at the mouth of the Scoudouc river had (site E) had 2 readings above the normal 35 (49 and 49) and 2 readings below (33 and 23). Water coming out of the Shediak River (site F) had one high reading in September of 110. Just speculation, but that is when farmers apply manure to fields and if the heavy rains come after application could possibly explain the elevated number.

In 2016 we were able to expand the number of sites and the number of sampling days. We started earlier in June and added a small sampling in October. To expand salt water testing we would have to secure additional funding to finance an expanded program. This will be addressed by the board over the winter.

For the same period, July to September, there were 13 incidences above the 35 MPN/100ml normal compared to 8 in 2015. August numbers were noticeably higher in 2016, a warmer, dryer summer compared to 2015. In 2016, all numbers were in an acceptable range for the June sample. Site “C” was a standout with above 35 MPN/100ml results for the July – September 4 samples, while sites “D” and “E” had 3 out of 4 above normal readings for the same dates. High readings “A” (240) lagoon end of the beach and “B” (46) parking lot end of the beach were notable at the end of August. The lagoon “C” where the tern raft was had the worst readings over all with a 350 on the end of August. Possibly this was influenced by the presence of the common tern colony. Second highest reading of 240 was at the mouth of the Scoudouc river on the 18th of August and at site “A” on the 30th of August.

There were 3 new sites added in 2016, one at the Cornwall stream outlet and one each at the two marinas. All three had normal low readings in June. The Cornwall site “H” had higher readings in 3 of 4 for the July to September timeline, 170 being the highest in September. The Shediak Marina had a 350 in mid-July and the Pointe Marina only a 39 in August.

DNA testing results

In 2016, we secured funding to do DNA source testing for 5 locations. As mentioned this was after a significant rain event that allowed adequate run-off to move water from the stream and river systems. Corresponding water samples were taken and MPN/100ml readings were very high at all locations. Sites 1 and 2 exceeded the highest reading levels possible (1700) for the lab. The water coming out of the Scoudouc river at the bridge into Shediak was 350 MPN/100ml.

The river by Chez Leo Take Out at the mouth of the Shediac river was 79 and the cove by the Grande-Digue Home Hardware was also very high at 920. So, generally, a heavy rain picks up and suspends fecal material from human, cow and dog sources somehow. All sites tested positive for gut bacteroides as explained previously. Human DNA was positive at 1, 2 and 4. Animal ruminants (cows) were positive at both rivers exits (sites 3 and 5) and at site 4. Pig DNA was positive at the Scoudouc river exit (site 3) but not the Shediac.

Dog DNA was positive at all sites, although not absolutely confirmed for the Shediac river. This pattern implies that dogs are present everywhere and the probability of feces not being adequately removed is current practice.

These results do not quantify which sources of coliform are more present than others. All the samples had multiple sources identified. We cannot tell for certain which sources are the main cause for the high counts.

Many factors can influence and contribute to what levels of bacteria will enter a water system. Though not all-inclusive, some of the factors of interest that can affect the final reading includes: amount of precipitation, temperature of the water, wind, flooding, pipe overflow, weather patterns preceding collection, number of persons in water, number of boats in water, state of the tides, time of day, flow from rivers, bird numbers, locations and density of flocks, upstream farming activities, etc.

CONCLUSION

Our Shediac Bay collection and testing guidelines describe our procedures that follow national guidelines. Results only provide a snapshot of fecal coliform levels at selected sites for Shediac Bay. Extreme abnormalities from the norm are what we are looking for as we develop a base set of values for an overall picture of the inner bay. The outflow from the lagoon and from the ponds in the parking lot show very high levels of fecal coliform in October after the major rain event.

The DNA results were most informative, showing human, ruminant and dog influences. The results vary in the different sites and this will help the Association target future restoration and monitoring projects.

We will incorporate results from Environment Canada shellfish monitoring data and data from Parlee Beach for some of the points we monitor in another water quality report. This will be on our website in the near future.

This monitoring was a pilot project of the association. We will be re-evaluating our program in 2017. We will look at existing funding programs such as the New Brunswick Environmental Trust Fund and the Recreation fisheries conservation partnership program (Fisheries and Oceans Canada) to help expand our monitoring and restoration work.

BIBLIOGRAPHY

American Public Health Association Inc. 1985. Laboratory Procedures for the Examination of Seawater and Shellfish. APHA. 5th Edition, 144 p.

Canadian Council of Ministers of the Environment (CCME). 1999. Canadian Environmental Quality Guidelines.