MAWQATMUTI'KW

OUR CONNECTION

Water is the driving force of all nature.

Leonardo da Vinci

Mouth of the Portapique River in the Cobequid Basin (inner Bay of Fundy), Nova Scotia.
Photo by: Gavin Scott

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Mawqatmuti'kw is also produced to feature articles and information about MAARS work to promote knowledge about aquatic resources, ocean management, communal commercial fisheries, collaborative partnerships and governance.

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Front Cover Credit
Juvenile green frog found near the Chiganois River, Nova Scotia. Image Credit: Gavin Scott

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NEWS FROM MAARS & MAPC

THE WELL WORLD

BY ANNA NIBBY-WOODS

The well was a community well that was hand dug many years before. No one remembered by whom or when. It was always there as far as I knew. There were a few unwritten rules for anyone who used the well. Everyone who drew the sparkling, clear water knew to take care of the well and 'leave it as you found it – Clean.' That rule also applied to the surrounding area. If there were a mess of overgrowth or rubbish you would automatically tidy it up or if a stone had fallen from the circular wall around the well you would replace it. I remember once a group of men from the neighbourhood coming together to do major repairs on the well and it was like a street party. Everyone chipped in to help, even us children. Now that I think of it, that community effort happened a lot. If someone had a big job to do everyone would get involved to make it happen. And so it went, for the years that I visited the well. I think the well must have served the entire neighbourhood of about a dozen families. Our house was the second closest to the well and it was still a fair clip away.

Our backyard had three distinct paths; all were well traveled, all were worn deep and smooth, and all started from the back steps of the porch. One went to the cloths-line; another went to the outhouse, and the third – to the well. A narrow reddish ribbon went straight across our backyard and down over a small bank and began to meander through a field of tall grass and short alders up to the curb of another bank at the edge of the dirt road that sliced the neighbourhood in half. Up over the road and back down on the other side the path picked up again. The trail began to change now on the other side of the road, as did the terrain. The change happened suddenly as if entering someone's front door. The trees were tall and

Anna Nibby-Woods is a Mi'kmaq Elder, artist and writer. Nibby-Woods a hyphenated combo is a pre-contact name meaning leaf and pronounced Nip-peech. Interestingly Anna married a woods. For the past fifty years Anna has worked in print, advertising and communication in one capacity or another as a graphic artist, production manager, art director, estimator, illustrator, copy writer, etcetera. Over the years Anna has diversified into several other fields including diversity management, cultural sensitivity and cultural eco-tourism. Images, stories and concepts gleaned from her Mi'kmaq culture become inspiration for her painting, sculpting, drawing and writing.

heavy on this side of the road and the path opened an arch in a wall of trees. Once inside the corridor itself grew dark and cool and as you walked you could feel your step quicken because of the downward slope. Coming back would not be as easy because you would be weighted down by the two full buckets of water you were there to retrieve and you would have to climb back up the slope.

Even though getting water was a daily chore and hard work that we all shared, I was always there, wanting to go along because I loved the walk. When I was really young my grandmother would let me carry a small amount of water in the bottom of a bucket that I struggled with using both hands. Later, I moved up to a half-bucket and finally a full bucket. I was so proud the day I got to carry a full bucket all the way home without spilling too much. Sometime later I would be able to carry two full buckets and I had gotten so good at it I'd make the whole trip home without spilling a drop, even coming up the steep hill, down the other side and across the field by way of the twisting path.

One hot summer day I was at the well alone, like I was many times before when I heard something unfamiliar. At first it startled me but my curiosity was stronger than my fear. I put my buckets down and gingerly began to look around. First around the well... nothing. Then I heard the noise again, this time it sounded like water splashing so I leaned over the stonewall and hung

Illustration by Anna Nibby-Woods

my head into the well. It was dark, real dark and I couldn't see anything but for sure I could hear it...whatever it was.

I left my buckets and ran home to get the one flashlight we owned. Us kids were forbidden to play with it. The flashlight was not a toy and we were told many times not to touch it but this was an emergency. As I returned to the well, I hoped that the batteries were still working because you never knew who might have had an emergency and forgotten to turn it off. Test the switch, yes, it worked and it threw a bright round patch of light. Again, I bent over the wall, this time armed with a 'light' stick. I was surprised, the sides of the well were visible and mostly dry, down, down, down and finally I saw the surface of the water. I moved the light beam around from side to side – nothing. What made the noise? Maybe a stone had fallen from the side of the well, maybe a stick had fallen from one of the overhanging branches, or maybe it was my imagination. Splash… my light flew in the direction of the noise. There it was, the largest bullfrog I had ever seen. It seemed as large as my head. How did it get down there? How long had it been there? Was it hurt? Could it hurt me? Was it making the well dirty? I screamed and turned to run, tripped over my water buckets that were sitting on the ground. Now I was lying on the ground next to the buckets, I felt burning across my shins and cold, wet soil stuck to my thigh. In a split second I was back on my feet, grabbed the empty buckets and ran up the hill, over the road, across the field and backyard, up the steps and into the back door, my feet hardly touching the ground, screaming the whole time.

My grandmother came instantly, probably expecting to see blood because of the commotion I was making. As I breathlessly told her what happened, my eyes as big as saucers, she began to smile. After she let me get everything out she calmly sat down and brought me onto her knee, crocked her elbow over my shoulder and pulled me close to her and hugged gently.

After a minute we got up and walked together hand-in-hand to the well. She took the flash light and shone it down to see the monster frog. We looked at it together while she spoke softly and explained the purpose of the frog in the well. It was all so simple and logical. She told me of a whole little world that lived independent of us and how we benefited. The frog was the king of that world, the world in the well. He wouldn't and couldn't hurt me and as a matter-of-fact if I paid close attention, *he would give me lots of information about his world, the well, my world and the condition of its contents.* I learned so much that day, about the well world, about myself, about fear, about listening. Listening to understand rather than listening to respond. Granny taught me to listen to understand and only from understanding will come caring, sharing, love and respect.

The well is caved in now and the path is overgrown and a lot of things from back then have vanished. Granny is gone too, but only from sight just like the unseen world she described to me that day. The memories and the lessons are still here, in me, vibrant, strong and bright.

I'm afraid that the frog more than ever needs our help now and so does the well and the water, the forest and the land that made all that possible.

Story Credit: by Anna Nibby-Woods

DAY IN THE LIFE OF A FISHER: AN INTERVIEW WITH CAPTAIN TONY CLEMENTS

by BRYAN MARTIN

As part of our conversations with Elders series and/or community members, we recently had the opportunity to speak with Captain Tony Clements who fishes lobster for the Native Council of Prince Edward Island. The interview took place in August 2023 and ran for approximately 30 minutes. A portion of it has been transcribed below. For the rest of the interview, you can listen to the entire conversation on the Clocean Podcast wherever you find your podcasts or at: https://mapcorg.ca/clocean-engager/

Hi Tony, how are you doing today?

I'm good, doing well – and yourself?

Oh great! I too am well.

So, we're here in your shed in Cascumpec Bay, just outside of Alberton. For those that are not familiar with the area, it is located on the Northwest coast of Prince Edward Island, on the Gulf side, so the Northeast, I guess - in that sense, up near the top. And for anybody who may not be aware, the Native Council has a Communal Commercial Fishery that operates nearly identical to the non-Indigenous fisheries – same season, same areas, same everything with the exception that many of the profits go back into the community rather than to an individual owner-operator.

Let's get started with you, how long have you been fishing for the Council?

Since they started, in 1999 I think was our first year.

Oh wow, so 24 years!

Yup, and I've been with them ever since.

But you used to fish before that correct? Do you mind saying how long that was?

Oh, I fished since I was 15 years old. I fished with my dad when I was younger and other people after that, all different types of species.

Actually, that was one of my questions, what else did you fish back then? Now I know you fish for lobster but, before that.

Yes, now all I fish for is lobster but, back then I fished for codfish – we used to drag for fish, I fished for scallops, mackerel, herring, rock crab, and that's probably about it. And since 1999 it's been pretty much lobster and some mackerel. And oysters too. I've fished on both sides as well, both out of Howard's Cove and out of Northport. My own license was in Howards Cove.

So people understand the fishing areas, you are currently fishing out of Lobster Fishing Area 24, LFA 24, which is pretty big, essentially from one end of the island to the other on the Gulf side, and all the way out to the Magdalen Islands – Can you fish wherever you want in that LFA?

Legally, yes but, gentleman's

Captain Tony Clements. Photo by Bryan Martin

agreement or whatever you want to call it, we kind of have our own little area that we probably should stay within. Each port has its own little area.

Right so, you can only fish a small portion of that entire LFA. And again, related to the fishery, since we are sitting here amongst some of your gear, and some people may not really understand how these traps works, can you explain to me how you actually catch a lobster? How does the trap work?

Well, you have two entrances to your trap, and you put bait in the middle part and then the lobsters go in through the little hole to get to the food, and then for some reason, I don't really know why, they go into the back end – into the parlour, where they can't get out. And like we said a while ago, we don't catch them all, we don't want to catch them all, but. There are lots of different types of traps and they mostly all work the same.

And an interesting thing here in PEI is that most everyone uses wooden traps as opposed to the metal/wire traps used elsewhere, any reason why. I heard it works better here?

Most everyone does. And yes, it just seems like they work better here, we've tried wire traps before and they didn't work as well. Although, there are a few people with wire traps in LFA 25 (Northumberland Straights – North), now there's quite a few. But that's because of the worms – the wooden traps won't last. But there are other guys over there that take their traps over to Nova Scotia and get them pressure treated, and

One of the lobster traps used on Captain Clements' boat during whale safe gear trials. Image Credit: Mitchell, V. 2022

they will last.

Interesting, I wonder how that affects the lobster or the bottom critters.

Some of them have been doing it for a long time and the traps will last 10 years compared to about three years without it. Especially from about West Point down to Borden.

Interesting, well the neat thing about the wooden traps as well is that, if you lose them there isn't a bunch of metal and plastic coating that will be there for many years.

Yup, the only thing that will be there is webbing, even the nails will rust out, the rest of it will rot.

Now I've been lucky enough to be on your boat and see how you set your traps, and unlike some areas that may set one trap with a rope leading up to a buoy, you essentially have one really long rope with a buoy on either end, and the traps are attached to that main line at regular intervals, so you essentially have this big 'U' shape with a buoy at the surface that goes down to the bottom to the first trap, and then along the bottom to five other traps, and back up to the surface. So that way you only have one line to haul for six traps instead of six lines for the same number. How do you haul those, I know it's not by hand?

No, no

Did you ever do that, by hand?

No, I never did. That's before my time.

So essentially you grab a hook, pass the line through a special winch, a hauler, and it hauls it all in automatically. But someone still has to handle those traps, which, well, isn't that easy on a pitching sea.

The equipment we have now is pretty easy compared to what it used to be, which is why we have such big traps, heavy traps because we have all this equipment that helps us bring it in.

Right, that's something I forgot to mention, that these traps have concrete in the bottoms of them that help them sink, which is obviously a very important part since lobster are on the bottom, but it does make the traps quite a bit heavier.

And do you fish bait as well?

No, not anymore, it wasn't really worth it. When I was in LFA 24, with the fall fishery, we used to go out and handline every once in a while, and we could catch enough to last us, sometimes a whole week, but now you can't even do that anymore, it is all closed down.

Ok, let's talk about the season now. You currently fish in LFA 24, which the season essentially runs from the beginning of May until the end of June – other parts of the Maritimes have different seasons. What is the weather like in early May?

This year was TERRIBLE (hahaha), it was windy, windy, windy, cold, windy, every day.

To put that into perspective, I remember you told me a story about you taking the temperature of a concrete block on one of your traps last May using an infrared thermometer and it showed minus 1 degree Celsius!

That was a lobster, on the lobster itself when it came up!

The lobster itself! Minus 1 degree Celsius. So, you're out there in the wind, on the water, getting wet, and the bottom temperature –

stuff you're handling is minus 1, which will freeze your hands. Wow.

It's cold, it's cold.

And then what about in June, near the end of the season, is it starting to get a bit too hot?

Oh yeah, it can get pretty hot on some days.

Ok, so you've been fishing for around 45 years, have you noticed a lot of change since you've started fishing…um…?

Oh, unbelievable the amount of change, yeah it is. There is just so much that is different: the boats are bigger and the traps are bigger, and there is more lobsters…being caught, I don't know where they are coming from but.

A lot more?

A lot more.

Are you catching different things in your traps as well, things that aren't lobster?

No, not really, that's been pretty much the same. You catch the odd crab, codfish. You never know what you're going to catch in a lobster trap.

What's the weirdest thing you've ever caught in a trap?

Um, a wolfish.

Yikes!

That was with my father in LFA 25. And one time we caught a white lobster, it was big, probably 5-6 pounds, but I've only ever seen one of those.

And what about the weather over those 45 + years, have you seen much of a change?

It seems to be, the weather in the fall season used to be really bad at the end, and now it seems to be later...the spring is a bit later getting nice, and the fall is a bit later getting bad, except for the odd hurricane. Other then that, I remember when, middle of October it was snowing, but now, usually, you're still in your t-shirt in mid October.

Right, yeah, we were on your boat two years ago doing some science work on, October 23rd I think, and it was hot. It was too hot, we were sweating hauling the equipment up.

Ok, so fishing season starts early May and ends late June. Here we are in late August and you're still working on traps. When does your working season start for those 10 weeks?

I probably start working on my spring stuff in March, getting the ropes ready, and buoys and the traps. A lot of guys fish two seasons, I don't anymore but, after that I build 300-400 lobster traps for the Native Council. That will take me until Mid-October, or late October.

How long for you to build one traps.

About an hour per trap, approximately. So about 400 hours. These aren't all mine, we aim to replace 50 traps per licence every year.

So one traps lasts around 6 years then.

Yeah, maybe a bit less in the fall but the guys are fishing a bit farther north where the water is colder so there are less worms. Then if any are lost, we have to replace those too.

Let's talk about the day to day. Let's go through a typical Tony's day during the fishing season. What time do you get up?

I usually get up around 3:00, 3:15 I'm up.

Wow!

I usually get to the wharf around 3:45, leave the harbour between 4:00-4:10, something like that. And I'm one of the later ones to get out, haha!

So why do folks get out so early, when it's still dark. Is it because they are masochistic or that they just really like the sunrise, what is it? Why do they get out on the water so early?

I don't know. (HAHAHA). I really don't know. I think way back, I've been told this by older fishermen, that way back it used to blow every day in the afternoon so they wanted to get out early in the morning to get their gear fished before it started to blow. And now, we just do the same, like I get up as early as I can. I don't want to go out any earlier then that. Some guys will get out at 3:00.

Wow, so essentially fishing in the nighttime instead of the day.

Yeah, but in LFA 25 there is a curfew now, you're not allowed to leave before 4:00 and you have to be in by 9:00 [pm]. LFA 24 there is no curfew over there.

Interesting, so why the curfew?

I think it's to keep the illegal activity down, cause when it's dark in the middle of the night, that's when illegal activity is going to happen.

Ok, interesting. Do you think there is much illegal activity happening? I know we are getting off topic here but, is there?

I would think that there is, lots of people fishing extra traps and other stuff.

And another thing you mentioned, not related to illegal activity but getting out early, was that because some people will check their traps multiple times a day.

When the lobsters are heavy, when there is good fishing, some of the people will check their traps a couple times a day, or more if they can.

***So** another reason to get out early.*

Yeah, more reason to get out early.

Ok, back to our original question, you get up a 3:15 in the morning, how does that compare to the off season? Are you stuck at getting up early all year?

Yeah, well I don't usually get up that early but I'm usually always up by 6:30.

And to get up at 3:15, what time do you have to go to bed at?

I go to bed usually around 10:00.

Ok, that's pretty late, I remember some of the radio announcers that were up for 3:30 or so, they would be in bed by 7:30-8:00 pm the night before. You must be tired then, you must be pretty done after 10 weeks of those early mornings.

Well when I get home now, at 2:00 or so in the afternoon, I'm getting to the age that I have to have a nap. I'm tired.

And when you get up in the morning, do you check the weather first thing, or is there something else?

Yup, that's probably the last thing I do before I go to bed and the first thing I do when I get up in the morning, is check the weather. I

always check the winter, even in the winter time. It's a habit.

So at what point would you call the crew and tell them, it's not fit to go out. What type of storm or weather conditions would prevent you from going out?

Well it really depends on the wind direction, if it's coming from the north or northeast, or even east. You know, if it's 25 knots or more (46 km/h), I'm probably not going out, because the harbour gets unsafe. The sandbar really. And I just have a small, old, boat and I don't push my luck. There's a lot of guys with these huge, new boats, and they will just, don't even look at the weather, they will just go.

Wow, 25 knots is a lot just to be standing on the deck. I don't know if you would have waves coming over your washboards at that point or not.

It is a lot, and yeah, the water would start coming over the sides now and again.

And do you get there before your crew?

No, no the crew is always there before me. Just a few minutes, but they can get their bait ready and other stuff before we start moving.

So, they are in charge of all that, getting the bait and supplies.

Yup, I just get on and get them to untie the boat.

Do you usually stop and have lunch at some point or, eat on the go, or perhaps you don't eat at all?

We usually, after we fish half the gear, we sometimes have to sail a little ways to the next string and we'll eat then.

***So** what will you have?*

Ah, pretty much just sandwiches, we have a microwave so sometimes we'll bring something we can heat up, or make hotdogs, or something like that.

*Nobody is taking bait and heating that up in the **microwave** are they?*

Nope, haven't had bait in the microwave yet (haha).

And is that what you would have for lunch all year or, once your season is done you are like "I'm done with sandwiches!"

Oh yeah, I'm done with sandwiches, I don't eat sandwiches much after the fishing season.

***So** you said you're back around 2:00 or so, and you might have a quick nap. Are you finished for the day or is there a bunch of maintenance to do afterwards?*

There always seems to be something to do, there is probably four days out of the week that I have to go back to the boat and fix this or, do something. Windows or, there's always seems to be something to do. I mean if I lived far away I would probably do it before coming home but, I'm only 10 minutes away, I'll just drive down and get things ready for the next day.

So, it's a long day, a long week.

Yeah, four days out of six I'll come down.

Right, because Sunday is a day off.

Sunday is a day off.

Is that everybody?

Nobody fishes on Sunday, a lot of them do their maintenance on Sundays, they will go down, change their oil or fix something. I don't know if it's a regulation or a fisherman's agreement.

It's gives people a rest at least.

Oh definitely, I definitely need a rest.

The other reason I came down today was to bring you some whale safe, or weak breaking strength rope. Can you tell me a bit about whales and your experience with them? I know there were a few close calls with closures here, well more then close calls I guess, an actually closure to the 10-fathom line this past spring. Is that something you have to check everyday as well? Checking to see, is there a closure, are there any restrictions right now?

Well, usually they will have that posted, if there is a whale spotted. I've never seen a right whale, never heard tell of one until a few years ago, ever.

Yeah, I think they have historically been a bit farther offshore, and it just happened that they showed up there this year. Have you seen many other whales?

Yeah, seen a few, this year, I seen a few whales. Because there are so many mackerel out there this year. Which is crazy, there are schools of mackerel everywhere. Because they closed the mackerel fishery and now there is all kinds of mackerel. But I don't know what kind of whales they are, they call them pilot whales or blackfish.

*Oh neat, **yeah** the black smooth skinned ones. There are usually a few minke whales in closer as well, they are sort of like humpbacks or fin whales but smaller. So, how far where the pilot whales offshore?*

Oh, you can see them, I saw one in about 40 feet of water when I was coming in, it was in close.

Mmm, maybe we have to get a whale watching tour company set up through the Council (haha).

Well I've been out a few times this summer and I've only seen one. I've seen more during the lobster season, but after the season I don't see many, I don't know why.

Did I miss anything in the life of a fisher? Do you like lobster?

Yeah I do, I really like them. Nice lobster sandwich. Love it.

Do you have them on the boat sometimes?

Um, sometimes, the other year when it was a COVID year, we couldn't sell all of our lobsters, I had lobster sandwiches every day, for the whole season. Everyday.

Wow, were you tired of it?

I was getting tired of it, **but**, I would still like to have one right now!

Haha, well listen Tony, thank you so much I really appreciate it.

No problem at all, glad to do it.

Story Credit: by Bryan Martin, Maritime Aboriginal Peoples Council

RESTORE: RESTORATION THROUGH OVERHEAD REFUGIA EXPLORATION A NEW PROJECT FOR THE

Maritime Aboriginal Peoples Council

by **JAMES VERES**

THE NEWEST PROJECT AT THE MARITIME ABORIGINAL PEOPLES COUNCIL (MAPC) IS THE RESTORATION THROUGH OVERHEAD REFUGIA EXPLORATION (RESTORE) PROJECT. This project will build on previous work at MAPC and aims to rehabilitate and restore aquatic environments deemed critical habitat for the endangered inner Bay of Fundy (iBoF) Atlantic salmon *(Salmo salar).* This work will focus on locating cold water refuges in freshwater aquatic environments and increasing fish passage to these habitats.

ResTORE builds on previous and existing projects within MAPC that worked within the historical natal rivers, and Critical Habitat rivers, for iBoF Atlantic salmon. Currently, we have one project, the Atlantic Salmon Comparative Assessment Project, which is focused on comparing the timing of release of unfed fry by the Department of Fisheries and Oceans (DFO) to the alevin and fry emerging in-situ in the project rivers. A previous project, the Five Watersheds Project, developed a restoration plan to eliminate barriers to fish passage in the watersheds of the Chiganois, Debert, Folly, Great Village, and Portapique rivers using habitat restoration methods (for example, denil steep water fish pass, digger logs, and chutes). ResTORE will build off both of these projects with the goal of identifying and improving upon cold water refuge areas for iBoF Atlantic salmon in the watersheds of Debert, Folly, Great Village, and Portapique.

This project will run from 2023 through to 2027 with community events and updates happening throughout each year.

PROJECT FUNDERS

The Aquatic Ecosystem Restoration Fund (AERF) is a DFO-led funding program (a follow-up to the Coastal Restoration Fund) aimed at supporting projects focused on the restoration and conservation of aquatic ecosystems across the country. Established to address environmental challenges affecting Canadian water bodies, the fund provides financial support to community-based organizations, Indigenous groups, and government agencies. These entities undertake various projects such as habitat restoration, water quality improvement, and the enhancement of fish habitats. AERF plays a vital role in promoting sustainable fisheries, preserving biodiversity, and ensuring the overall health of Canada's aquatic ecosystems.

The work supported by the AERF aligns with MAPC through its respect for Indigenous knowledge, emphasis on community involvement, dedication to environmental stewardship, and the promotion of socio-economic development. By collaborating with DFO, MAPC can make meaningful strides in preserving the rich aquatic heritage of Indigenous peoples in the maritime regions of Canada.

Drones, LiDAR, and Thermal Imaging

Atlantic salmon hold a significant place in the ecological tapestry of water bodies. Preserving their habitats is not just vital for their survival but also for maintaining the delicate balance of aquatic ecosystems. In this era of advanced technology, LiDAR (Light

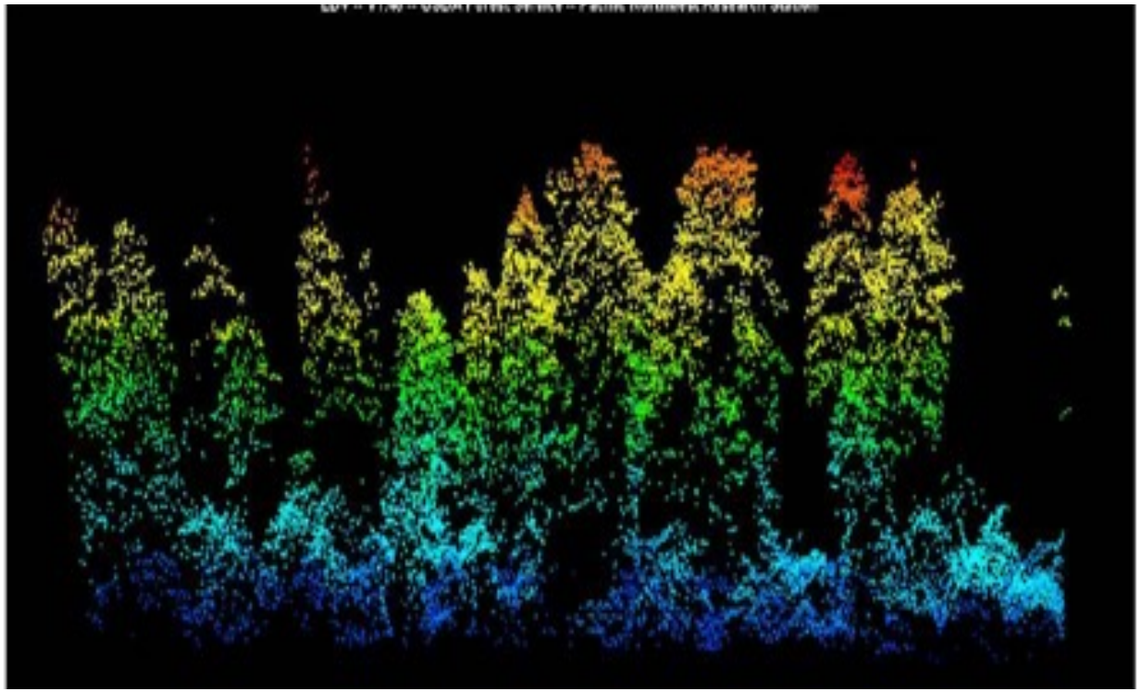


Figure 1. An example of LiDAR imagery being used to visually display height of trees. Red represents the highest point of the trees and the darker blue represents the lowest vegetation. (C) Andrew Ngeow, Oregon State University, licenced under CC BY-SA.

Detection and Ranging) and thermal imaging have emerged as indispensable tools for understanding and conserving Atlantic salmon habitats. Much of this project will depend on outputs from this type of technology to support the habitat assessments and decision-making; as such, the following section delves into the importance of these technologies in mapping environments specific to Atlantic salmon habitats and how drones equipped with LiDAR and thermal imaging sensors are reshaping salmon conservation efforts.

Significance for Atlantic Salmon Conservation

Accurate mapping of Atlantic salmon habitats is pivotal for their conservation. These fish are highly sensitive to environmental changes, especially in water depth and temperature. By employing LiDAR and thermal imaging technologies, MAPC can identify the optimal breeding, feeding, and sheltering areas crucial for Atlantic salmon populations. Preserving these habitats ensures suitable conditions for spawning and nurturing juvenile salmon, contributing to the overall sustainability of the species. Understanding thermal refuges is equally essential, as they provide sanctuaries during periods of elevated water temperatures, safeguarding salmon from stress and potential mortality.

Drones: Revolutionizing Atlantic Salmon Conservation

Drones equipped with LiDAR and thermal imaging sensors have revolutionized the way conservationists approach Atlantic salmon habitat conservation. These unmanned aerial vehicles (UAV) can navigate the most challenging and remote terrains, capturing high-resolution data from rivers, estuaries, vegetarian/riparian areas, as well as coastal regions. By integrating LiDAR and thermal imaging into drone technology, scientists gain real-time access to critical information. This data is then processed to create comprehensive maps, guiding conservation efforts. Drones enable precise monitoring of salmon habitats, helping conservationists and policymakers make informed decisions, ensuring the preservation of Atlantic salmon populations for future generations.

ResTORE: The Methods for In-Steam Restoration

There are many different methods of in-stream restoration that can be done to improve the aquatic environment for Atlantic salmon, and other species that share the freshwater river environment. Through the blending of LiDAR analysis and thermal imaging, in addition to other survey methods such as habitat suitability modelling, culvert assessments for fish passage, and water quality monitoring, we are able to better understand these dynamic habitats. ResTORE aims to make restoration recommendations in the study rivers to improve habitat connectivity and fish passage by thoroughly analyzing the outputs of thermal imagery, LiDAR, and multiple points of data.

Freshwater aquatic restoration relies on several key types of standard methods; for example, digger logs, deflectors, or rock sills. Selecting the appropriate restoration methods is reliant on accurate data about the surrounding habitats and may be unique to the area that is being considered for restoration. The ResTORE project team will collaborate with a committee made up of experts in the field as well as community members to choose the best method of restoration based on the data gathered throughout the project.

Common examples of in-stream restoration are:

Digger Logs

Digger logs, also known as large woody material, are fallen or deliberately placed logs in rivers and streams. They create or replicate natural natural shelters, spawning areas, and food sources for aquatic life. Digger logs stabilize streambanks, reduce erosion, and enhance the habitat complexity of water bodies. Their presence is vital for supporting fish populations, especially salmon, and maintaining the health of aquatic ecosystems.

In Figure 2, we can see a newly installed digger log with a deflector log. This method of restoration is meant to increase the “S” shape of the stream as the water flows and create a pool as a place of refuge and rest for aquatic fish species.

ROCK SILL

A rock sill is a structure consisting of strategically placed rocks or boulders across a river or streambed.

Figure 2. Example of a digger and deflector log (orange) installed in a stream using the flow of water (yellow) to dig out the pool below (blue). Image Credit: Veres, J. 2022

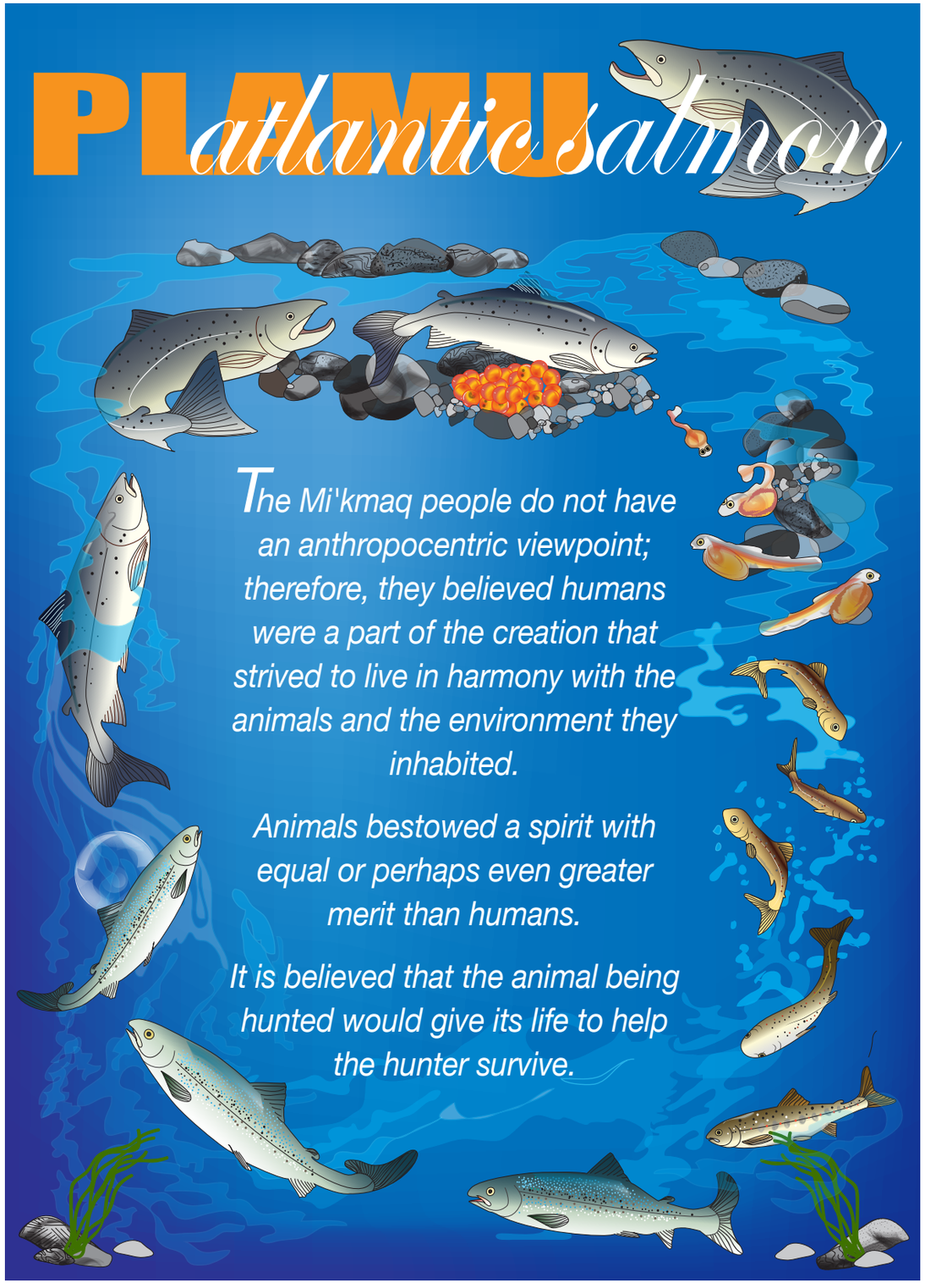
Figure 3 Example of a newly constructed rock sill (yellow box) with the pool (blue) just below the rock wall (orange). Image Credit: Veres, J. 2022

It is designed to slow down water flow, prevent erosion, and create natural habitats for aquatic organisms. Rock sills improve aquatic ecosystems by providing shelter and spawning grounds for fish, enhancing water quality, and supporting the overall health of the river or stream.

Where a stream is narrower in size, but we want to slow down the flow of water and boost the “S” curve of the stream, therefore, we would construct what’s known as a rock sill.

Figure 3 shows us a wall of rocks that will act as a deflector to funnel the water through a smaller opening. Rocks are taken from the immediate area below the sill to increase the creation of a pool. It’s important to have boulders in areas where you plan to have a rock sill. Salmonids, such as Atlantic salmon and trout species, prefer to hide and rest behind large boulders in times of high water.

Story Credit: By James Veres, Maritime Aboriginal Peoples Council



A COMPARATIVE ASSESSMENT OF ECOLOGICAL CONDITIONS FOR ATLANTIC SALMON IN THE NORTHERN MINAS BASIN RIVERS

by Gavin Scott

The Maritime Aboriginal Peoples Council (MAPC) is halfway through their three-year (2022-2025) research project, 'A Comparative Assessment of Ecological Conditions for Atlantic Salmon in the Northern Minas Basin Rivers', colloquially titled by its abbreviated name, the 'Salmon Comparative Assessment Project', funded by the aquatic stream of the Aboriginal Fund for Species at Risk (AFSAR) through Fisheries and Oceans Canada (DFO). The project investigates several conditions affecting the survival of the endangered inner Bay of Fundy Atlantic salmon: structures and substrate, the main physical components of salmon habitat; food availability, the available macroinvertebrates during key periods of the year; water velocity, the speed of the water relative to life stage preference; and water temperatures, a core aspect of their biological functioning. The main aspect of the study is to compare these ecological conditions of the Debert and Folly River sites where Coldbrook Biodiversity Facility (CBF) holds their unfed fry release program (juvenile salmon) and its timing relative to the emergence of salmon from eggs that have been incubated in Egg Incubation Baskets (EIBs). The boundary of the project focuses on the Debert and Folly Watersheds, but also includes the watersheds of Great Village, Portapique, and Economy.

INCUBATION AND RELEASE

2500 salmon eggs were incubated in November 2022, with a large majority of them emerging in the spring of 2023. 383 of the 2500 salmon eggs survived to hatchlings, a survival percentage totaling over 15%. While 15% may not seem like a solid return, previous years of incubating eggs using this methodology only returned 6-7%, on average. The salmon incubated in the Debert River and Folly River saw first emergence on May 31st and June 2nd, respectfully. Notably, these salmon emerged almost a month later than the salmon that were released as a part of

Figure 1. Left: Fry release program taking place in Spring 2023. Right: Egg incubation baskets being filled with salmon eggs in November 2022.

Figure 2. Left: Salmon alevin in emergence basket. Right: Salmon alevin being released from EIBs into the river.

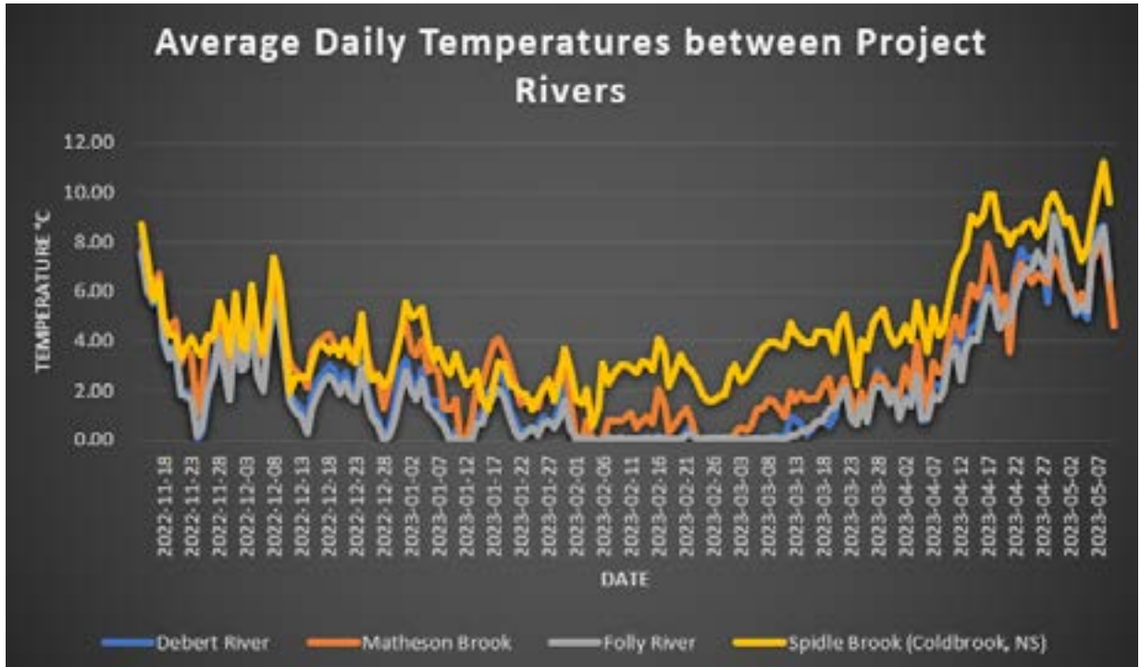


Figure 3. Temperature profile for MAPC project incubation sites and tributary used for the unfed fry program (DFO) incubation site. Spidle Brook's average daily temperature was warmer than both Debert and Folly Rivers over the incubation period, and hatched their eggs well before MAPC's eggs hatched, which were incubated in the Debert/Folly Rivers.

DFO's unfed fry release program, which took place on May 5th. Salmon egg development is determined by the water temperature over the incubation period; warmer average daily water temperatures will correlate to faster egg development, whereas river waters that are cooler will take longer for egg development. The salmon fry that were raised at CBF (Coldbrook, NS), which uses water pumped from nearby Spidle Brook, had warmer water temperatures across the entire incubation period (See Figure 3). The visual differences between May 5th and June 2nd for one of the incubation/fry-release sites can be seen in Figure 4.

Additionally, the differences in water quality and habitat dynamics were compiled between the release and the in-river egg hatching (parameters such as water temperature, food availability, acidity of the water, shade/cover etc.), with intent to consult with experts in the coming months, to determine any changes that could be made to the fry release program to optimize juvenile survival. Salmon alevin – the first stage after emerging from the egg where there is still a yolk sac attached – are very sensitive to certain water characteristics and it is paramount that the watershed is ecologically ready to sustain juvenile fry when the release program is set to take place.

PROMISING OBSERVATIONS

In September 2023, the MAPC team conducted fish capture and release surveys across several of the project sites. In the hunt for locating some of the juvenile salmon, the team was very pleased with the results of this year's electrofishing surveys (a safe means

Figure 4. Top: Folly River site during fry release program, May 5 2023. Bottom: Folly River site during first salmon emergence, June 2 2023. There are noticeable differences in foliage and discharge.

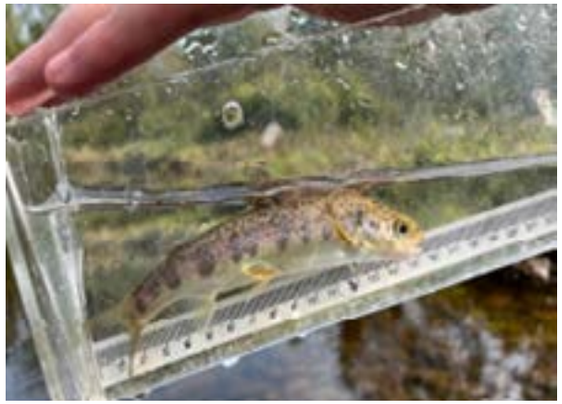


Figure 5. Several Atlantic salmon parr being identified and measured in Folly/Debert watersheds.

of attracting fish to a net, using a controlled electrical current). The team had their best capture across any electrofishing season MAPC has ever conducted - 75 individuals were caught in just a handful of sites across the two focal watersheds, those being the Debert and Folly Rivers. Especially encouraging is that there were more salmon jumping out of the water than the team could net! The majority of what was observed in the surveys were healthy salmon parr, an indicator that young juveniles are prospering in these freshwater environments.

Potentially even more encouraging was a couple salmon found on Matheson Brook in the Portapique watershed, one of the SCA incubation sites. This past May was the first year the team had incubated and released juveniles from EIBs on this particular tributary, and the hopes were high that a solid survivorship would be recaptured in the fall, given the fact that over 50% of the eggs at this site survived to hatch. Although not as many were caught as anticipated, the size of a few of the salmon caught raised questions about the parent source for these individuals. The team expected to catch only young of the year fry; however, two of the salmon were 6.4 and 6.5cm long respectfully, a measure that typically denotes a 1 year+ parr salmon, according to partners with the

Top: Salmon parr caught in Matheson Brook. Bottom: Team members electrofishing one of their sites.

CBF. In 2020, prior to MAPC incubating any salmon eggs at this site, eDNA surveys had returned positive Atlantic salmon hits. Furthermore, Matheson Brook is not one of the sites that the CBF releases fry. This begs the question, if these salmon were not ones that were incubated last year, how did they get there? Some theories point to a continuing wild population, which would suggest there are returning adults coming back to this river to spawn each year. Another possible, but less probable, theory is that they could be offspring from Atlantic salmon open-net pen aquaculture escapees, which has proven to be a significant concern in other iBoF rivers, that could bring stark consequences to the wild Atlantic salmon gene pool. Both a tissue and scale sample were taken from one of the individuals at Matheson Brook and submitted to the genetics laboratory at DFO. To date, the team has not received the results of this testing and are eagerly awaiting to hear back about the genetic composition.

Story Credit: Gavin Scott, Maritime Aboriginal Peoples Council

Assessing the impact of erosion and sedimentation on ATLANTIC SALMON and AMERICAN EEL in the NASHWAAK RIVER WATERSHED

by **KAYLI MCGARRIGLE, NBAPC**

The New Brunswick Aboriginal Peoples Council has been collecting and analyzing data over the last three years to assess the impact that erosion and sedimentation have on the natural habitat of Atlantic Salmon and American Eel in the once flourishing Nashwaak River Watershed. This was a three-year project (2020-2023) funded through the aquatic stream of the Aboriginal Fund for Species at Risk (AFSAR) by Fisheries and Oceans Canada (DFO). This project focuses on two COSEWIC- listed (Committee on the Status of Endangered Wildlife in Canada) species, the Outer Bay of Fundy Atlantic Salmon Population (Endangered) and the American Eel (Threatened). This project aims to investigate the status of the habitat along a 43km stretch of the Nashwaak River from Stanley to Penniac, in terms of the erosion risks to the species' habitat. This project used a plethora of methods to assess erosion which included a visual/physical assessment of the banks coupled with an assessment of various water quality parameters. Coupled with the assessment of erosion and habitat quality, to determine the use of habitat Environmental DNA (eDNA) and electrofishing was completed.

Figure 1. Project Area of approximately 43km from Stanley to Penniac, New Brunswick.

To comprehensively evaluate erosion along the Nashwaak River, a meticulous assessment of various key parameters was conducted at each site. These parameters encompassed the buffer zone, characterized by the natural vegetation directly adjacent to the watercourse; the riparian zone, which measured the percentage of natural vegetation covering a 30-meter area around the watercourse; the presence of exposed roots, denoting the percentage of roots visible along the bank of the study site; and the extent of erosion within a 30-meter segment of the watercourse. At regular intervals of 50 meters, these parameters were evaluated to identify areas requiring urgent restorative interventions. The evaluation yielded scores ranging from 0 to 14, with 0-4 indicating sites in a poor condition for habitat, 5-7 denoting fair condition sites, 8-11 representing sites in moderate condition, and 12-14 signifying sites in good condition. Out of a total of 358 sites assessed, the findings were as follows: 4.5% of sites were classified as being in poor condition, 12.6% in fair condition, 49.2% in moderate condition, and 33.8% in good condition.

Figure 2. Mass slumping erosion examples of a poor condition sites along the Nashwaak river system, New Brunswick, 2022.

Figure 3. In-river eDNA collection at Dunbar Falls tributary along the Nashwaak River Watershed.

To comprehensively assess the utilization of habitat by Atlantic Salmon and American Eel, a diverse array of methodologies was employed at multiple strategic points along the Nashwaak River and its tributaries. The selection of these site locations was informed by a combination of historical data, landowner insights, and Indigenous Traditional Knowledge pertaining to the pools and spawning grounds of these two culturally significant species. The analysis encompassed various water quality parameters, including water temperature (°C), turbidity (NTU), and conductivity (µSiemens/cm) in the year 2022, and expanded to include nitrate, ammonia, and pH/orp in 2023. In 2022, all the water quality parameters were

Figure 4. Electrofishing sampling showing fish species collected (left) and a Atlantic Salmon Parr (right).

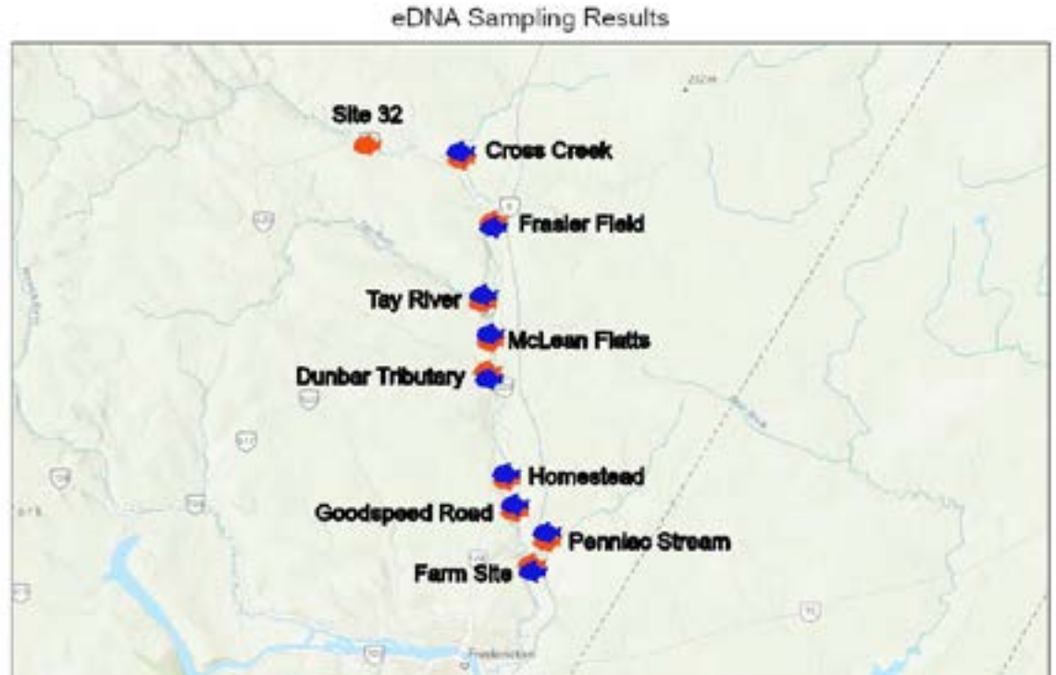


Figure 4. Nashwaak river eDNA sites, 10 sites total, 2-3 replicates completed at each site. Red symbols represent presence of American Eel (Anguilla rostrata) DNA and blue symbols represent presence of Atlantic Salmon (Salmo salar) DNA determined by the University of Maine.

found to adhere to the essential thresholds required to support both Atlantic Salmon and American Eel populations. To further scrutinize the presence and activity of these species, ten sites were selected for environmental DNA (eDNA) analysis, while an additional six sites were chosen for electrofishing. This dual approach allowed for a comprehensive understanding of the utilization of the Nashwaak River and its tributaries by American Eel and Atlantic Salmon.

In 2022, the eDNA analysis yielded promising results, with all ten sites displaying positive indications of American Eel presence, and nine of them showing positive signals for the presence of Atlantic Salmon. The sole exception was the northmost site, which exhibited a negative result.

The electrofishing conducted in 2023 revealed further insights, with American Eel identified at all sites and Atlantic Salmon documented at two specific locations: Youngs Brook and Dunbar Falls. This multifaceted approach provided a robust assessment of the habitat use by these two species in the Nashwaak River and its tributaries.

Next Steps: The NBAPC Natural Resources team is currently beginning their analysis of the 2023 samples. The eDNA samples for

2023 will be sent to the University of Maine for analysis to determine the presence or absence of Atlantic Salmon and American Eel within the ten designated sites along the Nashwaak River and its tributaries. Simultaneously, water quality analysis will be carried out to ensure that the thresholds for the two species of interest are not exceeded.

As the analysis progresses, a final report summarizing all the data collected and the project's findings will be prepared in the coming winter, marking the conclusion of this year's work. This report will serve as a valuable resource for habitat restoration efforts and future projects.

Figure 5. Nashwaak river electrofishing sites. Red symbols represent presence of American Eel (Anguilla rostrata) and green symbols represent presence of Atlantic Salmon (Salmo salar) and American Eel.

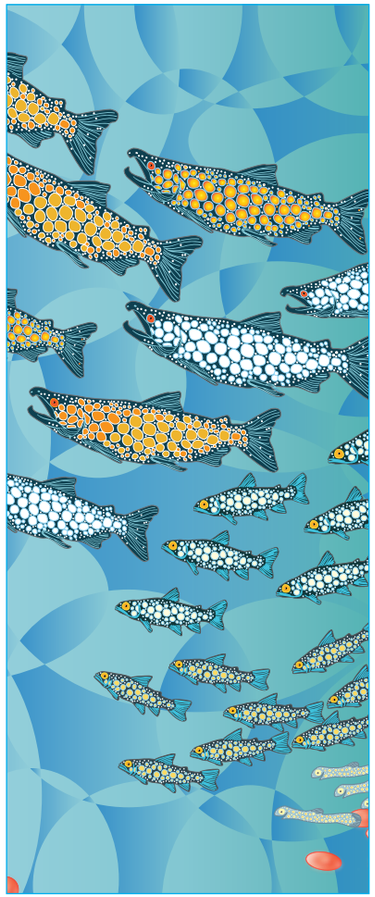


Illustration by Anna Nibby-Woods

Story Credit: Kayli McGarrigle, New Brunswick Aboriginal Peoples Council

UPDATE

CARING FOR THE BAY

BoFEP continues into its 26th year with a small but active program focussed on communication about the ecology, biodiversity, living fisheries resources, conservation, and overall ecosystem health of the Bay of Fundy. Most recently, the Proceedings of its latest biennial workshop, the 13th, were published in March 2023 on its website (www.bofep.org) and the next workshop is now being organized for June 4-7th, 2024, sponsored by the HMSC (Huntsman Marine Science Centre), BoFEP and ACCESS (Atlantic Canada Coastal and Estuarine Science Society). BoFEP produces a quarterly newsletter, the Fundy Tidings, on its website; this is distributed to approx. 400 people and organizations around the Bay. Two working groups (WG) are active – the long standing EIUI (Environmental Information – Use and Influence) program, formerly the Informatics WG, at Dalhousie University (www.eiui.ca) and the Ocean Literacy WG, also located at Dalhousie. Ocean and climate literacy will be a major theme at the upcoming workshop. Formation of a WG on coastal flooding is being planned. BoFEP is run by a Steering Committee of up to 24 members, and its management team meets once a month. New members are always welcomed, as are suggestions for new WGs and sources of support. (Peter Wells).

MINIMIZING RISK TO NORTH ATLANTIC RIGHT WHALES: TECHNOLOGICAL INVESTIGATIONS

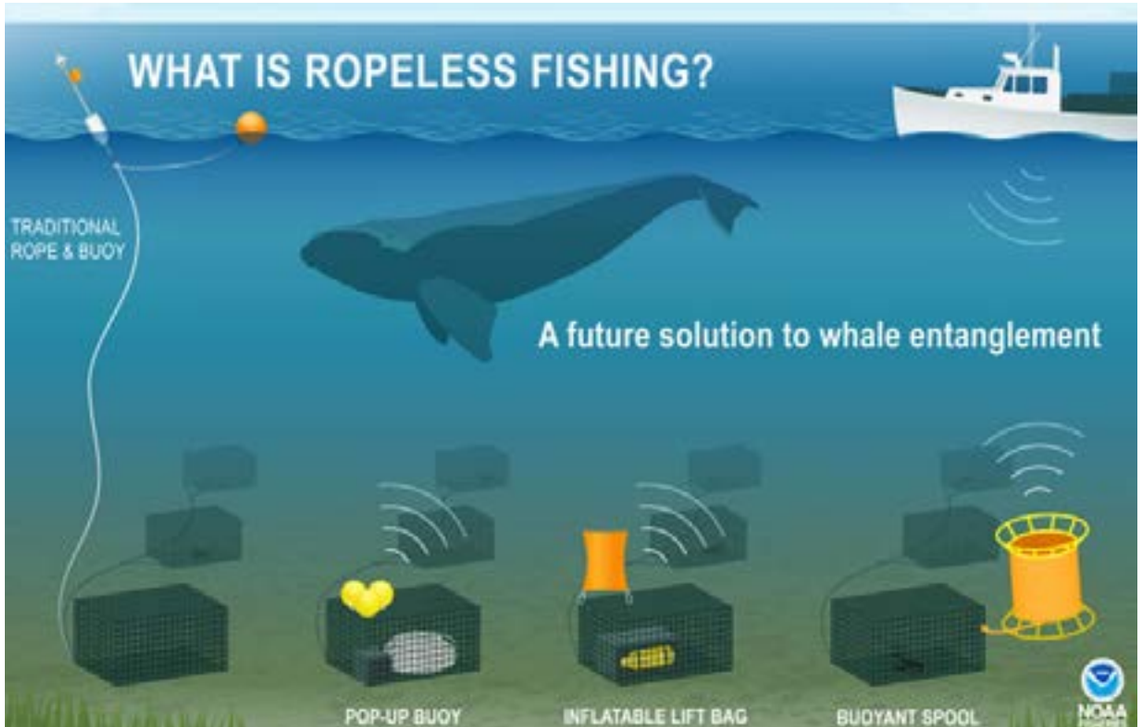
by **KIRKLEN JOHNSON**

WHO ARE WE?

The Canadian Wildlife Federation (CWF) was founded by hunting and angling groups who sought to conserve wildlife and habitats for the use and enjoyment of all. On Canada's East coast, the CWF Marine Team is focusing on identifying evidence-based solutions that will effectively protect marine wildlife while continuing to allow marine based industries to thrive. This is best achieved by working closely with industry partners such as fishing associations, shipping representatives and government agencies to evaluate risk and mitigation measures that protect wildlife while allowing fishing and shipping to take place in a safe and sustainable way.

OUR FOCUS

A large focus of CWF's efforts are on the critically endangered North Atlantic right whale (NARW). NARWs are found primarily along the Eastern coast of North America and is the world's most endangered large whale. They have two primary threats to their population: vessel strikes and entanglement in commercial fishing gear and ghost gear. To mitigate these threats, CWF's Marine Team is collaborating on several different projects under two main programs: 1) developing whale entanglement risk models in lobster and snow crab fisheries, and 2) working closely with fish harvesters to trial and adopt innovative fishing technologies to allow them to fish safely in the presence of whales.

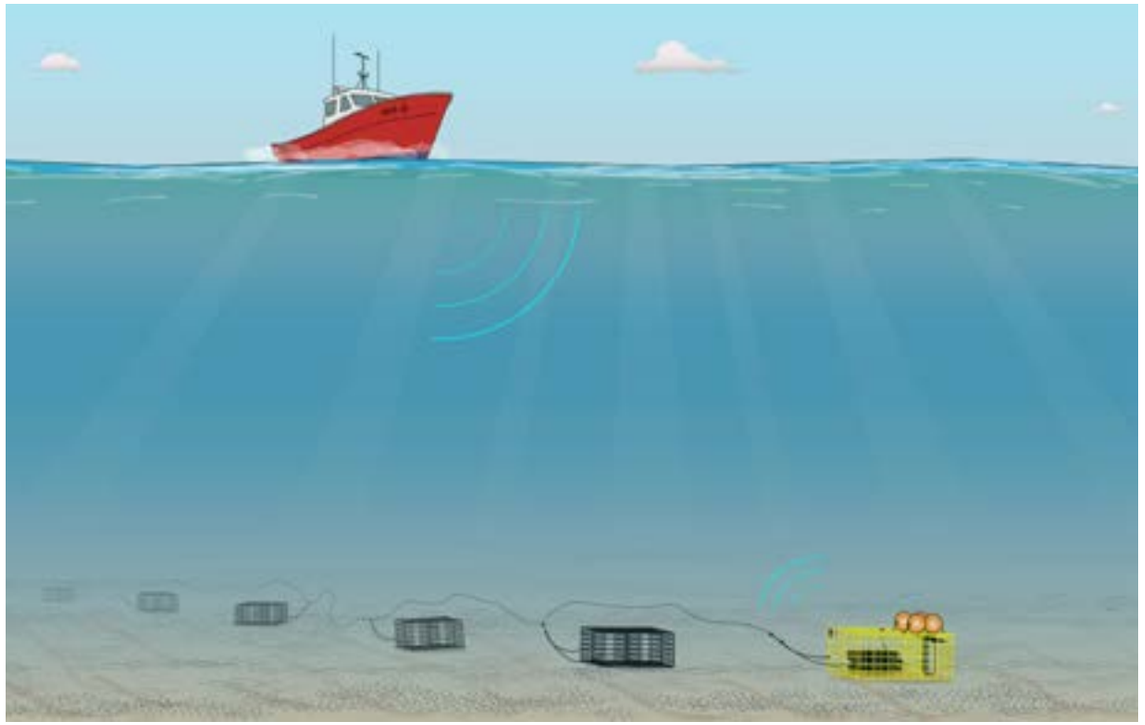


Various examples of on-demand fishing gear types compared to traditional buoy lines. From left to right: rope containment system (pop-up buoy), inflatable lift bag system and buoyant spool system (NOAA Fisheries).

CWF's gear trial program focuses on testing new and emerging "on-demand" (otherwise referred to as ropeless) fishing systems on commercial fishing vessels to evaluate their suitability in Atlantic Canadian fisheries. There are various types of on-demand systems as shown in the figure below. Their main function is to eliminate the vertical buoyline in the water column that connects a buoy at the surface to traps on the seafloor, reducing entanglement risk to any NARW or marine mammal swimming through the area.

Various examples of on-demand fishing gear types compared to traditional buoy lines. From left to right: rope containment system (pop-up buoy), inflatable lift bag system and buoyant spool system (NOAA Fisheries).

In addition to trialing on-demand systems, CWF has also developed the CanFISH Gear Lending Program, a fisheries assistance program created to help harvesters facing seasonal and temporary closures due to NARW presence. These closures often displace fish harvesters, causing economic stress for them and the coastal communities where they reside. On-demand gear is a viable option for harvesters to legally continue to fish in closed areas without presenting an entanglement risk. The CanFISH program eliminates barriers that currently exist for harvesters in the adoption of on-demand gear including access to the gear, learning how to use it effectively, and being licensed to use it. Through CWF's extensive at-sea trials, we are able to deliver the best-suited gear to harvesters and



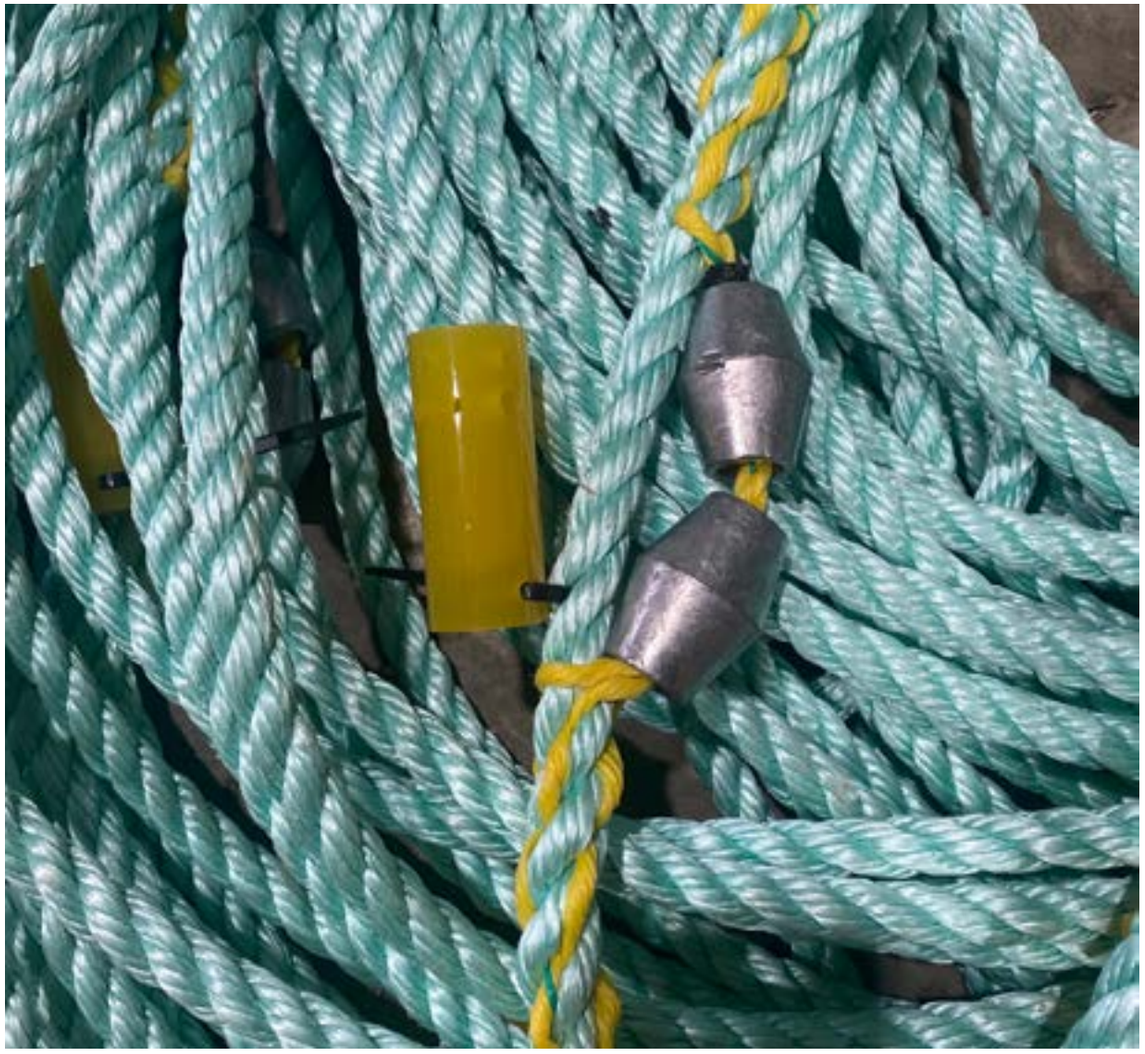
Lobster traps connected on the seafloor by groundlines with an on-demand system on the end. This is an example of a trawl set in a fishery closed due to NARW presence. (CWF)

provide them with the training and support to use it successfully throughout the fishing season. The program allows harvesters to fish in closures, free of charge, while gaining exposure to on-demand gear and learning what works best for them when using this innovative technology.

THE PROBLEM

When fishing with on-demand gear in a closure, harvesters are required by license to have several traps connected in series (i.e. a trawl) with an on-demand system on one end. The rope that connects each trap on the seafloor is called a groundline, as shown in the image below. Groundlines have become a point of concern in Canadian fisheries due to the possibility that whales who are feeding at or near the seafloor could become entangled in them. Studies have suggested that a groundline elevation greater than 3m (average body diameter of an adult NARW) in the water column would pose a risk of entangling a NARW. Currently, all groundlines connecting trawls in a fishery closure must be made with sinking or neutrally buoyant rope, meaning the rope will rest on or very close to the seafloor. This is an important consideration for harvesters when adopting on-demand gear because they often use floating rope in their traditional gear configurations, and replacing this would come at a significant cost.

Lobster traps connected on the seafloor by groundlines with an on-demand system on the end. This is an example of a trawl set in a fishery closed due to NARW presence. (CWF)



A depth sensor in a yellow plastic protective casing and two barrel weights attached to the floating section of the groundline.

GEAR EVALUATIONS

To better quantify the entanglement risk presented by groundlines, CWF is studying the elevation of various configurations of sinking groundlines between traps. For our 2023 groundline trials, we attempted to simulate fishing trawls commonly used in Northern Cape Breton Island and PEI crab fisheries which can range from 50 fathoms to 120 fathoms in length. These fisheries were chosen as they have previously been affected by closures and have fished with sinking groundlines while using on-demand gear. In each trial, Star Oddi depth sensors were attached at 5 fathom intervals along different groundline configurations. The sensors collected data on the depths of the lines over a period of time, allowing our team to model elevations when deployed on

the sea floor. when deployed on the sea floor.

A commonly used and recommended neutrally buoyant rope was used as a baseline for testing. The type of floating rope typically used as buoylines in these fisheries was modified in different ways to evaluate how it interacts with the seafloor.

Deep Trekker DTG3 starter kit (Ocean Innovations)

Once the groundlines were prepared, they were attached to a trawl and set to soak for approximately 24 hours before being retrieved. In 2023, five groundline variations have been tested:

- **Variation 1** (75 fathoms): 20 fathoms sinking rope, 55 fathoms floating rope weighted with two 8 oz barrel weights every 10 fathoms.
- **Variation 2** (75 fathoms): 55 fathoms neutrally buoyant rope, 20 fathoms sinking rope
- **Variation 3** (120 fathoms): floating rope with 10' inserts of sinking rope every 10 fathoms
- **Variation 4** (120 fathoms): neutrally buoyant rope
- **Variation 5** (75 fathoms): neutrally buoyant rope

Preliminary results show groundlines under 100 fathoms in length consistently spent more than 70% of the time at 1m or less elevation

and a maximum of 9% of the time above 3m elevation. This suggests that despite the variety of rope material and structure (i.e., leaded or with weights), groundline rope remained quite close to the seafloor and therefore at a lower risk to entangling whales. The longest rope tested, Variations 3 and 4 at 120 fathoms presented more variable elevation measurements, with some below 1m only 62% of the time. More testing is needed to confirm whether these lower measurements are because of the length of the groundline or the characteristics of the rope, or if it was a unique observation as a result of technical glitches or uneven seafloor terrain. This is an example of why additional examination with modern technology can be beneficial in such studies.

An exciting addition to the study in 2023 was the use of a remotely operated vehicle (ROV) to take a look at the groundlines under water. When conditions were favourable, CWF used a DTG3 ROV on loan from the Maritime Aboriginal Peoples Council (MAPC) to obtain real-time video footage of groundline elevations on the seafloor. This provides visual ground truthing that can be paired with the sensor data for a better understanding of how the groundlines behave between traps on the seafloor.

Video still from ROV footage of a groundline between traps on the seafloor. (CWF)

FINAL THOUGHTS

CWF will be continuing these groundline studies using depth sensors and an ROV on commercial fishing vessels throughout Atlantic Canada. By testing various rope types and configurations while measuring how they behave in the water column, appropriate recommendations can be made to fish harvesters using on-demand gear to fish in closures. This combination of on-demand gear and groundline recommendations allows us to ensure that very little risk is being posed to the NARW, allowing coexistence between this important industry and marine wildlife.

For more information, please reach out to kirklenj@cwf-fcf.org or visit www.canfishgear.ca.

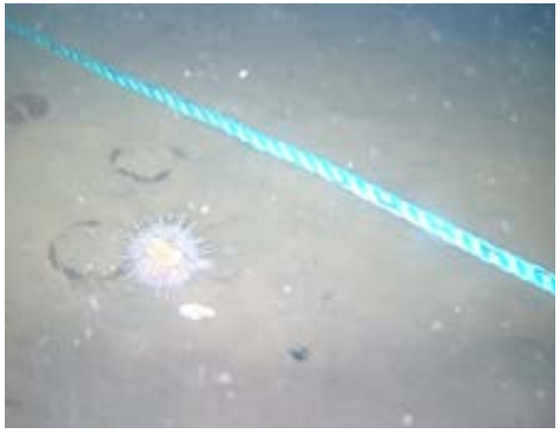


Illustration by Anna Nibby-Woods

Story Credit: Kirklen Johnson, Fishing Gear Technician, Canadian Wildlife Federation & CanFISH Gear Lending Program

AN INTRODUCTION TO SOCIAL IMPACT ASSESSMENT

by **KATE SPOONER**

Imagine that a provincial park was being proposed for development near your community. The process for any development is usually lengthy, and in this example the park developer would need to go through many steps and assessments to verify that the park development would not harm the environment, biodiversity or economy of the area. Unfortunately, there is another aspect that is often missed by any typical assessments that take place: people. The development of a park can certainly impact people both positively and negatively; it could impact peoples' wellbeing, their ability to access services, their family income, health and much more. The impacts that developments like a provincial park have on people can be measured by conducting a social impact assessment.

WHAT IS A SOCIAL IMPACT ASSESSMENT?

In a nutshell, a social impact assessment is the process of analyzing, monitoring and managing the intended and unintended social impacts of a development on the local population. It's a tool that can be used to help identify and understand the social, economic and cultural impacts of a development.

Let's go back to the example of a park being built nearby. A social impact assessment should ask questions like:

- How will the park impact the community's wellbeing?
- Would a park negatively impact any culturally significant areas?
- What services or infrastructure would be impacted by the new park area?
- Does the park provide business or employment opportunities?

Diagram depicting various components of people's wellbeing. From https://doorstephealth.in/social-impact-assessment/

For developments to be sustainable over a long period of time, the people either living in or using the area should be consulted in order for the area to thrive environmentally, economically and socially in the future.

In Canada, social impact assessments

are not mandatory under law; however, there is mention of health, social and economic conditions in the Impact Assessment Act and therefore a social impact assessment can be conducted if either a developer, government or community requires one or even on a voluntary basis.

WHAT ARE SOCIAL IMPACTS?

A key part of understanding what a social impact assessment is involves understanding what social impacts are. A social impact is something experienced by an individual, family, social group, or community, and is either felt or experienced in a perceptual or physical sense, or a combination of the two.

Social impacts involve changes to someone's way of life, their culture, and their community. In the context of a project development, social impacts can be direct, indirect, or induced. The social impacts of one project can also interact and overlap with the social impacts of other project developments in the area, either spatially (in the same space) or temporally (occurring at the same time).

Social impacts include but are not limited to:

- Way of life
- Culture
- Community
- Politics
- Health/Wellbeing
- Property/Housing
- Safety
- Livelihoods
- Environment
- Land

So, in the context of a provincial park development near your community, some social impacts could include:

WAY OF LIFE

- The location where the park is being developed could impact where someone has hunted for decades.

PROPERTY

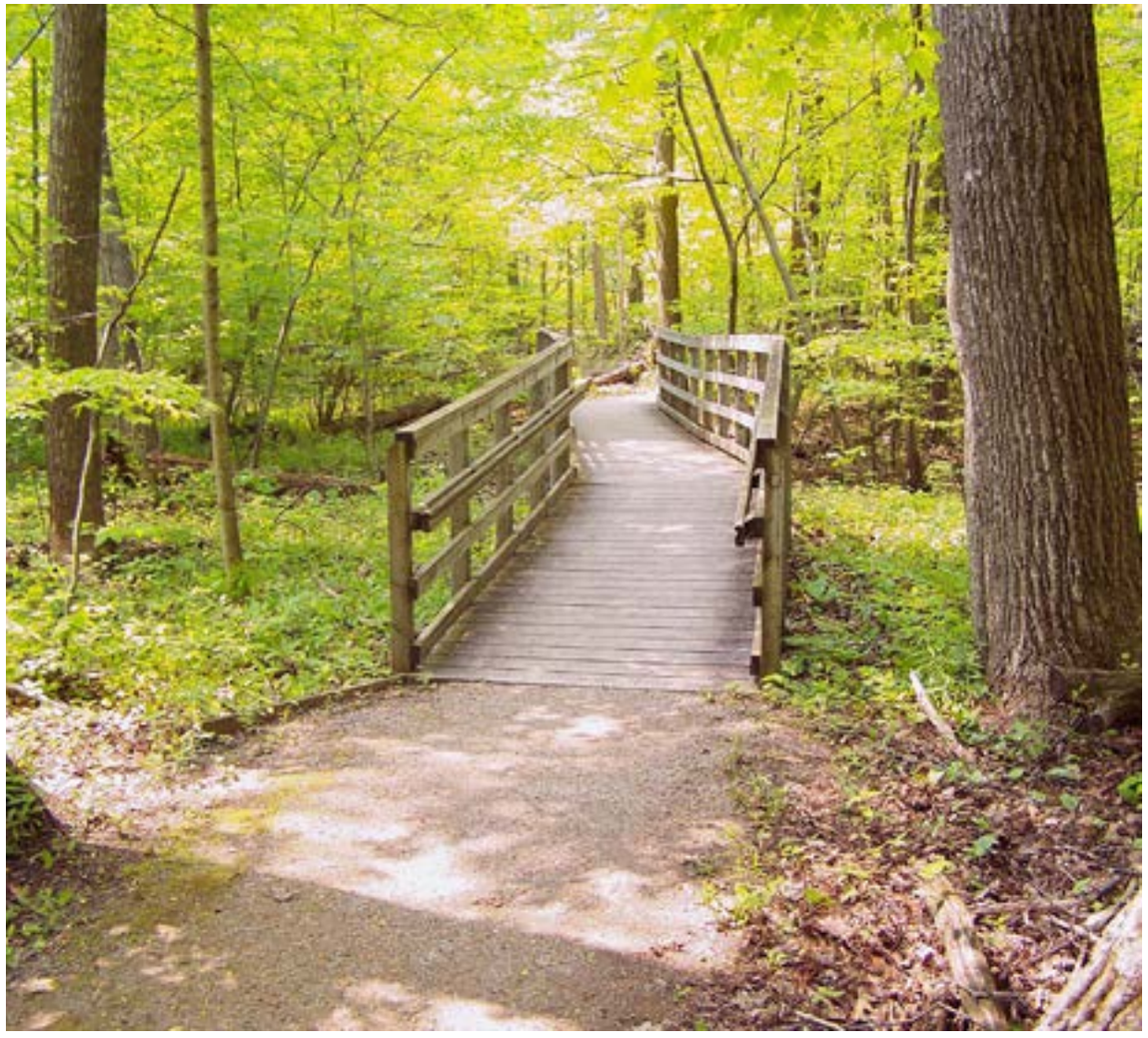
- The area which the provincial park would use would be removed from the real estate market.

HEALTH/WELLBEING

- A provincial park could improve peoples' health with the addition of community-based walking and hiking trails, encouraging people to be active outdoors free of charge.

WHAT DOES ALL OF THIS MEAN?

The Social Impacts of Marine Conservation project at MAPC is a 3-year project from 2023-2026, focused on understanding the social impacts of marine conservation areas on people and coastal communities, particularly the off-reserve Indigenous community, and by the end of the project, conceptualizing a framework for a social impact assessment with feedback from community members. Marine conservation areas can be compared to provincial parks in the ocean, where certain activities are prohibited and the ecology and conservation efforts are prioritized. The goal of the project is to better understand how these marine conservation areas are impacting people, and what social impacts (culture, community, land, livelihoods) should be given special attention as they are



As an example, a trailway in a provincial park may have many community benefits, but could have displaced others in its development. Image from Rondeau Provincial Park, Rondeau, ON, licensed under CC BY-SA

particularly important to the community in question. By giving the people affected a voice, the hope is that marine conservation areas can be effective and sustainable over a long period of time, having minimal negative impacts to the impacted communities.

Illustration by Anna Nibby-Woods

Story Credit: by Kate Spooner, Maritime Aboriginal Peoples Council

ATLANTIC SNOW CRAB

by **KATHRYN TOWNSEND**

Atlantic snow crab (Chionoecetes opilio) are native to the Northwest Atlantic, from the west coast of Greenland to the Gulf of Maine. They prefer cold temperatures ranging between -1 and 11°C, and sandy or muddy bottoms at depths from 20 to 2000m. In Atlantic Canada, most snow crab are found at depths of 70 to 280m in the Gulf of St. Lawrence, around Cape Breton, on the Scotian Shelf, on the Newfoundland and Labrador Shelf, and in Newfoundland bays.

Atlantic snow crab have a flat, round carapace (a dorsal section of an exoskeleton or shell), and long slender legs. Their colour changes as they age. Soon after moult they will be reddish on top and white on the underside. As they age, the red will fade to a duller olive shade and the underside will become yellowish. They can grow to a maximum carapace width of approximately 15cm, with the males growing twice as large as females. Due to this size difference, females are not commercially harvested.

Female snow crab can produce 16,000 to 160,000 eggs (the larger the female, the more eggs she will produce) in the spring, which are brooded for up to two years depending on ambient temperatures and food availability. The eggs hatch into larvae (Figure 1) from late spring to early summer. The larvae are pelagic (living in the open ocean) and feed on plankton for the first three to five months. While in the larvae stage they resemble tiny shrimp and will undergo several moults before settling on the ocean floor in late autumn as megalops. In the megalop (instar) stage they look like small crabs with long tails and will moult twice a year before metamorphosing into the first crab stage (instar 5). After they reach instar 5, the snow crab will moult once a year until they reach terminal moult, which occurs somewhere between instars 9 and 14 for males, and 9 and 11 for females. Once they reach terminal moult, they can live for up to six more years, meaning the female can reproduce two or more times depending on environmental conditions. Snow crab can become sexually mature by instar 9. Females begin to moult to maturity at approximately 55mm carapace width and mate between winter and spring while the carapace is still soft.

Atlantic snow crab on boat floor. Image under licence from Shutterstock, ID1302580729

Between moults, crabs build more organic tissue and prepare a new shell under the old one. Once the process is complete and conditions are suitable, the body shell splits at the back and the crab moults by slowly backing out of the old shell. Large crabs can take up to 10 hours to emerge. Immediately after moulting, the now soft crab takes up water and swells to its new size in a few hours. The soft shell gradually hardens and more muscles and other tissues grow inside replacing the water that was absorbed at moulting. Depending on water temperature and food availability, it can take two or more months for large mature crabs to lose their soft-shell condition.

The Atlantic snow crab fishery began in Eastern Canada in 1960 with incidental bycatch of snow crab in groundfish draggers near Gaspe, QC. It did not expand into its own targeted fishery until the late 1970s. In the 1980s it expanded again to become one of the largest fisheries in Canada in terms of landings and value. Fishing seasons have evolved for economic, safety, and conservation considerations, which include severe weather conditions, catch of soft-shell crab, disruption of mating periods, and overlap with other fisheries, namely lobster. The fishing season is variable, so in some fishing areas fishing occurs in spring and summer, while it can go until November in other fishing areas. Over the years the spatial distribution of total landings has shifted from being mostly inshore, to being mostly offshore. The annual harvest of snow crab is managed on the basis of Total Allowable Catch (TAC) that are established through the development of an

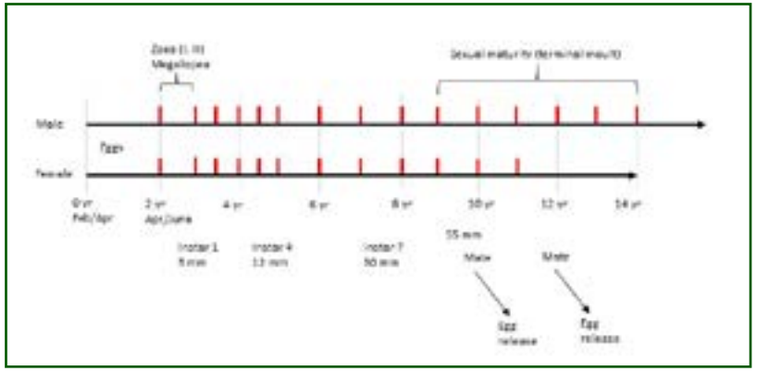


Figure 1: Life cycle of Atlantic snow crab. Figure taken from Eastern Nova Scotia Atlantic snow crab website.

North Atlantic right whale and calf. (c) Unknown author, licensed under CC BY-ND.

Integrated Fisheries Management Plan (IFMP) for each of the four management regions. Under these plans, licence holders are allocated a specific tonnage of crab and a maximum number of traps during the season within a specific Crab Fishing Area (CFA). Only male crabs that meet or exceed the minimum legal size of 95mm carapace width (CW) are harvested. A minimum mesh size of 13.5cm is required to allow females and small crabs to escape. If a female or snow crab smaller than the legal size is caught, they must be returned to the ocean alive. Within the larger CFA, grids are used to assess the incidence of soft-shelled, or recently moulted, crabs. If a high proportion of soft-shelled crabs are caught, the fishery will close for the remainder of the season in that particular grid. Closure thresholds differ by management area, but generally when 20% of the catch in the grid is comprised of soft-shelled crabs, that grid is closed. Harvesters have also requested voluntary management measures that have been introduced in some areas, including shortened fishing season and reduced number of traps.

Sizes of snow crab stocks are naturally variable, and largely affected by ocean climate variation (most notably water temperature), therefore, regardless of fishing activity, crab populations have periods of higher and lower abundance. Snow crab stock assessments are conducted on a regular basis through the Canadian Science Advisory Secretariat (CSAS), which is a peer reviewed process that includes internal and external experts, Aboriginal organizations, harvesters, and ENGOs.

Recently, the Atlantic snow crab (and American lobster) industry have been in the spotlight in relation to the North Atlantic right whale (Eubalaena glacialis) due to entanglements in the buoy line (vertical line in the water column) of the pots or traps. Due to these instances of entanglement of this extremely endangered species (population of 340 with only 72 breeding females), new management measures have been put in place for the snow crab and lobster fisheries, including gear marking and low breaking-strength rope. Gear markings are used to identify the country and fishing area of gear recovered from an entangled whale, while low breaking-strength rope are designed to break at 1,700 pounds of force, hypothetically making it easier for entangled whales to free themselves, thus reducing the risk of serious injury or death. These entanglements have also pushed the emergence and trialing of on-demand (ropeless) gear. Previous Mawqatmuti'kw issues contain more in-depth articles detailing these management measure changes and new gear.

The effects of climate change on Atlantic snow crab stocks are currently unknown. In Alaska, climate change and ocean warming is suspected to have caused the death of 11 billion snow crab causing the cancellation of the Alaskan snow crab 2022-23 and 2023-24 seasons with uncertainty moving forward. Atlantic snow crab also rely on colder temperatures and, it is likely, with the warming ocean temperatures that Atlantic snow crab stocks will decline or migrate north to colder water.

Story Credit: by Kathryn Townsend, Maritime Aboriginal Peoples Council

Illustration by Anna Nibby-Woods

MARINE CONSERVATION PROJECT UPDATE

by Bryan Martin

As many are all too well aware, our ocean is under ever increasing pressures: from climate change to pollution to destructive practices. With the intent to curb the destructive practices and in and attempt to help mitigate the effects of climate change, Canada has joined international efforts to protect 30% of our ocean by the year 2030. This protection would be afforded by setting aside areas in the ocean where oil & gas exploration and exploitation are not permitted, where dumping of harmful substances is restricted, and where certain fishing practices are excluded. Terminology may vary, but the new minimum standards revolve around conservation and protection of the marine environment.

This is also where things start to get tricky between conservation and harvesting. Sadly, with climate change, pollution, a changing economy (e.g., cost of fuel, increasing wages), and other factors, access to fisheries is becoming more and more challenging, particularly as we begin to see a shift in species ranges. Animals we may have consistently found in a particular place and a particular time may be showing up where we had never seen them before or at unexpected times of the year. These changes occur when environmental conditions change, such as temperature, salinity, or nutrients, meaning that the organisms must shift where they reside or feed. Take as an example snow crab and even lobster whose ranges have been shifting north for years due to warming bottom waters. Having species ranges shifting in or out of areas of marine protection can be incredibly devastating to fishing communities, including our partner councils' own Communal Commercial Fishing entities. These Communal Commercial Fishing entities can provide funding for services that benefit the community while offering well paid employment to members of the community, particularly those in rural fishing communities.

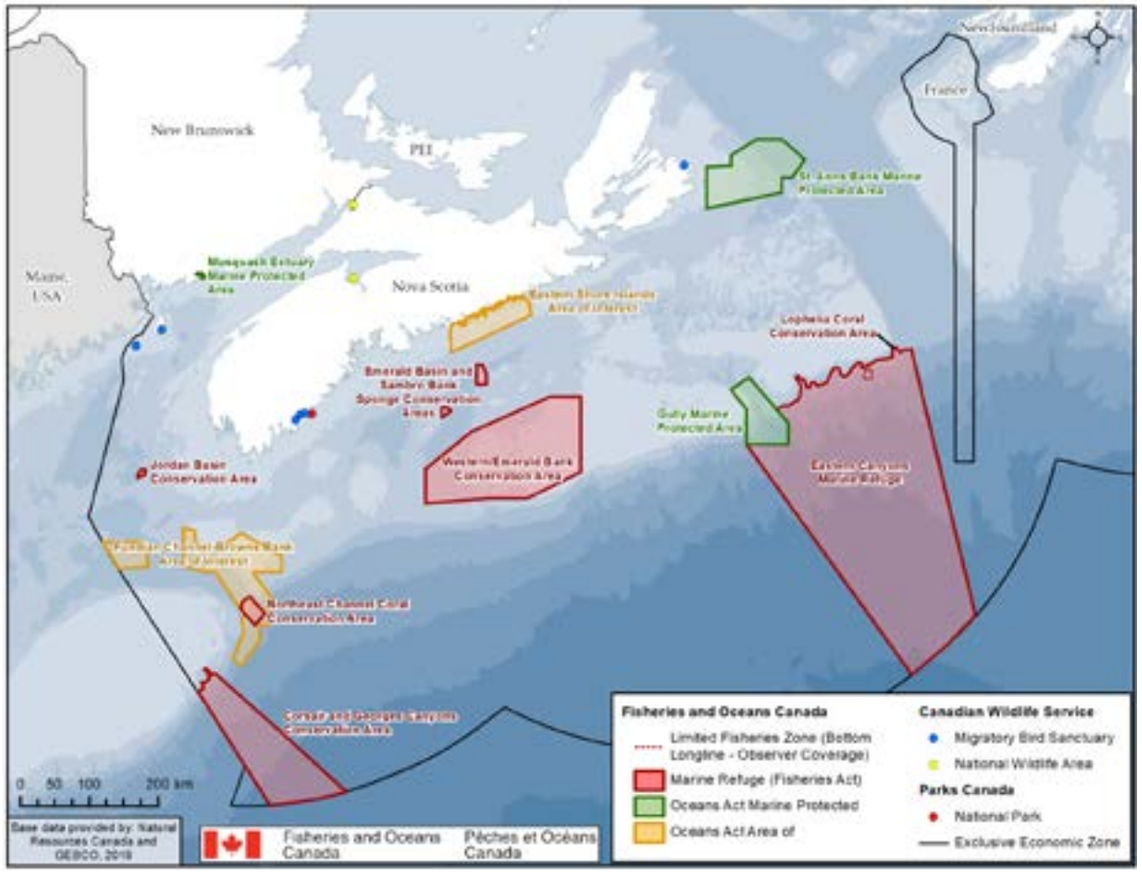
This is where the Marine Conservation project comes in: to assist and facilitate the conversations between the community, the fisheries managers, and the regulators, and to ensure that the voice of the off-reserve Indigenous community is present at negotiating tables. To ensure that we can protect necessary habitats while minimizing the socio-economic impact on communities.

Based on the differing types of conservation areas, whether Federal, Provincial, or private, marine conservation areas may have different impacts on Rightsholders. Similarly, federal conservation areas are put in place through different legislation which will affect the activities and extraction that can take place within their boundaries in different ways. Some are put in place to preserve cultural practices while others are set aside for biodiversity, while others still are to protect a particular species or habitat. One of the benefits of federal protected areas, at least those administered under the Department of Fisheries and Oceans, is that all Oceans Act Marine Protected Areas (MPAs) will have advisory committees made up of Rightsholders, stakeholders, academia, and relevant not-for-profit organisations. Decisions on activities related to these MPAs go through the relevant advisory committees. Through these committees there are many voices present to effectively steer decision making when changes in the environment occur. A similar system is now being set up for Marine Refuges in the Maritimes Region, which are administered under the Fisheries Act of the Department of Fisheries and Oceans. Although Marine Refuges are not new in Canada, they have recently been recognized as 'Other Effective Conservation Measures', or OECM's for short. These OECMs, for the most part, can now contribute towards Canada's goals of protecting 30% of the ocean by the year 2030. They are however not exclusionary, rather they function as variation orders under licence conditions. With regards to other marine conservation areas in the Maritimes, Environment and Climate Change Canada is currently scoping areas for marine National Wildlife Areas, while Parks Canada is scoping areas that could become National Marine Conservation Areas, both having differing outcomes and impacts on Rightsholders and stakeholders. Both of the latter are involving Indigenous communities from the beginning. Parks Canada in particular is mandated to protect areas for cultural importance, which is one of the reasons that many communities work with Parks Canada to establish and co-manage Indigenous Protected and Conserved Areas (IPCA). Parks Canada has been adamant that the "I" in IPCA comes first. These by definition are initiated and led by Indigenous communities, Nations, or organizations.

Although there is much abuzz with reaching 30% protection in the next 7 years, currently, much of the marine conservation discussions are revolving around the Fundian Channel – Browns Bank area of interest. This area, which lies off of the Southwest coast of Nova Scotia, is proposed to become a Marine Protected Area under the Oceans Act. This particular area (now split into multiple smaller areas) was chosen for its high biodiversity, presence of sensitive benthic organisms such as deep-water corals and sponges, important feeding areas for multiple species of whales and seabirds, and may be considered a thermal refuge with regards to a changing climate. It currently incorporates the infamous Hell Hole closure, the Northeast Channel Coral Conservation Area, and part of the Lobster Fishing Area (LFA) 40 that has been closed to lobster fishing since 1979. Therefore, these existing "refuges" have already restricted usage to a degree. Within the current plan, most of the fisheries that previously had access to the area of interest have been zoned-in, meaning they can continue to fish. The exception is mobile bottom contacting gear which is prohibited under the minimum standards. These include any type of gear that drag along or near the bottom such as trawls and dredges. There is a contentious no-take zone as part of the proposal; however, negotiations have attempted to minimize the impact to the extent possible.

To many peoples' continued chagrin, the Eastern Shore Islands is still considered an area of interest for an MPA and the conversation around protection is predicted to be reopened in the coming year or so. It is still to be determined whether or not opinions on the future listing of an MPA have changed based on the prospects of potential future development of offshore wind energy in the area.

Similarly, Environment and Climate Change Canada is currently undertaking a large project that is



Marine Conservation Areas in the DFO Maritimes Region. Image Credit: DFO

engaging Indigenous groups, industry, governments, and environmental not-for-profit organisations through 'Inner Bay of Fundy Conservation Planning' workshops (currently on workshop number 33!). These workshops are looking to determine what threats may exist for key species and landscapes with an overall goal of determining how best to protect and conserve them while minimizing socio-economic impacts. These planning workshops and conversations may eventually lead to a marine National Wildlife Area designation however, it is still too early in the process to determine if, or what that could look like and how much of the Inner Bay of Fundy it would encompass (certainly not all of it). The planning process is discussing ways to protect or restore a variety of habitats including but not limited to saltmarshes, rivers & estuaries, shorelines (rocky and other), mudflats, islands, as well as parts of the benthos and water column.

To date, I have only mentioned "area-based" conservation measures, which essentially entails drawing a box on a map and having somebody, usually a federal department or a partnership, regulate what happens inside that "box"; however, conservation can be more than just lines on a map. Conservation can also include working with a wide variety of partners to understand how we must proceed in order to protect the endangered North Atlantic right whale while having the minimum impact possible on communities, all the while ensuring that our great-grand-children have the opportunity to see whales swimming in the sea. MAPC-MAARS has been working on this particular endeavour by facilitating conversations between partner groups – including our own fisheries managers, and keeping up to date on proposed regulations. MAPC-MAARS has had the opportunity to be on the cutting edge of evolving whale-safe gear development and have been able to facilitate gear trials for "ropeless" and on-demand fishing gear. These gear types, although not intended to be used at all times, could be used in the event that whale-caused closures reoccur and fully prohibit access to fishing grounds using traditional methods. If approved, these novel gear types would permit fishers to continue fishing in areas closed to traditional gear types. We are still waiting on certain solutions and federal direction on these initiatives.

Although unrelated to conservation, we are keeping a keen eye on the upcoming offshore wind projects and Regional Assessment for offshore wind energy development. Though these are not conservation areas per se, they have the potential to impact fishers in a similar way. While offshore wind energy has been around for decades in Europe and parts of Scandinavia, it is still relatively new to North America. With rising energy costs and demands, climate targets, and plans for net-zero, our American neighbours to the south are rapidly increasing the number of offshore turbines along their coasts. In 2022, Nova Scotia indicated that the province was setting a goal of offering leases for 5 Gigawatts (GW) of offshore energy by 2030 in order to boost the economy, decarbonize our electricity grid, and to achieve objectives with respect to combating climate change. To put that into perspective, the provincial roadmap indicated that 1 GW of offshore wind can power up to 750,000 homes, meaning that 5 GW could power up to 3.7 million homes. Given that the provincial statistics indicate that the population of Nova Scotia was just over 1 million in April 2023, a goal of 5 GW means that there would be lots of energy to sell abroad (i.e., routes to market) or to transform into 'green' hydrogen to be used as low carbon fuels (another topic for another article!). The question of what 5 GW worth of wind turbines may look like on the water still remains, whether they are spread out across the province in small pockets or clumped together in one area estimated to be approximately the size of the Gully MPA. These could be located as far off as Sable Island Bank or within our enclosed bays, floating and tethered or pounded into the bottom sediment. At the moment, there is still uncertainty of how these potential wind turbine areas would affect both nearshore and offshore fisheries. MAPC-MAARS is closely following these developments and will be reaching out to the community through the Native Councils once more information regarding the Regional Assessment is available.

An example of offshore wind energy from the Northern Thames Estuary. (c) Ashley Dace, licensed under CC BY-SA

Lastly, even after years of working with the Councils, one of my passions still lies in ocean literacy, which is how I approach all the aforementioned projects. I see it as helping the community understand the science around the ocean in order to help us make sound decisions that benefit the ocean and the environment without undue harm to the community. These are not my decisions to make, I can only help ensure that our community is fully briefed on the subject at hand. Although MAPC's podcast series has slowed down due to other projects taking precedence, there are still plans to discuss these and other topics in the future. Anyone with questions or concerns on any of the topics discussed in this article can contact MAPC-MAARS for more information.

Story Credit: by Bryan Martin, Maritime Aboriginal Peoples Council

SUPPORTING COMMERCIAL FISHING SAFETY SYSTEMS through EMSA

by BARRY MARSMAN

The Enhanced Maritime Situational Awareness (EMSA) program and system, through its funding and core functionality pillars, continues to enhance and support the effectiveness of the maritime safety management systems of our partners' Aboriginal communal commercial fisheries entities, by complimenting organizational oversight efforts and external due diligence activities.

The key elements of the maritime safety management systems that are enhanced through EMSA participation include, but are not limited to:

1. Emergency preparedness and response
2. Records and statistical management
3. Investigations
4. Onboard inspections
5. Training and communication
6. Policy and regulatory compliance/due diligence
7. Oversight

EMSA continues to be a segue tool for the dissemination of important safety information that supports our due diligence efforts and building key relationships, while supporting Transport Canada's mandate regarding maritime safety education, and awareness. EMSA participation further supports our operational efforts in protecting our most important assets being our people, property, equipment and environment.

For example, the EMSA system sub-fleet management tool has provided our communal commercial fisheries entities important functionalities to enhance oversight of vessel fleets.

As you can see in the below image, EMSA supports informed decision-making in near real-time for any given vessel. Core funding further supports dedicated maritime safety

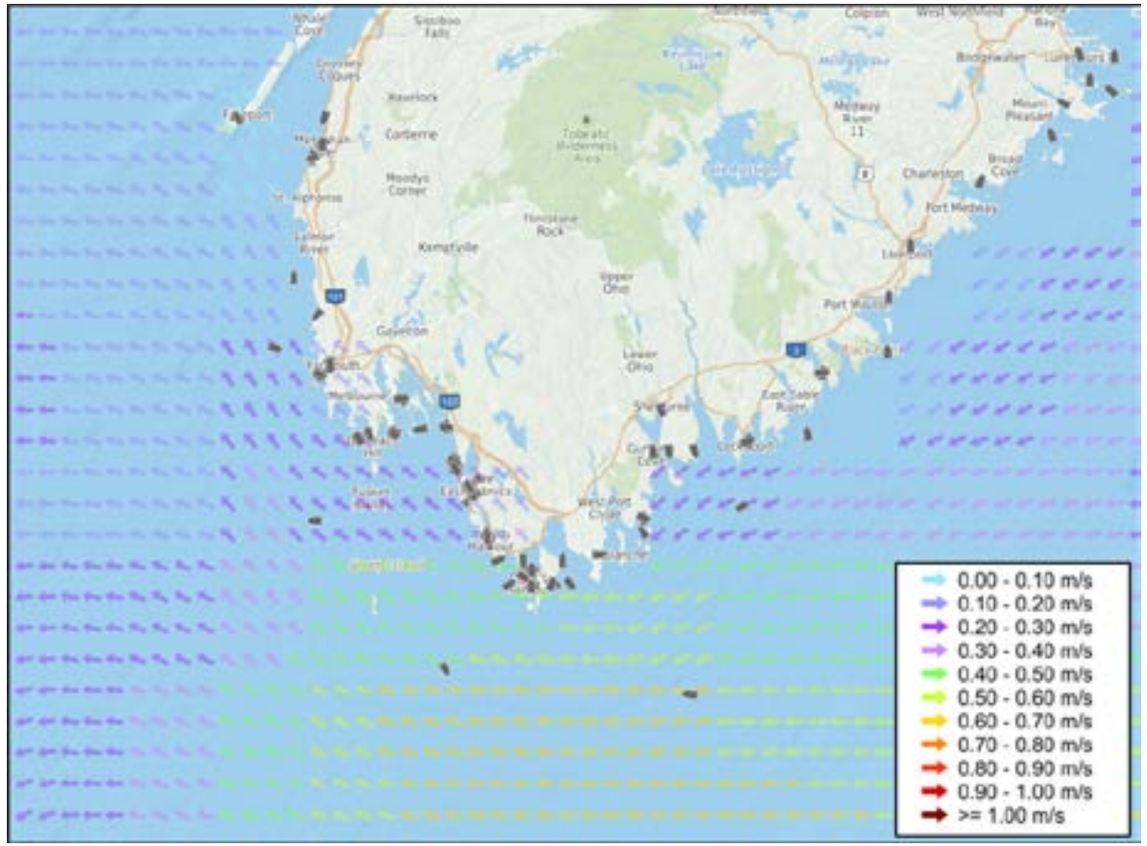


Figure 1. Fishing vessels (grey) in/near southwest Nova Scotia. Coloured arrows describe ocean currents in both speed and direction with the lowest speed in light blue and highest in dark red.

training, as well as continuing to hone the technological skills for the effective use of the EMSA system.

Through continued participation, we continue to nurture critical relationships with key Government Departments, both Federally and Provincially, with maritime safety mandates, such as Transport Canada, Fisheries and Oceans Canada, the Canadian Coast Guard, Transportation Safety Board and Provincial Departments of Labour (NS,NB,PEI)

Funding support from EMSA, as well as from Transport Canada's Community Participation Funding Program (CPFP), has enabled the Maritime Aboriginal Peoples Council (MAPC) to hold in-person sessions dedicated to maritime safety education and awareness.

We continue to organize these critically important safety engagement sessions with all three of the Aboriginal Communal Commercial Fisheries entities: L'nu Fisheries; Mime'j Seafoods; and Aboriginal Seafood Network.

Past sessions were held in partnership with Transport Canada, Fisheries and Oceans Canada, the Transportation Safety Board, and the respective Provincial Labour Departments.

Safety engagement sessions are critically important and must be ongoing in order to

Figure 2. Safety training to ensure that everyone knows how to use the critical life-saving equipment on board the vessel. Top left: Donning immersion suits. Bottom right: Inflating a life raft. Centre: Group photo with PFDs and immersion suits.

achieve an adequate level of proficiency and understanding when it comes to evolving regulations the use and care of key life saving appliances/equipment, and vessel emergency response procedures.

Maritime safety is continuously evolving, as such, our attitudes towards safety management must evolve as well. Fishing vessels are considered a place of work under the respective Occupational Health and Safety Acts of Nova Scotia, New Brunswick, and Prince Edward Island.

We must remain mindful that fishing vessels, are dynamically-situated with seasons, within multiple bodies of water throughout the Maritimes. The inherent risk of working at sea compounded by various external weather conditions presents a host of hazards and risks daily that must be identified, eliminated, controlled, and/or mitigated.

It is without question, that EMSA participation has contributed to a safer more informed work environment for our most valuable asset being our people, while enhancing our organizational efforts in demonstrating due-diligence.

Why does due diligence have special significance?

Due diligence is important as a legal defence for charges under applicable occupational health and safety legislation and the Canada Shipping Act (strict liability offences). If charged, a defendant may be found not guilty if they can prove that due diligence was exercised. In other words, the defendant must be able to prove that all precautions, reasonable under the circumstances, were taken to protect the health and safety of workers. Due diligence is demonstrated by your actions before an event occurs, not after.

The Supreme Court of Canada decision in R. v. Sault Ste. Marie, [1978] 2 SCR 1299 created strict liability offences as a middle ground between mens rea offences and absolute liability offences. Strict liability offences allow the defence of due diligence, where the accused has exercised a reasonable standard of care in protecting against the events which occurred.

CSA 2001

- **254 (1)** No person may be found guilty of an offence under this Act if the person establishes that they exercised due diligence to prevent its commission.

- **Vessels**

(2) No vessel may be found guilty of an offence under this Act if the person who committed the act or omission that constitutes the offence establishes that they exercised due diligence to prevent its commission.

As previously mentioned, MAPC's continued participation in the EMSA program and use of the EMSA platform in a near real-time operational context, enhances the capacity for our partner Councils to adhere to the principles of Safety of Life at Sea (SOLAS) throughout many of the day-to-day facets of managing an Aboriginal Communal Commercial Fishery.

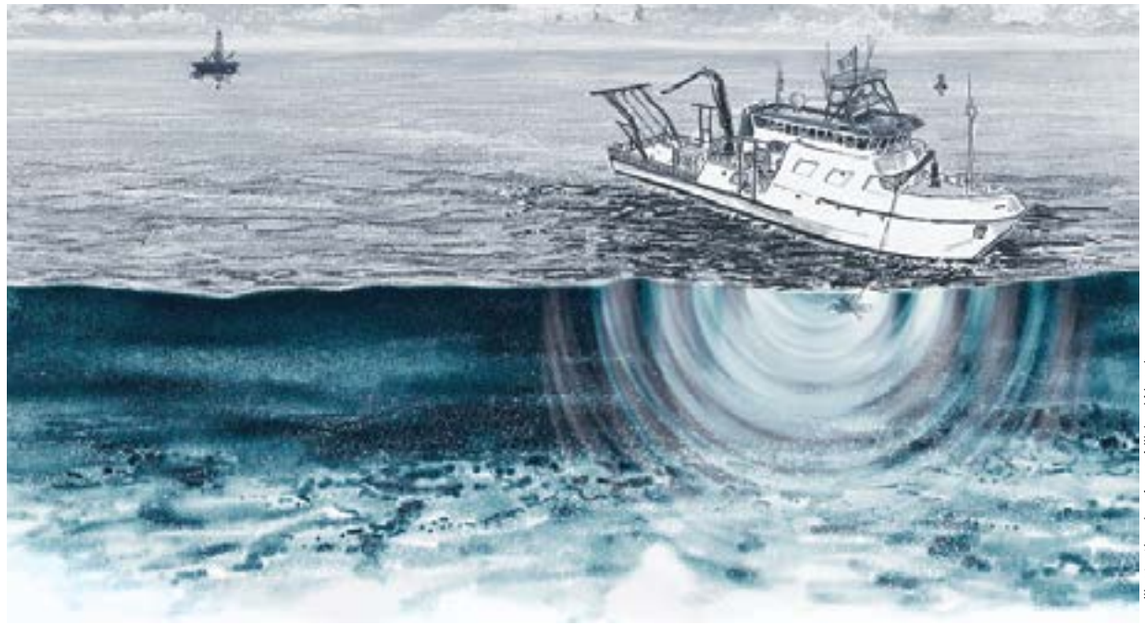


Illustration by Anna Nibby-Woods

Story Credit: by Barry Marsman, Maritime Aboriginal Peoples Council

WIND ENERGY IN NOVA SCOTIA

by CHRISTINA DAVIS

The Province of Nova Scotia has set a goal to reduce the use of greenhouse gas emissions by 53% below 2005 levels by 2030 and to achieve net-zero emissions by 2050. Net-zero emissions refers to the reduction of polluting emissions so that the amount of greenhouse gases going into the atmosphere are balanced by greenhouse gas removals from the atmosphere. Removals can be achieved by minimizing the use of fossil fuels and ensuring that any emissions are offset by removals, such as those absorbed by forests from the atmosphere. As part of the climate change goals in Nova Scotia, one goal is to move the reliance on coal, gas, and electrical imports to renewable energy (Figure 1 and 2). Most recently, a part of achieving this reduction in fossil fuel use, and simultaneously increasing dependence on renewable energy sources, has come from implementing several wind energy projects (wind farms) throughout the province.

Wind energy is electricity captured from wind moving through turbines, spinning a generator inside of the turbine creating electricity. The generated electricity is then adjusted to the right voltage before being transferred to the power grid. Once transferred to the grid it can used for either residential or commercial purposes (Figure 3).

In some cases, the electricity may be used for a specific development. One example of this type of project is the EverWind Green Hydrogen project being completed in Point Tupper on Cape Breton Island. The proponents plan to construct several wind turbines to power the production of green hydrogen. As well, wind energy could potentially be sold privately to consumers, which is currently proposed as part of the Mersey Wind Project being undertaken by Mersey River Wind Inc, in Milton, Nova Scotia.

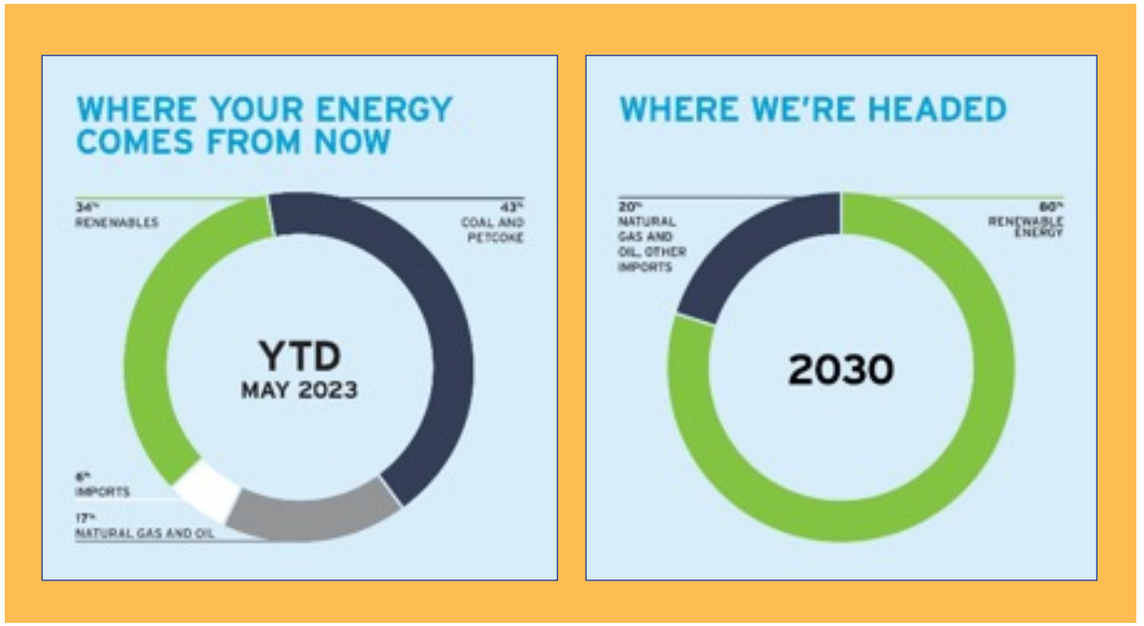


Figure 1: The Year to Date (YTD) energy make-up for the province of Nova Scotia, based on a report published by Nova Scotia Power.

Figure 2: The projected energy make-up for 2030 the province of Nova Scotia, based on a report published by Nova Scotia Power.

Nova Scotia has experienced significant wind development due to its strong coastal winds and some of the highest average wind speeds in Canada, making it an ideal location for wind energy projects. To date, Nova Scotia has more than 300 commercial wind turbines making the province a leader in Canada for wind energy production based on the electricity generation capacity within the province. The graphic below generated by Nova Scotia Power shows some of the wind projects completed throughout the province, including those undertaken by Nova Scotia Power, Independent Power Producers (IPPs), and the Community Feed-In Tariff (COMFIT) Program. The COMFIT Program is offered by the Government of Nova Scotia and enables involvement in the renewable electricity generation space by community organizations such as municipalities, First Nations, Community Economic Development Investment Funds, co-operatives, and non-profit organizations (Figure 4).

While wind energy developments are important to continue to meet energy demands in order to reduce reliance on fossil fuels in Nova Scotia, there are also many impacts to the environment due to these developments that are both large and small in scale. Two of the major habitat impacts seen in NS due to wind developments include habitat fragmentation and watercourse alterations.

Habitat fragmentation refers to what happens when parts of a large, connected habitat are destroyed, leaving behind smaller unconnected areas which can happen when new roads are being constructed through a forested area. This large, previously connected habitat provides important habitat for many species, including Mainland Moose (Alces alces), which require a great deal of continuous, large, connected habitat to live and reproduce. Without proper habitats to forage for food, mate, and calve, the species are not able to complete their life cycle. Given the sensitivity of this species, habitat

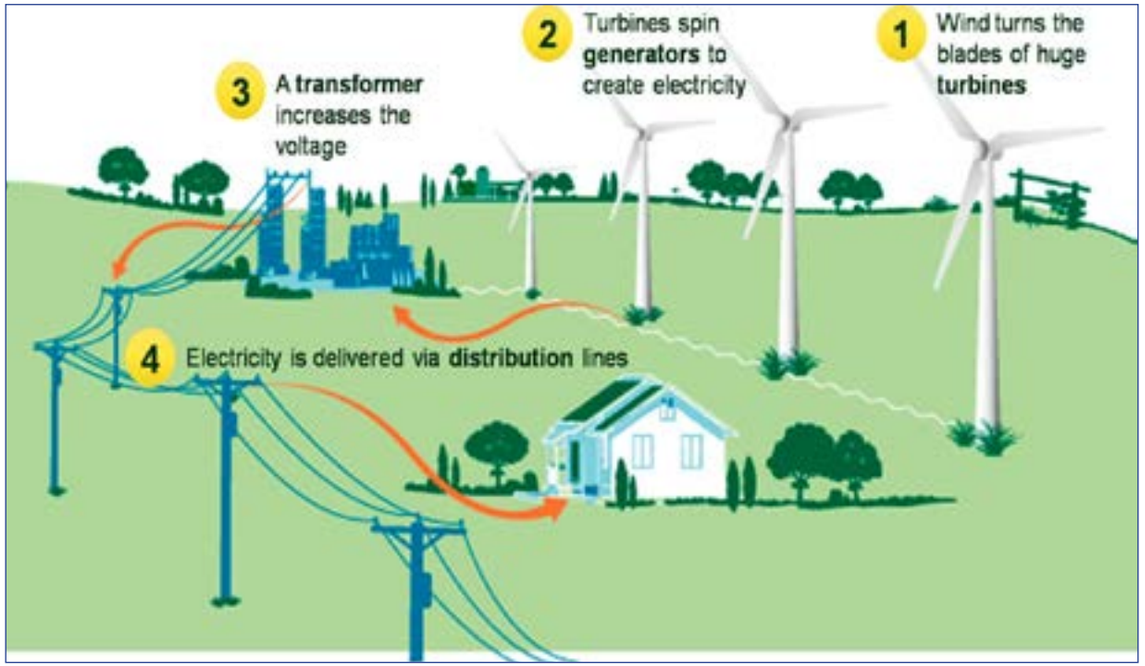


Figure 3: A graphic depiction of how wind energy is generated and transferred to the grid to be used for residential or commercial purposes (Credit: https://sgkplanet.com/en/what-is-a-wind-turbine-and-how-does-it-work/#)

fragmentation from development is considered one of the biggest factors in the decline of the-Mainland Moose population.

As well as habitat fragmentation, wind developments can also have significant impacts on both migratory birds and bats within an area. Birds and bats can also be affected by habitat fragmentation, similarly to Mainland Moose. Some of the other impacts to these species can be from collisions, which is commonly associated with wind turbines, as well as noise interference. According to some studies, bird and bat mortality from wind turbine collisions may be highly underreported due to a few factors. Firstly, the birds may be eaten by other animals – before there is the opportunity to search for any mortalities. Only those birds that are located at the base of the turbine are counted, and therefore there could be some that are missed. There is also the potential for the human error factor when it comes to bird mortality detections. A study completed in 2020 found humans missed about 20% of birds and up to 14% of bats that were able to be detected or located by dogs. This indicates that not only could there be underreporting due to predation, but that the human factor also plays a significant role in the detection of bird and bat mortalities.

One of the other potential impacts of wind developments is watercourse alterations, meaning changes to the water flow or waterway in some way. This can include infilling wetlands, which can have a huge impact on water flows in an area, as well as affect how the water is being filtered in an ecosystem since wetlands are a significant filter for watersheds. Wind power developments can also have impacts on fish passage through the installation of culverts, which can affect how watercourses connect, affecting where fish continue to live and reproduce. For example, if an old spawning area gets taken away or destroyed, the fish will

Figure 4: A map depicting the wind farm projects currently active in the province of Nova Scotia (Credit: https://www.nspower.ca/cleanandgreen/clean-energy/clean-energy-sources)

need to find new areas to spawn. As well, the installation of bridges can introduce sediment and other contaminants to the watercourse, affecting the ecosystem through changes in dissolved oxygen in water, pH (a measure of the acidity of the water), and more. Sedimentation, when sediment gets into the water course, can impact many fish species or suffocate fish eggs and affect the reproduction of that species.

While wind development has been a large portion of the renewable energy focus in Nova Scotia, there may be some question as to why there is limited solar energy development in the province. According to Canada-wide modeling of solar energy potential, Nova Scotia ranks number nine overall behind provinces such as Nunavut, Prince Edward Island, and New Brunswick. Nova Scotia is also well below the Canadian average for solar energy potential of 1133 kilowatt hours per kilowatt per year, at 1090 kilowatt hours per kilowatt per year (Figure 5). Given this information, it is unsurprising that Nova Scotia has had very limited large-scale solar energy development. While there are a few larger-scale solar projects under development currently there are no active large-scale solar

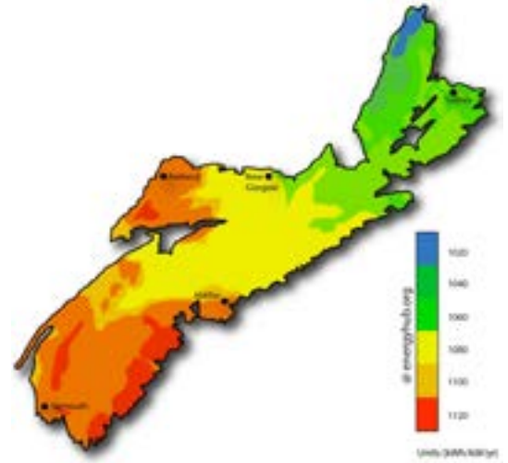


Figure 5: A map depicting the potential solar energy for the province of Nova Scotia (Credit: https://www.energyhub.org/nova-scotia/)

electricity developments.

To work toward the goal of significant emission reductions by 2030, Nova Scotia has seen several wind farm developments built throughout the province. While there are many benefits to the reduction in reliance on fossil fuels, there are also potential negative impacts because of these wind power developments. While not all impacts have been discussed in this article, some crucial impacts have been explained in depth: habitat fragmentation, impacts to birds and bats, and water alterations. It is likely Nova Scotia will continue to see new renewable energy developments as they move toward their 2030 goals, including wind energy developments. We hope that the information here will provide those interested with a brief background on wind energy and the environmental impacts associated with wind turbines and farms so that you can continue to be involved in the discussions on renewable energy in Nova Scotia.

Story Credit: by Christina Davis, Maritime Aboriginal Peoples Council

AT HOME AND ON THE OTHER SIDE OF THE POWER OF WATER

by Leslie Kirkness

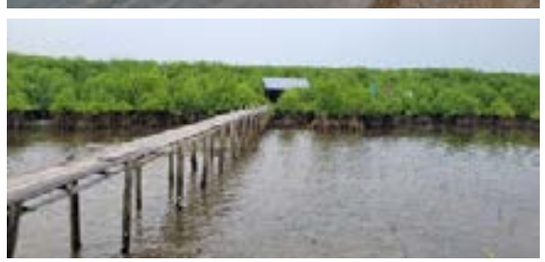
Indigenous peoples in Canada have always had a connection with water and treated water with respect, viewing water as a living entity with its own spirit. Water is the bringer of life and continues to provide gifts to us throughout our lives.

Water is thought to have a woman spirit. Just like human women who are the beings who bring life into our world, water does the same. Women in some North American Indigenous cultures are the protectors of water and are the keepers of water ceremonies. The connection between water and women is strong.

Indigenous peoples in North America have used rivers and lakes as a means for quick and effective travel to conduct trade and meet-ups with other Indigenous groups. Vegetation and marine animals have always been staples in North American Indigenous cuisine as well as the source of traditional medicines that were gleaned and collected both next to and within bodies of water.

There is a common yet widely different approach to water in Cambodia. Having been given the opportunity to live, experience and research in Cambodia, I had gained first-hand experience and knowledge to the approach Cambodian Indigenous peoples have when viewing and dealing with water and the issues that arise when water sovereignty for Indigenous groups is tarnished or ignored.

The Indigenous peoples in Cambodia have their own teachings when it comes to water. They have their own traditions when receiving gifts from water and have seasons when they can glean from the land and water and when not to do so. Just like in Canada, where Turtle Island has a variety of Indigenous peoples who have



1: Indigenous International Interns CambodianTeam, 2: Indigenous youth swimming in the Mekong River, 3: Mangrove farm along river and ocean, 4: Healing spring on top on mountain. Photo Credit Leslie Kirkness

their own cultures and traditions, Cambodian Indigenous peoples 'Khmer Krom' are made up different Indigenous groups, each with their own traditions and cultures.

I was posted in Cambodia along with three other interns as guests of the Cambodian Society for Volunteers (CSV) and Cambodian Indigenous Youth Alliance, through the International Indigenous Youth Internship Program under the auspices of GPI Atlantic and the Atlantic Council for International Cooperation.

We met four different Indigenous groups: the Kroul people, Bunong people, Steang people, and Mhoun people. These Indigenous groups suffer hardships on their own land and within their villages. Water management issues and resource degradation is common, and the negative impacts of hydro electrical development projects have affected Indigenous villages more so than non-Indigenous communities due to the lack of consultation and recognition by companies and government entities. This reality is also true for Canadian Indigenous communities, as well as Indigenous nations around the world.

The lack of recognition from the government and non-Indigenous groups is an issue that halts the Indigenous groups in Cambodia from self-determination and sustainability. The Indigenous peoples in Cambodia have difficulty in trying to voice their concerns and deal with environmental and intersectional issues that stem from the land and water. There is only so much capacity building that can take place, when there is a lack of concern or interest from the Government and non-Indigenous groups.

The Indigenous peoples in Cambodia continue to lose traditions and cultural teachings due to the on-going development projects situated along the Mekong River. Hydro electrical dams that are being built along the Mekong not only in Cambodia but in other countries the Mekong passes through prior to Cambodia are causing unpredictable water levels, and disasters for the Indigenous peoples.

Before the development and implementation of hydro electrical dams within the Mekong River, the Indigenous peoples had a connection with the land, and water. Traditional knowledge was passed through from one generation to another regarding monitoring the water levels, when and when not to glean from the riverbanks, when you can swim and when you can't and even when was the best time to fish. These days the water levels are unpredictable and can cause serious problems to the surrounding land. The Indigenous peoples are losing native plant species and are noticing the change in the grade of fish. It was noted during our community meetings with these Indigenous groups that illness runs more rampant among the villages now, that has not ever been seen in the past. The people are experiencing more illnesses and the capacity to treat these illnesses is expensive and at times unobtainable within the vicinity of their settlements. As a result of the rise in water pollution and the lack of sanitation materials, Indigenous peoples are faced with increased hardship when dealing with health concerns, or even day-to-day activities.

Issues of food sovereignty continue to arise, as the quality of fish that is caught in the Mekong has decreased. It was stated by some youth and elders that the fish that is caught tastes different, and not for the better. The size of the fish has decreased and there is a concern that the fish are no longer able to properly migrate to traditional breeding grounds which is a concern as fish is a staple dish commonly served within the villages and is a means to make money by selling at the market.

The Indigenous peoples in Cambodia are experiencing hardships in trying to be self-sufficient. The lack of education for youth is a hurdle many face and there is a common tendency for young people to remove themselves from school to help provide for the family and village. This leads to trend of not being able to secure employment. The lack of education makes it harder for community members to advocate for Indigenous villages. As the Mekong River is drastically changing, the need for younger family members to help within the family is increasing. There is less fish than before, droughts are causing farming issues and the cost of living is increasing.

Due to the lack of engagement and/or consultation with the Indigenous communities, Indigenous peoples are not involved in the water management system which is further contributing to the degradation of water. Monsoon season brings severe flooding to Indigenous communities when the hydroelectric dams cannot handle the swift influx of water. Given that there is a lack of an emergency management system and external response efforts are rarely adequate or timely, Indigenous communities can become quickly overwhelmed.

The Indigenous groups in Cambodia continue to voice their concerns on environmental issues and resource management. We had the opportunity to attend a community celebration where four Indigenous groups meet up once a year to discuss their concerns and issues. The Indigenous groups have come together in a coalition to bring these issues forward to the government and various partners associated with environmental and resource management projects. Slowly these issues are being reviewed and brought to the table in order to find some type of resolution. However, further capacity building and more recognition from government is needed to help create sustainable and self-sufficient Indigenous communities.

Although there have been positive strides forward in address Indigenous issues and sovereignty, the Cambodian Government and international stakeholders have the responsibility to ensure appropriate measures are being taken when approaching development work and incorporating consultation with Indigenous peoples into the process. Indigenous peoples tend to be disregarded and this speaks to all Indigenous peoples around the globe. Indigenous peoples, particularly in this area, typically lean toward strengthening positive environmental management, but there is a tendency to place higher value on economic development, even when it is environmentally-destructive. The lack of Indigenous inclusion muzzles the voice for the environment.

Having spent some time in Cambodia and having the privilege to be raised in Canada as well as being an Indigenous Cree man, I have a more in-depth understanding on how water is the key to providing an amazing and bountiful life. Having the opportunity to speak with the Indigenous peoples in Cambodia has been a privilege that I will not ever forget. Now I see the similarities of the on-going issues the Cambodian and Canadian Indigenous peoples face and the lack of capacity when championing for water, land, and overall environmental sovereignty.

When the time comes, when the land is dry, the air is contaminated and the water is poisoned, governments will turn to Indigenous peoples for guidance. My fear is that by the time government entities acknowledge the mishandling of environmental management, the land, air, and water may be far too gone for immediate healing. Indigenous peoples have been and continue to be the stewards of land, air, and water. Governing officials have the opportunity and duty to learn from Indigenous peoples but first they need to make the first step in tackling Indigenous issues and work in partnership with Indigenous peoples. Economic development is important to keep a country afloat, however, economic development will not succeed if we have a sick mother earth.

Water is strength, powerful or calm. It is patient, healing, and nourishing. Water is flexible, spiritual, and immortal. Water is the basis for life today. Only time will tell if we as a species take the appropriate measures to ensure that future generations have a healthy planet to live on. Our leaders must lead our nations into a healthy future, and not allow money to lead the decisions that will affect our future.

Manito Mikisew Ininew/Leslie Kirkness
ACIC/GPI Atlantic International Intern

Story Credit: by Manito Mikisew Ininew/Leslie Kirkness, ACIC/GPI Atlantic International Intern

A COMPELLING REASON

When I was a kid, I remember singing the song "You've got the whole world in your hands…" (sometimes "he's got the whole world in his hands"). And, because it's a bit of an ear worm, you also probably now have it in your head. I found this little nursery washed up on a Nova Scotia beach in the winter and it reminded me of how fragile life can be. At the bottom of the sea, this kelp holdfast (the place where organisms like kelp and seaweed attach to the bottom) is full of life. You can see the tiny eggs that have begun to "eye out". I have no idea what species this is; although, I would guess some sort of sea snail – I held this delicate little world in my hand for a moment before setting it back in the ocean. Obviously, it was no longer anchored and I have no idea of the circumstances of its arrival on shore, so it's impossible to know if the eggs were still viable, and, if they were, if they would survive. In that moment, I chose to release them back to the sea in the hopes that they would survive. Small choices can hold immense power.

Vanessa Mitchell

It is in your hands to create a better world for all who live in it
- Nelson Mandela

Noel Knockwood, (1932-2014) BA, Elder, Veteran, Canadian First Nations Leader and Mi'kmaq Grand Council Kaptin and spiritual leader of the Mi'kmaq People.

THE ABORIGINAL PERSPECTIVE

The purpose of this article is to familiarize the reader on the Mi'kmaq aboriginal perspective on Mother Earth and her relationship to humankind. We present our case from our language, culture, and Spirituality, and from this point of view we make our presentation. As the decedents of our aboriginal Mi'kmaq forefathers, we speak for ourselves. We do not want others to speak for us and we will not make accommodations for or deals with the polluters.

We want to educate others from our aboriginal perspective, and to understand the natural law as it is given from the God of our understanding. As we unfold our reasons to you, we reaffirm our beliefs, and that we recognize sound environmental lifestyles and economic livelihoods. We also commit to influence all politics that affect our people on our land. We want Elders and youth involvement. We will protect our rights to practice our spiritual beliefs.

Since Mi'kmaq land claims have not been settled, we could secure a legal injunction (stop) until our claims are resolved.

As Chief Seattle said in his spec in 1888, "…Earth does not belong to man, man belongs to Mother Earth, and what he does to Mother Earth, he does to himself…contaminate your bed, and you will one night suffocate in your waste… but perhaps it is because I am a savage and do not understand."

Europeans could not understand our ways. This is Eurocentrism that many people of today believe, is that everything began in Europe, and we that must all conform to that culture. For over five hundred years, they have failed to make us as they are (European Caucasian) totally. Many of us today follow the Canadian Charter of Right and Freedoms. Section (2) Freedom of Conscience and Religion, which states, "Within the Charter, we are guaranteed the right to worship or not as we wish in a manner, place and time of our choice." We take this legal path to protect our beliefs.

The essence of native traditional spirituality as practiced by Mi'kmaq men, women and children is deeply rooted and flows from the body of Mother Earth. Aboriginal sovereignty is based on the natural law of the Creator and is inherent to all citizens of the First Nations on Turtle Island (North America) and is inseparable from aboriginal spirituality.

The knowledge, intelligence and wisdom of traditional aboriginal spirituality is carried within the hearts and minds of the Elders (Spiritual Leaders) of the Mi'kmaq First Nations and the Metis. This knowledge is passed on from generation to generation through the traditional oral process of story telling and teachings about the truths and realities of many thousands of life experiences.

The Creator gave us sovereignty of the land on which we were placed. The Creator gave us our Mi'kmaq language and Sacred Teachings to live in harmony with nature and humankind. We exercise our rights and responsibilities to govern ourselves, and that no other nation can take this right from us as it is inherent. It is from this holistic worldview that we present our case in our Mi'kmaq philosophical perspective to the land and our culture.

For over four hundred years, the Canadian Government has systematically attempted to assimilate the aboriginal peoples into the non-native society and they have failed. The process incorporated was to deny the native people of their political, cultural, economic, social and spiritual ways. Simply put; the ethnic cleansing denied native people of their right and it continues today.

In reference to our environment, our ancestors occupied all of the land, which is known today as Nova Scotia, Prince Edward Island, most of New Brunswick, parts of the Gaspé in Québec, Newfoundland and Maine. The Mi'kmaq owned and controlled over 77 million square acres of land and all of its resources. We have right to this land through thousands of years of occupation. No other can make that claim other than the Mi'kmaq. In the Treaty of 1752 not one inch of land was purchased, ceded, surrounded, or taken away. We lost our land through sheer use and occupation.

A traditional Indian is a person of aboriginal status who placed Christianity to one side and follows the aboriginal philosophy. He is a person who participates in the holy rituals and sacred ceremonies. This consists of the sacred peace pipe ceremony, sweet grass ritual and the purification ritual of the sweat lodge. Some natives follow both Christianity and traditional beliefs.

The term traditional elder is applied to people who possess the knowledge, intelligence and wisdom of our aboriginal philosophies. They know the history of our people through oral traditions and many of them are familiar with oral genealogy. These elders speak the language, perform the ceremonies and are able to respond to the non-Christian spiritual needs of their people. The rituals mentioned are not Christian prayers, because our forefathers did not pray that way. In 1610 at Port Royal the first Mi'kmaq Grand Chief was baptized into a foreign faith known as Christianity. He was given the name Henry after King Henry. From that time onward the aboriginal people accepted Christianity.

To pollute Mother Earth is sacrilegious to the Mi'kmaq people because we believe that everything on Mother Earth is holy and sacred. Therefore, we need to develop a policy on environmental justice. In ancient times prior to the arrival of the Europeans, our ancestors were good housekeepers. They used all parts of the animals they killed to sustain their lives. Nothing was wasted; even the hooves of animals were used as sacred rattlers.

If toxic waste is dumped on Indian Reservation Land it will not grab attention or make headlines on the national scale as nuclear waste or oil drilling does. In most cases small companies will do the dumping and Indian reservations will be their targets. Toxic waste produces leachate and come from landfills. This requires constant monitoring.

Did you know that conventional incineration technology will not totally destroy municipal solid waste. The current technology does not destroy all organics in gases like dioxins and furans and through run-offs known as leachate, and will continue to contaminate the soil and water that we all rely on. The storage and disposal of toxic chemical waste has been the major impetus in environmental racism. Since many of these wastes and by-products will be placed on Indian reservations known as solid waste management sites, we cannot make deals with the polluters without financial compensation.

We require good human energy to develop a policy on environmental justice. The Waste Management Industry has grown in recent years. These companies have traveled far and wide in order to find cheap dump sites. Eel Ground First Nation Reserve is now on the list to have their sacred land polluted with commercial, industrial, toxic, and human waste.

We need to popularize a new angle on Native Sovereignty and the Mi'kmaq Nation does not need anyone's permission to make that declaration. There are two kinds of sovereignty known as 'political' and 'true'. No one can give us self-government; we need to do it ourselves. The Mi'kmaq are not seeking special rights, we want equal international Mi'kmaq rights on our own homelands. To stop pollution, we want to enforce Mi'kmaq law on Mi'kmaq land, or to use the laws that are already in place.

Large corporations, bureaucrats, governments, and the general population take a hostile view on Native sovereignty when it blocks their projects. In other cases, they use sovereignty as a loophole to get around provincial, municipal or federal legislation to dump waste on Native lands.

If we as Native people are part of the problem then we are also part of the solution. Our responsibility is to guarantee our people that we will negotiate a deal where there will be no losers. We should be able to compromise a settlement where we to will benefit from this experience. To often in the past we were excluded in the determination of our social, political and economic destinies. All of the above mentioned must be acknowledged with a written guarantee that we as Native people and our land, animals, birds, fish and other living things that we cannot see will not be affected by residual contamination from the solid waste to be buried on our land.

A Mi'kmaq Indian and Canadian Veteran Soldier (Smagnis) Mr. Knockwood grew up on the Shubenacadie Indian Reserve until he was taken from his family home at the age of 9 and placed in the now infamous Shubenacadie Residential School. That's where he remained until his 16th year and a few years later he joined the Canadian Armed Forces and served in Korea. Over the years since his military service Mr. Knockwood has had many personal and professional accomplishments in education, training, activism, culture, human rights, consulting and Mi'kmaq spirituality to mention a few. Noel Knockwood was the first Aboriginal Sergeant-at-Arms for the Nova Scotia Legislature.

Some of Mr. Knockwood's honours and awards are the United Nations Service Korean War and Canadian Voluntary Service Medals; Appointment for life as Spiritual Leader of the Mi'kmaq Nation; Meritorious Award on Human Rights by the Government of Nova Scotia; and recipient of the National Aboriginal Achievement Award.

IKANAWTIKET

environmental respect l'environnement

The objective of IKANAWTIKET Environmental Incorporated is: to promote the preservation of the natural environment by educating and informing the public about environmental issues, biodiversity in the Maritime Provinces, Aboriginal culture, Aboriginal worldview, and traditional knowledge in relation to the environment.

IKANAWTIKET advances education by undertaking research which is made available to the public, providing training and instruction, offering courses, seminars, convening conferences, meetings and developing educational tools related to understanding and respecting the environment.

The charitable work of IKANAWTIKET Environmental Incorporated benefits the community by preserving and protecting the environment through the preservation, protection, and restoration of habitats, and increasing the public's understanding about the environment and its importance to all life.

IKANAWTIKET Environmental Incorporated

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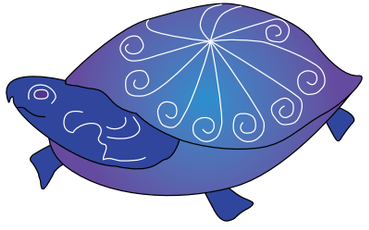
"Is controlling nature worth destroying our environment and our biodiversity, killing our young, and poisoning our food, water, and air?"



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MARINE ANIMAL RESPONSE SOCIETY

Operating throughout the Maritime Provinces since 1999, Marine Animal Response Society (MARS) is a Canadian charitable organization dedicated to marine animal conservation.

Driven by a small team of deeply committed staff and hundreds of passionate volunteers, MARS strives to make positive conservation impacts and inspire people to become stewards of our oceans. Fundamentally, MARS responds to incidents of dead or distressed whales, dolphins, porpoises, seals, sharks and sea turtles. MARS operates a toll-free hotline 365 days a year that offers communities immediate access to expert advice on stranded, dead or distressed marine animals. Often the first experts on scene, MARS is legally authorized by the Government of Canada to assist live animals in distress; retrieve carcasses to investigate health, causes of harm and death; and to ensure the collection of valuable data and samples throughout the region.

However, MARS doesn't just provide expert boots on the ground for marine animal incidents. MARS staff are active participants on leading conservation advisory groups and bodies. MARS conducts research and monitoring, often in collaboration with external partners, to better understand the health of marine animals and the health of the ocean. MARS relays this information to communities through engagement and works to inspire people to make choices that support more vibrant oceans for future generations.
In each area – response, research and engagement – MARS also collaborates with other non-governmental organizations, Indigenous partners, industry and all levels of government to advance science-based conservation goals for marine animals and secure a sustainable future for all Maritimers.

Visit **marineanimals.ca** for more information, reports, or to find out how you can donate or volunteer.