



Photo: Joachim S. Müller



Peju

**Mi'kmaq Ecological Knowledge:
Cod in Unama'ki**

Peju Mi'kmaq Ecological Knowledge: Cod in Unama'ki

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We would like
to dedicate this
publication to
beloved family
members and
Elders of Unama'ki
who have carried
on the traditions
and shared their
knowledge and
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the resource.

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Introduction

Aboriginal Traditional Knowledge (ATK) is a broad description of an integrated package of knowledge that includes the local knowledge of species, environmental practices and management systems, social institutions that provide the rules for management systems, and world views that form the basis for our beliefs. ATK comes from watching and listening, through direct experience of song and ceremonies, through the activities of hunting and daily life, from trees and animals, and in dreams and visions.

Knowledge, values, and identity are passed down to the next generation through practice, ceremonies, legends, dance, or song. ATK, and more specifically Mi'kmaq Ecological Knowledge (MEK), the Mi'kmaq way of life, is derived from centuries of interaction, observation, and adaptation to the natural environment. It is the Mi'kmaq science of survival intertwined with spirituality and culture unique to the people.

The collection and preservation of ATK is becoming more important. Initially used in land negotiations, ATK is increasingly recognized for use in scientific assessments, management plans, and recovery strategies for several species protected through Canadian legislation, known as the Species at Risk Act. Because of the potential use for MEK for culturally important species such as the American eel (katew), and Atlantic salmon (plamu), demand for specific ecological knowledge held by the Mi'kmaq is increasing. While there are protocols in place for the collection of MEK, little documentation has been produced for sharing this knowledge beyond the community's use and culture.

Unama'ki Institute of Natural Resources (UINR) is an organization that represents the five Mi'kmaq communities of Unama'ki (Cape Breton Island, Nova Scotia) on natural resources issues. UINR contributes to an understanding and protection of the Bras d'Or Lakes' ecosystem through research, monitoring, education, management, and by integrating Mi'kmaq and conventional ways of understanding, known as Two-Eyed Seeing.

UINR was identified as the lead organization to collect, interpret, and store MEK for this region.



Mi'kmaq World View

The Mi'kmaq are part of Wabanaki, the Algonquin-speaking confederacy that includes four other Nations; Maliseet, Passamaquoddy, Penobscot, and Abenaki. Mi'kma'ki (land of the Mi'kmaq) includes the five Atlantic provinces and northern Maine.

Mi'kma'ki was held in communal ownership. Land and its resources were not commodities that could be bought and sold but were considered gifts from the Creator. This view is very different from the Western view of land. As Mi'kmaq, we were the caretakers of the seven districts of Mi'kma'ki and we strived to live in harmony. This belief remains strong in our culture today.

We view the world and all that is in it as having spirit. We consider all life equal to our own and treat it with respect. We developed an intimate understanding of the relationships between the living and non-living so that each plant, animal, constellation, full moon, or red sky tells a story that guides our people so they can survive. These beliefs affect the manner in which we treat the natural world for sustenance and survival. Animals and plants are not taken if they are not needed. All spirits are acknowledged and respected as relatives and are offered tobacco, prayer, or ceremony (or combination) when taken. No part of an animal is wasted. All parts that cannot be used are returned to the Creator. This consciousness is described by the Mi'kmaq word, Netukulimk.

The Mi'kmaq right to fish for food, social and ceremonial needs, and for a moderate livelihood, is recognized by the Supreme Court of Canada and protected by the Constitution of Canada.



Bras d'Or Lakes

The Bras d'Or Lakes, situated in the center of Cape Breton Island, Nova Scotia, are a large estuarine body of interconnecting bays, barachois ponds, channels, and islands. The Bras d'Or Lakes formed approximately 10,000 years ago when the existing basin that was carved out of soft sandstone from the last glacial period became flooded by adjacent ocean water.

The term “Lakes” refers to two main components. The North Basin and the Bras d'Or Lake, connected by a 500 m wide opening (Barra Strait), are known collectively as the Bras d'Or Lakes.

The smaller component, the North Basin, branches into two channels that lead to separate small openings to the Atlantic Ocean.

The Great Bras d'Or Channel is 30 km long with an average depth of 19.5 m, average width of 1.3 km and is the source of the majority of saltwater exchange between the Lakes and Sydney Bight (Atlantic Ocean).

St. Andrew's Channel connects to Sydney Bight through a much more restrictive opening known as the Little Bras d'Or Channel. This channel, 8 km in length, less than 100 m wide and approximately 5 m deep, does not contribute significantly to temperature and salinity distributions. At their southern-most point, the Bras d'Or Lakes connect to the Atlantic Ocean at St. Peters, a small, man-made canal that allows only an occasional exchange of water during vessel movements.

The Bras d'Or Lakes has been designated in the World Network of Biosphere Reserves by UNESCO–Man and the Biosphere Programme.



Photo: Hans Hillewaert



The perimeter of the Bras d'Or Lakes measure approximately 1,000 km and have a total area of 1,080 km². Their average depth is 30 m but varies throughout. St. Andrew's Channel, for example, has a maximum depth of 280 m while small bays and coves have average depths of 10 m or less. Tidal range diminishes rapidly from the Great Bras d'Or Channel inward, with tidal ranges between 16 cm near the entrance to 4 cm at Iona. Currents also follow the same pattern but are stronger in the channels and choke points. Salinity and temperature varies by area. Salinity ranges from 30 ppt in the Great Bras d'Or Channel to salinities lower than 18 ppt in semi-enclosed basins, but averages tend to fall around 22 ppt in most of the open regions. Winter temperatures fall to just below 0°C and the coves and ponds freeze over. However, in the past few years, some of these areas did not freeze. Summer temperatures exceed 16°C in July and surface and sub-surface temperatures are even higher (>20°C) in shallow coves, especially in River Denys Basin. Substrata are primarily silt with smaller proportions of sand, gravel, and boulders.

The environmental quality of the Lakes is still considered to be very good. Sewage is the primary source of pollution. Sediments from land are becoming increasingly difficult to control and have the potential to alter important habitats. Organic contamination and heavy metals in sediments, water, and biota are well below the federal sediment and water quality guidelines. The Bras d'Or Lakes has been described as having a relatively low level of natural productivity.

The Bras d'Or Lakes are home to a variety of biota. Warm and cold water fish and invertebrates are present with several fish species, such as mackerel, herring, and salmon migrating to the Lakes annually to spawn. The primary commercial fisheries are for lobster, eel, and gaspereau. Invasive species, such as the green crab, the MSX oyster disease parasite, eel swimbladder parasite, and the golden star tunicate have found their way into the Bras d'Or Lakes. With their rare physical and chemical oceanography, range of temperate, arctic biota occurring in less than 10 km of water, and diversity of habitats, the Bras d'Or Lakes are truly a unique ecosystem.

The Bras d'Or Lakes are of great significance to Mi'kmaq heritage in this region. The Mi'kmaq word for the Bras d'Or Lakes is Pitu'paq, meaning "to which all things flow." The Lakes have provided a food source for the Mi'kmaq. Numerous fish species, such as mackerel, trout, salmon, smelt, gaspereau, cod, hake, flounder, herring, eel, and others provide protein to our diet, as do resident invertebrates such as lobster, mussels, oysters, clam, scallops, whelks, and quahogs. Numerous bird species, such as geese and duck, have thrived here and were hunted. These gifts are important to communal health and are intertwined in our culture. The Lakes are also a means of transportation between hunting and fishing areas and those used for spiritual solidarity, like Malikewe'j (Malagawatch) or Mniku (Chapel Island).



Knowledge Gathering

Mi'kmaq ecological knowledge gathered for this report was collected from Mi'kmaq harvesters through a series of interviews and workshops.

For knowledge collection and sharing, UINR follows Mi'kmaq Ecological Knowledge protocols established by the Assembly of Nova Scotia Mi'kmaq Chiefs, Mi'kmaq Ethics Watch (Unama'ki College), Unama'ki Parks Canada sites (prepared for Parks Canada by UINR 2007), and advice of Elders and fishers.

In September 2011, the application for the collection of Mi'kmaq ecological knowledge on cod was submitted to the Mi'kmaq Ethics Watch for consideration for approval. Approval was obtained in December 2011.

A workshop was held January 30, 2012 in Membertou, Cape Breton, Nova Scotia. Selection of participants included a balance of Elders, current harvesters, Aboriginal Fishery Guardians, and knowledge holders. Knowledge holders were not randomly selected. Selection of Elders was based on a referral method from UINR's Elder Advisor. Current harvesters were selected from a pool of individuals who were representative of active harvesters.

Another workshop was held March 28, 2012 to add to existing knowledge and to interpret and review the knowledge gathered.



Knowledge

The views in this report do not represent those of the entire Mi'kmaq nation. Participation by UINR and the Mi'kmaq in this workshop group is not, and should not, be construed as consultation. Any new areas being proposed by the Crown(s) to have expanded legal protection would require separate consultation under the Mi'kmaq-Nova Scotia-Canada Consultation process.

The knowledge contained in this report is strongly connected to Mi'kmaq tradition, the practice of cod harvesting in the Bras d'Or Lakes, and the transfer of knowledge between generations through stories and practice.

Due to the short time frame in which this knowledge was collected, this report should not be considered an exhaustive account of the Mi'kmaq ecological knowledge presently known.



Photo: Tim Lambert

Bras d'Or Lakes Peju/Cod

Mi'kmaq harvesting of cod spans many generations and is a reflection of local and intimate understanding of many of the fish species found in the Bras d'Or Lakes. The practice and transfer of this knowledge are important and active components of Mi'kmaq culture in Unama'ki today.

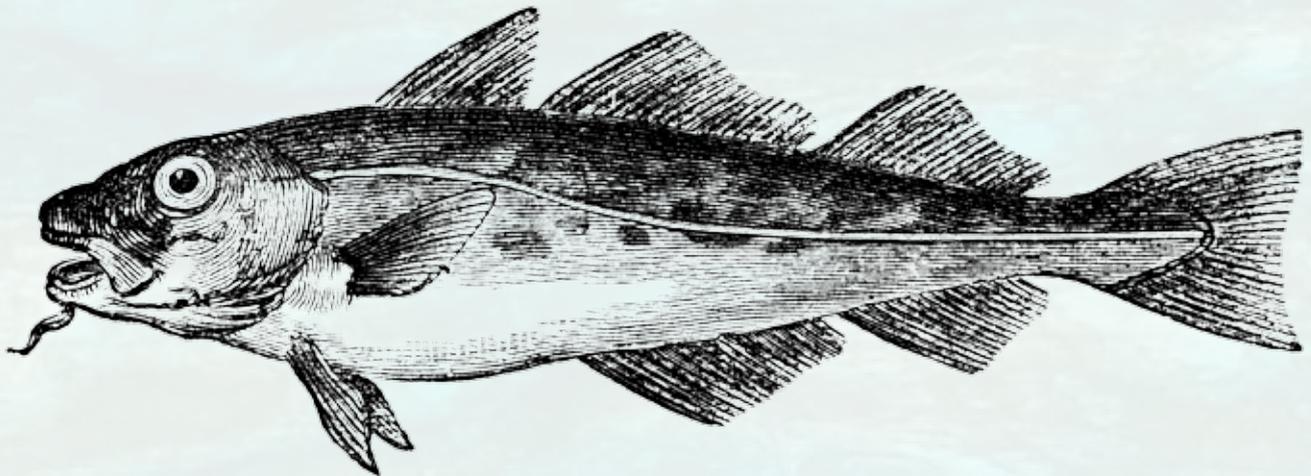
Peju/Cod Harvesting

Atlantic Cod is found throughout the Bras d'Or Lakes and is primarily harvested in fall and winter through the ice but can be harvested in other seasons as well. It is harvested in all areas of the Bras d'Or Lakes, but concentrated along the shores of Mi'kmaq communities.

Methods used to catch Atlantic Cod include jigging, hand lines, rod and reel, gill nets, and night spearing. Types of bait include squid, smelt, bean pork, worms, and anything shiny.

Some harvesters prefer to use anything white in colour and others prefer not using bait at all. Trap nets have been used indirectly to catch cod.

Cod is a scavenger that will bite regardless of type of bait.



Harvest Timing

Harvesting time varies by season. In spring and fall, cod moves close to shore in the evening and is harvested with bait. The capture of tomcod is a sign that cod will soon follow. In winter, cod is jigged through ice. Where you harvest on the Bras d'Or Lakes determines the size of fish you catch. Larger cod is found in deep waters. Smaller cod is captured in coves, closer to shore. In summer, cod is found off deeper waters requiring the harvester to have access to a boat.

There are many cues from nature to signify the onset of cod harvesting. Cod starts to overwinter around October when there is an increase in fresh water. When birds congregate, it is time to harvest cod. When leaves begin to change colour in Autumn, cod is abundant. The presence of smelt, herring, and capelin also signal harvest time. The amount of ice found in these areas has decreased over the years, likely due to climatic changes.

Time of day is important when harvesting. Cod is more abundant at dusk rather than during the day.



Photo: Tim Lambert



Habitats

Cod has always been present in the Bras d'Or Lakes. Often when harvesting for other species, such as trout or mackerel, one will catch cod instead.

It is noted that Bras d'Or Lakes' cod is a different colour than ocean cod. Bras d'Or Lakes' cod is darker in colour, with a brown back and yellowish belly. Ocean cod is lighter, with a grey back and white belly.

Salinity and temperature are factors in local movements. During rainy seasons, cod tends to move to deeper, cooler waters and return in December.

It moves during all seasons, especially from June/July until December/January.

During fall months, cod is very noticeable as it feeds close to shore.

Climate change seems to be shifting migration times and residency of cod in the Bras d'Or Lakes. Increased rainfall events have likely caused cod to move to deeper, higher-saline waters.

There doesn't seem to be any one specific area that holds special significance to Atlantic Cod in the Bras d'Or Lakes. The entire lake system is used for feeding, spawning, and juvenile nursery areas. Harvesters indicate that feeding occurs year-round with spawning occurring in late winter and early spring.

Cod schools before spawning and possibly feeding.

Juvenile cod is not observed very often and there appears to be general consensus among harvesters that it does not school with larger cod. Small cod has been reported in areas of low salinity in spring (April). It is speculated that juvenile cod may be able to tolerate lower salinities than larger, older cod.

Cod is described by harvesters as "the crow of the ocean." Its large mouth lets it

eat a wide variety of food. Bras d'Or Lakes cod is known to eat small and large fish, invertebrates, and even non-natural items like floats and garbage. Cod frequented trout aquaculture cages in Whycocomagh Bay, eating residual feed.

Cod feeds close to shore in the evenings. Examples of food found in stomachs during cleaning are sticklebacks, mummichog (minnows), mackerel, smelt, gaspereau, silversides, green crab, trout, small eels, and mussels. Squid and snow crab were also found in cod stomachs but where the cod originated is unknown. Cod likely feeds on eggs, larvae, and juveniles of many other fish species. Cod itself is an important food for eagles, seals, and porpoises.





Photo: Bernadette MacPherson Morris

Preparation and Uses

Cod has been used primarily as food. Only cod larger than 24 inches (61 cm) was prepared. Historically, it was a main staple, especially during winter months when other species could not be harvested. It sustained communities during tough times. Cod was consumed quite often and was humourously referred to by many other names, such as chicken or pork. Because of its availability and reliability, it was often prepared fresh. On occasion, and when cod was harvested in seasons when there was a chance it could spoil, it would be dried or salted as it deteriorates much faster than meat from mammals. Cod was used in stews and soups and added to dishes to increase protein content. It was baked, boiled, and used in chowders and fish cakes. Traditionally, all parts of cod were used. Heads were boiled and eaten, including eyes, which were considered a delicacy. Roe (eggs) from cod is cherished by Elders and is still consumed today. Cod tongues and cheeks were boiled in stews. In a dish known as Tepotunji', intestines were prepared for eating by first emptying the contents, washing, and filling with cod liver.

Prior to the collapse of the cod fishery, tails were used as bait, especially for lobster, or used as pet food. Bones were used in gardens as fertilizer. Skins were used for wraps and casts. Oil from the stomach was extracted and used to calm the water when harvesting oysters.

Parasites

Parasites were observed in cod harvested in all locations and were not considered a problem in preparation or consumption. Parasite loads were found to be higher in shallow, warm water. To remove worms, cod is boiled or put in freshwater.

The Value of Peju/Cod

Cod is considered sacred. It was always present when needed. It kept many families alive during winter and was consumed as often as eel. Cod harvesting is linked to our past. Many recollect memories of salting cod with their grandfathers, or their grandmothers asking for the heads to boil before they spoiled.

Historically, cod was harvested en route to the St. Anne's Mission in Chapel Island and was traded for potatoes, produce, meat, and other necessities. Bartering was a very effective means to acquire other items that were considered a necessity.

In winter, harvesting cod was a necessity as well as an opportunity to socialize on the ice and in the community. People harvested more when there was no employment, depending on cod to get them through tough times. It was commonly harvested on Thursdays because fish was traditionally consumed on Fridays. The experience of harvesting cod, with its reliability and location close to communities, enabled harvesters to venture out without endangering their lives. This was a rite of passage to becoming harvesters.

Elders believe longevity and mental alertness is related to consumption of fish. As less cod is available today, people are concerned that more and more of their traditional diet is being depleted. Instead, they rely on other fish or have to purchase cod which many cannot afford at current prices.





Current Cod Population in the Bras d'Or Lakes

The cod population in the Bras d'Or Lakes is very low. Many traditional harvesting areas no longer have cod. In the recent past (10 to 15 years ago), one would catch cod with every cast. When harvesting trout, you would catch cod instead. Now, the reverse is true. Today when you attempt to harvest cod, you will almost certainly catch trout. A typical catch, for a thriving cod population, was 20 cod in 10 to 20 minutes, even as recently as 2007. Now harvesters find it takes much longer. For example, one cod may be caught during six months of trying. Other harvesters share similar experiences of few catches over long harvesting hours.

A decline in the size of captured cod is noted as well. Historically (and as recently as 1987), cod in the Bras d'Or Lakes was very large, often reaching 39.4 inches (1 m) in length, requiring harvesters to use sleds to transport their catch. Ice fishing holes had to be expanded in order to land cod. Presently, people are fortunate to capture cod that measure 24 inches (61 cm) or more. A maximum size observed now is about 23 to 24 inches (58.5 to 61 cm).



Traditional Management of Cod [Netukulimk]

Not all individuals harvest cod. Some are very good at it so they are relied upon to support and supply the community with cod. They are “netukulimktiek.” They harvest according to the principles of netukulimk, ensuring fish are there for all generations. Harvesting areas are rotated and harvesters take what is needed with the least amount of harm to the fish and the population.

As with other species, there is a Mi'kmaq season for cod. Cod is primarily harvested in winter but is also harvested throughout the year in smaller quantities. The quality of cod in winter is favoured for its firm flesh and fewer parasites. Spring cod has a fleshy belly with more parasites but contains roe.

Two traditions are very prominent when harvesting. At the beginning of the ice harvesting season, there was an unwritten law that the first five fish were meant for the eagle. The more fish shared meant that you would get more in return. The other tradition related more to respecting juvenile fish. Mi'kmaq did not harvest until after June 28. It was believed that new life was still developing so it must not be disturbed.

Cod was shared among community members or bartered. Only what could be consumed would be taken. Most people did not have refrigerators so they would fish when needed. If too many were taken and could not be used in a reasonable amount of time, then the cod would be salted or dried. Salting or drying would be a last resort as it would alter the flavour and texture of the meat.

Historically, cod under 24 inches (61 cm) was not kept. If it was not damaged, it would be returned. If the cod was damaged and the harvester felt that it would not survive, then it would be kept. Presently, small cod under 12 inches (30.5 cm) are put back if not badly damaged. Because the method used to catch cod can seriously harm it, most cod are kept. Because many harvesters are concerned about the lack of cod, they are not harvesting as often.

Harvesters reduce handling as much as possible if they have to put the cod back. They feel that handling the fish results in injury and increased susceptibility to parasites and bacteria.



Mi'kmaq Concerns

There is an element of sadness expressed by harvesters about the scarcity of cod. Something once so plentiful and life sustaining is no longer available to harvesters or their communities. Loss of cod stocks means future generations will not be able to sustainably harvest cod as we have done in the past.

With such low numbers, distribution, and sizes in the Bras d'Or Lakes, harvesters are concerned that their children may not have opportunity to experience cod and traditional cod harvesting. They are worried about dietary changes and the effects the decline will have on health and culture. Cod is used to supplement our diet. The loss of cod is causing social and economic hardship. We are concerned about the impact it will have on the Lakes' ecology.

Observations were made about the increase in the number of seals in the Bras d'Or Lakes which may be contributing to cod's decline.



There is recent concern about the colour of the cod's liver and if it should be consumed. In the past, cod liver was white but now, in several areas it has been observed to be pink. It is unclear whether the change in colour is related to food or water temperature.

A reduction in quantity and quality (small-sized cod) is also a great concern.

Despite the closure to groundfish dragging in the Bras d'Or Lakes 20 years ago, the cod population is at its lowest. There is great concern for the future of cod.

A Call for Action

Cod management extends beyond local management. Changes at the national and international level are needed. Boats that fish indiscriminately are wasteful.

We also must make local changes, even if they affect our harvesting practices, to make the statement that cod is in trouble.

The current mode of harvesting and consciousness need to change.

We must understand that we are interconnected with everything.

Every action has a positive or negative outcome.

We must encourage sustainable harvesting practices in the commercial fishery in which we are now participants. While our ancestry is Mi'kmaq, current commercial harvesting practices do not reflect Mi'kmaq traditional management. We must work with our communities to change this.

It is the Mi'kmaq responsibility and duty to address this issue as a group.

Current commercial methods, both international and domestic, are unsustainable. Our interconnectedness and interdependence on aquatic life, and because we see ourselves as stewards of the natural world, requires a strong message from the Mi'kmaq. Decisions today must positively affect the next seven generations.

Holistically, we must work toward sustaining and improving water quality and fish habitat, including land management practices that affect fish habitat.

Habitat must be present in order to fully contribute to cod conservation.

We must maintain harmony and balance.

Cod is not a commodity. It is a living entity.

Its survival is our foremost concern.





References

- Assembly of Nova Scotia Chiefs. 2007. Mi'kmaq Ecological Knowledge Study Protocol. 1st Ed. Kwilmu'kw Maw-klusuaqn Mi'kmaq Rights Initiative. 22 pp.
- Berkes, F. Sacred Ecology: traditional ecological knowledge and resource management. Philadelphia: Taylor & Francis. 209 pp.
- Berneshawi, S. 1997. Resource management and the Mi'kmaq Nation. The Can. J. Native Studies. Vol. 17(1): 115-148.
- Denny, S. 2009. Aboriginal Traditional Knowledge: Moving Forward Workshop Report. Unama'ki Institute of Natural Resources. Available: [On-line] www.uinr.ca/wp-content/uploads/2009/02/ATK-2009-WEB.pdf. 17 pp.
- Gurbutt, P.A., B. Petrie and F. Jordon. 1993. The physical oceanography of the Bras d'Or Lakes: Data analysis and modeling. Canadian Technical Report of Hydrography and Ocean Studies: 147.
- Holmes Whitehead, R. and H. McGee. 2005. The Mi'kmaq: How their ancestors lived five hundred years ago. Halifax: Nimbus Publishing Limited. 60 pp.
- Krueger, W.H. and K. Oliveira. 1997. Sex, Size, and gonad morphology of silver American eels *Anquilla rostrata*. Copeia. 2: 415-420.
- Lambert, T.C. 2002. Overview of the ecology of the Bras d'Or Lakes with emphasis on the fish. Proc. N.S. Inst. Sci. 42:65-100.
- Mi'kmaq Ethics Watch. Research Principles and Protocols. Cape Breton University. Available: [On-line]: www.cbu.ca/mrc/ethics-watch.
- Petrie, B. and J. Raymond. 2002. The oceanography of the Bras d'Or Lakes: General Introduction. Proc. N.S. Inst. Sci. 42:1-8.
- Petrie, B. and G. Bugden. 2002. The physical oceanography of the Bras d'Or Lakes. Proc. N.S. Inst. Sci. 42:9-36.
- Strain, P. and P.A. Yeats. 2002. The chemical oceanography of the Bras d'Or Lakes. Proc. N.S. Inst. Sci. 42:37-64.
- Tremblay, M.J. 2002. Large epibenthic invertebrates in the Bras d'Or Lakes. Proc. N.S. Inst. Sci. 42:101-126.





**UINR–Unama’ki Institute
of Natural Resources**

is Cape Breton’s Mi’kmaq
voice on natural resources
and the environment.

UINR represents the five Mi’kmaq
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forestry, marine science research,
species management, traditional Mi’kmaq
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