# END-OF-LIFE FISHING GEAR MANAGEMENT IN NEW BRUNSWICK

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FISHING GEAR COALITION
OF ATLANTIC CANADA

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# TABLE OF CONTENTS


EXECUTIVE SUMMARY ..... III

INTRODUCTION ..... 1

BACKGROUND ..... 1
RESEARCH GOALS ..... 2
RESEARCH FOCUS AREA ..... 2

METHODS ..... 3

BASELINE DATA COLLECTION ..... 3
BASELINE DATA ANALYSIS ..... 4

RESULTS AND DISCUSSION ..... 5

MAJOR COMMERCIAL FISHERIES IN NEW BRUNSWICK ..... 5
HARBOURS AND LOBSTER FISHING AREAS IN NEW BRUNSWICK ..... 6
LOBSTER FISHING GEAR TYPE BY LFA ..... 8
QUANTITY OF FISHING GEAR USED ..... 9
FISHING GEAR RETAILERS ..... 10
*LOBSTER TRAPS* ..... *11*
*ROPE* ..... *12*
MANAGEMENT PRACTICES FOR END-OF-LIFE FISHING GEAR ..... 13
*WASTE RESOURCE MANAGEMENT FACILITIES* ..... *13*
*SMALL-SCALE SOLUTIONS* ..... *17*
*LARGE-SCALE SOLUTIONS* ..... *17*

CONCLUSIONS AND RECOMMENDATIONS ..... 19

CONCLUSIONS ..... 19
RECOMMENDATIONS ..... 20

ACKNOWLEDGEMENTS ..... 21

REFERENCES ..... 21

APPENDICES ..... 22

APPENDIX A - QUESTIONNAIRES ..... 22
APPENDIX B – AMALGAMATED HARBOURS FOR HARBOUR SIZE CATEGORIES BY NUMBER OF BOATS ..... 24

# EXECUTIVE SUMMARY

This report summarizes the results of a comprehensive study to gain an understanding of the life cycle of fishing gear in New Brunswick – from its manufacturing and use to its end-of-life management. In particular, the study focused on end-of-life fishing gear generated by the commercial lobster fishery, as this is the prominent target species in New Brunswick fisheries, and thus produces the greatest amount of gear.

Data were gathered using online research methods and through conversations with industry representatives. The data collected were summarized by fishing gear type and use, gear suppliers and retailers, size and location of commercial fishing harbours, waste resource management facilities, and the end-of-life management of gear from the commercial fishery. Maps were created to illustrate the spatial relationships within and between these research focus areas.

In 2019 the Department of Fisheries and Oceans issued 1 620 lobster licences in New Brunswick. About 40 540 traps are replaced annually in New Brunswick. About 5 350 km or 164 tonnes of rope are replaced in New Brunswick each year. Fish harvesters in New Brunswick are responsible for managing their end-of-life fishing gear and transporting it to the nearest waste resource management facility. The linear distance to these facilities varies throughout the province in which 80% of core commercial fishing harbours are located within 50 km of a waste resource management facility, 13% are located within 25 km, and only the Grand Manan fishing harbours are located within 10 km. Some fish harvesters continue to illegally dump their gear, notably due to a lack of waste resource management facilities in or near their communities.

This research identified one metal recycler with capacity to recycle all wire lobster traps generated in New Brunswick. However, solutions to responsibly manage wood traps at end-of-life are less consistent, with all solutions at a small-scale or landfilled. Currently rope is primarily sent to landfill or stockpiled at Fundy Plastics, but Atlantic Canadian recycling solutions are under development. These solutions show promise for the future if their capacity can be scaled up.

Recommendations, for the near and longer term are as follows:

1. Use the results of this research as well as the lessons learned and success of developing and piloting a management program for end-of-life fishing gear in Nova Scotia to expand it to New Brunswick.
2. Work with the eight coastal regional commissions in New Brunswick to ensure facilities accept wire lobster traps “as-is” for recycling.
3. Evaluate the feasibility of issuing a province wide tender for the collection and recycling of wire lobster traps to help ensure all wire lobster traps are recycled.

4. Further investigate solutions to increase diversion of wood traps from landfills that minimize non-wood contaminants and the need for fish harvesters to dismantle them.
5. Collaborate with fishing industry stakeholders to promote the use of traps with a longer life that are fully recyclable.
6. Determine reliable solutions with the necessary capacity to manage end-of-life rope and build upon recent recycling developments that are beginning to show promise in Atlantic Canada.

This report fills existing knowledge gaps for the current state of end-of-life fishing gear management in the province. The baseline data gathered for this report provides the necessary foundation for implementing better management practices, as well as supporting potential development of product stewardship programs for end-of-life fishing gear in New Brunswick.

# INTRODUCTION

## BACKGROUND

The Fishing Gear Coalition of Atlantic Canada (FGCAC) has been working collaboratively on developing sustainable solutions for end-of-life fishing gear and associated materials since forming in December 2018. The FGCAC is composed of over 30 members from a variety of backgrounds including industry, government, Indigenous communities, academia, non-governmental organizations, and the public. It is actively pursuing three pillars of focus:

1. Resource management,
2. Retrieval and innovation, and
3. Research and communications.

Building upon the FGCAC's previous research published, such as the *End-of-life Fishing Gear Management in Nova Scotia* report (2020), that found a lack of a unified program for recycling or reuse of end-of-life fishing gear in Atlantic Canada. Understanding the current management of end-of-life fishing gear in New Brunswick is necessary to support developing sustainable and long-term solution for end-of-life fishing gear across Atlantic Canada and eastern Québec.

This New Brunswick study is part of a larger project funded by the Department of Fisheries and Oceans Canada (DFO) Sustainable Fisheries Solutions & Retrieval Support Contribution Program (SFSRSCP). SFSRSCP projects fall under four themes: ghost gear retrieval, responsible disposal, acquisition and piloting of available technology, and international leadership. This project fits within the responsible disposal theme, and as such must "work with relevant partners (ports, industry, etc.) to identify and facilitate measures or activities related to the responsible disposal and recycling of ghost gear and end-of-life fishing gear". For this to be feasible, a solid understanding of the current situation at core commercial fishing harbours and waste resource collection sites across New Brunswick is necessary. The data gathered in this report compliments work initiated in Nova Scotia, and information presented in the other provincial end-of-life fishing gear management reports for this project, for determining efficient and effective infrastructure for end-of-life fishing gear collection and management throughout the province.

This study documents the current state of fishing and waste resource management infrastructure and management practices in New Brunswick to gain a better understanding of potential gaps and challenges surrounding the management of end-of-life fishing gear in the province. Information gathered will provide valuable insight into where the larger project should focus its efforts to support the long-term goal of implementing a management program for end-of-life fishing gear across Atlantic Canada and eastern Québec.

## RESEARCH GOALS

The overall research goal of this report was to develop a comprehensive repository of data on the fishing industry and its practices to better manage end-of-life fishing gear in New Brunswick. Specifically, the main outcome of this research was to develop a spreadsheet of the compiled information on the types and quantity of gear used and/or replaced, suppliers and retailers of this gear, number of fish harvesters, size and location of fishing harbours, and waste resource management costs and infrastructure available to accept end-of-life gear. As well, maps were developed to visualize the data gathered of largest concentration areas of harbours for end-of-life gear and their proximity to waste resource management facilities. The findings of this report will be used as the foundation for assessing infrastructure needs and costs for collecting and managing end-of-life fishing gear throughout New Brunswick.

## RESEARCH FOCUS AREA

Research for this report focused primarily on lobster, as it is the main fishery in New Brunswick, contributing 20% ($0.3 billion) of all Atlantic commercial lobster fishery landed values in 2019 (DFO 2021). Throughout Atlantic Canada and Québec, DFO manages 45 lobster fisheries, including one for the offshore fishery and one that is closed for conservation. New Brunswick falls within two DFO inshore lobster fisheries management regions: Southern Gulf of St. Lawrence and Maritimes. The Maritimes Region inshore lobster fishery comprises twelve Lobster Fishing Areas (LFAs), with four fished from New Brunswick in the Bay of Fundy (35-38; Figure 1). The Southern Gulf of St. Lawrence comprises five LFAs, with three fished from New Brunswick (23, 24, and 26a; Figure 1).

Indigenous peoples fished lobster with a variety of fishing gear long before European colonialists began harvesting the resource. Lobster is one of the longest regulated fisheries in Canada. Before the late 1800s, the lobster fishery had no restrictions on who could fish and how much could be caught (DFO 2020a). Following the change from manual harvesting and harpooning to baited lobster traps in the late 1800s, practices have changed only in efficiency of gear (faster, larger vessels and larger, more efficient traps), which increased fishing pressure significantly (DFO 2020a). Limited entry licensing and three licence classes were introduced in the 1960-70s (DFO 2020a). These classes are: Category A for licences authorized to those fully dependent on lobster fishing, Category B for licences authorized to those not fully dependent but with a historical attachment to the fishery (since 1968), and Communal Commercial. A report produced by the Fisheries Resource Conservation Council in 1995 led to a series of multi-year lobster management plans throughout Atlantic Canada aimed at increasing egg production (DFO 2020a).

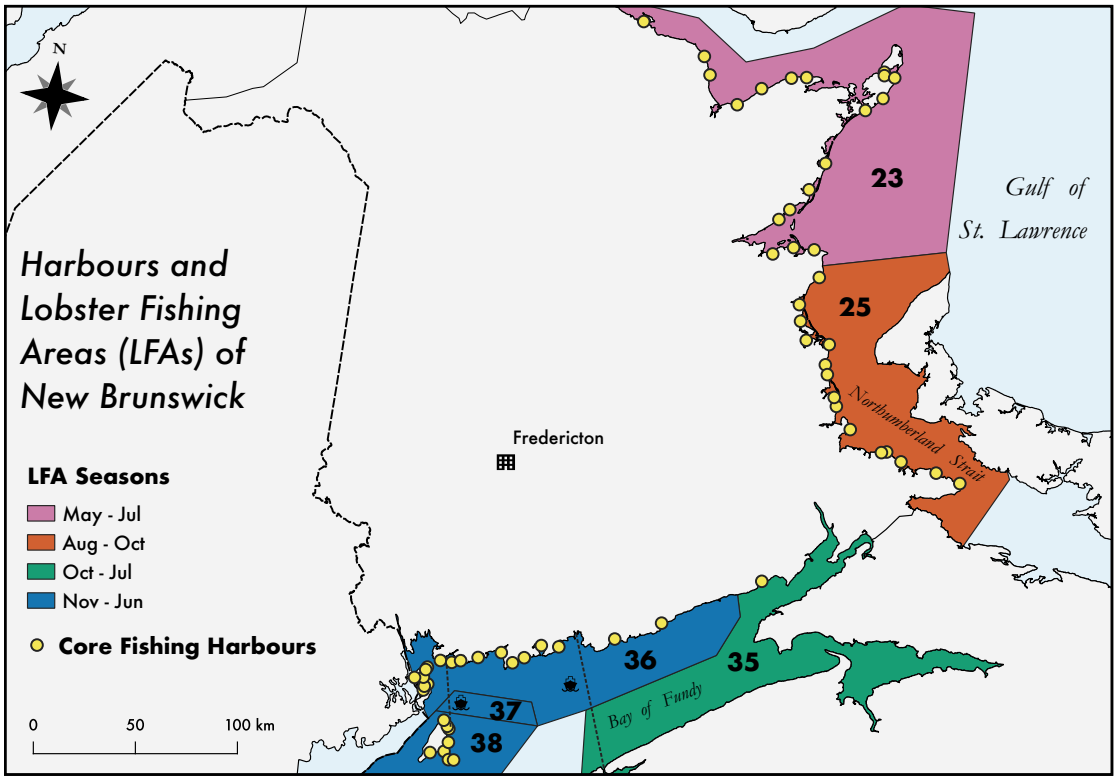


**Figure 1.** Harbours and lobster fishing areas (LFAs) in New Brunswick. Map projection: NAD 83 CSRS UTM Zone 20N, Transverse Mercator. Sources: LFA delimiter lines and provincial boundaries modified based on Coffen-Smout (2020), DFO. Map created using QGIS 3.10 by Rachel A. Kendall.

LFA seasons are staggered, with LFA 23 and 25 having short lobster fishing seasons lasting three months, with LFA 23 in the spring to late summer and LFA 25 in late summer to fall. LFAs 35-38 in the Bay of Fundy have longer fishing seasons running from fall to spring/summer (Figure 1). In 2019, 1 462 lobster licences were issued to participants in the lobster fishery of LFAs fished in New Brunswick (DFO pers. comm. January 12 and March 18, 2021), representing approximately 15% of the 10 000 licensed fish harvesters in Canada (DFO 2015). Lobsters are caught using baited wire or wood traps that are placed on the seafloor, as either single or multiple traps attached to synthetic rope lines. This gear, when abandoned, lost, or discarded, makes up a large portion of marine debris and is harmful to the fishery, causing habitat degradation and indiscriminate fishing (Goodman 2020).

# METHODS

## BASELINE DATA COLLECTION

Data was collected on various aspects of the commercial fishery in New Brunswick from December of 2020 to March of 2021. This research focused on the commercial lobster fishery and end-of-life fishing gear management. Prior to contacting industry representatives, readily available information was gathered online. To gain an understanding of the current

management of end-of-life fishing gear throughout the province, waste coordinators, waste resource management facilities (transfer stations, construction and demolition (C & D) sites, and landfills), and recyclers were contacted for interviews. These interviews provided information on tipping fees applicable to end-of-life fishing gear, acceptable products, and required product preparation (Appendix A).

Phone conversations and online surveys were conducted with 32 fish harvesters and harbour authorities from across the province in the months of January, February, and March of 2021 (Appendix A). The waste resource management facilities (13) were contacted for phone interviews in December of 2020 and January of 2021. These interviews were used to gain an understanding of the types of lobster traps and fishing ropes that are used in the commercial lobster fishery throughout New Brunswick, the types of materials these products are made from, quantities replaced annually, and current barriers or opportunities to end-of-life fishing gear management.

Information relating to 64 active core New Brunswick commercial fishing harbours was provided by the Small Craft Harbours program of DFO. Small Craft Harbours' Harbour Authorities provided information on each harbour's location and the number of commercial fishing boats registered to fish at each harbour. DFO Gulf and Maritimes office provided information pertaining to lobster licensing and LFA seasons. Based on information collected from the fishing industry, each LFA and harbour was classified by the type of lobster trap used, whether primarily wood, wire, or a combination of both.

## BASELINE DATA ANALYSIS

Four maps were created using QGIS Version 3.10. Provincial boundaries were derived from a LFA shapefile (Coffen-Smout 2020) and reprojected to World Geodetic System 1984 Universal Transverse Mercator (UTM) Zone 20N. Some topological errors needed to be adjusted and re-digitized to reflect official LFA and provincial boundaries. Addresses of core commercial fishing harbours and waste resource management facilities were geocoded and presented in the maps using the MMQGIS plugin with ESRI Geocoding URL. If addresses could not be geocoded, they were corrected using coordinates gathered from Google Maps. Core commercial fishing harbours (64 active Small Craft Harbours) were categorized by the number of fishing boats (not necessarily lobster fishing) to approximate harbour size and presented on three maps. Since some harbours were situated close together, they were amalgamated for presentation purposes in the harbour size categories (Appendix B).

Buffers of 10, 25, and 50 km were drawn around each waste resource management facility on one map using the vector buffer processing tool. The buffers were drawn to illustrate how far fish harvesters currently must transport their end-of-life gear from core commercial fishing harbours. For another map illustrating the primary lobster trap type used (wire or wood), LFAs were categorized by whether more harbours per LFA use wire, wood, or a combination of both wire and wood.

Quantity of lobster traps and rope replaced annually were estimated using New Brunswick licence numbers provided by DFO (pers. comm. January 12 and March 18, 2021) and rope weights provided by S. Burke (pers. Comm. December 4, 2020). The maximum number of traps issued reflects the trap limit per licence for each LFA (e.g., LFA 23 has a limit of 300 traps per licence) unless in a partnership, which permits two licences on one boat. For a partnership, the maximum number of traps allowed is 1.5 times the number of traps of the licence (e.g., a partnership in LFA 23 could have a maximum total of 450 traps).

# RESULTS AND DISCUSSION

## MAJOR COMMERCIAL FISHERIES IN NEW BRUNSWICK

Lobster is the most commercially valuable species in New Brunswick (Table 1). Other important commercial species harvested in the province include snow scrab, herring, sea scallop, and shrimp (Table 1). The type of gear used varies among these fisheries. While lobster, snow crab, and shrimp fisheries use traps, those used for crab have a conical steel frame covered with netting, while lobster traps are traditionally made of wood or vinyl coated steel wire. Sea scallops are fished using steel drags; herring are harvested using seines, gillnets, midwater trawls, and weirs (Table 1) (DFO 2020b).

**Table 1.** Primary commercial fisheries in New Brunswick and the types of gear used.

| Species | 2019 Landings ($ Thousands)[a] | Gear Used |
|---|---|---|
| Lobster | 299 848 | Wire or wood traps; some wood-wire combinations; polypropylene/polyethylene rope; buoys; concrete or steel ballasts; rubber. |
| Snow Crab | 153 899 | 6-7 ft conical steel traps: welded steel ring frame, netting, twine, rope, and plastic cone. |
| Herring | 21 495 | Purse seines, tuck-ring seines, fixed gear, midwater trawls, weirs and gillnets. |
| Sea Scallop | 10 536 | Steel scallop drags/dredges 12-17 ft wide; 'miracle gear' or Digby drags; 2-3 in rubber washers. |
| Shrimp | 9 034 | Passive traps (wire) and trawl line. |

[a]DFO (2021).

To support the FGCAC's End-of-Life Fishing Gear Management Project for Atlantic Canada and eastern Québec, the research of this report focused primarily on lobster traps and rope. Lobster traps are composed of a variety of parts and materials, but the main materials can include wood, vinyl coated steel wire, rubber, netting, and ballasts made of concrete or steel. Rope made from polyethylene, polypropylene, and/or a blend of polyethylene and polypropylene are used in lobster fishing in New Brunswick. Additionally, buoys constructed from various rigid plastic resins and expanded polystyrene are also used.

Though lobster is the primary species harvested by fish harvesters, many will harvest other species, particularly during the off-season for lobster. Snow crab is the second most commercially valuable species harvested in the Gulf of St. Lawrence, with the fishing season open from May until the middle of July (or until the quota is reached). Scallop was noted during interviews as the main secondary species harvested during the winter, notably in the Bay of Fundy, and herring was noted as a main secondary species harvested during the spring or summer.

## HARBOURS AND LOBSTER FISHING AREAS IN NEW BRUNSWICK

There are 64 core commercial fishing harbours in New Brunswick, all managed by DFO Small Craft Harbours, ranging in size from 1 up to 149 boats per harbour. When amalgamating harbours managed by the same harbour authority or due to proximity (Table 5, Appendix B), this reduced the number of harbours to 46 in Figure 2 and increased the range up to 325 boats for Grand Manan Island. Most core fishing harbours will have either 11-25 boats (41%) or 26-75 boats (26%). Only seven harbours/amalgamated harbours have more than 75 boats (15%) (Figure 2). The remaining harbours have 1-10 boats (18%). In New Brunswick there are three locations with large fishing activity where the largest harbours are located: Miscou Island, the southernmost Bay of Fundy (Grand Manan, Deer Island, Blacks and Beaver Harbours), and Greater Miramichi and Kent Regional Commissions (Escuminac, Pointe-Sapin, Richibucto). In the upper reaches of the Bay of Fundy coast, there are only a few harbours in the 1-10 and 11-25 boat categories (Figure 2).

Fishing seasons in LFAs 23 and 25 are limited to three months, while LFAs 35-38 have longer fishing seasons (Table 2). In 2019, LFA 23 had the most licences issued (45% of all licences) but has a shorter fishing season than the LFAs of the Bay of Fundy (Table 2). The LFAs have trap limits ranging from 250 to 375 per licence holder (Table 2).

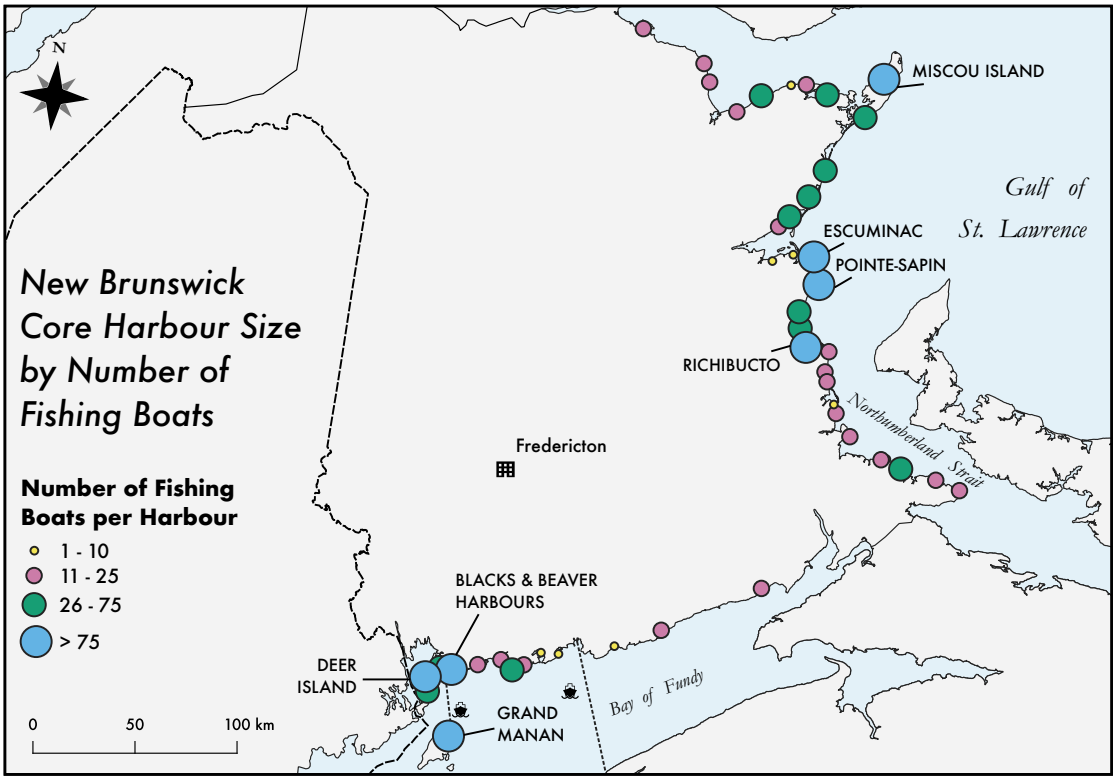


**Figure 2.** Size of core New Brunswick commercial fishing harbours by number of boats. Refer to Figure 1 for map sources.

**Table 2.** Lobster Fishing Area (LFA) licences and traps, 2019.

| LFA | Fishing Season | Total Licences | Trap Limit per Licence[b] | Maximum Traps Licensed |
|---|---|---|---|---|
| 23 | May 3 - Jul 5 | 664 | 300 | 199 200 |
| 25 | Aug 8 - Oct 9 | 471 | 240 | 113 040 |
| 35 | Oct 15 - Dec 31;<br>Mar 1 – Jul 31 | 20[c] | 300 | 6 000 |
| 36[a] | 2nd Tues Nov – Jan 14;<br>Mar 31 – Jun 30 | 173 | 300 | 51 900 |
| 38[a] | 2nd Tues Nov – Jun 30 | 134 | 375 | 50 250 |
| **Total** | — | **1 462** | — | **420 390** |

Season, licence, and tag information from DFO pers. comm. January 12 and March 18, 2021. [a]LFA 37 is shared among LFA 36 and 38. [b]Trap limit is for "Category A" or full-time licence holders. Part-time or "Category B" licences are allowed 30% and Partnerships 150% the limit of a single full-time licence. [c]Total licences for fish harvesters in LFA 36 determined by using the approximate number of lobster fishing boats per harbour.

## LOBSTER FISHING GEAR TYPE BY LFA

The information presented in this section is derived from conversations with members of the fishing industry, mainly fish harvesters and harbour managers, as well as fishing gear retailers and fishing associations. Wire lobster traps are primarily used by fish harvesters in New Brunswick, but fish harvesters are beginning to switch back to using more wood lobster traps in the Gulf of St. Lawrence. All wire traps are used in the Bay of Fundy (LFAs 35-38) whereas primarily wire traps are used in LFA 25 and a mixture of wire and wood traps are used in LFA 23 (Figure 3).

The primary fishing rope used by fish harvesters is made of polypropylene, polyethylene, or a blend of polyethylene and polypropylene. Rope diameter size, and therefore rope weight, used by lobster fish harvesters varies by LFA. Lobster fishing rope is commonly sold as 366 m (1200 ft) coils, with 3/8 and 7/16-inch diameter rope indicated as the most used among lobster fish harvesters in the Gulf of St. Lawrence. In the Bay of Fundy, 11/32 to 3/8-inch diameter rope are used for single traps and 1/2 to 9/16-inch are used for trawls. Weight of these coils commonly sold to lobster fish harvesters will vary from about 13 to 15 kg (28 to 77 lb) (S. Burke, pers. comm. December 4, 2020). The type of lobster traps and fishing rope used vary throughout the province due to factors such as ocean floor topography, currents and tides, and as a personal preference based on perceived fishing ability and efficiency.

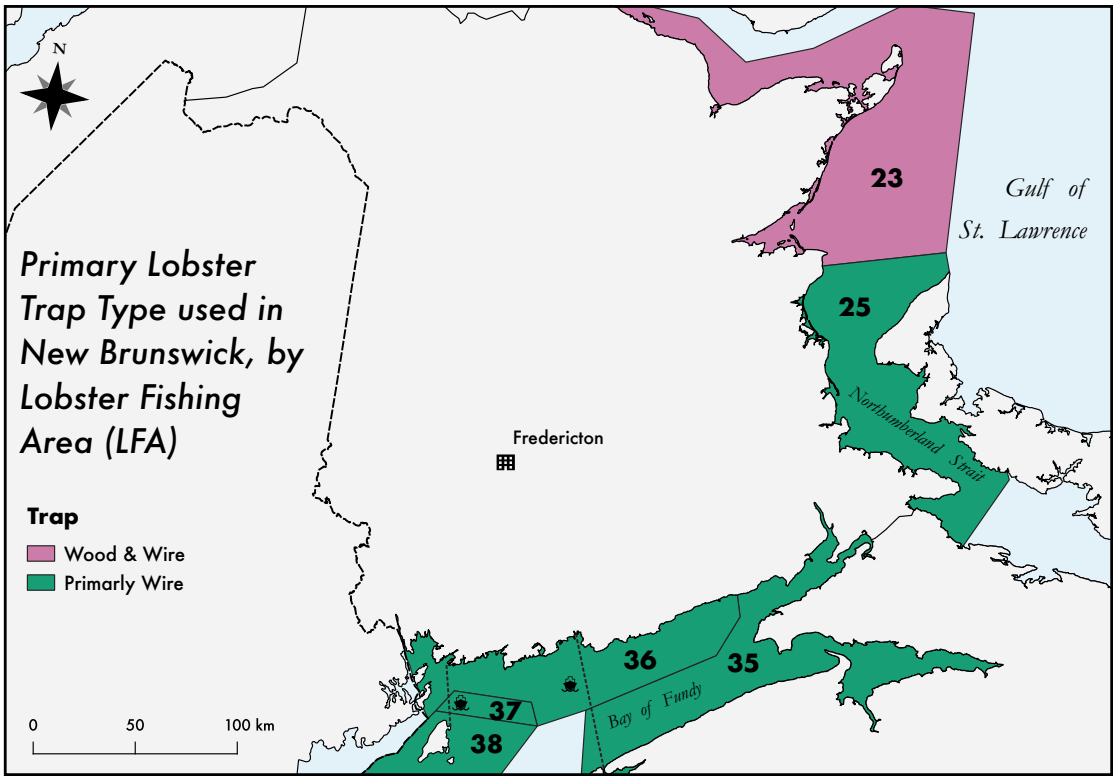


**Figure 3.** Primary lobster trap type (wire, wood, or both) by LFA. Refer to Figure 1 for map sources.

Lobster is primarily fished near shore with smaller single wire or wood traps (3-4 ft in length) in LFA 23 and 25 (Figure 3). In the Bay of Fundy (LFAs 35-38), marine conditions are harsher, notably with the strong tides, so larger traps (4 ft in length) are generally set as a trawl line with stronger rope that has a larger diameter and contains more polypropylene. This type of fishing also requires the use of wire traps as they are sturdier, maintain a consistent weight, and can be built larger than wood traps. A fish harvester from the New Mills harbour in the northern part of LFA 23 noted how about six years ago he began using wood traps from Prince Edward Island and found that they fished better than wire traps and now more fish harvesters are also making the switch. A fish harvester from the Botsford harbour in the southern part of LFA 25 also has noticed an increase in wood traps being used and trucks transporting wood traps from Prince Edward Island, but he cannot use wood traps in the Botsford area due to marine worms.

## QUANTITY OF FISHING GEAR USED

In 2019, there were 420 390 lobster trap tags issued in LFAs fished from New Brunswick (DFO pers. comm. January 12 and March 18, 2021). Information on lobster trap and fishing rope replacement was derived from conversations with 28 fish harvesters across New Brunswick. The quantity of traps replaced annually by fish harvesters ranged from 1 up to 105, with 50% of the fish harvesters replacing greater than 20 traps annually and averaging about 23 traps replaced per fish harvester per year. According to B. Morse with the Grand Manan Fishermen's Association, the fish harvesters collectively replace about 10 000 wire traps annually (pers. comm. October 21, 2021). The quantity of rope coils replaced annually by fish harvesters ranged from less than 1 and up to 20, and fishing gear suppliers noted that 10-20 coils of rope are replaced annually on average by fish harvesters.

Multiplying the total number of licences issued per LFA in 2019 (licences represent number of lobster fish harvesters) by the approximate number of traps replaced per fish harvester (Table 2), about 40 544 traps were replaced annually by fish harvesters in LFAs 23-34 and 35-38. Breaking down the total number of traps to wire versus wood traps (Figure 3), about 7 636 wood traps would be replaced annually. In comparison, about 32 908 wire traps would be replaced annually. These estimates assume that fish harvesters in LFAs 25 and 35-38 fish entirely with wire traps and that fish harvesters in LFA 23 fish with 50% wire traps.

Assuming 10 coils of rope are replaced per fish harvester annually, approximately 14 620 coils of rope would be replaced in LFAs 23-25 and 35-38 each year. By multiplying the number of coils replaced by the length of rope in a coil (366 m or 1 200 ft), this represents 5 350 km (17 544 000 ft) of rope replaced each year. In weight, this represents 164 tonnes annually. Fish harvesters were also asked how many crab pots they replace annually, but for many the answer was that they last longer than lobster traps, or only a few will be replaced due to damage or loss during storms. Like crab pots, wire lobster traps were noted to last longer in the water and may not be required to be replaced for up to five years. Determined by the Association des crabiers acadiens (pers. comm. January 19, 2021), about 3-6 crab pots are replaced annually, and fishing rope is replaced every 11±3 years.

The replacement lobster trap and rope numbers are estimates based on average values provided by 24 fish harvesters in New Brunswick and fishing gear suppliers. These values will vary from year to year depending on how many traps are lost by fish harvesters due to storms and other environmental conditions, as well as economic restraints. According to a fish harvester from Campobello Island, fish harvesters may purchase wire traps that they end up not liking due to preference or because they do not fish well, thus they will replace these traps potentially increasing the amount replaced each year.

## FISHING GEAR RETAILERS

Of the seven main fishing gear retailers in New Brunswick, five also sell fishing rope (Table 3). Of these retailers, five sell wire traps, and two sell wood traps. Additionally, retailers often sell supplies for constructing and repairing wire and wood traps. The major fishing gear retailers identified are Entreprises Shippagan, Spartan Industrial Marine, and Rainbow Net and Rigging. Lobster fish harvesters often construct their own traps using material purchased from fishing gear retailers or fishermen's co-ops.

Hackett Enterprises does not have a physical location in New Brunswick but supplies traps by transport from Prince Edward Island. Rainbow Net and Rigging owns a location dedicated to building wire lobster traps in New Brunswick. Hampidjan Canada was noted as having only very low rope sale volumes in the lobster and crab fisheries in Atlantic Canada. Crab fish harvesters purchase crab pots from Rainbow Net and Rigging and Spartan Industrial Marine.

**Table 3**. Types of lobster traps sold by retailers.

| Company | Wire Traps | Wood Traps |
|---|---|---|
| Bouctouche Bay Industries | ✓ | × |
| Entreprises Shippagan | ✓ | ✓ |
| Hackett Enterprises | × | ✓ |
| Rainbow Net and Rigging | ✓ | × |
| Seacoast Fishing Supplies | × | ✓ |
| Spartan Industrial Marine | ✓ | × |
| SS Trap and Wire | ✓ | × |

Sale of lobster traps and their materials (wood or wire) indicated by a '✓'. Not all retailers sell constructed traps, and some retailers sell used traps. An 'x' indicates that the material is not sold.

## LOBSTER TRAPS

Traditionally, lobster traps were made of wood. This changed over time as lobster traps constructed of vinyl coated wire entered the market. The main wire mesh brands noted during phone conversations with retailers were Aquamesh and Cavatorta. However, wood traps are still commonly used in New Brunswick and are returning in popularity in the Gulf of St. Lawrence. Wire and wood traps also include twine netting, rope, and ballasts (Figure 4). The ballast or weight is used to ensure the lobster traps sink to the sea floor and is typically made of either concrete or steel. Lobster traps can be sold with the concrete ballasts already poured in the vinyl mesh, or ballasts can be added in after purchase.

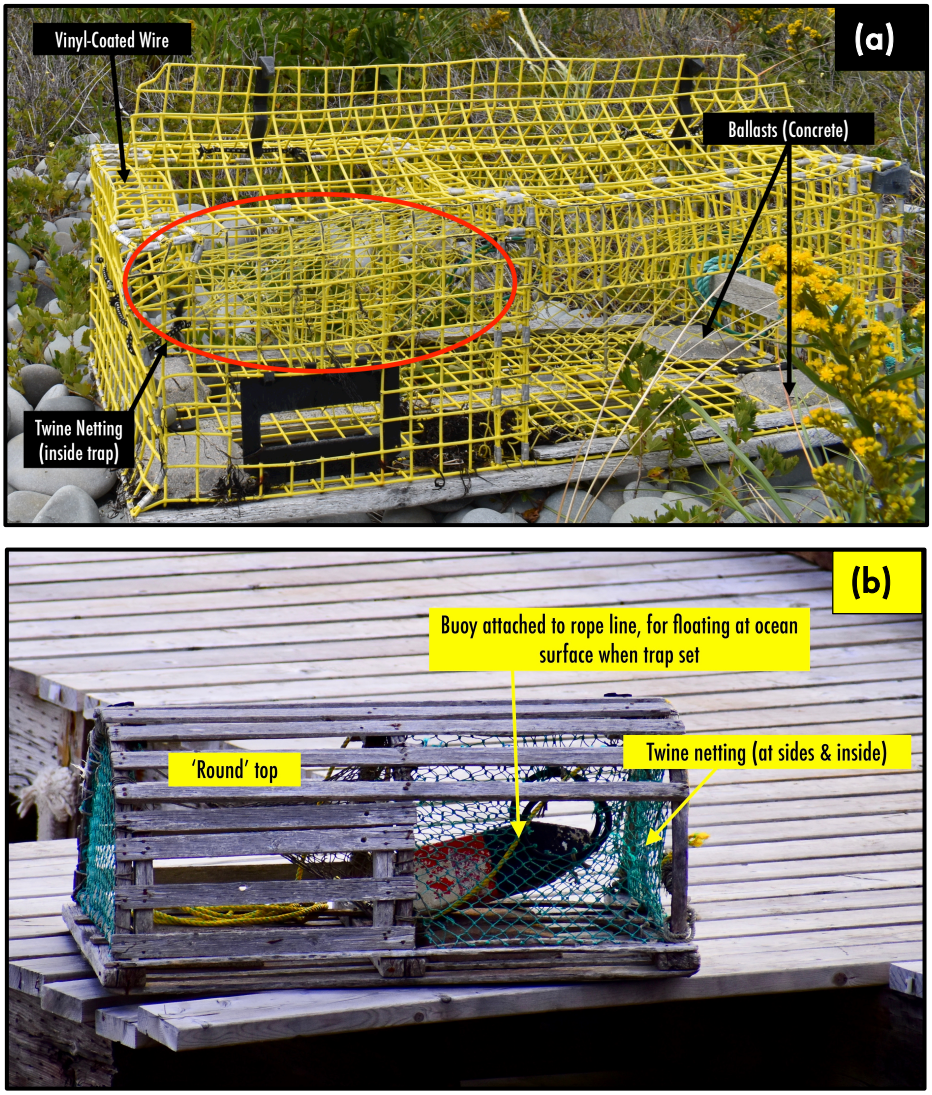


**Figure 4.** Diagram showing the parts of (a) a wire lobster trap and (b) a 'round' wood lobster trap. Photos copyrights Rachel A. Kendall.

Two retailers of lobster traps (SS Trap and Wire, Hackett Enterprises) sell only concrete ballasts in their traps, while two other retailers sell only steel ballasts (Rainbow Net and Rigging, Spartan Industrial Marine). Additionally, most retailers provide custom-built lobster traps that are tailored to individual fish harvester needs and preferences. Many retailers indicated that traps 3-4 ft in length were among the most common sizes sold in New Brunswick in which 3 ft length traps are used in the Gulf of St. Lawrence. However, the size of the traps purchased vary by harbour and will often correspond to the size of the fishing vessel, as fish harvesters with larger vessels tend to purchase larger traps and vice versa. The number of traps sold annually by retailers varied from 1 000 up to 50 000 traps, though the 50 000 quantity includes shipments to other Atlantic provinces.

## ROPE

Of the 11 brands of lobster fishing rope identified as being sold by retailers and distributors in New Brunswick, 46% are polyethylene material, 9% are polypropylene material, and 45% are a blend of polyethylene and polypropylene (Figure 5). There are many other ropes used for specific purposes, such as the polyester or polypropylene with a latex core Trapcord, manufactured by Novabraid for lobster trap doors. Other ropes are made of nylon, but these are not commonly used for lobster fishing in New Brunswick. Major retailers and distributors of lobster fishing rope in New Brunswick are Entreprises Shippagan, Spartan Industrial Marine, and Rainbow Net and Rigging. Polysteel Atlantic rope was indicated by fish harvesters as a commonly used fishing rope brand, which is the only manufacturer of lobster fishing rope in Atlantic Canada and is the largest supplier of rope to retailers and distributors. The approximate quantity of fishing and aquaculture rope sold annually by suppliers to New Brunswick ranged from 57 to 450 tonnes.

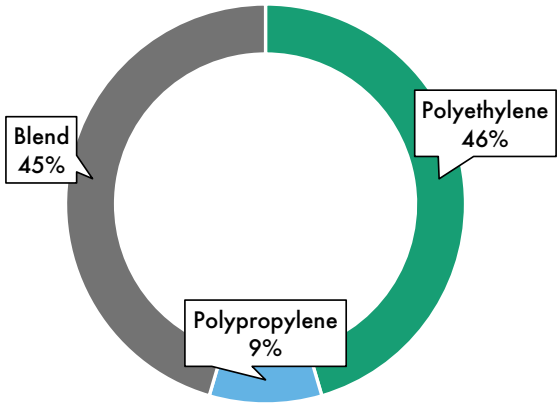


**Figure 5.** Percentage of lobster fishing rope made using polyethylene, polypropylene, or a blend of both.

## MANAGEMENT PRACTICES FOR END-OF-LIFE FISHING GEAR

### WASTE RESOURCE MANAGEMENT FACILITIES

Waste resources are managed by twelve Regional Service Commissions in New Brunswick, with eight of the Regional Service Commissions along the coast with core fishing harbours. Fish harvesters in New Brunswick are responsible for managing their end-of-life fishing gear. Ideally, fish harvesters will transport their gear to the nearest transfer station, C & D facility, or directly to a landfill within their Regional Service Commission. However, two Regional Service Commissions (Kent and Greater Miramichi) do not have commercial waste services or facilities for fish harvesters to dispose of their end-of-life fishing gear. In these cases, the fish harvesters are required to direct haul to a waste resource management facility in another Regional Service Commission.

Most fishing harbours across the province do not have collection programs in place for end-of-life fishing gear. If harbour authorities provide collection bins, they are to be used only for "black bag" garbage that would be generated by the fish harvesters on their boats, but not for rope or lobster traps. Some harbours along the Bay of Fundy have fishing rope collection bins provided by the Huntsman Marine Science Centre, where the rope is used for crafts or sent to Fundy Plastics. Most collection bins for recyclables are restricted to "blue bag" recyclables such as beverage containers generated on the boats and not end-of-life fishing gear. Some harbour authorities will organize as-needed removal of end-of-life fishing gear by renting large dumpsters or organizing harbour clean-ups when gear is taking up too much space at the harbour. Rather than taking their end-of-life fishing gear to waste resource management facilities, many harbour users will stockpile rope and lobster traps at their homes or other personal properties.

To help visually approximate the distance that fish harvesters need to transport their end-of-life gear, 10, 25, and 50 km buffers were drawn around each of the waste resource management facilities in the province (Figure 6). These buffers represent the current situation, and no determination has yet been made as to what is considered a reasonable distance for a fish harvester to have to transport their gear. This mapping shows that 41 of the 46 amalgamated harbours are located greater than 10 km from either a municipal or private waste resource management facility (Figure 6). Of the larger fishing harbours (> 75 boats), only the Grand Manan harbours are located within 10 km of a waste resource management facility. Another 6 harbours are located within 25 km of a waste resource management facility. The larger fishing harbours (> 75 boats) fall outside the 25 km buffer and the harbours of Escuminac, Pointe-Sapin, and Richibucto are greater than 50 km from a waste resource management facility. Furthermore, nine additional harbours, all along the Gulf of St. Lawrence, are located greater than 50 km from a waste resource management facility. Although located within the 50 km buffer boundaries, those harbours on Deer Island do not have access to a waste resource management facility without driving to the mainland through the United States or by ferry that has only seasonal service. In contrast, the fish harvesters on Grand Manan Island have waste management services fully provided by the Grand Manan Fishermen's Association and Island Waste and Recycling.

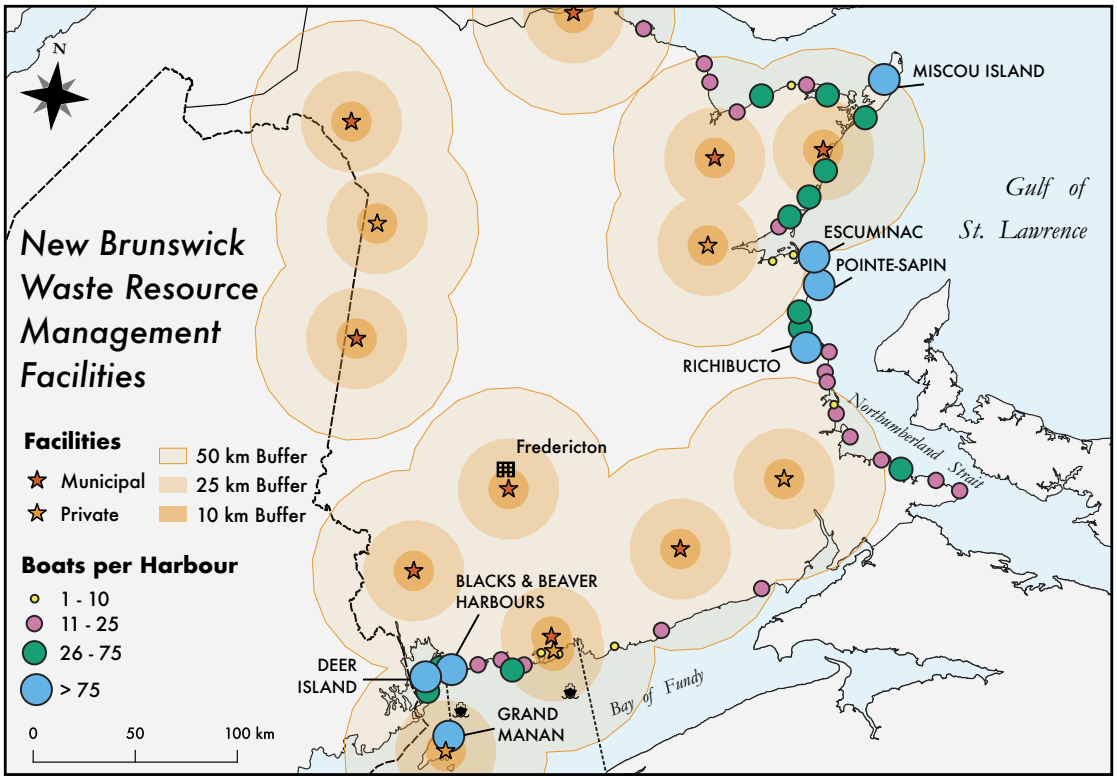


**Figure 6.** New Brunswick core commercial fishing harbours and waste resource management facilities with 10, 25, and 50 km buffers. Refer to Figure 1 for map sources. Not all facilities accept or receive fishing gear.

Tipping fees for end-of-life wire traps, wood traps, and fishing rope vary by Regional Service Commission throughout the province. Regional Service Commissions charge tipping fees ranging from $0 to $123 per tonne. The Island Waste and Recycling transfer station on Grand Manan Island is the only facility that does not charge tipping fees for end-of-life fishing gear. All end-of-life fishing gear is charged the Industrial, Commercial, and Institutional (ICI) waste tipping fee (i.e., not residential waste tipping fee), except in the case that rope is removed from wood traps. Eco360 will accept them as C & D waste at a reduced cost.

Of the seven facilities that accept wire traps, three recycle the metal and only one (Island Waste and Recycling) accepts them for recycling with the ballasts, netting, and other materials still attached (Table 4). Traps not recycled are landfilled. There are seven facilities that receive and accept wood lobster traps. Since the traps typically still contain concrete ballasts and plastic netting when they arrive at the facility, they often end up in the landfill (Table 4). One facility was identified at accepting wood traps for the C & D landfill if the rope and netting is removed, charging $50 compared to $116 for ICI waste.

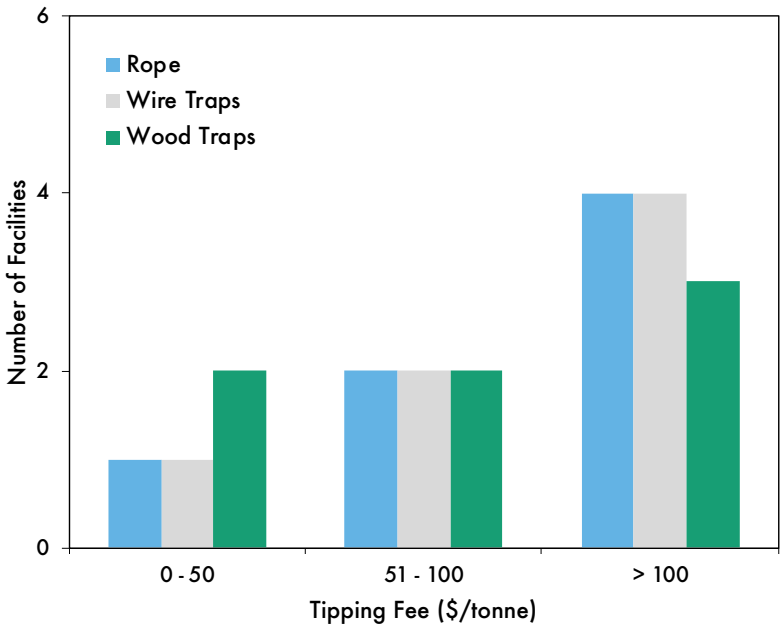


**Figure 7.** Tipping fees charged for end-of-life fishing gear by waste resource management facilities in New Brunswick.

Currently most of the rope received at these facilities is landfilled. An exception is Island Waste and Recycling that is stockpiling end-of-life fishing rope to ship to Fundy Plastics in the hopes of finding a market to recycle the rope. Styrofoam is accepted at the Eco360 facility with no tipping fee charged as it is recycled. Three facilities (Fredericton Region Sanitary Landfill, Northwest Regional Services Commission Sanitary Landfill, and Southern Valley Transfer Station) were noted as not regularly receiving end-of-life fishing gear as there are no coastal areas within their Regional Service Commissions (Table 4). Additionally, the two private GLF locations do not have public drop-offs (Table 4).

Kent and Greater Miramichi Regional Service Commissions do not have waste resource management facilities and represent one of the larger fishing areas in New Brunswick. However, Kent Regional Service Commission has Eco-Depots, in partnership with Eco360, for residential waste collection and individuals are permitted to dispose of up to five lobster traps each. The Kent Regional Service Commission is actively seeking a solution to managing end-of-life fishing gear and is therefore supportive of a program by the Fishing Gear Coalition of Atlantic Canada managing end-of-life fishing gear in New Brunswick.

Fish harvesters, harbour managers and presidents, and waste coordinators overwhelmingly expressed support, interest, or a need for a solution to managing end-of-life fishing gear in New Brunswick. Common barriers to disposal noted by fish harvesters were high tipping fees, limited recycling options, and lack of infrastructure or distance to waste resource management facilities. Many fish harvesters interviewed stressed the need and desire for more recycling options for end-of-life fishing gear. Some areas in New Brunswick lack greater waste management resources than others. For example, many fish harvesters at the New

Mills harbour do not know how to dispose of their end-of-life fishing gear because, according to a fish harvester from this harbour, nothing is advertised in their communities. He stressed the importance of providing education on the fish harvesters' responsibilities to looking after the environment and properly managing their waste. New Mills harbour is also located greater than 25 km from the nearest waste resource management facility (Figure 6).

**Table 4.** Management of end-of-life lobster traps at New Brunswick waste resource management facilities.

| Regional Commission | Facility Name | Wire Traps | Wood Traps |
|---|---|---|---|
| Acadian Peninsula | Acadian Peninsula Regional Service Commission Waste Processing Centre | × | × |
| Chaleur | Red Pine Solid Waste Management Site* | ✓ | × |
| Fredericton | Fredericton Region Sanitary Landfill | --- | --- |
| Fundy | Crane Mountain Landfill* | ✓ | × |
| Fundy | GFL Solid Waste Saint John | --- | --- |
| Greater Miramichi | GFL Miramichi Construction & Demolition Landfill | --- | --- |
| Kings | Regional Waste Management Facility | × | × |
| Northwest | Northwest Regional Services Commission Sanitary Landfill | --- | --- |
| Restigouche | Restigouche Transfer Station | × | × |
| Southeast | Eco360 | × | × |
| Southwest | Hemlock Knoll Landfill | × | × |
| Southwest | Island Waste and Recycling (Grand Manan) | ✓ | --- |
| Western Valley | Southern Valley Transfer Station | --- | --- |

'✓' indicates facilities that receive lobster traps for recycling or allow collection by third parties for reusing or repurposing to divert the traps from landfill. 'x' indicates that the traps are landfilled. '---' indicates that a facility either does not accept or receive fishing gear. *Facilities accept wire traps only if concrete ballasts and other material is removed prior.

The fishing industry can be a significant source of waste in various parts of the province, as rope, wood traps, and most wire traps are not currently diverted from the landfill and in more extreme cases may be illegally dumped at sea or on land as well as burned or buried. Although some facilities indicated that they recycle wire traps, not all gear received is reused or recycled due to an item's condition, recycling cost, or the capability of the facility to hold and separate the materials. For example, traps that arrive at a facility tangled with other waste may not be easily separated and will end up in the landfill. Rope in particular was raised as an issue, as it is difficult to manage by facilities and there are limited options to divert it from landfill. For example, Grand Manan Island Waste and Recycling receives on average 200 tonnes of fishing rope annually both from fish harvesters and from shoreline clean-ups.

## SMALL-SCALE SOLUTIONS

Some fish harvesters have their own small-scale solutions for diverting their end-of-life fishing gear from landfills. Likewise, Island Waste and Recycling and some harbour authorities will set aside end-of-life fishing gear for similar solutions in which local community members use the gear for projects. Although these small-scale solutions are effective for some individual fish harvesters or communities, they are not adequate to sustainably divert all end-of-life fishing gear across the province. Examples of small-scale solutions identified during interviews are:

1. Repairing or reusing old lobster trap parts on newer traps,
2. Using lobster rope for making mats, baskets, and other craft products,
3. Selling old lobster traps as décor,
4. Burning clean wood from wood lobster traps for fuel,
5. Reusing rope for other uses such as tying down tarps and in horse fences,
6. Using wire lobster traps for retaining walls, and
7. Selling or donating rope to aquaculture farmers who use it for their mussel longlines for seed collecting and as buoy lines. Some fish harvesters in LFA 25 found a place in Prince Edward Island that will pay for some old rope for cultivating mussel spats.

## LARGE-SCALE SOLUTIONS

Currently limited options exist for recycling fishing rope in New Brunswick. As a result, most facilities in the province must landfill rope and even lobster traps at their end-of-life. While recycling markets exist for pure polyethylene or polypropylene rope, having fish harvesters keep these rope types separated or having to separate them out after they are intermixed, poses both logistical and technical challenges.

Fundy Plastics in Pennfield, New Brunswick, accepts various plastics including end-of-life fishing rope. The fishing rope collected in bins provided by Huntsman Marine Science Centre

at the wharves of southwestern New Brunswick not used for crafts are sent to Fundy Plastics. All the fishing rope stockpiled at Grand Manan Island Waste and Recycling (about 200 tonnes per year) is also sent to Fundy Plastics. Recently, they have stopped accepting Styrofoam used in aquaculture farming, likely due to not having a buyer. Fundy Plastics has recently purchased equipment to bail the plastic fishing rope but has yet to secure a steady buyer to recycle the plastic. Some recent developments are beginning to show promise for rope recycling in Atlantic Canada, such as Goodwood Plastic Products and Drastic Plastics using fishing rope in their plastic products and Sustane Technologies that have a process currently undergoing regulatory approvals to convert various plastic resins into diesel fuel. These new developments are summarized in the FGCAC's report on *End-of-life Fishing Gear Management in Nova Scotia* (2020). The rope recyclers in Nova Scotia may be potential future solutions to managing the fishing rope stockpiled at locations in New Brunswick.

In New Brunswick, American Iron and Metals (AIM) Recycling was identified as the main metal recycler with a large shredder for processing wire lobster traps with the ballasts attached. AIM Recycling was also identified as one of the main recyclers of wire lobster traps in Nova Scotia in which the processing facility is in Saint John, New Brunswick for all Atlantic Canada. Limar Enterprises, a trucking company based in Notre-Dame, New Brunswick, also plays a significant role collecting lobster traps throughout New Brunswick and Nova Scotia and transporting them to AIM Recycling in Saint John for processing and recycling. Currently, Grand Manan Island Waste and Recycling has a deal with AIM Recycling, who shipped 160 000 wire traps last year to them, and Fundy North Fishermen's Association is seeking a deal with AIM Recycling to recycle large quantities of their members' wire lobster traps.

Prices paid for the wire lobster traps from both waste resource facilities and individuals are tied to the global metal market and while they will vary from year to year, they are generally around $5-10 per tonne. The price paid will also depend on what percentage of the traps contain concrete ballasts as concrete can add significantly to the weight and subtract from the value. Some fish harvesters may take their traps directly to a metal collector or processor rather than to a waste resource management facility. Many smaller local metal collectors throughout the province receive wire lobster traps and supply AIM Recycling. These collectors include D R Scrap Metals, Tri Province Enterprises, Rayan Environmental Solutions, Jamie's Scrap Metal, Miramichi City Surplus, and Godzilla Recycling. Simpson Scrap Metal Recycling was noted as the main scrap metal buyer by Crane Mountain Landfilled, but when contacted directly, it was confirmed that they do not actually accept wire lobster traps. All the metal collectors require the concrete ballasts be removed prior to acceptance. Typically, waste resource management facilities in the province issue tenders or Requests for Quote to sell their metal stockpiles. These metal stockpiles often consist of a separate stockpile of wire lobster traps.

# CONCLUSIONS AND RECOMMENDATIONS

## CONCLUSIONS

Lobster is the primary commercial fishery in New Brunswick, contributing commercial landings of $0.3 billion in 2019. Although lobster is important both economically and culturally to coastal communities of New Brunswick, the scale of the fishery produces large volumes of end-of-life fishing gear to manage. Wire and wood lobster traps and plastic rope are the main gear used. Nearly all rope, and many traps, are not diverted from landfills and in some extreme cases, may be illegally dumped at sea or on land, or even burned.

The size of traps and diameter of rope used varies throughout the province as do the materials that the traps and rope are made of. Larger primarily wire traps are used in the southwest part of the province and smaller and primarily wood traps are used in the northeast part. Wire, however, is more dominantly used overall. Polyethylene and polypropylene rope, or blends of the two, are used in the lobster fishery, with larger diameter rope needed in the Bay of Fundy for use in trap trawl lines whereas smaller diameter rope is used for single trap fishing. With increasing use in wood lobster traps along the Gulf of St. Lawrence, there will be increased volumes needing to be managed at end-of-life, with no active large-scale solutions identified in the province.

The variety of traps and rope used results in differing amounts and types of end-of-life gear received by waste resource management facilities throughout the province as well as end-of-life management challenges. In total, about 40 540 lobster traps are replaced annually by fish harvesters in New Brunswick. More end-of-life wire traps are generated each year than wood traps, with about 32 900 wire traps replaced annually compared to 7 600 wood traps. This is reflected in products sold by retailers in the province, with most selling only wire traps. Furthermore, a total of approximately 14 620 coils of rope, measuring 5 350 km or weighing 164 tonnes, are replaced each year in New Brunswick.

Fish harvesters in New Brunswick are responsible for managing their end-of-life fishing gear by taking it to the nearest waste resource management facility or a metal recycler in the case of wire lobster traps. The linear distance to these facilities varies notably throughout the province. Of the 64 core commercial fishing harbours, only the Grand Manan harbours are within a 10 km range of a waste resource management facility, 13% are within 25 km, and 80% are within 50 km. Some fish harvesters continue to illegally dump their gear, notably due to lack of waste resource management infrastructure in their communities or a lack of clear waste management education. However, fish harvesters interviewed in New Brunswick expressed support, interest, or a need for a solution to managing end-of-life fishing gear. Their common suggestions were for regular collection programs organized at designated times throughout the year.

This research identified one primary metal recycler with the capacity to recycle all wire lobster traps generated in New Brunswick on an annual basis with no requirement for fish harvesters to remove concrete ballasts and other material: AIM Recycling. Although wire lobster traps can be recycled, most waste resource facilities do not recycle them. Only Crane Mountain Landfill and Red Pine Solid Waste Management Site were identified as setting aside wire lobster traps for recycling, but still charge ICI waste tipping fees.

In contrast to traps, rope is primarily sent to landfill because the multi-material composition of most rope used in the lobster fishery prevents it from being recycled by traditional plastic recyclers. In New Brunswick, Fundy Plastics is stockpiling end-of-life fishing gear they receive in the hope of securing a buyer, but to-date has yet to find one. In addition, the technology and infrastructure required to separate the single resin rope from the blends once collected does not currently exist. While there are some potentially promising solutions in Atlantic Canada, such as using the rope in plastic lumber or converting it to diesel fuel, these do not currently have the capacity to manage all end-of-life rope generated across Atlantic Canada on an annual basis.

## RECOMMENDATIONS

Based on the research findings, the following recommendations for the near and longer term can be made:

1. Use the results of this research as well as the lessons learned and success of developing and piloting a management program for end-of-life fishing gear Nova Scotia that is accessible, cost-effective, and environmentally responsible solution and expanding it to New Brunswick.
2. Work with the eight coastal regional commissions in New Brunswick to ensure facilities accept wire lobster traps “as-is” for recycling.
3. Evaluate the feasibility of issuing a province wide tender for the collection and recycling of wire lobster traps to help ensure all wire lobster traps are recycled.
4. Further investigate solutions to increase diversion of wood traps from landfill that minimize non-wood contaminants and the need for fish harvesters to dismantle their traps.
5. Collaborate with fishing industry stakeholders to promote the use of wire and wood lobster traps with removable/reusable ballasts, traps that are durable and repairable to extend their useful life, and new innovative traps that are fully recyclable.
6. Determine reliable solutions across Atlantic Canada with the necessary capacity to manage end-of-life fishing rope and build upon recent recycling progress being made in Atlantic Canada by companies such as AIM Recycling, Fundy Plastics, Goodwood Plastic Products, Drastic Plastics, and Sustane Technologies.

# ACKNOWLEDGEMENTS

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# APPENDICES

## APPENDIX A - QUESTIONNAIRES

### QUESTIONS FOR WASTE RESOURCE MANAGEMENT FACILITIES

1) What type of products do you accept?
2) Do you see much fishing gear come to your site? What do you see most of?
3) What are the tipping fees for fishing gear? (Wire traps, wood traps, rope, netting)
4) Do lobster traps need to be separated/stripped before bringing to the facility?
5) What happens to traps that are not stripped before arriving?
6) Do you recycle metal lobster traps?
7) Does the metal need to be kept separate from other metals?
8) Who buys/collects the metal for recycling?
    a. How often do they come and how much do they take?
    b. Is there any required preparation, such as removing concrete weights?
9) Is wood from wood traps recycled?
10) If fishing gear is not accepted, is there adequate space available to accept fishing gear products?

### QUESTIONS FOR FISHING GEAR RETAILERS

1) How many lbs of rope is approximately supplied annually to New Brunswick?
2) What is the most common rope sold in New Brunswick?
3) How many traps are approximately supplied annually to New Brunswick?
4) What is the most common trap size/type sold in New Brunswick?

### QUESTIONS FOR HARBOUR AUTHORITIES AND FISH HARVESTERS

1) Approximately how many vessels fish from this harbour?
2) What are the primary species fished at this harbour?
3) What is the most common type of lobster trap used at this harbour?
4) [Fish harvester specific] On average, how many lobster traps do you replace annually?
5) [Fish harvester specific] On average, how many crab pots do you replace annually?
6) [Fish harvester specific] What is the most common size (in diameter) rope that you use?
7) [Fish harvester specific] On average, how many coils of rope do you replace annually?
8) Does the harbour have a waste receptacle/dumpster on site?
9) Is end-of-life fishing gear permitted in the waste receptacle/dumpster?
    a. If no, why not?
10) Does your Community or Municipality currently offer, or do you currently have access to facilities/businesses that will recycle, reuse, or redirect end-of-life fishing gear collected at your harbour?
11) Are there any barriers that you face in dealing with end-of-life fishing rope, lobster traps, and/or crab pots at your harbour facility?

12) Are there stockpiles of old or discarded fishing gear (such as traps, rope) at the harbour?
13) Do you have any suggestions of how end-of-life fishing gear management practices can be improved at your harbour?
14) In the future, how would you like to receive information and education about potential opportunities or projects to manage end-of-life fishing gear?

## APPENDIX B – AMALGAMATED HARBOURS FOR HARBOUR SIZE CATEGORIES BY NUMBER OF BOATS

**Table 5. Amalgamated Harbours for Categorized Harbour Size by Number of Boats.**

| Location | Harbours |
|---|---|
| Blacks & Beaver Harbours | Beaver Harbour, Blacks Harbour |
| Campobello Island | Head Harbour, Malloch Beach, Wilsons Beach |
| Deer Island | Fairhaven, Leonardville, Lords Cove, Stuart Town |
| Grand Manan | Gull Head, Ingalls Head, North Head, The Whistle, Woodwards Cove, Whale Cove, White Head |
| Miscou Island | Laméque, Miscou, Pigeon Hill, Petit-Shippagan, Saint-Marie-sur-Mer, Savoy Landing |