

END-OF-LIFE FISHING GEAR MANAGEMENT IN PRINCE EDWARD ISLAND



Tignish Harbour © Harbour Authority of Judes Point/Tignish

June 25, 2021
Email: info@fgcac.org

Author Information:

Rachel A. Kendall, Project and Operations Coordinator, Fishing Gear Coalition of Atlantic Canada (FGCAC)

Sonia Smith, Project Lead, Fishing Gear Coalition of Atlantic Canada (FGCAC)

Marquita Davis, Project Lead, Fishing Gear Coalition of Atlantic Canada (FGCAC)

Natalya Dawe, Project and Communications Coordinator, Fishing Gear Coalition of Atlantic Canada (FGCAC)

This report serves as a living document subject to revisions upon new and additional information that is uncovered.

Information presented in this report was funded by Government of Canada - Fisheries and Oceans Canada.



Fisheries and Oceans
Canada

Pêches et Océans
Canada

Canada 

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 PRINCE EDWARD ISLAND.....	5
HARBOURS AND LOBSTER FISHING AREAS IN PRINCE EDWARD ISLAND.....	6
FISHING GEAR TYPE BY LFA	8
QUANTITY OF LOBSTER GEAR USED IN THE FISHERY.....	9
LOBSTER FISHING GEAR RETAILERS.....	10
LOBSTER TRAPS.....	11
ROPE.....	12
MANAGEMENT PRACTICES FOR END-OF-LIFE FISHING GEAR	12
WASTE RESOURCE MANAGEMENT FACILITIES.....	12
SMALL-SCALE SOLUTIONS	16
LARGE-SCALE SOLUTIONS.....	17
CONCLUSIONS AND RECOMMENDATIONS.....	17
CONCLUSIONS	17
RECOMMENDATIONS	19
ACKNOWLEDGEMENTS.....	19
REFERENCES.....	20
APPENDICES	21
APPENDIX A - QUESTIONNAIRES	21
APPENDIX B – AMALGAMATED HARBOURS FOR HARBOUR SIZE CATEGORIES BY NUMBER OF BOATS	22

EXECUTIVE SUMMARY

This report summarizes the results of a comprehensive study to gain an understanding of the life cycle of fishing gear in Prince Edward Island – 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 Prince Edward Island 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 1 213 lobster licences in Prince Edward Island. About 37 600 lobster traps are replaced annually in Prince Edward Island, with over 90% of these traps being made of wood or wood combined with wire tops and/or bottoms. About 1 780 km or 79 tonnes of rope are replaced in Prince Edward Island each year. Fish harvesters in Prince Edward Island 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, with 20% of core commercial fishing harbours within a 10 km range of a waste resource management facility and 87% within 25 km. However, some fish harvesters continue to illegally dump their gear or bury it themselves, notably due to high tipping fees to dispose of it and a lack of recycling options.

This research identified a metal recycler with the capacity to recycle all wire lobster traps generated in Prince Edward Island. 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, 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 Prince Edward Island.
2. Work with Island Waste Management Corporation, Superior Sanitation, and A & S Scrap to ensure facilities accept wire lobster traps “as-is” for recycling.
3. 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.

4. Collaborate with fishing industry stakeholders to promote the use of traps with a longer life that are fully recyclable.
5. 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 Prince Edward Island.

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 Prince Edward Island is necessary to support developing sustainable and long-term solutions for end-of-life fishing gear across Atlantic Canada and eastern Québec.

This Prince Edward Island 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 Prince Edward Island 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 Prince Edward Island to gain a better understanding of potential gaps and challenges surrounding the management of end-of-life fishing gear. 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 Prince Edward Island. 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 Prince Edward Island.

RESEARCH FOCUS AREA

Research for this report focused primarily on lobster, as it is the main fishery in Prince Edward Island, contributing 14% (\$0.23 billion) of all Atlantic Canadian 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. Prince Edward Island falls within the DFO Southern Gulf of St. Lawrence inshore lobster fisheries management region. The Southern Gulf of St. Lawrence inshore lobster fishery comprises five Lobster Fishing Areas (LFAs) (23-26a and 26b), stretching from the northern coast of New Brunswick to northern tip of Cape Breton in Nova Scotia, with three LFAs fished from Prince Edward Island (24, 25, 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).

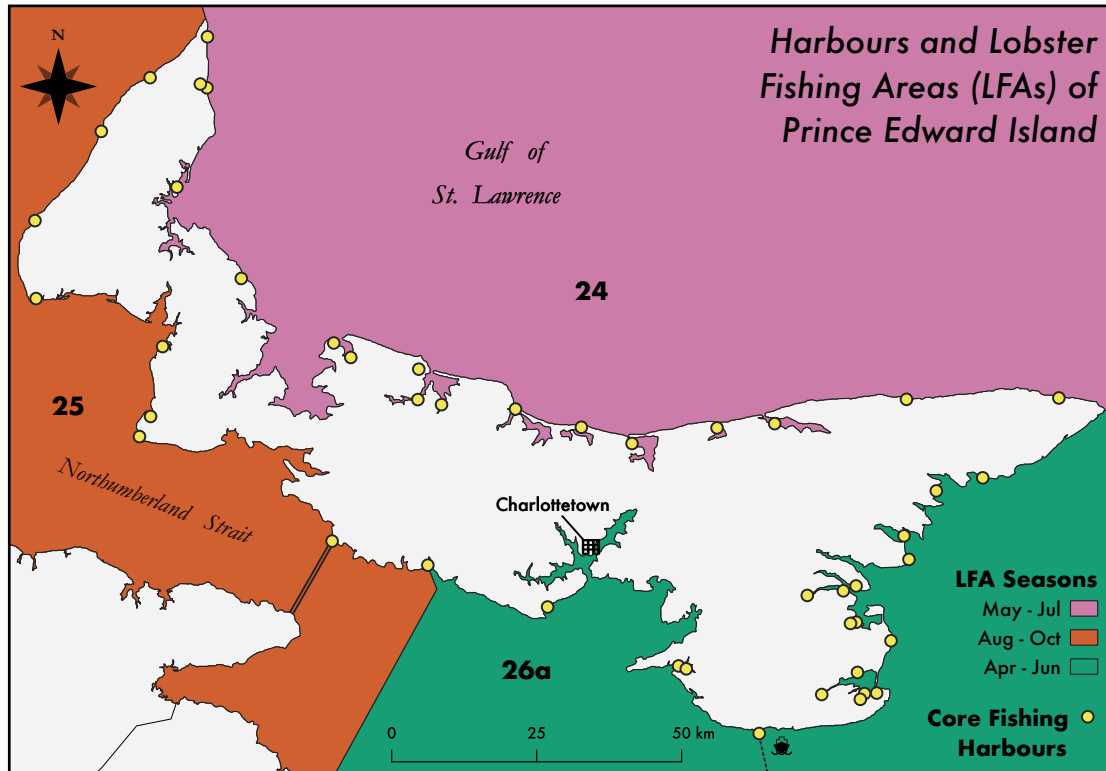


Figure 1. Harbours and lobster fishing areas (LFAs) in Prince Edward Island. Map projection: NAD 83 CSRS UTM Zone 20N, Transverse Mercator. Sources: LFA delimiter lines and provincial boundaries modified based on Coffen-Smout (2020), DFO. Map created using QGIS 3.10 by Rachel A. Kendall.

LFA seasons are staggered, each lasting three months in Prince Edward Island, with LFA 24 fished in spring, LFA 26a fished in spring to early summer, and LFA 26a fished in summer and early fall (Figure 1). In 2019, 1 338 lobster licences were issued to participants in the lobster fishery of LFAs 24-26a (DFO pers. comm. March 25, 2021), representing about 13% of the 10 000 licensed fish harvesters in Canada (DFO 2015). Lobsters are caught using baited wood, wire, or wood-wire combination traps placed on the seafloor mostly as single traps in Prince Edward Island, 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 Prince Edward Island 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 and waste resource management facilities (transfer stations, construction and demolition (C & D) sites, and landfills) 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 43 fish harvesters and harbour authorities from across the province in the months of January, February, and March of 2021 (Appendix A). All waste resource management facilities (12) 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 Prince Edward Island, the types of materials these products are made from, quantities replaced annually, number of fishing boats per harbour, and current barriers or opportunities to end-of-life fishing gear management.

Information relating to 45 active core Prince Edward Island commercial fishing harbours was provided by the Small Craft Harbours program of DFO. Small Craft Harbours' Harbour Authorities and their users provided information on each harbour's location and the number of commercial fishing boats registered to fish at each harbour. DFO Gulf 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, wood-wire combination traps, or a mixture of these traps.

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 (45 commercially active Small Craft Harbours and the Souris private harbour) were categorized by the number of fishing boats (not necessarily lobster fishing) to approximate the size of harbour and presented on three maps. Harbours managed by the same harbour authority were amalgamated for presentation purposes in the harbour size categories and trap type maps (Appendix B).

Buffers of 10 and 25 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, LFAs were categorized by whether more harbours per LFA use wood, wire, wood-wire combination traps, or a mixture of these traps.

Amounts of lobster traps and rope replaced annually were estimated using Prince Edward Island lobster licence numbers provided by DFO (pers. comm. March 25, 2021) and rope weight 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 25 has a limit of 240 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 25 could have a maximum total of 360 traps).

RESULTS AND DISCUSSION

MAJOR COMMERCIAL FISHERIES IN PRINCE EDWARD ISLAND

Lobster is the most commercially valuable species in Prince Edward Island (Table 1). Other important commercial species harvested in the province include snow crab, oyster, mackerel, and tuna (Table 1). The type of gear used varies among these fisheries. While both lobster and snow crab 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. Oysters are generally fished by aquaculture and using tongs and racks; mackerel are fished using purse seines; tuna are harvested using angling gear, tended lines, longlines, weirs, and/or electric harpoons (Table 1) (DFO 2020b).

Table 1. Primary commercial fisheries in Prince Edward Island and the types of gear used.

Species	2019 Landings (\$ Thousands) ^a	Gear Used
Lobster	231 115	Wire or wood, or wood-wire combination traps; polypropylene/polyethylene rope; buoys; concrete or steel ballasts; rubber.
Snow Crab	42 572	6-7 ft conical steel traps: welded steel ring frame, netting, twine, rope, and plastic cone.
Mackerel	3 205	Small (<19.8 m) and large (>19.8 m) purse seines.
Tuna	2 779	Angling gear with rod and reel; Tended Line; Trap net/weirs; Pelagic longline; Electric harpoon.
Oyster	2 492	Tongs and rakes operated by hand without mechanical assistance; Aquaculture.

^aDFO (2021).

To support the FGAC'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 Prince Edward Island. 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 Prince Edward Island, with the fishing season open from May until the middle of July (or until the quota is reached) (Prince Edward Island Seafood 2021). Aquaculture is common with oyster leases predominantly concentrated on the north and south shores according to the P.E.I. Aquaculture Alliance (2021) and the third most commercially valuable species in the province (Table 1). Many fish harvesters interviewed from these areas noted aquaculture (oysters, mussels, and clams) as a secondary species harvested. Both mackerel and tuna were also noted by fish harvesters as common secondary species harvested.

HARBOURS AND LOBSTER FISHING AREAS IN PRINCE EDWARD ISLAND

There are 46 core commercial fishing harbours in Prince Edward Island (45 active Small Craft Harbours and the privately-owned Souris harbour) ranging in size from 1 to at least 145 boats. Most core fishing harbours have 26-75 boats (47%) and then 1-10 boats (30%). Only three harbours have more than 75 boats (7%), with Judes Point/Tignish being the largest harbour in the province with at least 145 boats (Figure 2). The remaining harbours have 11-25 boats (16%). Two of the largest harbours, Judes Point/Tignish and Alberton, are located near the northwestern tip of the island, with the other largest, North Lake, located at the northeastern tip (Figure 2). The least number of boats are along the Northumberland Strait, with mostly small harbours (1-10 boats).

Fishing seasons in all LFAs along Prince Edward Island are limited to three months (Table 2). In 2019, there were 343 000 lobster trap tags issued in LFAs 24-36a in Prince Edward Island. LFA 24 had the most licences issued (47% of all licences; Table 2). Each LFA has a different trap limit ranging from 240 to an average of 412 for LFA 24 per licence holder (Table 2). As LFA 24 had the most traps licensed in 2019 and is where the three largest harbours (Judes Point/Tignish, North Lake, and Alberton) are located, this represents the largest lobster fishing area of Prince Edward Island.

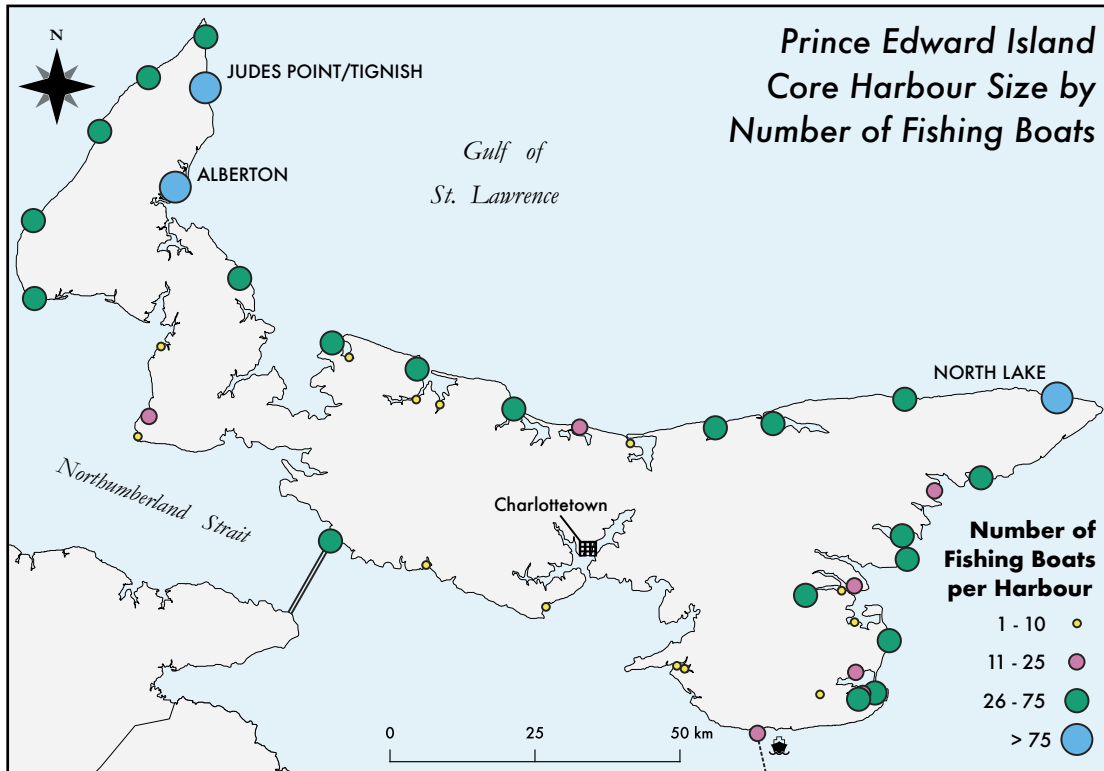


Figure 2. Size of core Prince Edward Island commercial fishing harbours by number of boats. Refer to Figure 1 for map sources.

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

LFA	Fishing Season	Total Licences	Trap Limit per Licence ^a	Maximum Traps Licensed
24	May 3 - Jul 3	633	412	190 000
25	Aug 8 - Oct 9	225	240	54 000
26a	Apr 30 - Jun 30	355	374	99 000
Total	—	1 213	—	343 000

Season, licence, and tag information from DFO pers. comm. March 25, 2021. ^aTrap 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.

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 government. Wood traps are primarily used by fish harvesters throughout Prince Edward Island, with many of these wood traps also containing wire tops, bottoms, or other wire parts (Figure 3). At the north side of the province and in the spring, fish harvesters use wood and wood with wire tops or bottoms. The wire top trap door is taken from wire traps and added to the wood traps, which was indicated as being done for buoyancy and because the traps will be stronger against marine worms when the water becomes warmer. Wire traps are used in the fall (LFA 25) because marine worms are known to create many holes in the wood and the traps will dismantle in a couple years.

Two fish harvesters interviewed who fish at West Point harbour in LFA 25 noted they used primarily wire traps here, however, all other harbours in LFA 25 indicated that either they primarily used wood or a combination of wood and wire. Although LFA 26a is noted as a mix of wood and wire traps in Figure 3, the wood traps may be wood-wire combo traps. When asking fish harvesters if they primarily use wood or wire, they often noted wood, but further conversation led to an understanding that these wood traps may often contain wire parts.

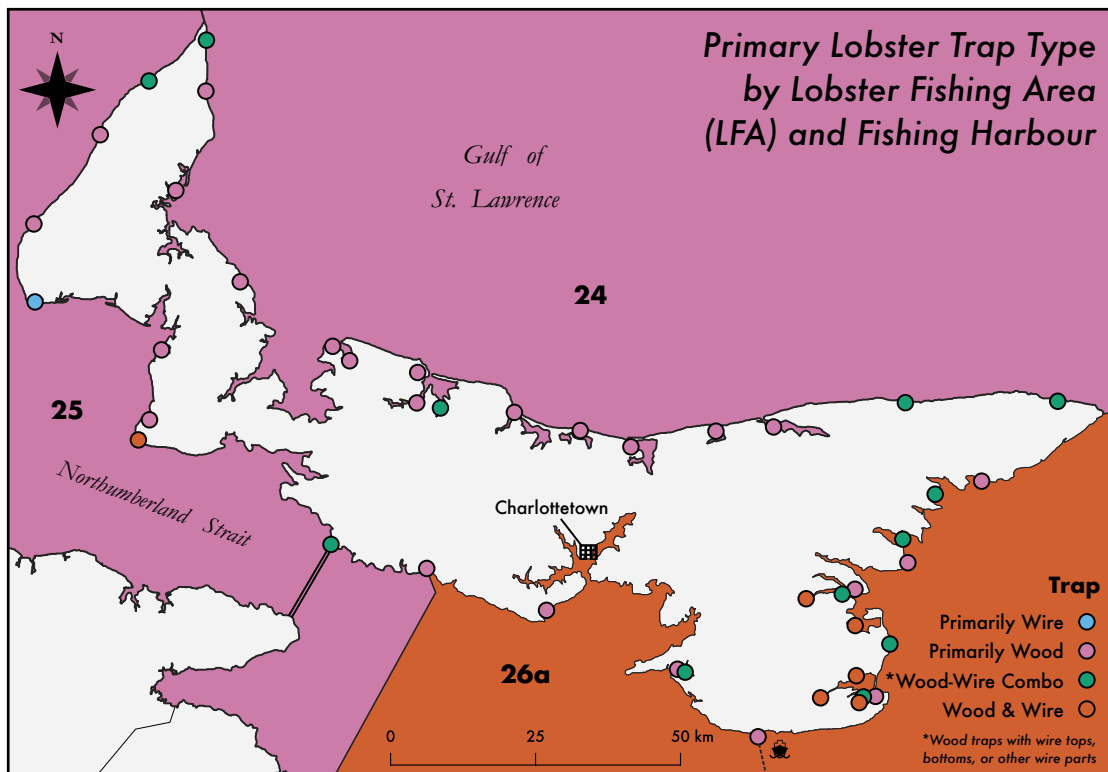


Figure 3. Primary lobster trap type (wire, wood, or both) by LFA and by fishing harbour. Refer to Figure 1 for map sources.

Lobster is primarily fished near shore with single pots, with the same rope used for everything. However, during one conversation with a fish harvester who fishes from West Point harbour indicated fishing in 'bunches' in which multiple traps are attached together by rope. The primary fishing rope used by fish harvesters is made of polyethylene, polypropylene, or a blend of polyethylene and polypropylene, with 3/8-inch diameter rope indicated as the most common used among lobster fish harvesters in Prince Edward Island. 25/64-inch rope is also commonly laced over crab pots. Lobster fishing rope is generally sold as 366 m (1200 ft) coils. The weight of these coils is approximately 36 lb for 3/8-inch diameter rope (S. Burke, pers. comm. December 4, 2020).

QUANTITY OF LOBSTER GEAR USED IN THE FISHERY

Compared to the Maritimes region (Atlantic Coast and Bay of Fundy), the waters of the Gulf are calmer and shallower, so fishing is generally done approximately 10 miles offshore and never greater than 100 ft in depth. This results in traps lasting for longer than in rougher marine conditions. Many fish harvesters noted that they may not need to replace their lobster traps or fishing rope for up to the length of their fishing career as there are not many harsh stormy conditions to damage the gear.

Information on lobster trap and fishing rope replacement was derived from conversations with 33 fish harvesters in Prince Edward Island. The quantity of traps replaced annually by fish harvesters ranged from 1 up to 75, with most annually replaced quantities greater than 20 (75%) and averaging about 30 traps replaced per fish harvester per year. The quantity of rope coils replaced annually by fish harvesters ranged from less than 1 to 8, averaging about 4 coils of rope replaced per fish harvester per year.

Multiplying the total number of licences issued per LFA in 2019 (licences represent the number of lobster fish harvesters) by the approximate number of traps replaced per fish harvester (Table 2), about 37 600 lobster traps would have been replaced annually by fish harvesters in LFAs 24-26a. Of this total, 52% would have been replaced by fish harvesters in LFA 26a, 29% replaced in LFA 25, and 19% replaced in LFA 24. Breaking this down by trap preference per harbour (Figure 3), one harbour indicated preference of wire traps and six harbours indicated both wood and wire being used, resulting in 91% of the total traps being replaced having been wood or wood-wire combination traps.

Approximately 4 850 coils of rope would be replaced in LFAs 24-26a 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 1 780 km (5 822 400 ft) of rope replaced each year. In weight, this represents 87 tonnes annually. Fish harvesters were also asked how many crab pots they replace annually, but for many the answer was that they have yet to replace their pots, or only a few will be replaced due to damage or because lost during a storm. Three fish harvesters indicated that they replace 10-20 crab pots annually.

The replacement lobster trap and rope numbers are estimates based on average values provided by 33 fish harvesters in Prince Edward Island. 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.

LOBSTER FISHING GEAR RETAILERS

Of the five fishing gear retailers and suppliers in Prince Edward Island, three also sell fishing rope, two sell constructed lobster traps, and four sell materials to build lobster traps (Table 3). Two of these retailers sell only wood traps. Additionally, the retailers may sell used fishing supplies and used wood lobster traps. The major trap retailers in Prince Edward Island are Hackett Enterprises and Eastern Trap Supplies. Lobster fish harvesters often construct their own traps using material purchased from fishing gear retailers or fishermen’s co-ops. Co-ops in Prince Edward Island are Tignish Fisheries Co-op Association, Cabot Fishermen’s Co-operative, Acadian Fishermen’s Co-op, and Machon Point Fisherman’s Co-op.

The retailers and suppliers of lobster fishing rope in Prince Edward Island are Rainbow Net and Rigging, Spartan Industrial Marine/Hercules Group of Companies, and Vernon d’Eon Fishing Supplies, as well as the fishermen’s co-ops. Only Spartan Industrial Marine and Vernon d’Eon Fishing Supplies have retail locations on the island; the other companies supply material by transport from Nova Scotia. Hampidjan Canada was noted as having only very low rope sales volumes in the lobster and crab fisheries in Atlantic Canada.

Table 3. Types of lobster traps and trap material sold by retailers.

Company	Wire Traps	Wood Traps
Eastern Trap Supplies	×	✓
Hackett Enterprises	×	✓
Rainbow Net and Rigging	✓	✓
Spartan Industrial Marine	✓	×
Vernon d’Eon Fishing Supplies	✓	×

Sale of lobster traps and their materials (wood, 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

Lobster traps in Prince Edward Island are predominately made of wood, with many wood traps with vinyl coated wire tops and/or bottoms, with some fish harvesters using full wire traps. The main wire mesh brands noted during phone conversations with retailers were Aquamesh and Cavatorta. Wood and wire traps also include twine netting, rope, and ballasts (Figure 4). The ballast or weight is used to ensure the lobster traps sink to the seafloor and is typically made of either concrete or steel. Lobster traps can be sold with the concrete ballasts already poured in the vinyl mesh of wire traps, or ballasts can be added in after purchase. The wood traps may be either square or the traditionally round shape (Figure 4). Traps used in Prince Edward Island are generally 3-4 ft in length and weigh about 75-80 lbs with the ballast. The number of traps sold annually by retailers varied from 2000 up to 50 000 traps, though the 50 000 quantity includes shipments to other Atlantic provinces.

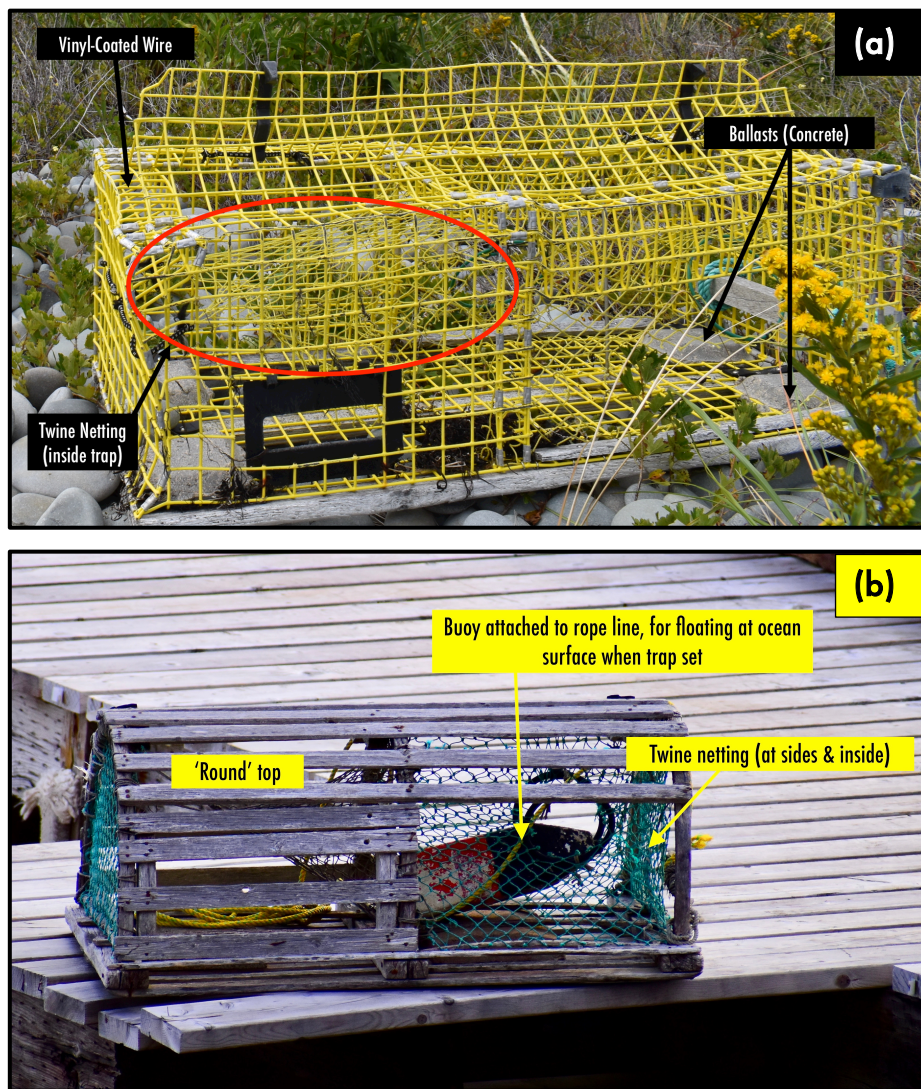


Figure 4. Diagram showing the parts of (a) a wire lobster trap and (b) a 'round' wood lobster trap. Photos copyrights Rachel A. Kendall.

ROPE

Of the 12 brands of lobster fishing rope identified as being sold by retailers and distributors in Prince Edward Island, 50% are polyethylene material, 8% are polypropylene material, and 42% are a blend of polyethylene and polypropylene (Figure 6). There are many other ropes used for specific purposes, such as the polyester or polypropylene with a latex core Trapcord, manufactured by Novabraid in Nova Scotia for lobster trap doors. Other ropes are made of nylon, but these are not commonly used for lobster fishing in Prince Edward Island. Major retailers and distributors of lobster fishing rope in Prince Edward Island are Vernon d'Eon Fishing Supplies, 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 the largest supplier of rope to retailers and distributors. The approximate quantity of fishing and aquaculture rope sold annually by suppliers to Prince Edward Island ranged from 90 to 450 tonnes.

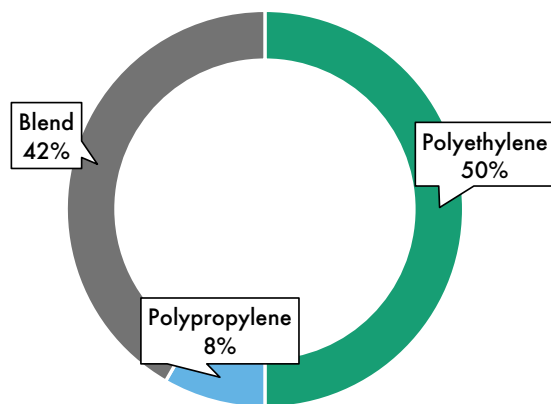


Figure 5. Percentage of lobster fishing rope made using polyethylene, polypropylene, or a blend of both.

MANAGEMENT PRACTICES FOR END-OF-LIFE FISHING GEAR

WASTE RESOURCE MANAGEMENT FACILITIES

Fish harvesters in Prince Edward Island are responsible for managing their end-of-life fishing gear. Ideally, fish harvesters will transport their gear to the nearest disposal facility. If harbour authorities provide collection bins, they are to be used only for regular waste that would be generated by the fish harvesters on their boats, but not for rope or lobster traps. Some harbours have collection bins for recyclables, but these would be restricted to “blue bag” recyclables such as beverage containers generated on the boats and not end-of-life fishing gear.

Most fishing harbours across the province do not have collection programs in place for end-of-life fishing gear and if there are bins provided, bulky items like lobster traps are not permitted. Reasons noted for not having collection programs were costs being too high and issues with the public disposing of their waste in the bins. 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. There

are containers at some fishing harbours that receive about ten tonnes of rope per week during the summer fishing season and about five tonnes per week in other seasons (Edward Clarke, pers. comms. January 6, 2021). 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. Common barriers to responsible disposal of end-of-life fishing gear noted by fish harvesters were high tipping fees and limited recycling options.

To help visually approximate the distance that fish harvesters need to transport their end-of-life gear, 10 and 25 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 37 of 46 core commercial fishing harbours are farther than 10 km from a waste resource management facility (Figure 6). None of the larger fishing harbours (> 75 boats) are located within 10 km of a waste resource management facility. However, 40 of the 46 core fishing harbours are located within 25 km of a waste resource management facility. The larger fishing harbours (> 75 boats) of Judes Point/Tignish and Alberton fall within the 25 km buffer, but North Lake is outside the 25 km buffer. The other harbours falling outside the 25 km buffer are three small harbours with 1-10 boats and two harbours with 11-25 boats, each approximately 30-40 km from the nearest waste resource management facility.

Waste management is primarily provided by Island Waste Management Corporation for all homes and businesses through the province's Waste Watch Program, which includes six Waste Watch Drop-Off Centres (Table 4). Most end-of-life fishing gear is sent by the Waste Watch Drop-Off Centres to the landfill at the East Prince Management Facility. Additionally, the private waste management company, Superior Sanitation, owns the Summerside Waste Watch Drop-Off Centre and a C & D facility (North Road Holding). In Charlottetown, the PEI Energy Systems Waste Plant accepts various commercial materials, but only very small quantities of rope and netting mixed in and no lobster traps. There are also three private C & D sites, but these are owned by construction companies and used solely for their construction debris and are therefore not included in this report analysis.

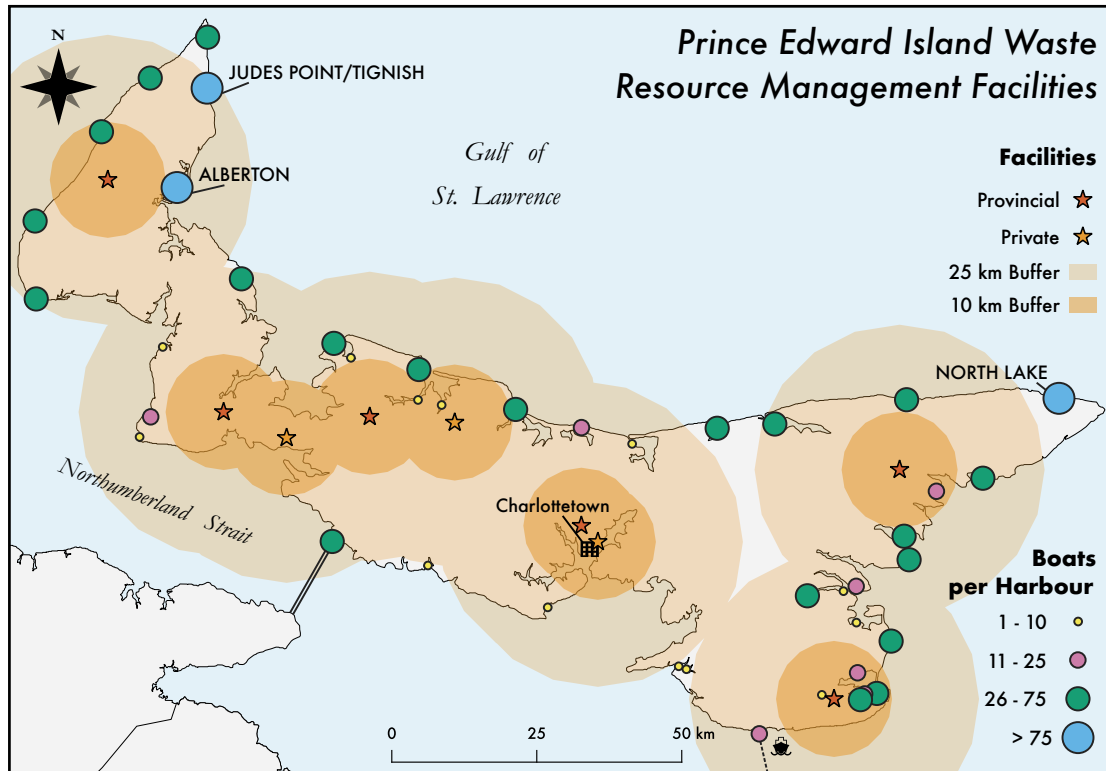


Figure 6. Prince Edward Island core commercial fishing harbours and waste resource management facilities with 10 and 25 km buffers. Refer to Figure 1 for map sources. Not all facilities accept or receive fishing gear.

Table 4. Management of end-of-life lobster traps at Prince Edward Island waste resource management facilities.

Region	Facility Name	Wire Traps	Wood Traps
Central	Greenisle, Charlottetown Waste Watch Drop-Off Centre*	✓	✗
Central	New London Waste Watch Drop-Off Centre	✓	✗
Capital	PEI Energy Systems Waste Plant	—	—
Capital	Superior Sanitation - North Road Holding	—	✗
Eastern	Dingwells Mills Waste Watch Drop-Off Centre	✓	✗
Eastern	Murray River Waste Watch Drop-Off Centre	✓	✗

East Prince	East Prince Waste Management Facility, Wellington Centre*	✓	✗
East Prince	Summerside Waste Watch Drop-Off Centre*	✓	✗
West Prince	Brockton Waste Watch Drop-Off Centre*	✓	✗

'✓' indicates facilities that receive lobster traps for recycling or allow collection by third parties for reusing or repurposing to divert the traps from landfill. '✗' 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.

Tipping fees for any end-of-life fishing gear, including wire lobster traps, wood lobster traps, fishing rope, and crab pots, are charged the commercial waste tipping fee of \$115 per tonne at all Waste Watch Drop-Off Centres. The East Prince Waste Management Facility is the only landfill facility in Prince Edward Island, and all commercial waste including traps and rope are charged a tipping fee of \$100 per tonne. Only wood traps may be disposed of at the North Road Holding C & D facility, which charges \$70 per tonne.

The waste resource management facilities in Prince Edward Island receive more wood traps than wire traps, which are generally crushed and sent to the landfill at the East Prince Waste Management Facility. Prior to the PEI Department of Environment asking that traps not be sent to construction pits anymore, wood traps would be buried in construction pits. The landfill has lined pits, whereas construction pits are not lined, so they are limited as to what they can accept because wood traps now contain too much netting. Wood traps may be crushed and sent to the North Road Holding C & D facility, which has a lower tipping fee than the East Prince Waste Management Facility. Concrete ballasts may remain in wood traps if they are sent to the landfill, but many fish harvesters will remove the ballasts to reduce tipping fees.

Wire traps can be recycled and sold as scrap metal. Although some Waste Watch Drop-Off Centres explained that Metal traps do not need the cement ballasts removed because the metal recycler bails them and the excess material is removed in the process (Brockton, Murray River), other Waste Watch Drop-Off Centres indicated that the metal recycler will not accept the wire traps if the concrete ballasts are still attached (New London). The remaining Waste Watch Drop-Off Centres noted how full wire traps with the ballasts rarely come as fish harvesters do not want to pay the high fees with the ballasts. The metal recycler that buys scrap metal from the Waste Watch Drop-Off Centres is A & S Scrap, co-owned by John Ross & Sons. However, a follow up phone call with A & S Scrap revealed that they require the concrete removed from the traps. It may be that if there is a large pile of metal traps, this is cost-worthy to remove the concrete, but not for small quantities of traps, resulting in the different requirements among Waste Watch Drop-Off Centres. Concrete removed from wire traps to be recycled are landfilled. Traps not recycled are landfilled.

Currently all the rope received at the Waste Watch Drop-Off Centres is landfilled, as is any other fishing gear. Other gear received in large quantities at the Waste Watch Drop-Off Centres are oyster cage floaters, netting, and buoys. Most end-of-life fishing gear received at the East Prince Waste Management Facility comes from the Brockton Waste Watch Drop-Off during fishing seasons, which is located near two of the largest core fishing harbours (Judes Point/Tignish and Alberton; Figure 6).

Many wood traps have wire mesh tops, bottoms or other wire parts, making them more difficult to manage, and will therefore end up in the landfill if taken to a Waste Watch Drop-Off Centre. Although all lobster traps are accepted at all the Waste Watch Drop-Off Centres, many fish harvesters rarely take their traps because of the high tipping fees even with the concrete ballasts removed. Instead, fish harvesters have their own means of disposing or reusing their end-of-life lobster traps. Some fish harvesters noted that wood traps can be taken to a C & D site because the wood will break down.

The fishing industry can be a significant source of waste in various parts of the province, as rope, wood traps, and wire traps are not always 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, 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, rope or traps that arrive at a facility tangled with other waste may not be easily separated and will end up in the landfill. Fishing rope was raised as an issue, as it is difficult to manage by facilities and there are limited options to divert it from landfill.

SMALL-SCALE SOLUTIONS

Some fish harvesters have their own small-scale solutions for diverting their end-of-life fishing gear from landfills. 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, such as wire or ballasts, on new traps,
2. Rope used by aquaculture farmers for mussel lines, buoy lines, and seed collecting,
3. Using lobster rope for making mats, baskets, and other craft products,
4. Selling old lobster traps to lobster fish harvesters in other LFAs and provinces,
5. Burning wood from wood lobster traps for fuel,
6. Reusing concrete ballasts in driveways or as gravel in the floor of barns,
7. Using netting and rope like a tarp for covering loads, tying trees, or for in gardens and on farms.

The most common reuse indicated for lobster fishing rope was selling or donating it to oyster and mussel aquaculture farmers in the province who use it for their mussel longlines for seed collecting and as buoy lines. A mussel farmer who was interviewed noted that he purchases old rope from lobster fish harvesters for using to collect seeds by cutting up for drops because the frayed rope is better for allowing the seeds to stick. Some lobster fish harvesters interviewed noted that up to 90% of their rope is reused by aquaculture farmers.

LARGE-SCALE SOLUTIONS

Currently limited options exist for recycling fishing rope and lobster traps in Prince Edward Island. As a result, most facilities in the province must landfill rope and 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.

Some recent developments are beginning to show promise for rope recycling in Nova Scotia, 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 FGAC's report on *End-of-life Fishing Gear Management in Nova Scotia* (2020).

In Prince Edward Island, A & S Scrap was identified as the largest metal recycler, which is co-owned by John Ross & Sons. John Ross & Sons is one of the main recyclers of wire lobster traps in Nova Scotia, which accepts the traps "as-is" with the ballasts attached and have a large shredder for processing a variety of metals. Other local metal collectors would sell their metal to A & S Scrap. These collectors include Charlottetown Bottle & Metal, Gallant's Scrap Iron & Metals, and Highland Bottle & Metal Exchange, but only Charlottetown Bottle & Metal said they would accept the wire traps with the concrete. Some fish harvesters may take their traps directly to a metal collector or processor rather than to a waste resource management facility.

CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

Lobster is the primary commercial fishery in Prince Edward Island, contributing commercial landings of \$0.23 billion in 2019. Although lobster is important both economically and culturally to Prince Edward Island, the scale of the fishery produces large volumes of end-of-life fishing gear to manage. Wood and wire lobster traps and plastic rope are the main gear used. Nearly all rope and traps are not diverted from landfills and in some extreme cases, may be illegally dumped at sea or on land, or burned.

Wood lobster traps, including wood traps with wire parts, are more dominantly used overall in Prince Edward Island. Polyethylene and polypropylene rope, or blends of the two, are used in the lobster fishery, as consistently the same diameter of 3/8-inch across the province. Lobster is primarily fished near shore in relatively shallow water using single pots, with the same rope used for everything.

The variety of trap types 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 37 600 lobster traps are replaced annually by fish harvesters in Prince Edward Island. More end-of-life wood or wood-wire combination traps are generated each year than fully wire traps, with about 91% wood and wood-wire traps replaced annually. This is reflected in products sold by retailers in the province, with the main trap supplier selling custom wood and wood-wire combination traps and other retailers and suppliers selling low quantities of wire traps. Furthermore, a total of approximately 4 850 coils of rope, measuring 1 780 km or weighing 79 tonnes, are replaced each year in Prince Edward Island and are primarily landfilled.

Fish harvesters in Prince Edward Island are responsible for managing their end-of-life fishing gear by taking it to the nearest Waste Watch Drop-Off Centre. The linear distance to these facilities varies throughout the province. Of the 46 core commercial fishing harbours, 9 (20%) are within a 10 km range of a waste resource management facility and 40 (87%) are within 25 km. Some fish harvesters continue to illegally dump their gear or bury it themselves, notably due to high tipping fees to dispose of it and a lack of recycling options. However, fish harvesters in Prince Edward Island overwhelmingly 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 or designated times “to allow fish harvesters to bring their end-of-life fishing gear only (traps, nets, rope, etc.) to a designated [Waste Watch Drop-Off Centre] to be sorted and disposed of” (*Anonymous*, pers. comm. January 5, 2021).

This research identified one metal recycler with the capacity to recycle all wire lobster traps generated in Prince Edward Island on an annual basis, but the wood-wire combination traps would require extra effort to remove the wire. However, most of the waste resource management facilities continue to send lobster traps to the landfill, except at the Brockton and Murray River Waste Watch Drop-Off Centres, or if fish harvesters separate the wire from the other material. Solutions to responsibly manage wood traps at end-of-life are less consistent across the province. While some fish harvesters deconstruct their traps and use the wood for fuel, most wood traps are transported to waste resource management facilities with the mesh netting still attached, where these traps will be landfilled or buried in the C & D facility.

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 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 the region 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 in Nova Scotia that is accessible, cost-effective, and environmentally responsible solution, and expanding it to Prince Edward Island.
2. Work with Island Waste Management Corporation, Superior Sanitation, and A & S Scrap to ensure facilities accept wire lobster traps “as-is” for recycling.
3. 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.
4. 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.
5. 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 Goodwood Plastic Products, Drastic Plastics, and Sustane Technologies.

ACKNOWLEDGEMENTS

The baseline data collection for this report was made possible with the funding provided by the Department of Fisheries and Oceans Solutions & Retrieval Support Contribution Program (SFSRSCP). Thank you to all the members of the fishing industry, retailers and distributors, municipal waste coordinators, and waste resource management facility supervisors, and other participants who dedicated time to speak with us and answer our questionnaires. This work would not have been possible without the support of all the members of the Fishing Gear Coalition of Atlantic Canada.

REFERENCES

- Coffen-Smout, Scott. (2020). **Lobster Fishing Areas NE Atlantic** [unofficial]. Dartmouth, NS: Aquatic Ecosystems Branch, Fisheries and Oceans Canada, Bedford Institute of Oceanography.
- Dawe, N., Kendall, R. A., Goodick, M., and Smith, S. 2020. **End-of-life Fishing Gear management in Nova Scotia**. [Report]. Fishing Gear Coalition of Atlantic Canada. Available from: <https://fgcac.org/end-of-life-fishing-gear-project/>.
- DFO. (2021). Seafisheries landed value by region, 2018. **Government of Canada, Department of Fisheries and Oceans Canada**. Available from: <https://www.dfo-mpo.gc.ca/stats/commercial/land-debarq/sea-maritimes/s2018av-eng.htm>.
- DFO. (2020a). **Integrated fisheries management plans**. Government of Canada, Department of Fisheries and Oceans Canada. Available from: <https://www.dfo-mpo.gc.ca/fisheries-peches/ifmp-gmp/index-eng.html>.
- DFO. (2020c). **Fisheries by species - Atlantic and Arctic commercial fisheries**. Government of Canada, Department of Fisheries and Oceans Canada. Available from: <https://www.dfo-mpo.gc.ca/fisheries-peches/commercial-commerciale/atl-arc/index-eng.html>.
- DFO. (2015). **Lobster**. Government of Canada, Department of Fisheries and Oceans Canada. Available from: <https://www.dfo-mpo.gc.ca/fisheries-peches/sustainable-durable/fisheries-peches/lobster-homard-eng.html>.
- Goodman, A. (2020). **State of abandoned, lost and discarded fishing gear in the Canadian Maritimes (East Coast)**. Fishing Gear Coalition of Atlantic Canada. [Report]. Available from: <https://fgcac.org/end-of-life-fishing-gear-project/>.
- P.E.I. Aquaculture Alliance. (2021). **PEI Oyster Industry**. Available from: <https://www.aquaculturepei.com/oyster-industry.php>.
- Prince Edward Island Seafood. (2021). **Snow Crab**. Available from: <https://princeedwardislandseafood.com/portfolio/snow-crab/>.

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 AND SUPPLIERS

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

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
French River	French River, French River – South Landing
Tignish	Judes Point, Tignish
Sturgeon	Sturgeon, Sturgeon (Bridge)