LABRADOR – ISLAND TRANSMISSION LINK ENVIRONMENTAL ASSESSMENT

Socioeconomic Environment: Marine Fisheries in the Strait of Belle Isle Component Study

May 2011

nalcor energy
LOWER CHURCHILL PROJECT

LABRADOR – ISLAND TRANSMISSION LINK ENVIRONMENTAL ASSESSMENT
Environmental Component Studies: Introduction and Overview

Nalcor Energy is proposing to develop the *Labrador – Island Transmission Link* (the Project), a High Voltage Direct Current (HVdc) electrical transmission system extending from Central Labrador to the Avalon Peninsula on the Island of Newfoundland.

The Project was registered under the Newfoundland and Labrador *Environmental Protection Act* (*NLEPA*) and the *Canadian Environmental Assessment Act* (*CEAA*) in January 2009 (with subsequent amendments and updates), in order to initiate the provincial and federal environmental assessment (EA) processes. Following public and governmental review of that submission, an Environmental Impact Statement (EIS) was required for the Project. The EIS is being developed by Nalcor Energy, in accordance with the requirements of both *NLEPA* and *CEAA* and the *EIS Guidelines and Scoping Document* issued by the provincial and federal governments.

In support of the Project's EIS, Nalcor Energy has undertaken a series of environmental studies to collect and/or compile information on the existing biophysical and socioeconomic environments and to identify and assess potential Project-environment interactions. This environmental study program has included field surveys, associated mapping and analysis, environmental modeling, and the compilation and analysis of existing and available information and datasets on key environmental components. This report comprises one of these supporting environmental studies.

A general guide to these Environmental Component Studies, some of which are comprised of multiple associated reports, is provided on the opposite page.

The information reported herein will be incorporated into the Project's EIS, along with any additional available information, to describe the existing (baseline) environmental conditions and/or for use in the assessment and evaluation of the Project's potential environmental effects and in the identification and development of mitigation.

This study focuses on the relevant aspects of the proposed Project – including the proposed and alternative HVdc transmission corridors, marine cable crossings, and/or other Project components and activities – as known and defined at the time that the EA process was initiated and/or when the study commenced. Project planning and design are ongoing, and as is the case for any proposed development, the Project description has and will continue to evolve as engineering and EA work continue. The EIS itself will describe and assess the specific Project components and activities for which EA approval is being sought, and will also identify and evaluate other, alternative means of carrying out the Project that are technically and economically feasible as is required by EA legislation.

The EIS and these Component Studies will be subject to review by governments, Aboriginal and stakeholder groups and the public as part of the EA process.

Nalcor Energy – Lower Churchill Project

LABRADOR-ISLAND TRANSMISSION LINK: ENVIRONMENTAL COMPONENT STUDIES (CSs)

Component Study	Reports	
1) Vegetation CS	**Report 1a** **Ecological Land Classification**	**Report 1b** **Wetlands Inventory & Classification**
	Report 1c **Regionally Uncommon Plants Model**	**Report 1d** **Timber Resources**
	Report 1e **Vegetation Supplementary Report**	
2) Avifauna CS		
3) Caribou & Other Large Mammals CS	**Report 3a** **Caribou & Their Predators**	**Report 3b** **Moose & Black Bear**
4) Furbearers & Small Mammals CS		
5) Marine Environment: **Fish & Fish Habitat, Water Resources CS**	**Report 5a** **Marine Fish: Information Review**	**Report 5b** **Marine Flora, Fauna & Habitat Survey**
	Report 5c **Marine Habitats (Geophysical) Survey**	**Report 5d** **Water, Sediment & Benthic Surveys**
	Report 5e **Marine Surveys: Electrode Sites**	**Report 5f** **Marine Surveys: Supplementary**
6) Freshwater Environment: **Fish & Fish Habitat, Water Resources CS**		
7) Marine Environment: **Marine Mammals, Sea Turtles & Seabirds CS**	**Report 7a** **Marine Mammals, Sea Turtles & Seabirds: Information Review**	**Report 7b** **Marine Mammal & Seabird Surveys**
	Report 7c **Ambient Noise &** **Marine Mammal Surveys**	
8) Species of Special Conservation Concern CS		
9) Marine Environment & Effects Modelling CS	**Report 9a** **Strait of Belle Isle: Oceanographic Environment & Sediment Modelling**	**Report 9b** **Strait of Belle Isle: Marine Sound Modelling - Cable Construction**
	Report 9c **Electrodes: Environmental Modelling**	
10) Historic & Heritage Resources CS		
11) Socioeconomic Environment: **Communities, Land & Resource Use,** **Tourism & Recreation CS**	**Report 11a** **Communities, Land & Resource Use,** **Tourism & Recreation**	**Report 11b** **Current Levels of Accessibility** **Along the Transmission Corridor**
12) Socioeconomic Environment: **Aboriginal Communities & Land Use CS**		
13) Socioeconomic Environment: **Marine Fisheries in the Strait of Belle Isle CS**		
14) Viewscapes CS		

Environmental Component Study Required Under the EIS Guidelines: Comprising Reports (Shaded cells above)	
Avifauna: 2, 7a, 7b	Furbearers: 4
Caribou (and Predators): 3a	Timber Resources: 1d
Water (Quality and Quantity): 5a, 5d, 5e, 5f, 6	Marine and Freshwater Fish and Fish Habitat: 5, 6, 7, 13
Species at Risk: 8	Historic Resources: 10
Viewscapes: 14	Socioeconomics: 11, 12, 13
Environmental study reports submitted as additional background information: 1a, 1b, 1c, 1e, 3b, 9	

Labrador – Island Transmission Link

Socioeconomic Environment: Marine Fisheries in the Strait of Belle Isle Component Study

Preface

This *Marine Fisheries in the Strait of Belle Isle Component Study* has been prepared and submitted as part of the Environmental Assessment (EA) of the proposed **Labrador-Island Transmission Link** (the Project).

The Main Report (March 2010) describes fishing activities in the area of the Project's proposed marine cable crossings of the Strait of Belle Isle, and makes use of fisheries statistical data as well as consultations with fishers and other industry representatives. An attached Supplementary Report (December 2010) provides additional information on fishing equipment and activities, with a focus on the Strait of Belle Isle scallop fishery. A further Supplement presents the results of a previous (2001) review of fisheries in the Strait of Belle Isle, as additional background information.

The Project concept for the proposed Strait of Belle Isle marine cables - as described in the January 2009 EA Registration submitted to initiate the EA process - saw the preliminary identification of potential cable landing sites at Forteau Point, Labrador and Mistaken Cove, Newfoundland (with alternatives at L'Anse Amour and Yankee Point in Labrador and on the Island, respectively). From there, multiple cables would be placed in two identified marine corridors across the Strait, as illustrated in the map below. These potential corridors and landing sites are thus reflected in the mapping in this Marine Fisheries Study, which was initiated in 2009 and completed in 2010.

Since that time, Nalcor Energy has continued with its Project planning and engineering work, and in doing so, has proceeded to evaluate other possible design options and alternatives. The Proponent is continuing to focus on Forteau Point as the likely Labrador cable landing site. On the Newfoundland side of the Strait of Belle Isle, Shoal Cove has also been identified as a possible site.

If these cable landing site options were to be finalized, on-land horizontal directional drilling technology may be used to install the cables from these locations, out to and under the Strait for up to several kilometers. From there, the cables would be placed on the seabed and protected with rock berms. With this option, the cables would be placed within one marine corridor (rather than two) across the Strait (see the map below) - which is essentially an amalgamation of the two marine cable corridors included in the 2009 EA Registration and shown in this Marine Fisheries Study Report, utilizing portions of each corridor along with a new short segment in to Shoal Cove.

Given the nature and regional study area of this *Marine Fisheries Component Study*, the information and results included in it are therefore equally applicable to either of the above described marine cable corridor options in the Strait of Belle Isle.

The environmental information presented in this *Component Study* will be incorporated and used in the Project's eventual Environmental Impact Statement (EIS), which will provide a summary description of the existing environment and an environmental effects assessment for the proposed Project.

Labrador – Island Transmission Link

Marine Fisheries in the Strait of Belle Isle Component Study

Prepared for:

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March 15, 2010

This report, prepared by Canning & Pitt Associates Inc. for Nalcor Energy, describes fisheries activities in the area proposed for the *Labrador-Island Transmission Link* Project's submarine cable crossings of the Strait of Belle Isle. The report describes relevant fisheries activities, 1989-2008, for the wider Strait of Belle Isle area (NAFO Unit Area 4Ra) and then focuses on more recent local fisheries near the potential submarine cable corridors, the Study Area for this report. In addition to fisheries statistical data, the report also draws on consultations with representatives of fishers from Study Area ports on both sides of the Strait.

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1.0 INTRODUCTION

Nalcor Energy is proposing to develop the *Labrador-Island Transmission Link* (the Project), a High Voltage Direct Current (HVdc) transmission system extending from Gull Island in central Labrador to Soldiers Pond on the Island of Newfoundland's Avalon Peninsula. The Project will include submarine cable crossings of the Strait of Belle Isle.

The Environmental Assessment (EA) of the Project is ongoing, with an Environmental Impact Statement (EIS) currently being prepared by Nalcor Energy. In preparation for and in support of the Project's EA, this *Marine Fisheries Component Study* was prepared on behalf of Nalcor Energy by Canning & Pitt Associates Inc. of St. John's NL, to provide baseline marine fisheries information for eventual use in the EIS.

The report presents a description and analysis of the fisheries activities in the areas adjacent to, and which may potentially interact with, the proposed submarine cable crossing corridors of the Strait of Belle Isle during their construction and/or operation.

To establish a regional context, this report also provides an historical analysis of relevant fisheries activities in recent years (up to 2008) for the broader Strait of Belle Isle area. It then focuses more specifically on data from harvesters homeports in the general area of the proposed submarine cable corridors (the Study Area for this baseline report). To supplement the existing and available statistical data, the report also draws on discussions with fisher representatives in the Study Area ports on both the Labrador and Newfoundland sides of the Strait.

1.1 Project Overview

The proposed *Labrador – Island Transmission Link* (the Project) involves the construction and operation of transmission infrastructure within and between Labrador and the Island of Newfoundland.

The proposed transmission system, as currently planned, will include the following key components (Figure 1):

- an ac-dc converter station at Gull Island in central Labrador, on the north side of the Churchill River adjacent to the switchyard for the Lower Churchill Hydroelectric Generation Project;
- an HVdc transmission line extending from Gull Island across southeastern Labrador to the Strait of Belle Isle. This overhead transmission line will be approximately 407 km in length with a cleared right-of-way averaging 60 m wide, and consist of single galvanized steel lattice towers;
- cable crossings of the Strait of Belle Isle with associated infrastructure, including three to five cables placed across the Strait and under the seafloor through various means to provide the required cable protection;
- an HVdc transmission line (similar to that described above) extending from the Strait of Belle Isle across the Island of Newfoundland to the Avalon Peninsula, for a distance of approximately 688 km;
- a dc-ac converter station at Soldiers Pond on the Island of Newfoundland's Avalon Peninsula; and

- electrodes at each end of the HVdc transmission line in Labrador and on the Island, with overhead lines connecting them to their respective converter stations.

Project planning and design are currently at a stage of having identified a 2 km wide corridor for the on-land portions of the proposed transmission line, and 500 m wide corridors for the proposed Strait of Belle Isle cable crossings, as well as various alternative corridor segments in particular areas (Figure 1). It is these proposed transmission corridors and components that were the subject of Nalcor Energy's environmental baseline study program. Project planning is in progress, and it is anticipated that the Project description will continue to evolve as engineering and design work continue. The EA of the Project will also identify and evaluate alternative means of carrying out the Project that are technically and economically feasible.

The HVdc transmission line will extend from Central Labrador to a crossing point on the Labrador side of the Strait of Belle Isle. From there, cables will extend under and across the Strait and make landfall on the northwestern side of the Island of Newfoundland's Northern Peninsula (Figure 1). A number of alternative cable landing sites have been identified on both the Labrador and Newfoundland sides of the Strait. Two potential submarine cable corridors, which extend from these potential landing sites and across the Strait, have also been identified for these cable crossings. These corridors are approximately 25 – 35 km in length, depending upon the specific landing site alternatives involved. Construction of the submarine crossings would include the placement of three to five cables within the two separate corridors across the Strait (two to four cables to carry the power and one to be used as a spare). Both cable crossing corridors would therefore be used.

These and other potential landings sites and cable crossing approaches will continue to be explored and evaluated through on-going engineering review and analysis.

A number of methods will likely be used to protect the cables across the Strait of Belle Isle. Primarily, the currently identified corridors make use of natural sea-bed features to shelter the cables in valleys and trenches to minimize the possibility of iceberg contact or interaction with fishing activity. In order to access these natural deep valleys and ocean bed contours and to provide further required protection, various cable protection techniques are under consideration, including tunneling and rock trenching. Rock placement and the laying of concrete mattresses over the cables are also being evaluated for specific areas.

Engineering analyses are ongoing to assess these and other potential approaches and techniques for protection of the subsea cables. The eventual selection of particular approaches and methods for cable protection along the route and specific portions of it is the subject of on-going analysis, and will be based on water depths, terrain and seabed geology, substrate characteristics, risk exposure, and overall technical and economic viability.

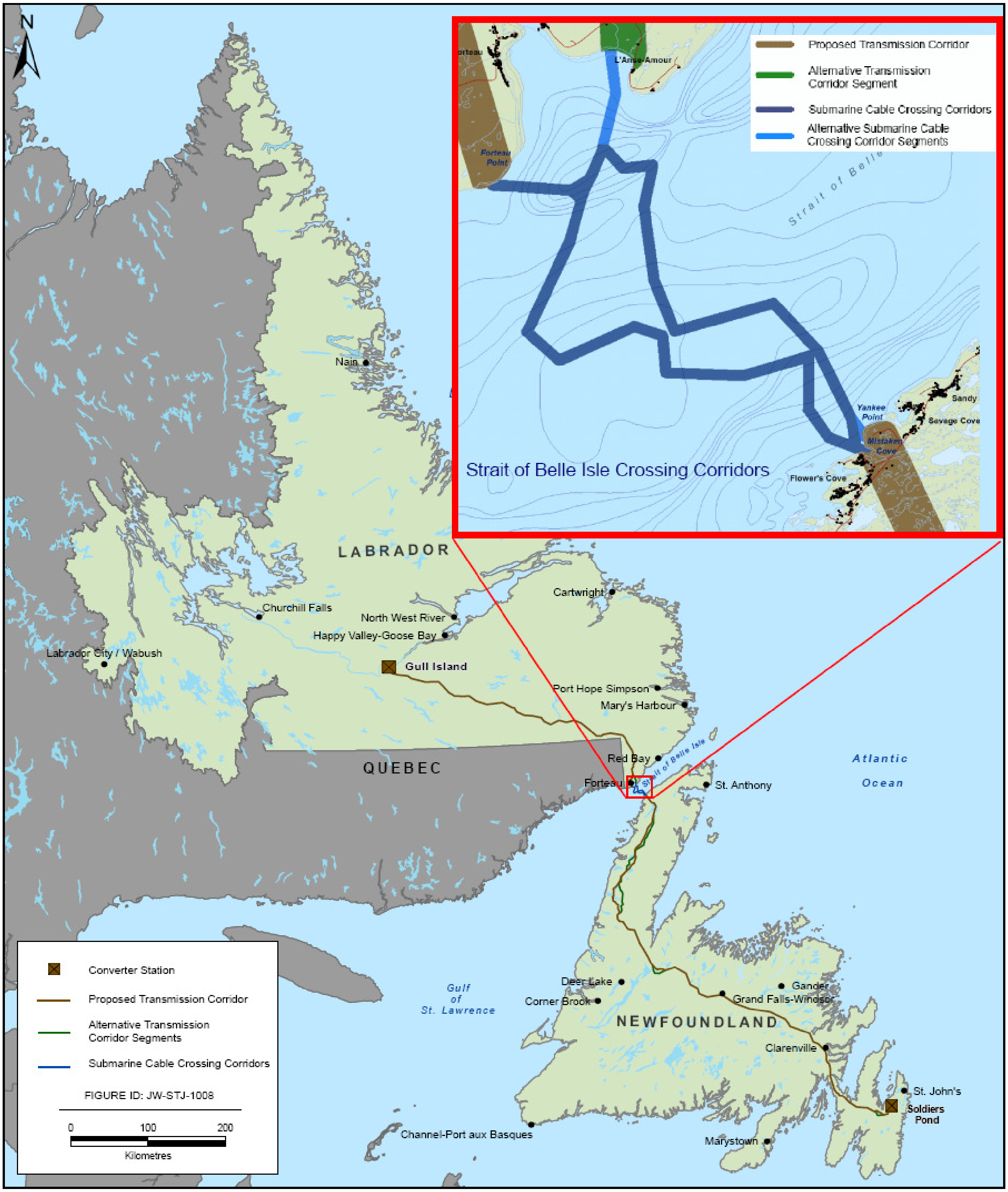

Figure 1. The Labrador-Island Transmission Link

1.2 Study Purpose and Objectives

The purpose of this marine fisheries baseline study is to establish and describe the current status of the relevant fisheries in the Strait of Belle Isle area. Baseline studies are an important part of the EA process and initially assist in identifying the valued environmental components (VECs) that might be affected by a project, and upon which the EA should therefore focus. In the effects assessment stage of the EA process, the baseline information is used to establish the existing conditions or "norm" against which any effects (positive or negative) may be assessed and evaluated.

The specific objectives of this study are therefore to identify and describe fish harvesting activities in the general vicinity of the proposed Strait of Belle Isle cable crossings, including the general regional area (NAFO Unit Area 4Ra) and a Study Area generally encompassing the proposed cable corridors (Figures 1 and 2).

The Study Area for this report is defined generally as the waters of the Strait of Belle Isle between Forresters Point and Eddies Cove East on the Island of Newfoundland side, and between L'Anse Au Clair and Pinware on the Labrador side of the Strait. These waters include the identified submarine transmission cable corridors and adjacent fishing areas.

In addition to compiling and analyzing existing and available statistical data and other information on fishing activities in this area, a key study objective was also to consult with relevant fishers about the harvesting activities that take place in the vicinity of the proposed transmission corridors and to report the information gathered through these discussions.

This study is focused on marine fish harvesting activities in the Strait of Belle Isle, primarily commercial fishing activities conducted in order to generate fishing income, such as accessing and setting gear on established fishing grounds, retrieving/hauling the gear to harvest the fish and getting the catch back to port. Recreational fisheries (most of which are for cod) are also described.

Separate baseline studies have been prepared with respect to the biophysical aspects of the marine environment, including marine biota and habitats in the Strait of Belle Isle.

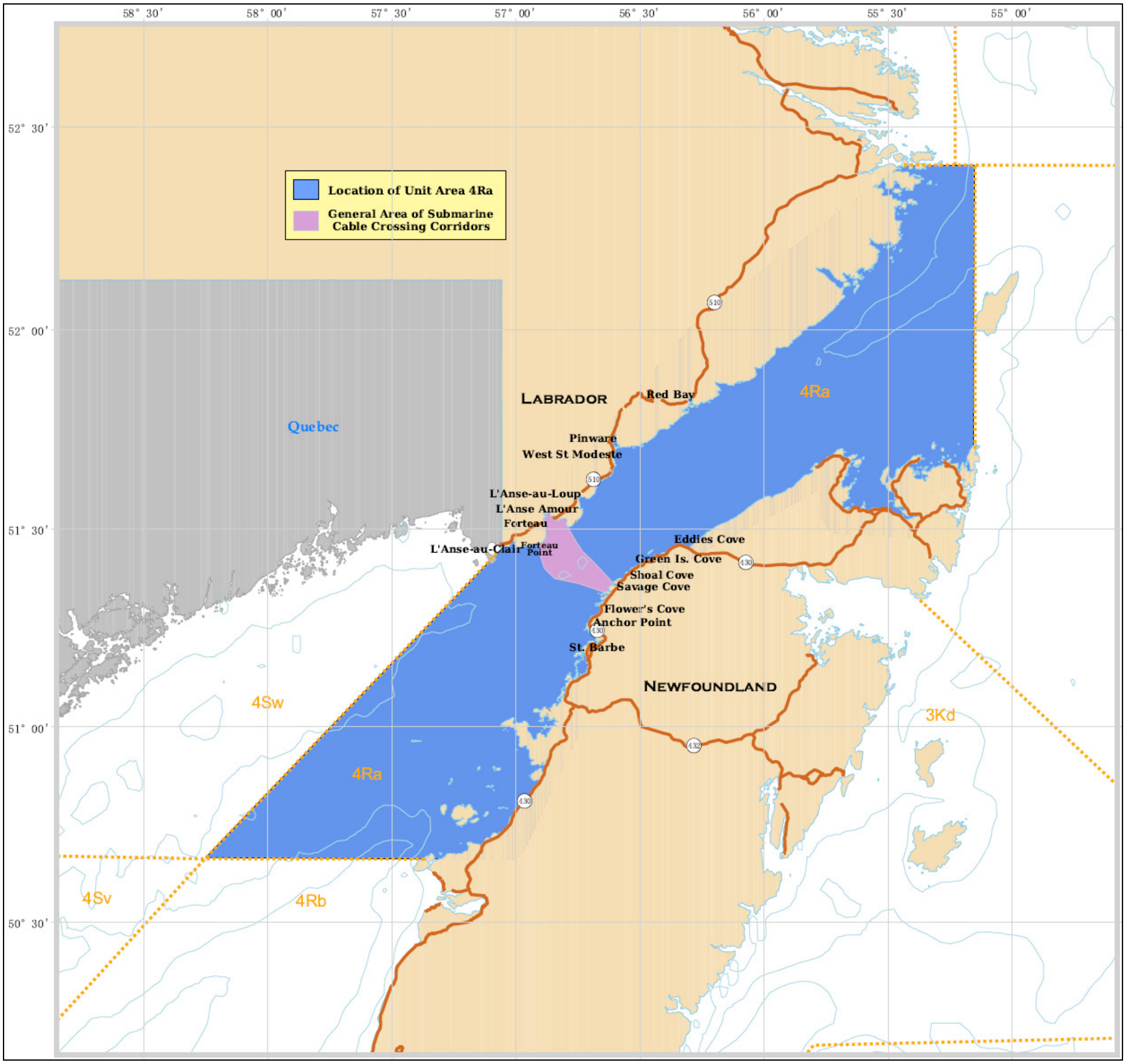

Figure 2. NAFO Unit Area 4Ra

1.3 Approach and Methods

This study establishes the regional and Study Area fisheries baseline by using both available statistical data from the federal Department of Fisheries and Oceans (DFO) and information gathered from consultations with representatives of commercial fish harvesters in the Study Area.

The data analysis is presented on two levels: 1). a regional analysis based on Northwest Atlantic Fisheries Organization (NAFO) management Unit Area (UA) 4Ra, and 2). a more detailed analysis of fisheries activities within 4Ra by fishing enterprises with homeports in the Study Area. This second, more focused, analysis is based on a special data subset obtained from DFO as well as information gathered directly from study area fishers during consultations organized in October 2009. Each of these methods is described further in the sections that follow.

1.3.1 **Statistical Data Sources**

The statistical information and analysis used in this study are based on time-series data from DFO Newfoundland and Labrador Region Statistics Division, Policy and Economics Branch, which describe the quantity, month and location (by fisheries management UA) of fish harvesting. The datasets also include information on fishing gear, vessels, and other aspects of the fisheries. They were acquired from DFO in digital form, for the period 1989 to 2008.

These datasets represent fish landings in the Newfoundland and Labrador Region only. An analysis of the Quebec Region and Gulf Region DFO data for recent years (e.g. 2003 and 2004) indicated that less than 10 tonnes (<0.1%) on average of the fish harvested from 4Ra is landed in those two regions combined. The consultations with area fisheries in late 2009 also confirmed that fishing activity in this area of the Strait of Belle Isle is undertaken almost exclusively by fishers based in Newfoundland and Labrador.

For the regional analysis, Unit Area 4Ra data were used. These data capture species harvested from 4Ra wherever – within Newfoundland and Labrador Region - they were landed or processed. Thus, catches by fishers who are not based in the area are included, while catches made by Strait-based vessels are excluded if they were harvested beyond the 4Ra area.

For the Study Area homeport analysis, a special dataset was prepared and provided by DFO Newfoundland and Labrador Region containing harvesting data by fishing enterprises registered in homeports within the general corridor area. Fishers from these ports typically conduct at least part of their harvest within or immediately adjacent to the proposed submarine transmission corridors. Because DFO NL does not release catch statistics for an individual port, the dataset prepared by DFO was provided as aggregated data for groups of the relevant homeports. The homeports used and their group aggregations for this analysis are as follows. (Figure 3 indicates the port locations within the Study Area.)

Group 1 (Newfoundland, West)

Forresters Point
Black Duck Cove
St. Barbe
Anchor Point
Deadmans Cove

Group 2 (Newfoundland, East)

Bear Cove
Flowers Cove
Nameless Cove
Savage Cove
Sandy Cove
Shoal Cove East
Paynes Cove
Green Island Cove
Green Island Brook
Eddies Cove (East)

Group 3 (Labrador)

L'Anse Au Clair
Forteau
Buckles Point
English Point
L'Anse Amour
Fox Cove
Schooner Cove
L'Anse Au Loup
L'Anse Au Diable
Capstan Island
West St. Modeste
Pinware

The resulting dataset contains 10 years of data (1999-2008) which indicate year, month, species, vessel class, gear type, Unit Area of harvest, quantity of harvest, and value[1] of harvest. A portion of this dataset also indicates the specific location of the catch in degrees and minutes of latitude and longitude, where available.

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1 It should be noted that the value data reflect several other factors than simple resource availability or fishing effort since value differences from year to year may be the result of price changes and external market factors which are affected by international exchange rates. Prices may even vary within the fishing season. Consequently, much of the historical analysis provided in this report involves quantity of harvests (tonnes of fish landed), which is more directly comparable from year to year.

While all of the fishing data used in this study indicate the overall Unit Area in which the fish were harvested, a lesser amount (about 20% of 4Ra in 2008) is also georeferenced with the specific location (latitude and longitude) of the harvesting location.[2] However, such locational information is generally more readily available for offshore harvests and for larger fleet sectors than for fish caught in inshore areas with smaller boats. For instance, in 2008 in 4Ra, 0% of the lobster harvest was georeferenced but 73% of the shrimp catch was.

Although the georeferenced subset is clearly not sufficient to pinpoint the location of all relevant harvesting locations, it is still useful for providing a general indication of some important harvesting grounds within 4Ra. Maps based on the available georeferenced data for 2004-2008 are therefore included in this report. These are "rolled up" (aggregated) maps, which combine the georeferenced information for all five years of the dataset.

2 The location given is that recorded in the vessel's fishing log, and is reported in the database by degree and minute of latitude and longitude; thus the position is accurate within approximately 0.5 nautical mile of the reported co-ordinates. It should be noted that for some gear, such as mobile gear towed over an extensive area, or for extended gear, such as longlines which may be several miles long, the reference point does not represent the full distribution of the gear or activity on the water. However, over many data entries, the reported locations create a fairly accurate indication of where such fishing activities generally occur.

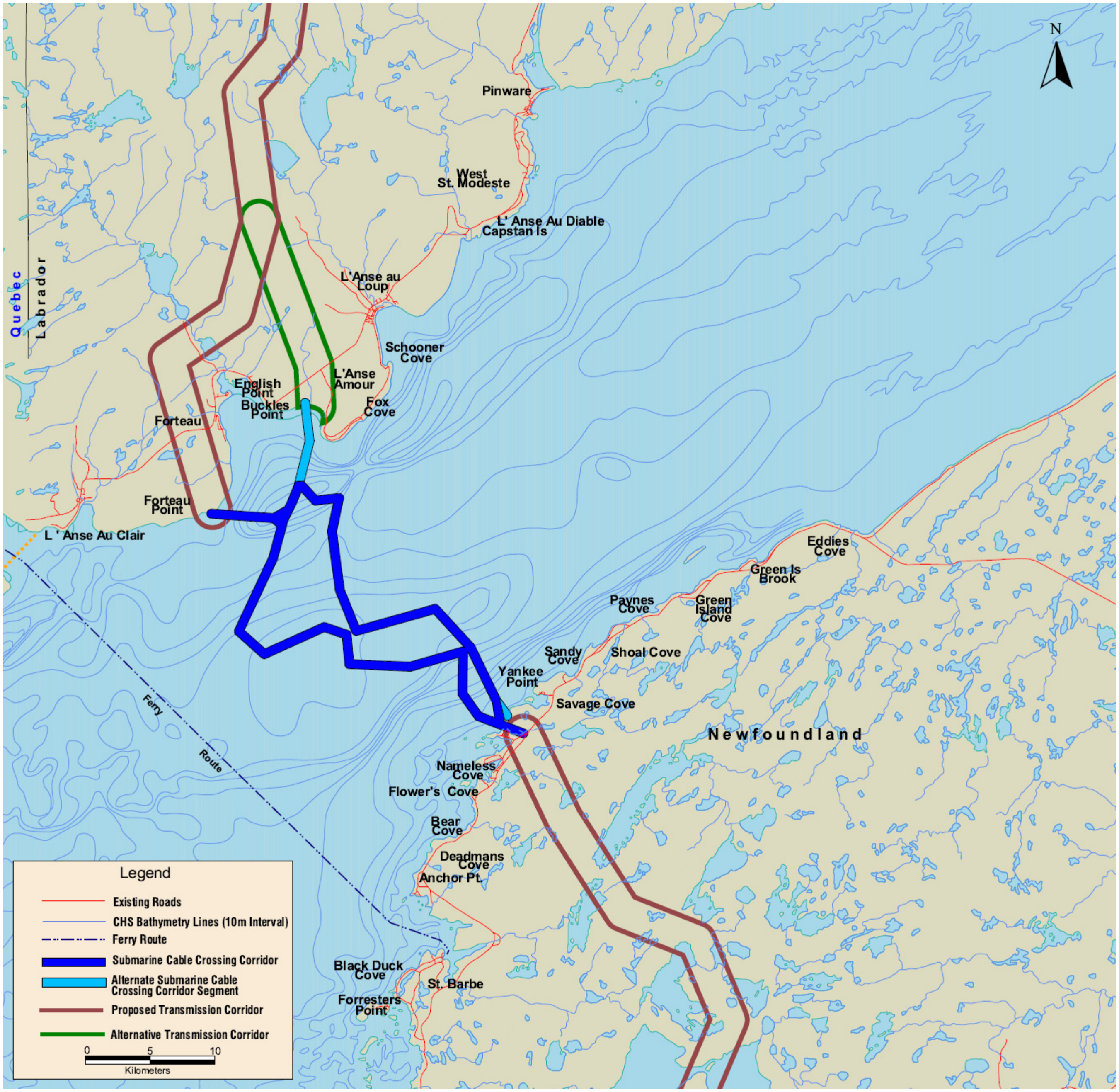


Figure 3. Study Area Homeports and Potential Submarine Cable Crossing Corridors

1.3.2 Fisher Consultations

In October 2009, Nalcor Energy's fisheries consultants organized meetings with representatives of the fishing industry from both sides of the Strait of Belle Isle. The main purpose of these meetings was to gather additional baseline information on fisheries resources and established fish harvesting activities in the vicinity of the proposed transmission corridors. The meetings also offered an opportunity to provide fishers with more information about the Project, and for fishers to ask questions about or comment on the proposed cable corridors and their potential effects for consideration in the EA. This "issues scoping" information was also recorded for eventual use in the EIS.

The Labrador meeting was organized with the assistance of the Chair of the Labrador Straits Development Corporation (LSDC) Fisheries Committee, and the FFAW's Staff Representative helped organize the Flower's Cove meeting. Details about the organization of these meetings and lists of persons attending are included in Appendix A.

Fish harvesting information gathered from these consultations is included in the descriptions of the Study Area fisheries presented in later sections of this report.

2.0 REGIONAL AREA FISHERIES (4Ra)

This section provides an overview of historical (20-year retrospective, 1989 – 2008) and recent (2004 – 2008) commercial fisheries data in the marine area in the vicinity of the proposed Strait of Belle Isle transmission corridors - specifically, NAFO UA 4Ra.

The first section describes the general make up of the fisheries in UA 4Ra, and the following sub-sections provide more specific information about each of the key economic species.

2.1 4Ra Overview

The following graph (Figure 4) shows the trends in overall fisheries in UA 4Ra over the past 20 years. As the data indicate, during that period the fisheries in 4Ra underwent significant changes, owing largely to the collapse of groundfisheries (mainly cod, see Figure 10) after 1991 and consequent fisheries moratoria and reductions within the area (after 1993).

Whereas in 1989 groundfish (primarily Atlantic cod) made up nearly 70% of the total 4Ra harvest of nearly 14,000 t, it had dropped to less than 4% by 1994, and the overall harvest dropped to just over 4,000 t that year. Groundfish catches have slowly increased since then and, in the last few years, have represented just over 16% (by quantity) of the overall catch.

On average, since 2004, the annual 4Ra harvest has been between 8,000 t and 9,000 t, although it dropped to below 6,000 t in 2008 owing to a significant drop in the capelin catch in that year, according to fisher representatives attending the L'Anse au Loup meeting. (The substantial decline in the harvest of capelin since 2006 is also indicated in Figure 18 below.)

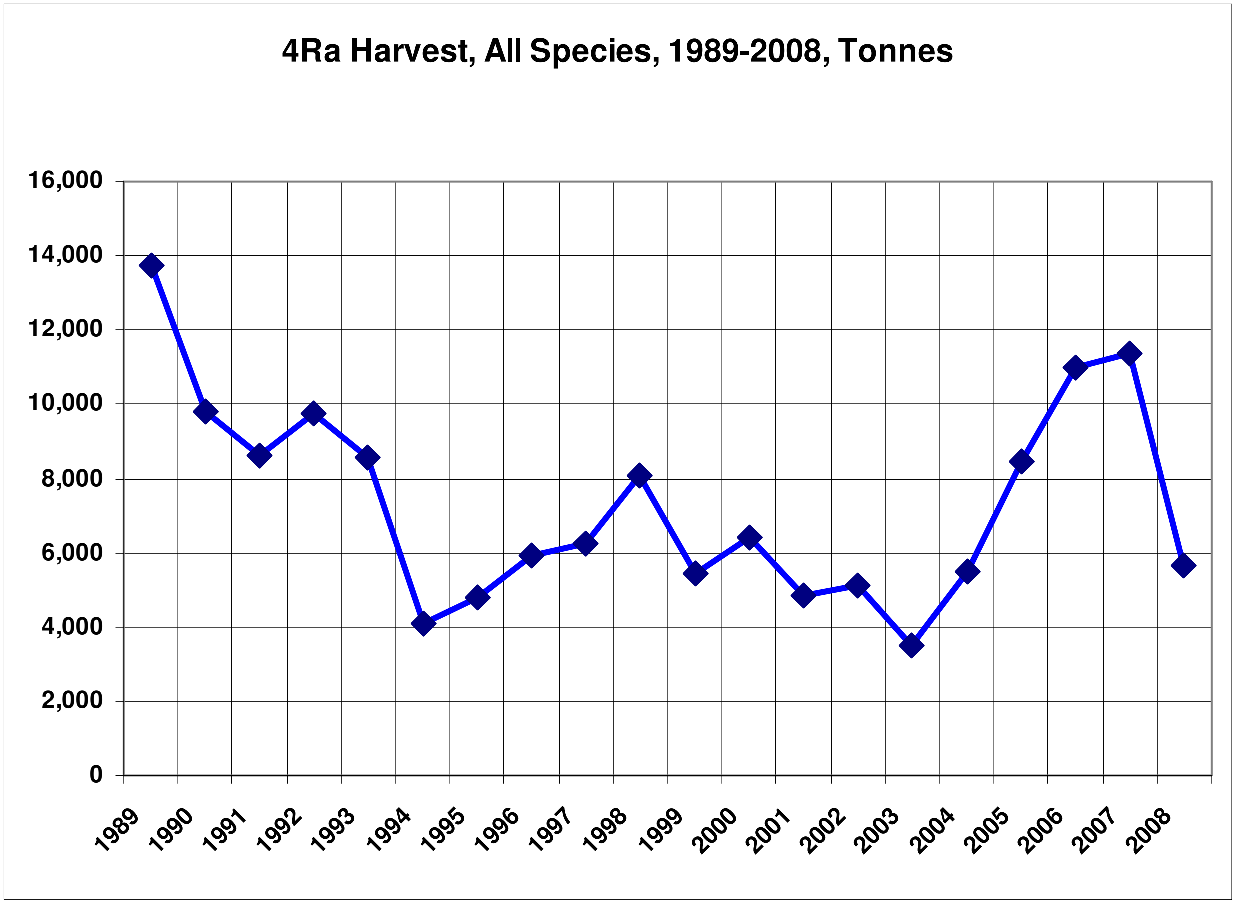


Figure 4. All Species Harvests from UA 4RA, 1989-2008

The following table identifies the fish species harvested by fishers from UA 4Ra in recent years, averaged over the 5-year period 2004-2008.

As this table indicates, the key species fisheries in the area are currently lobster, cod, capelin, shrimp, scallop, mackerel, and herring in terms of quantity and/or value. Together these species fisheries made up more than 76% of the area's catch by value and almost 96% by quantity. Seal harvesting, which provides supplementary income (through the sale of skins) for some fishers, comprised a further 14% of total fishing income.

Table 1: Harvest from Unit Area 4Ra by Value and Quantity, 2004 – 2008 Average

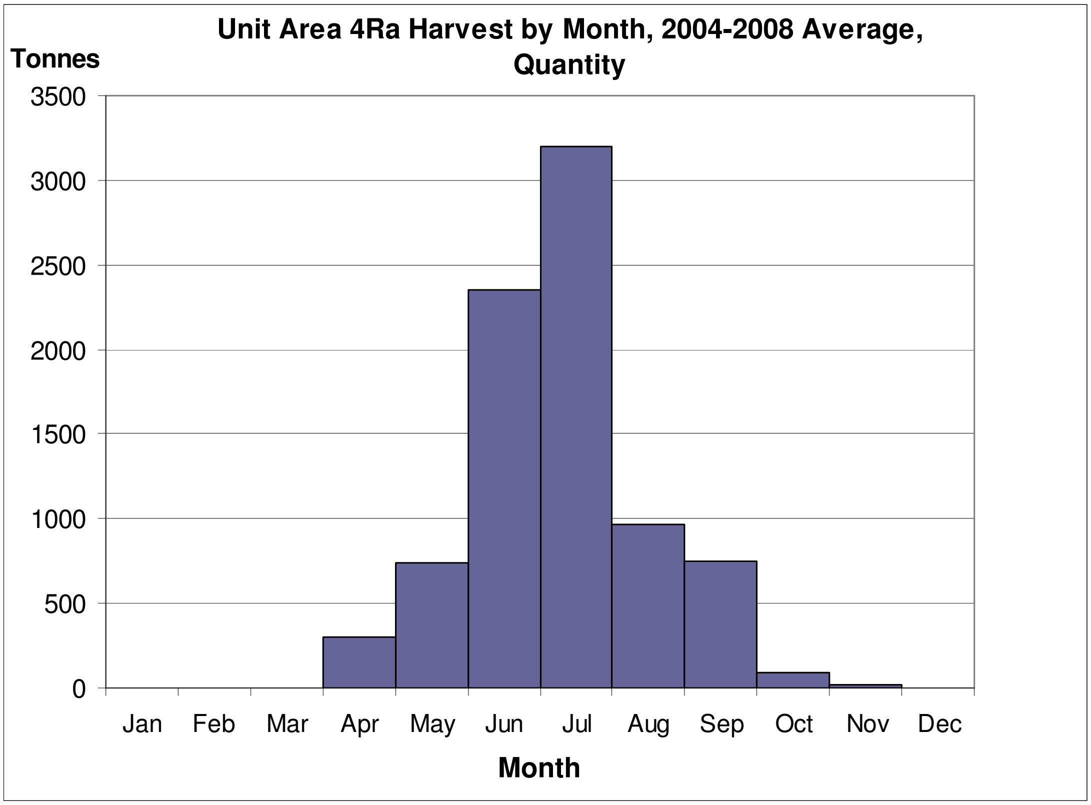
Species	Value ($)	% of Total	Quantity (t)	% of Total
Lobster	2,307,454	26.4	209.4	2.5
Cod, Atlantic	1,607,771	18.4	1,150.1	13.7
Seal Skins, Harp, Beater	1,254,842	14.3	--	--
Capelin	1,000,879	11.4	4,004.7	47.7
Shrimp	832,328	9.5	863.9	10.3
Scallop, Iceland	516,761	5.9	397.0	4.7
Roe, Lumpfish	290,860	3.3	56.6	0.7
Mackerel	254,370	2.9	743.4	8.9
Turbot/Greenland Halibut	247,719	2.8	141.5	1.7
Herring, Atlantic	136,199	1.6	681.8	8.1
Halibut	135,973	1.6	21.7	0.3
Crab, Queen/Snow	56,746	0.6	14.5	0.2
Sea Cucumber	28,813	0.3	44.5	0.5
Seal Fat	20,805	0.2	41.5	0.5
Seal Skins, Harp, Ragged	19,810	0.2	0.0	0.0
Eels	17,665	0.2	4.1	0.0
Whelks	10,883	0.1	11.8	0.1
Other	7,325	0.1	4.6	0.1
Winter Flounder	2,568	0.0	5.8	0.1
American Plaice	1,180	0.0	1.6	0.0
Total	**8,750,952**	**100.0**	**8,398.6**	**100.0**

2.2 Seasonality

Many of these fisheries have different seasons, based on regulation, seasonality of fish presence and movements, and/or harvesting strategy. The following graphs (Figure 5) show the overall monthly harvesting pattern for the 4Ra zone, averaged for 2004-2008, by quantity and value.

As they indicate, nearly all the harvest by quantity and value occurs between April and September, with a peak in July. In terms of value, the distribution is somewhat more even during the first three months of this period owing to more high-value species being harvested in May and June (e.g. snow crab, lobster), and seal harvesting in March and April.

Table 11 in Section 3 provides detailed information about the fishing seasons in the corridor area.



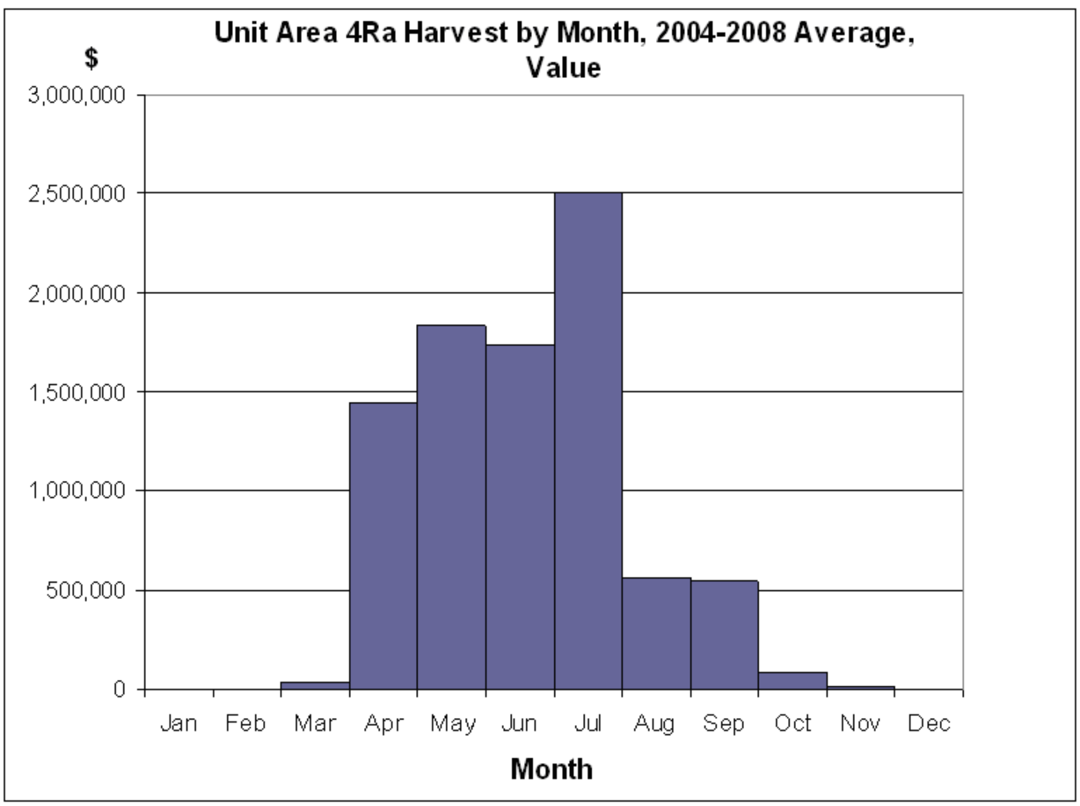


Figure 5. Harvest from Unit Area 4Ra by Month, Quantity and Value, 2004 – 2008 Average

2.3 Harvesting Locations

As discussed previously, about 20% of the overall catch data from 4Ra is georeferenced with the specific latitude and longitude of the harvesting location. Though this information applies primarily to larger vessel fleet sectors and certain species (e.g. shrimp, but not lobster), it nevertheless provides a good indication of past harvesting locations. These data are mapped in this section, as well as in following sections describing key species fisheries. The two views (Figures 6 and 7) presented below are of the full 4Ra area and a closer, zoomed-in view, highlighting the Study Area and the general area of the submarine cable crossing corridors (i.e. the "corridor view"). The data are aggregated for all species, all months and all years from 2004 to 2008.

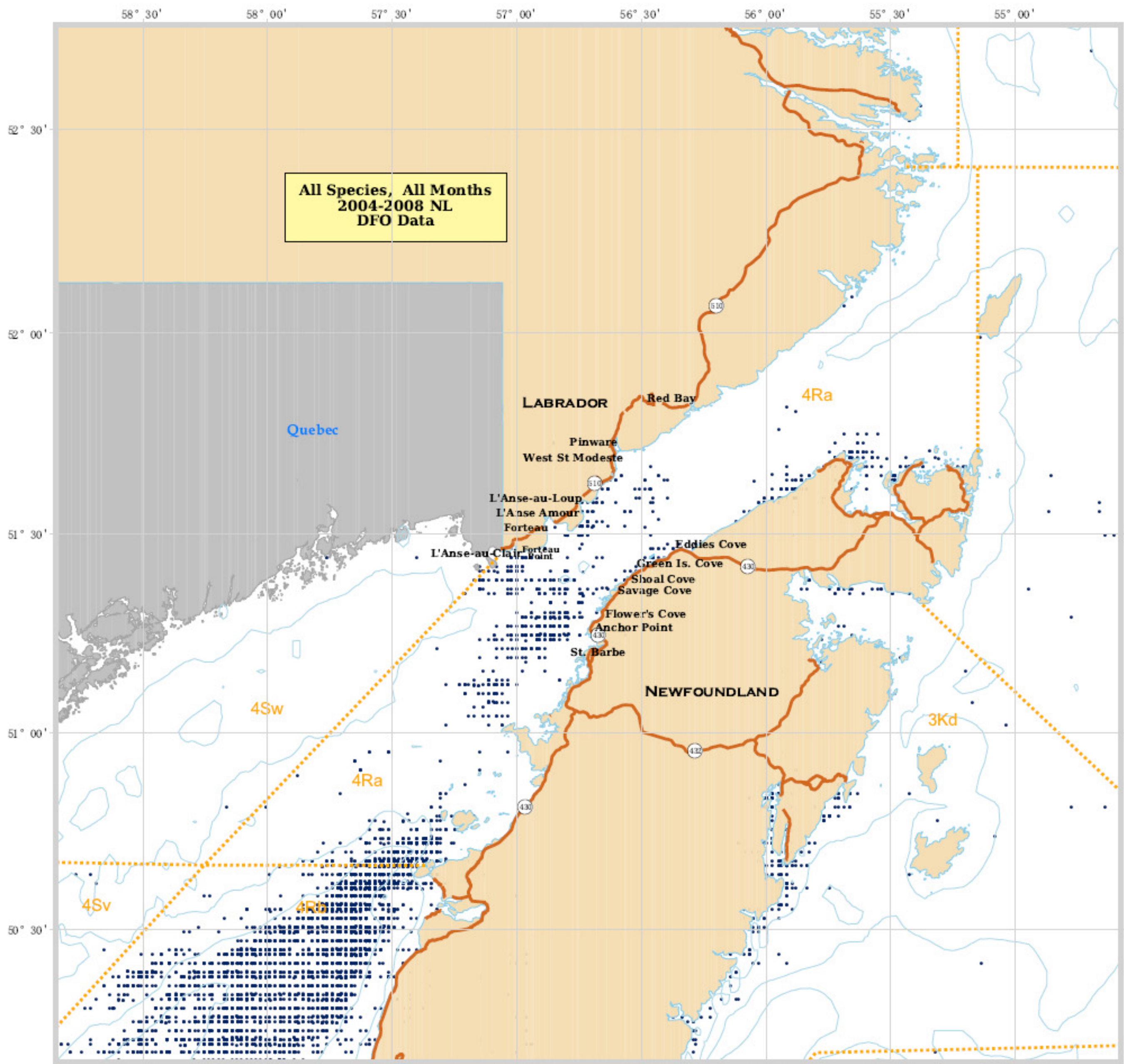


Figure 6. All Species (Georeferenced Data), 2004-2008 Aggregated, 4Ra

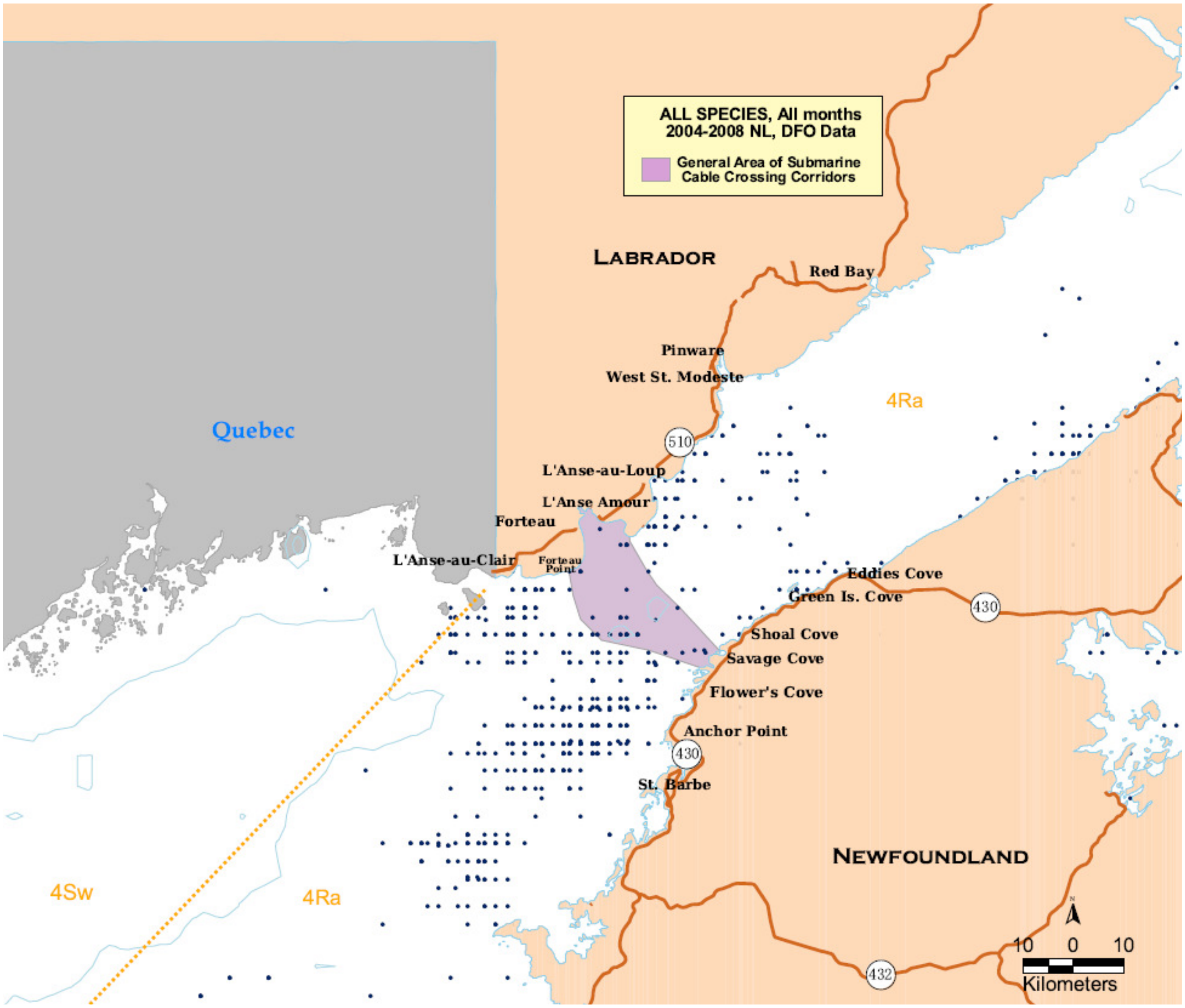


Figure 7. All Species (Georeferenced Data), 2004-2008 Aggregated (Corridor View)

2.4 Fishing Gear and Vessels

The following tables quantify the average 2004-2008 harvest from 4Ra by fishing gear type, and by vessel class (length). The gear used reflects the principal fisheries in the area: e.g. pots for lobster and snow crab, and gill nets and longlines for groundfish. Although the purse seine fishery is most significant in terms of quantity (32% of the harvest on average), this accounts for only 8% of the harvest by value, owing to the relatively low price per kilogram for species (e.g. capelin) usually harvested with this gear.

The fact that small boats (up to 34 feet) catch the greatest share of the harvest by quantity (69% by value and 57% by quantity) reflects the small-boat, local inshore fisheries that predominate in this area.

Table 2: Harvest from Unit Area 4Ra by Gear Type, Value and Quantity, 2004 – 2008 Average

Gear Type	Value ($)	% of Total	Quantity (t)	% of Total
Pot	2,375,353	27.1	236.1	2.8
Gill Net (Set or Fixed)	2,055,640	23.5	1,423.8	17.0
Seal Hunting	1,301,333	14.9	42.8	0.5
Shrimp Trawl	832,328	9.5	863.9	10.3
Purse Seine	698,280	8.0	2,682.6	31.9
Trap	550,876	6.3	2,265.8	27.0
Dredge (Boat)	545,764	6.2	441.8	5.3
Longline	195,580	2.2	76.8	0.9
Hand Line (Baited)	112,080	1.3	179.1	2.1
Tuck Seine	38,864	0.4	148.1	1.8
Beach & Bar Seine	21,629	0.2	29.4	0.4
Fyke Net	11,692	0.1	2.3	0.0
Eel Pots	5,973	0.1	1.7	0.0
Bottom Otter Trawl (Stern)	5,393	0.1	4.2	0.0
Other	167	0.0	0	0.0
Total	**8,750,952**	**100.0**	**8,398.4**	**100.0**

Table 3: Harvest from Unit Area 4Ra by Vessel Class, Value and Quantity, 2004 – 2008 Average

Class No	Vessel Length	Value ($)	% of Total	Quantity (t)	% of Total
0	1 - 34 Feet	6,059,638	69.2	4,773.1	56.8
1	35 - 44 Feet	822,439	9.4	1,122.8	13.4
2	45 - 54 Feet	376,937	4.3	458.7	5.5
3	55 - 64 Feet	1,248,488	14.3	1,186.5	14.1
4	65 - 74 Feet	77,553	0.9	259.3	3.1
5	75 - 99 Feet	47,605	0.5	172.0	2.0
6	100 - 124 Feet	118,293	1.4	426.3	5.1
Total		**8,750,952**	**100.0**	**8,398.6**	**100.0**

2.5 Key Species Fisheries

The following sections provide data regarding the key species fisheries (identified above) for Unit Area 4Ra. In each case, the data presented indicate the 20-year harvesting history for the species in 4Ra, the average harvest by month in recent years (2004-2008), and – where there were sufficient data – a map of the species harvesting locations, aggregated for 2004-2008. Section 3.3 of this report provides more information on several of these fisheries from a Study Area perspective, drawing on information from fisher consultations.

2.5.1 Lobster

The lobster fishery, which has been the highest value fishery in 4Ra, has gone through a number of cycles over the last two decades, as the following graph (Figure 8) shows, ranging from a high of more than 500 t in 1989 to a low of about 70 t in 2001. The fishery is focused between May and July in this area, as indicated in Figure 9.

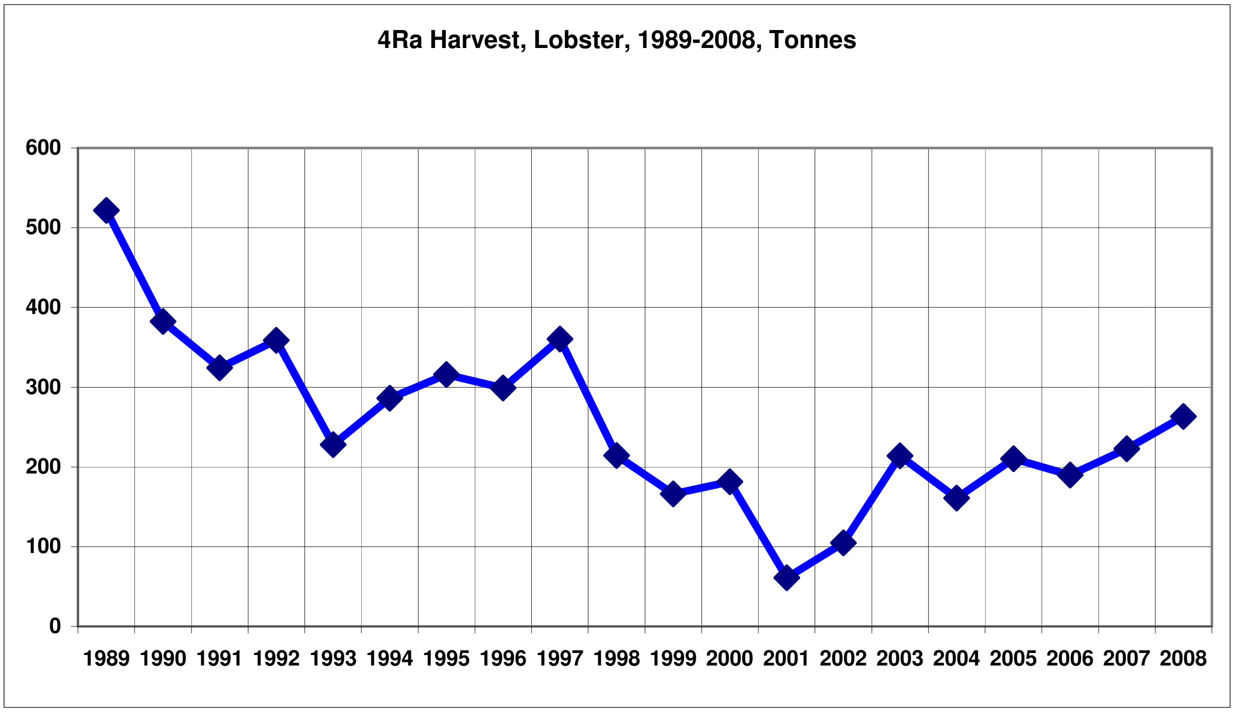


Figure 8. 4Ra Lobster, Annual Harvest 1989-2008

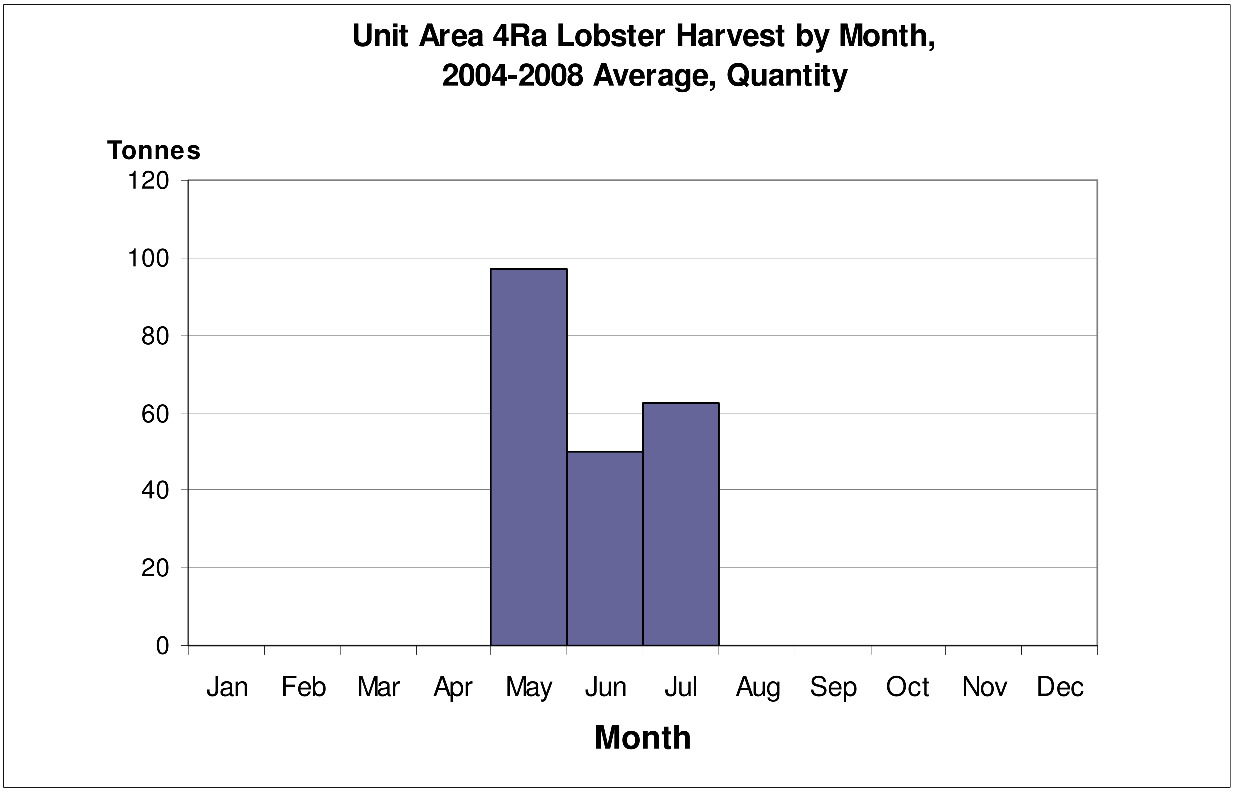


Figure 9. 4Ra Lobster, by Month, 2004-2008 Average

2.5.2 **Atlantic Cod**

As described above, Atlantic cod harvests dropped drastically after the closure of the fisheries in the early to mid 1990s, falling from more than 9,000 t in 1989 to almost nothing five years later. As Figure 10 shows, the 4Ra harvest still remains relatively low at about 1,500 annually in recent years. However, it is still the second most important harvest in the area in terms of average catch values.

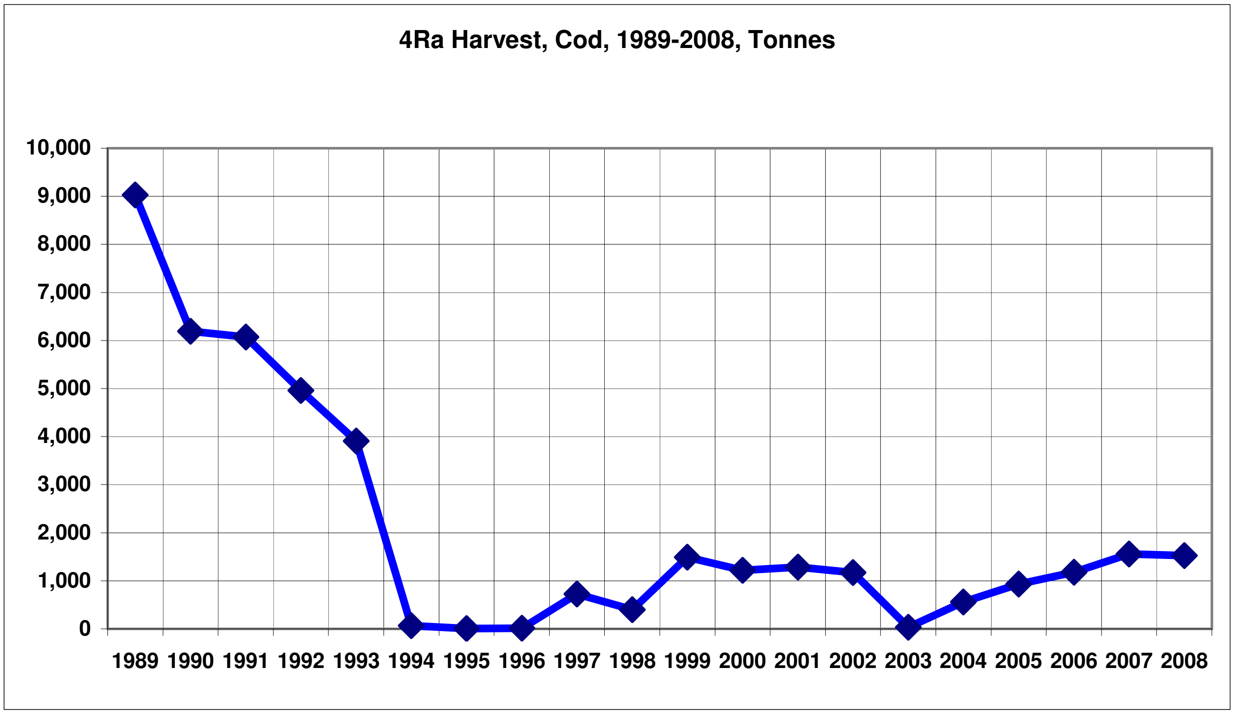


Figure 10. 4Ra Cod, Annual Harvest 1989-2008

As the following graph (Figure 11) of average cod harvest by month indicates, the fishery occurs mainly in July and the early autumn.

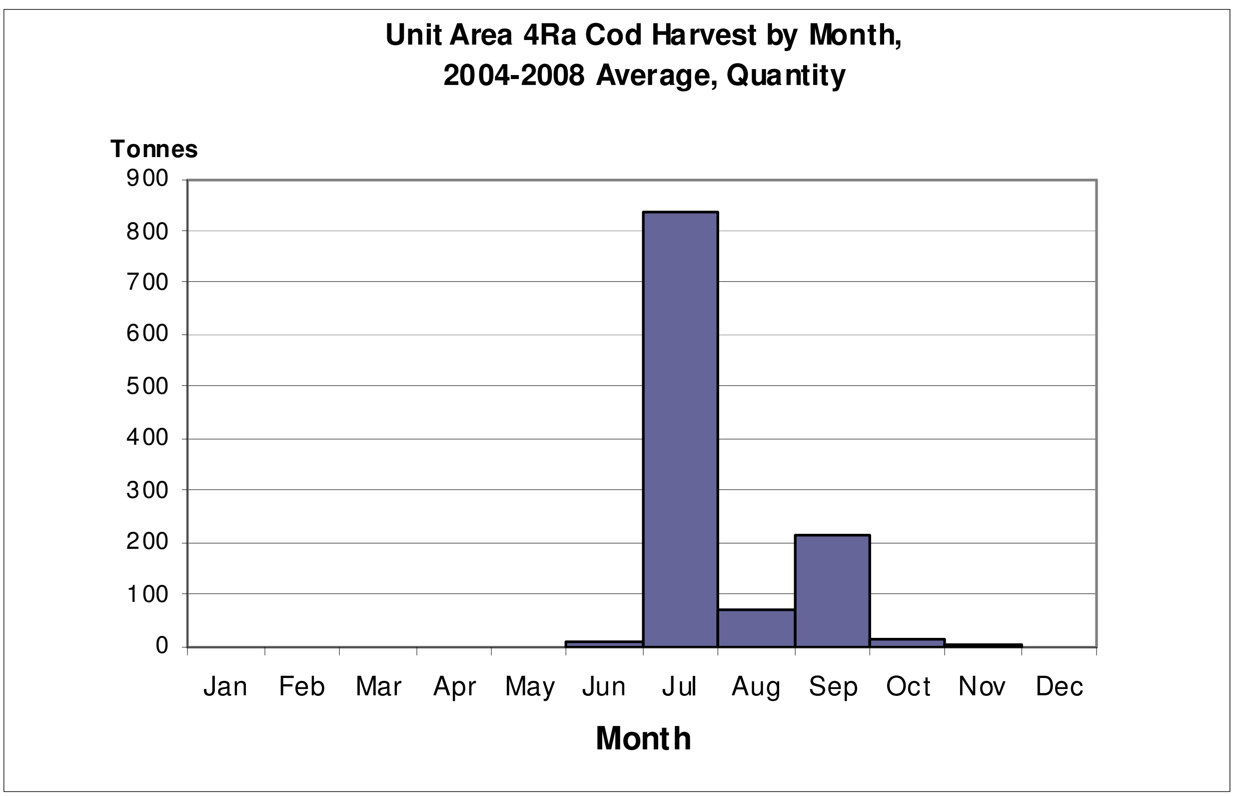


Figure 11. 4Ra Cod, by Month, 2004-2008 Average

The following maps show the georeferenced portion of the cod harvest for the five years 2004-2008, aggregated for all months. As they indicate, there is relatively little recorded harvest in the corridor area.

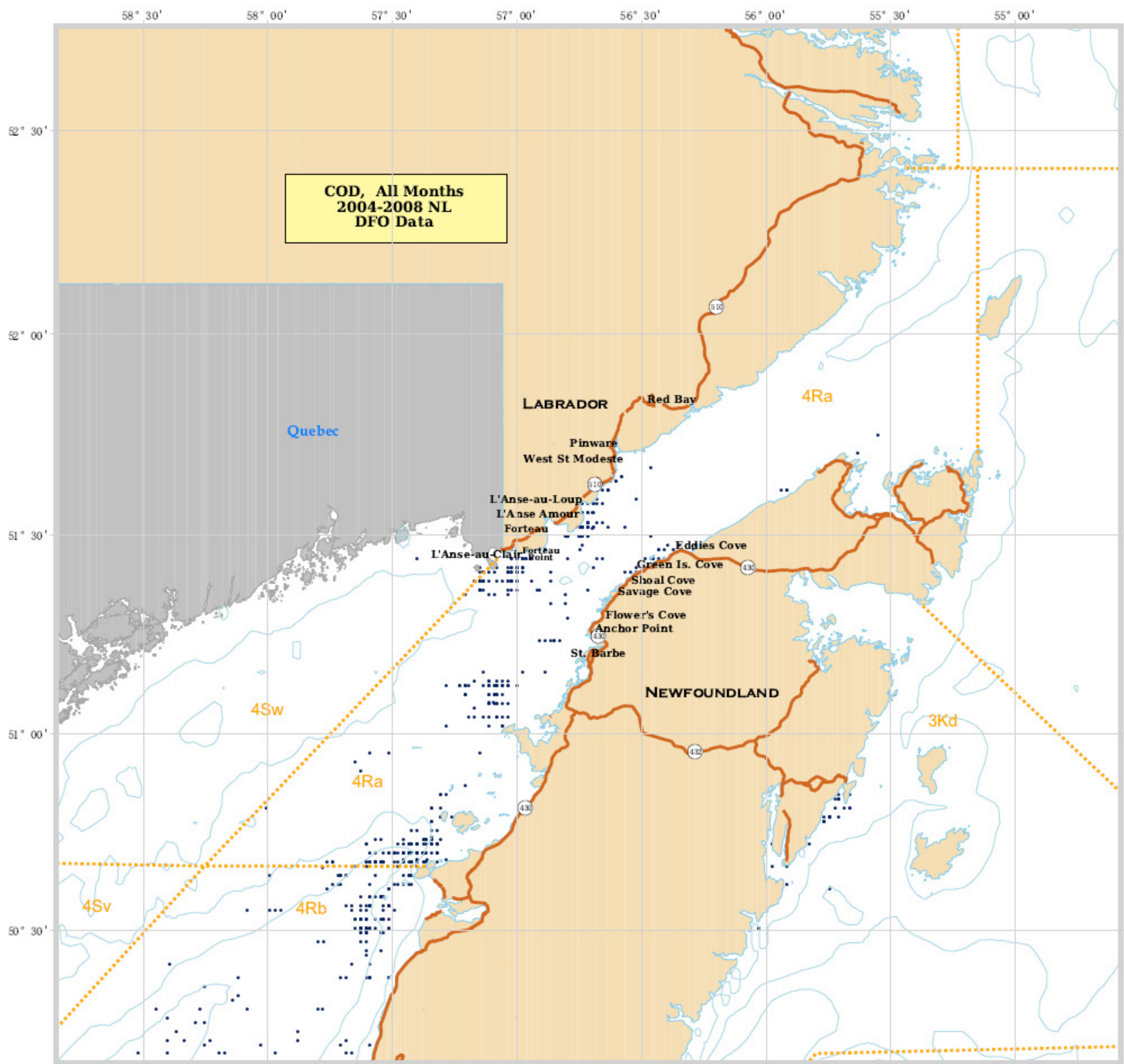


Figure 12. Cod (Georeferenced Data), 2004-2008 Aggregated

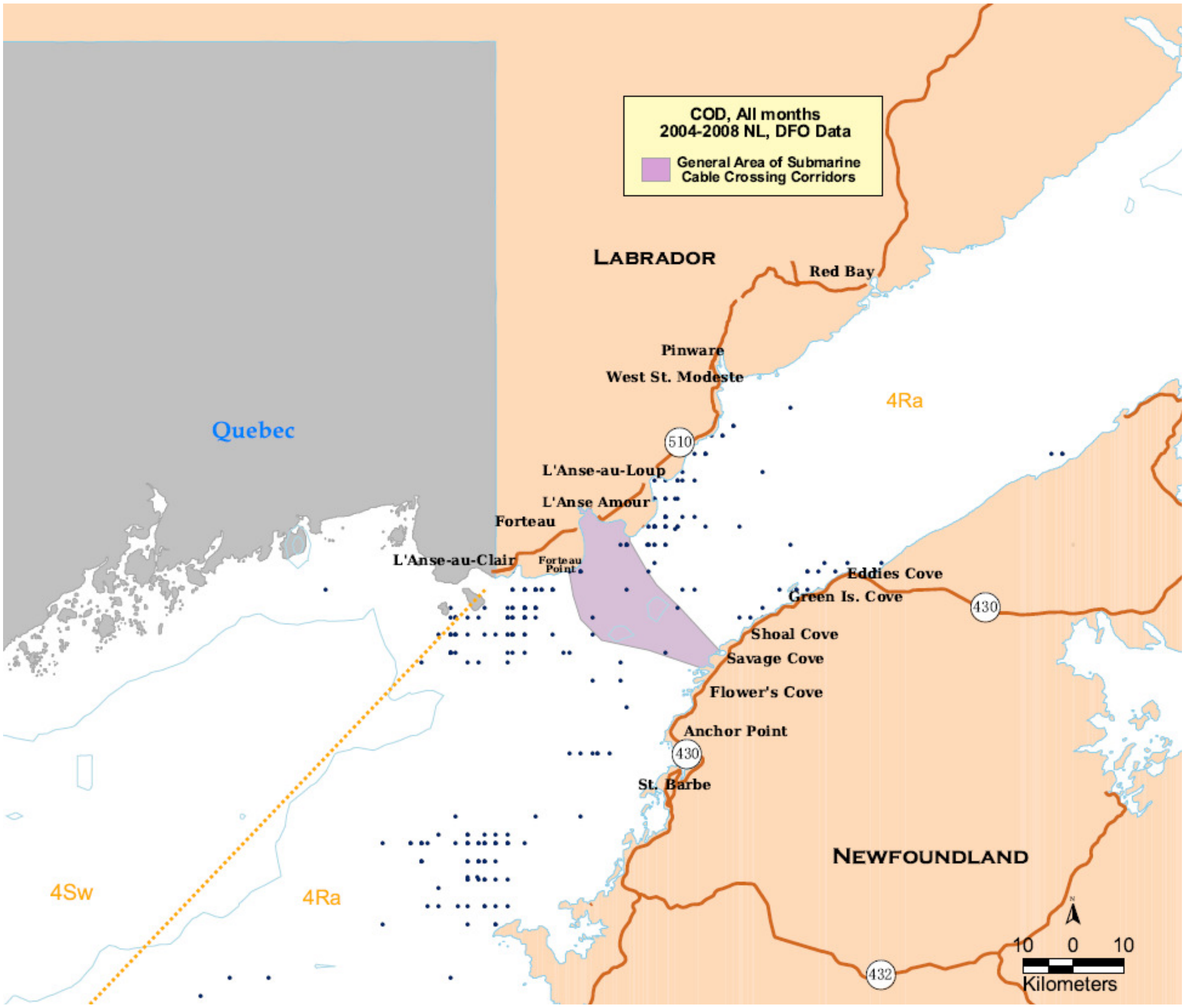


Figure 13. Cod (Georeferenced Data), 2004-2008 Aggregated (Corridor View)

2.5.3 **Other Groundfish**

As was the case with Atlantic cod, catches of other groundfish also declined in the early 1990s, though not to the extent of cod, as the following graph, Figure 14, shows. In recent years the principal other groundfish species in 4Ra have been lumpfish, turbot and halibut (together, a little under 8% by value since 2004).

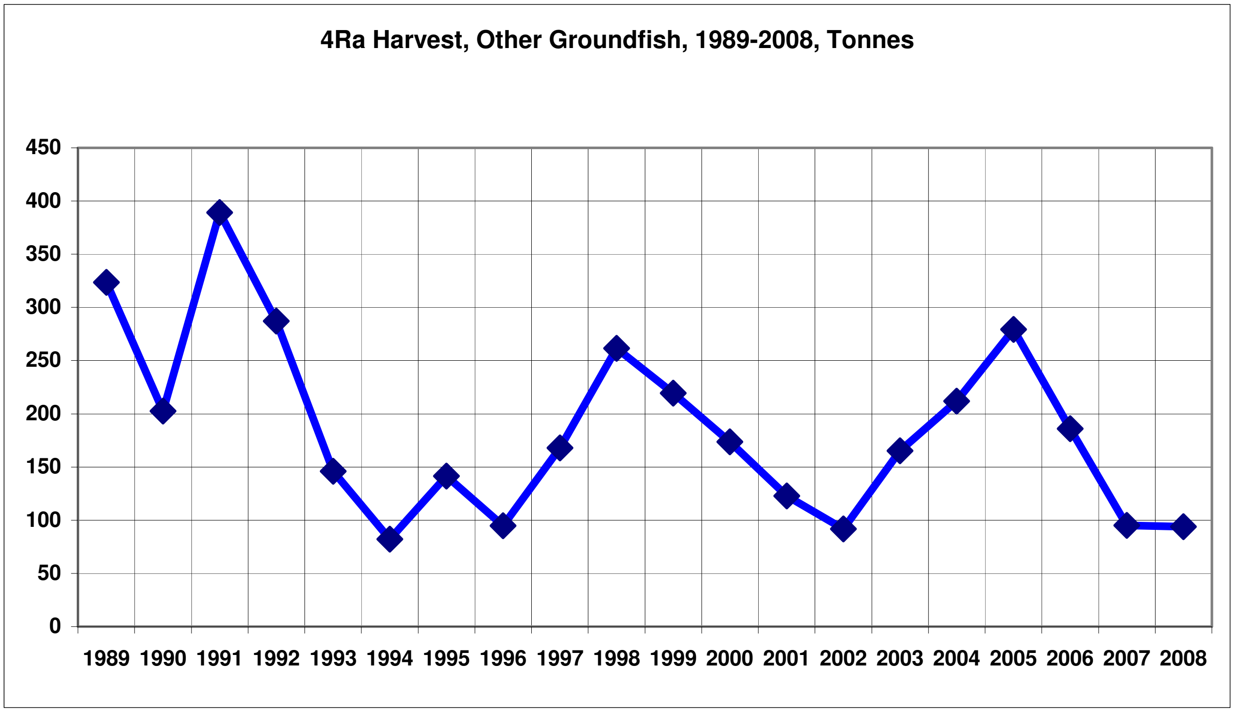


Figure 14. 4Ra Other Groundfish, Annual Harvest 1989-2008

As with cod, harvesting activities associated with other groundfish species occur between May and July with a noticeable peak in June (Figure 15).

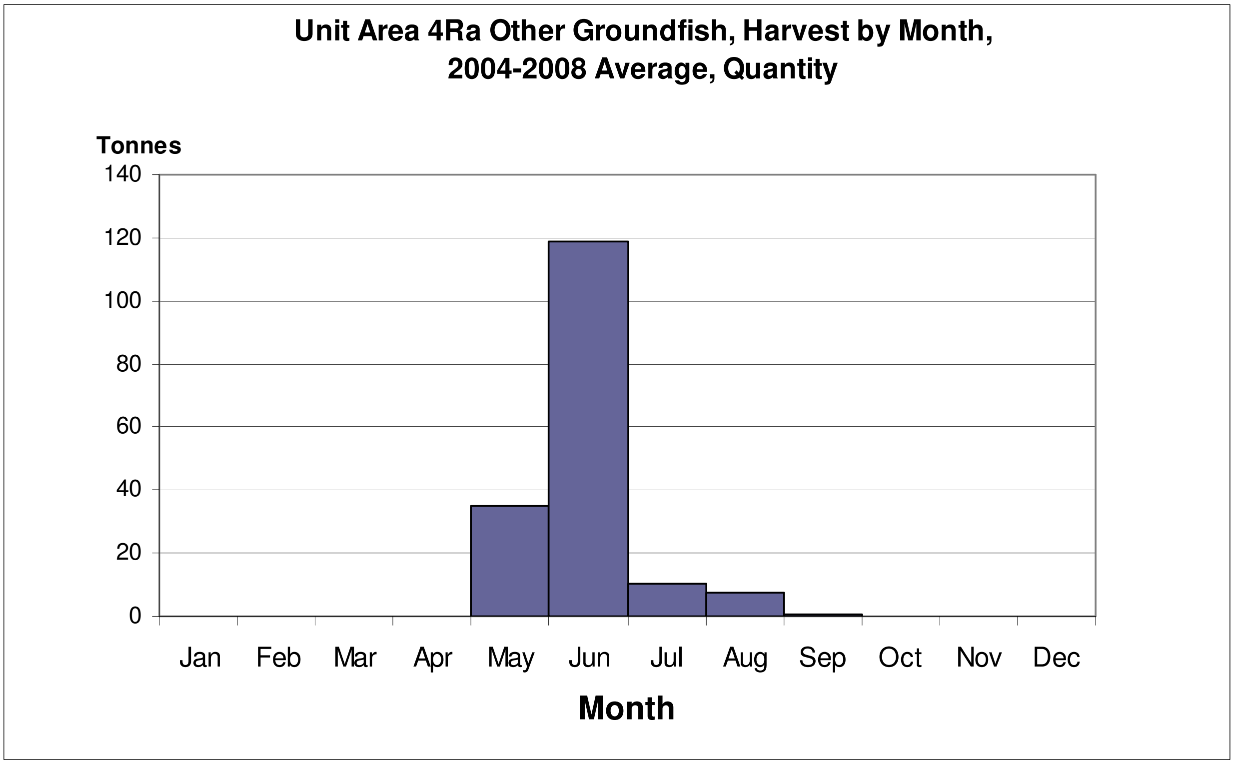


Figure 15. 4Ra Other Groundfish, by Month, 2004-2008 Average

The harvesting locations, based on the georeferenced subset of data, are shown in the following maps, Figures 16 and 17. As indicated, these species are harvested in many of the same locations as cod, though very little has been recorded (georeferenced) within the corridor area.

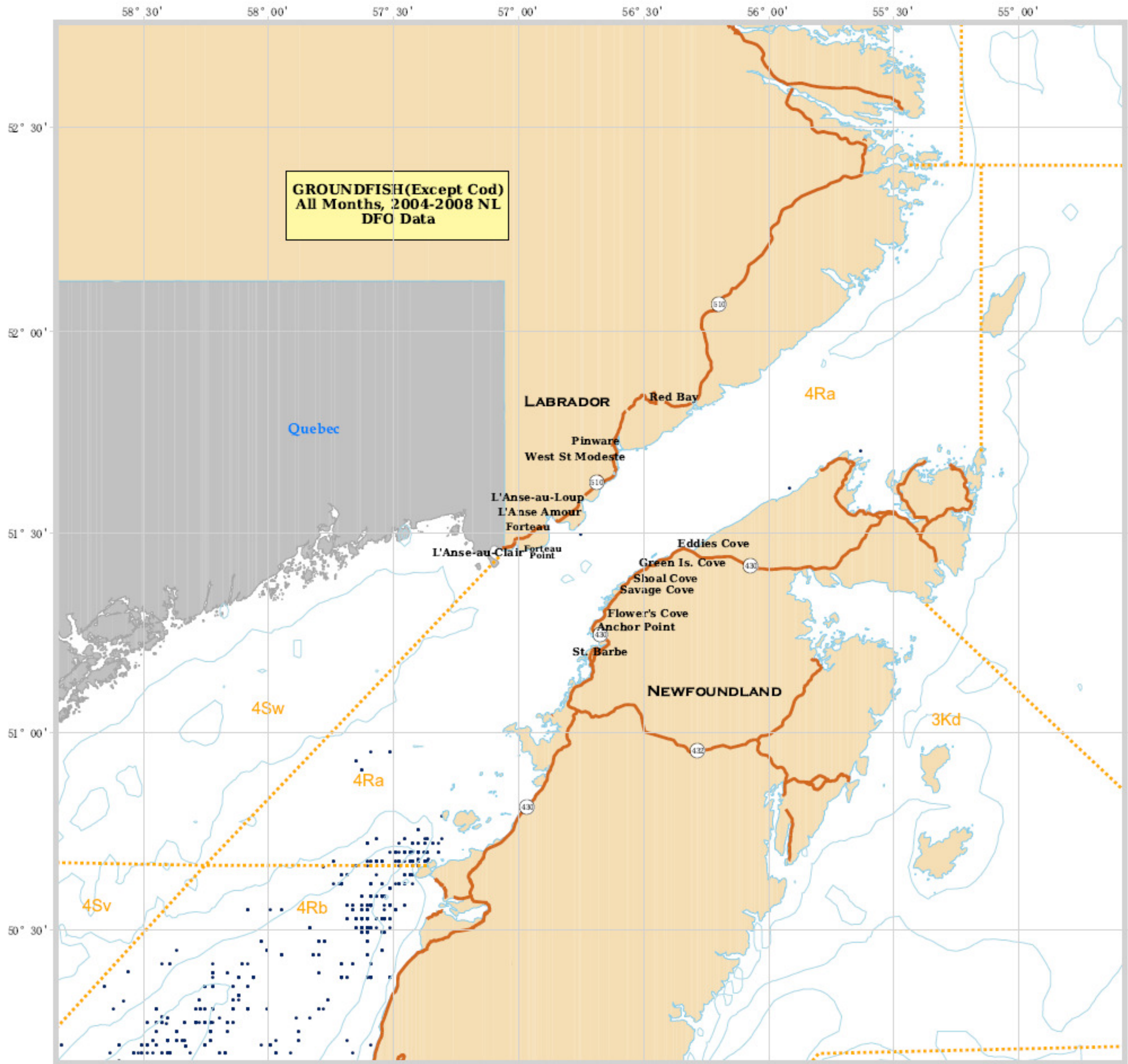


Figure 16. Other Groundfish (Georeferenced Data), 2004-2008 Aggregated

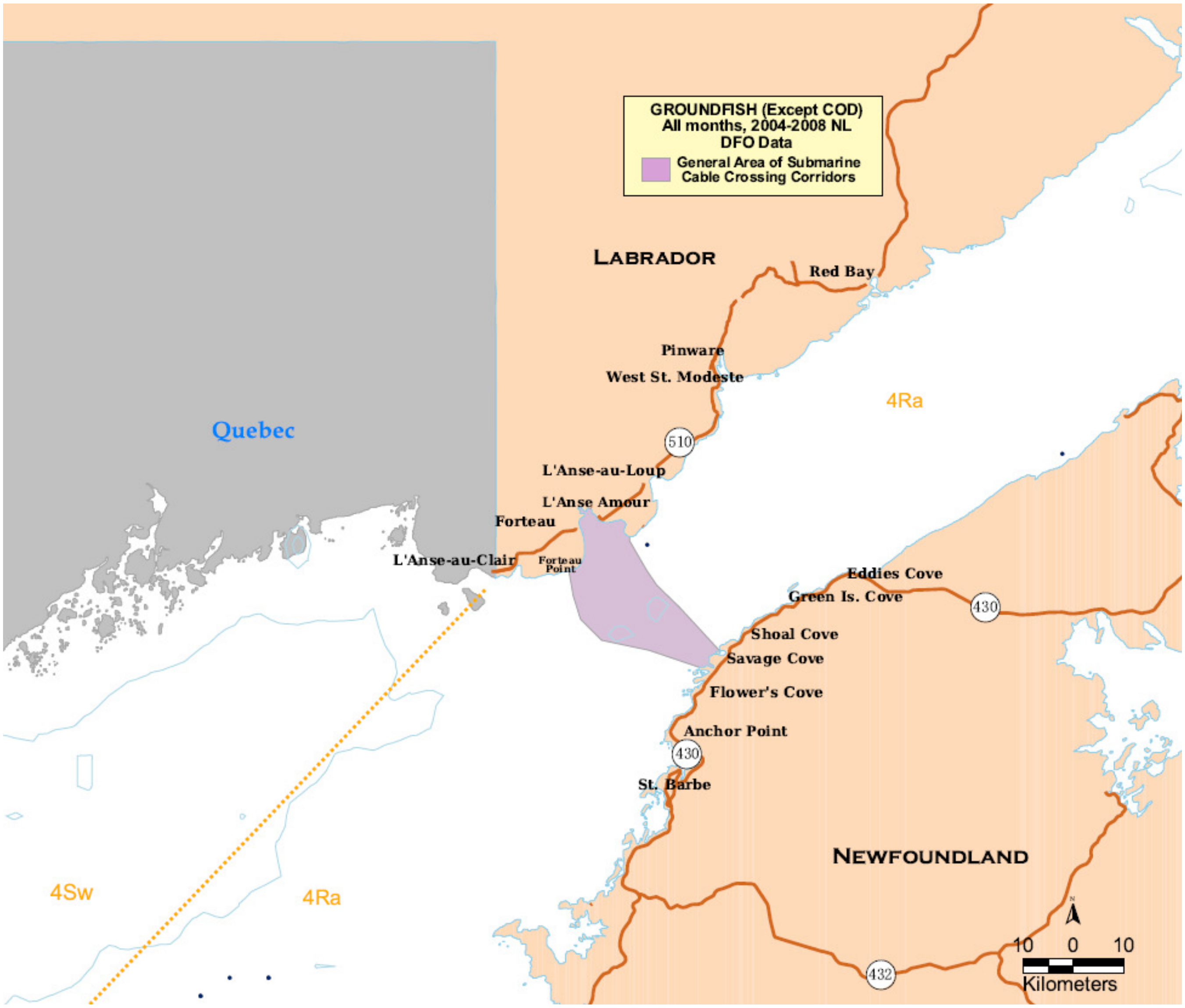


Figure 17. Other Groundfish (Georeferenced Data), 2004-2008 Aggregated (Corridor View)

2.5.4 Capelin

Capelin harvesting activities vary in response to market demand and thus can fluctuate greatly from year to year. As the following graph shows, since 1999, there was very little harvest until a spike in landings between 2004 and 2007. This spike meant that, during the 2004-2008 period considered in this report, landings were relative high in value (11.4% of total average harvest, by value). However, for the previous 15 years, the average was just a fraction of this amount.

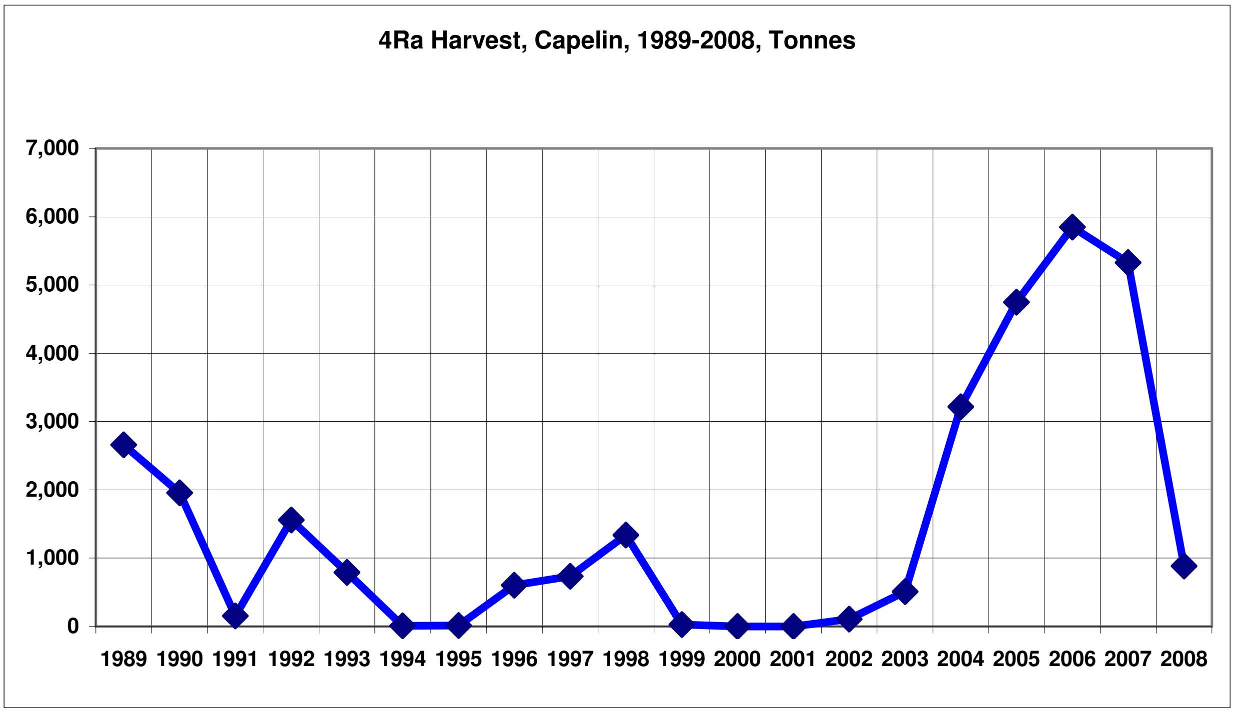


Figure 18. 4Ra Capelin, Annual Harvest 1989-2008

The capelin harvest in this area has been primarily a July fishery (Figure 19). While only a small proportion of the capelin harvest is georeferenced, the information available indicates that fishing effort tends to focus near the coastlines, as Figures 20 and 21 show.

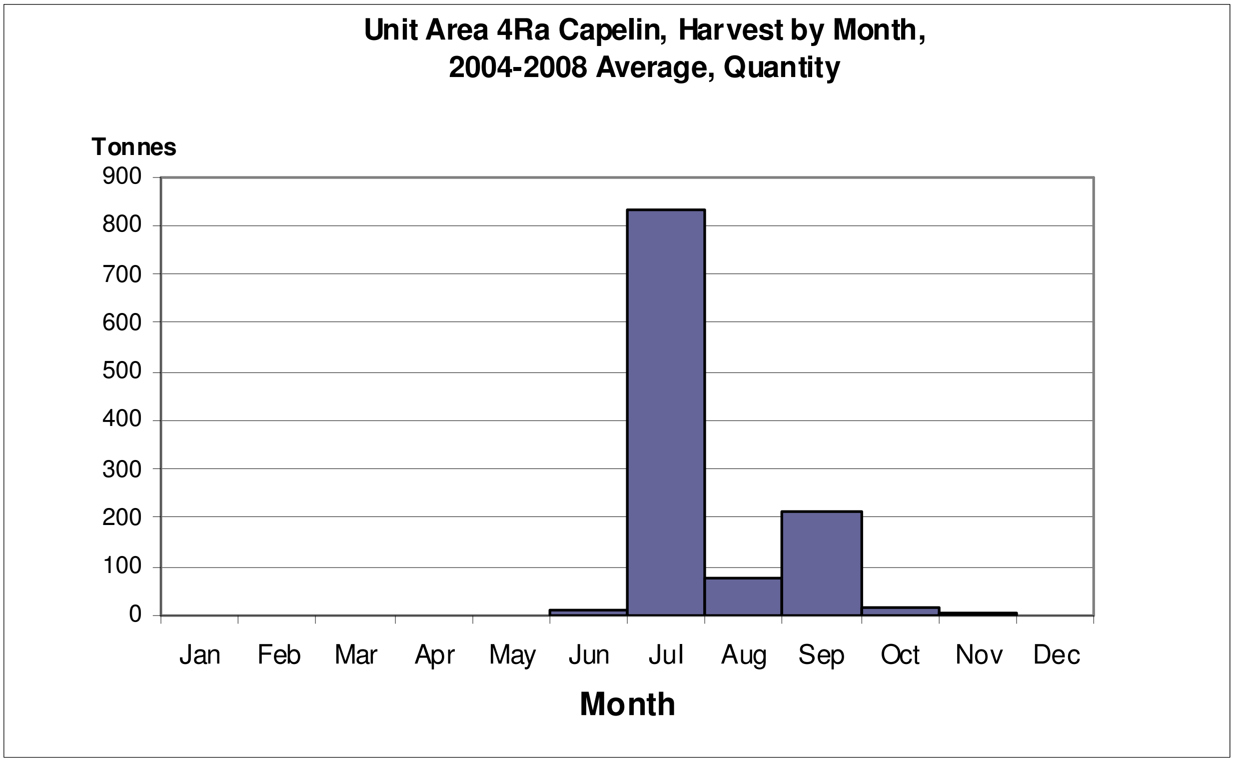


Figure 19. 4Ra Capelin, by Month, 2004-2008 Average

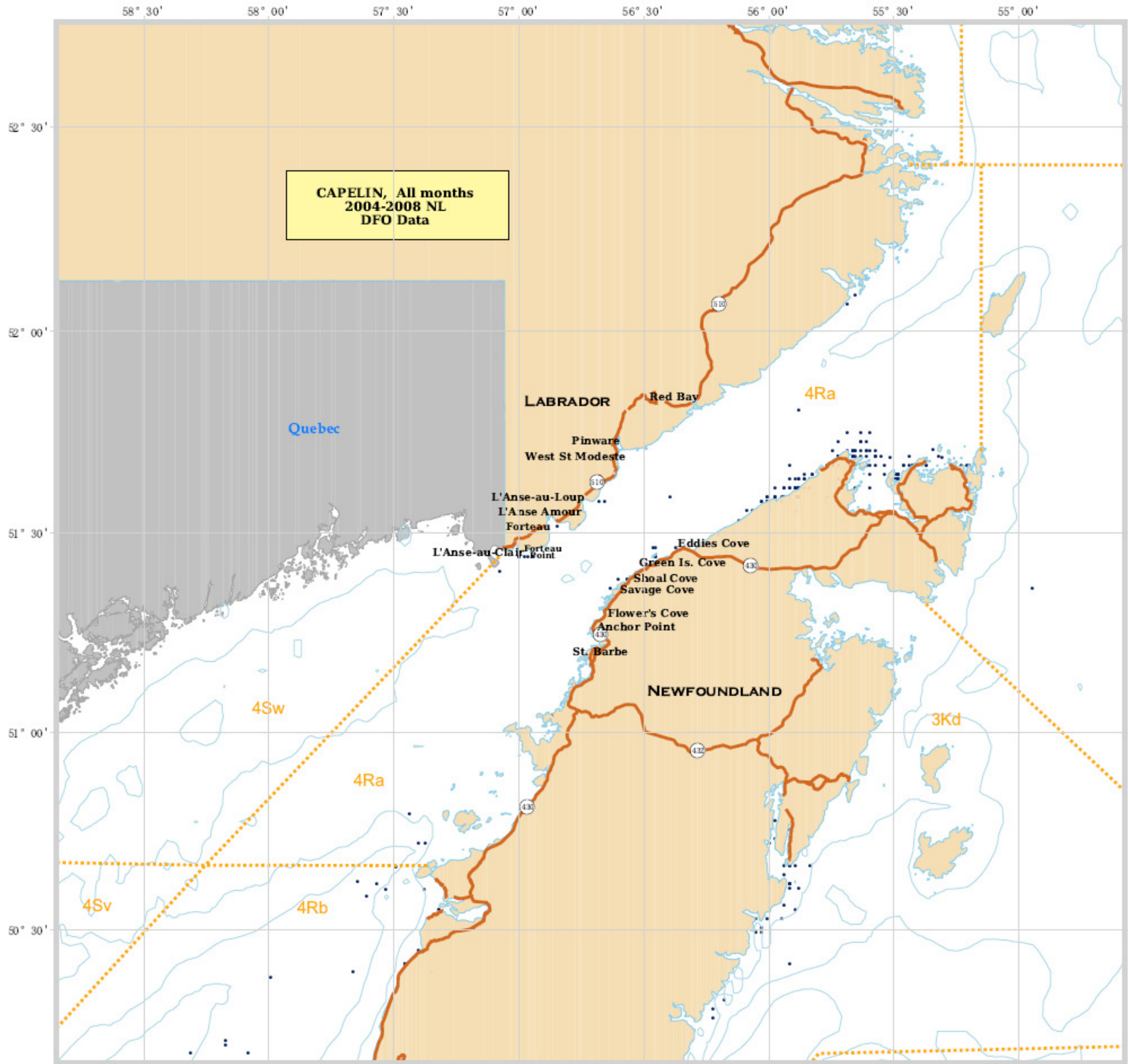


Figure 20. Capelin (Georeferenced Data), 2004-2008 Aggregated

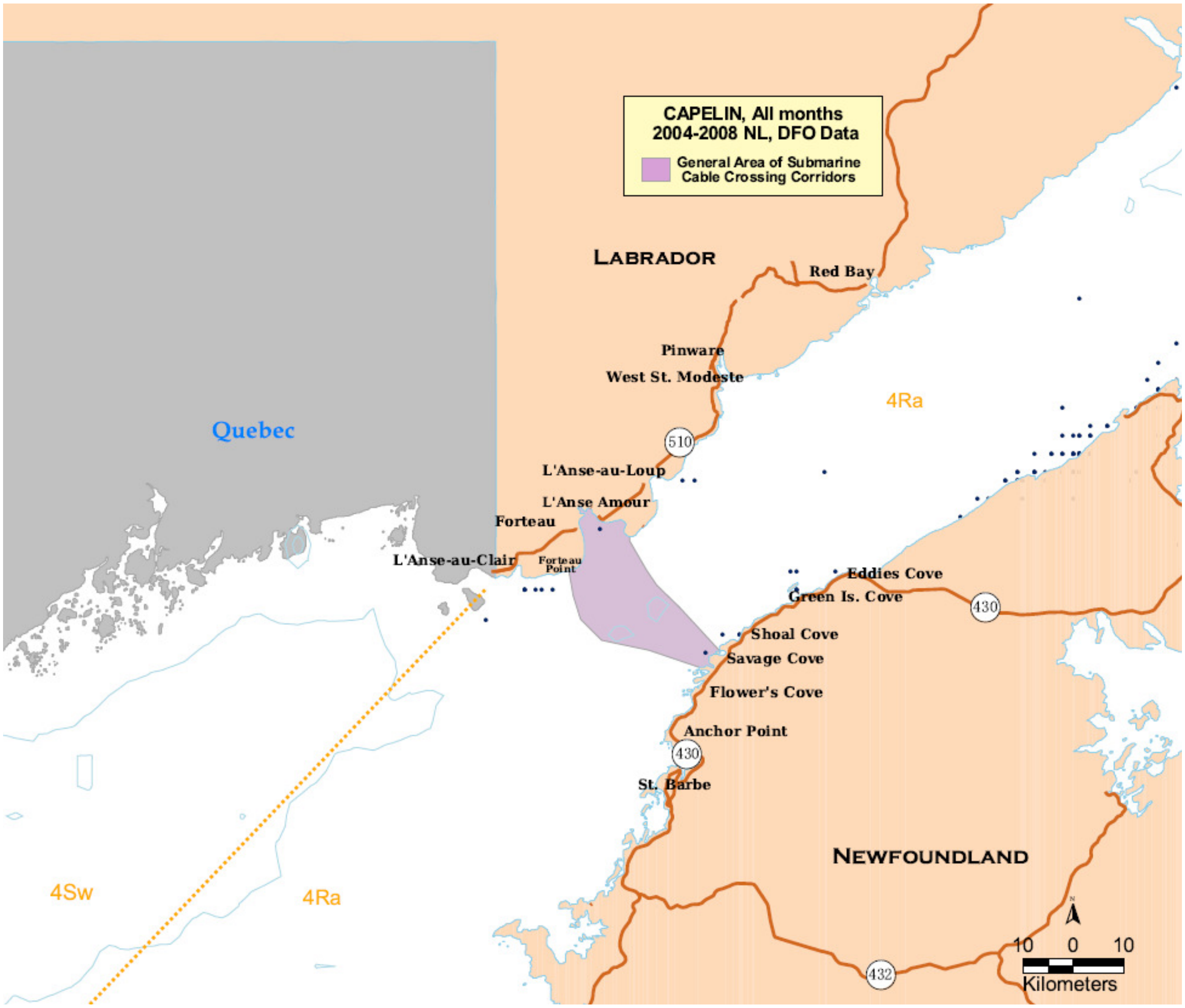


Figure 21. Capelin (Georeferenced Data), 2004-2008 Aggregated (Corridor View)

2.5.5 **Snow Crab**

Although snow crab emerged as a very important economic species in the years following the groundfish closures, as the following graph (Figure 22) shows, crab catches in 4Ra have been very low since 2002. This species has accounted for less than 1% of the overall species catch value in the past several years. Even though the 4R quota remained high after 2006 (1,535 t), snow crab fishers were catching only about 35% of the available quota. In 2009, the 4R quota dropped to 902 t, but the catch that year dropped to 288 t for the entire Division. The decline in the 4Ra crab catch since 2002 has been greater than in 4R as a whole.

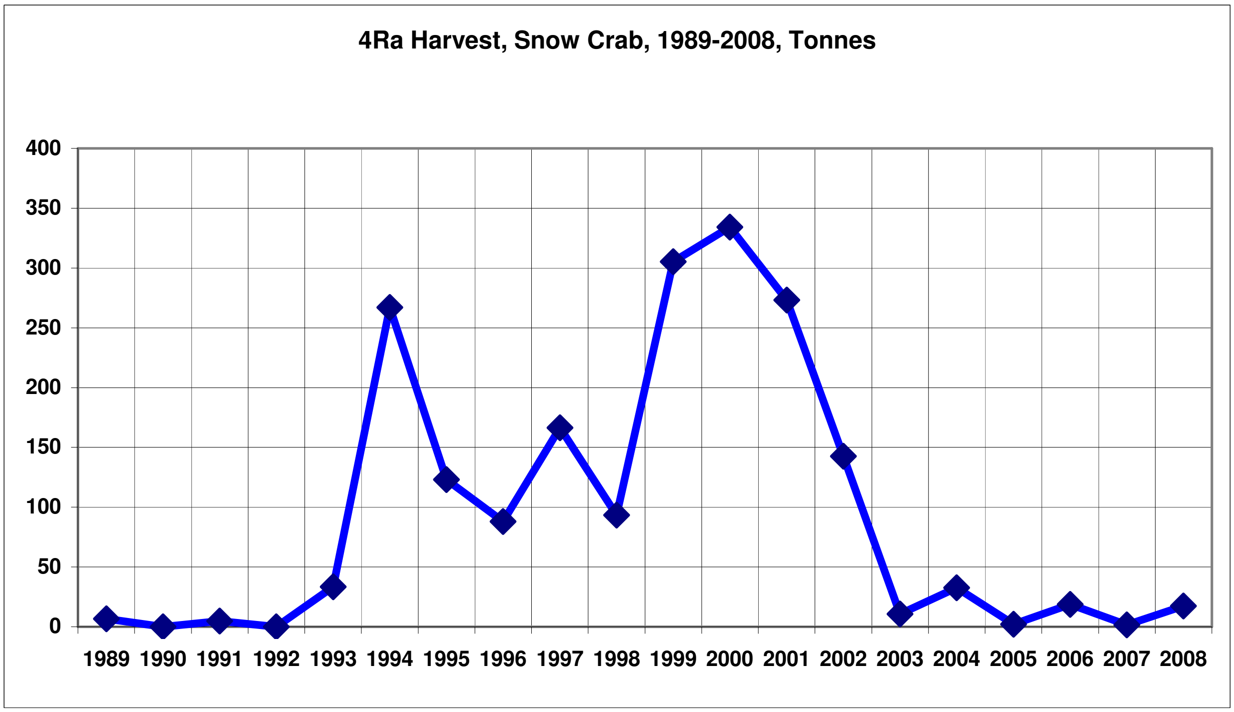


Figure 22. 4Ra Snow Crab, Annual Harvest 1989-2008

As Figure 23 indicates, the snow crab harvest peaks in June, but may continue until the early fall during some years.

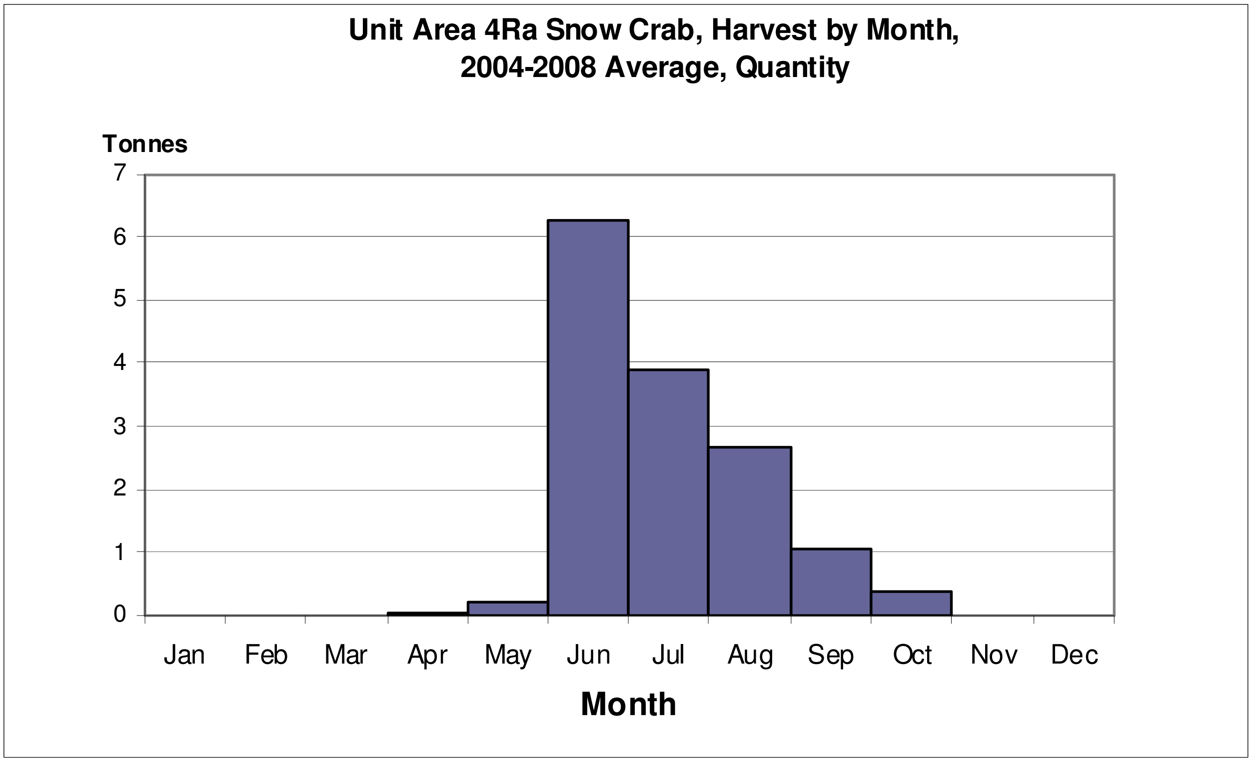


Figure 23. 4Ra Snow Crab, by Month, 2004-2008 Average

The following maps (Figures 24 and 25), which show georeferenced snow crab data, indicate that most of the documented crab harvesting activities occur outside the Study Area.

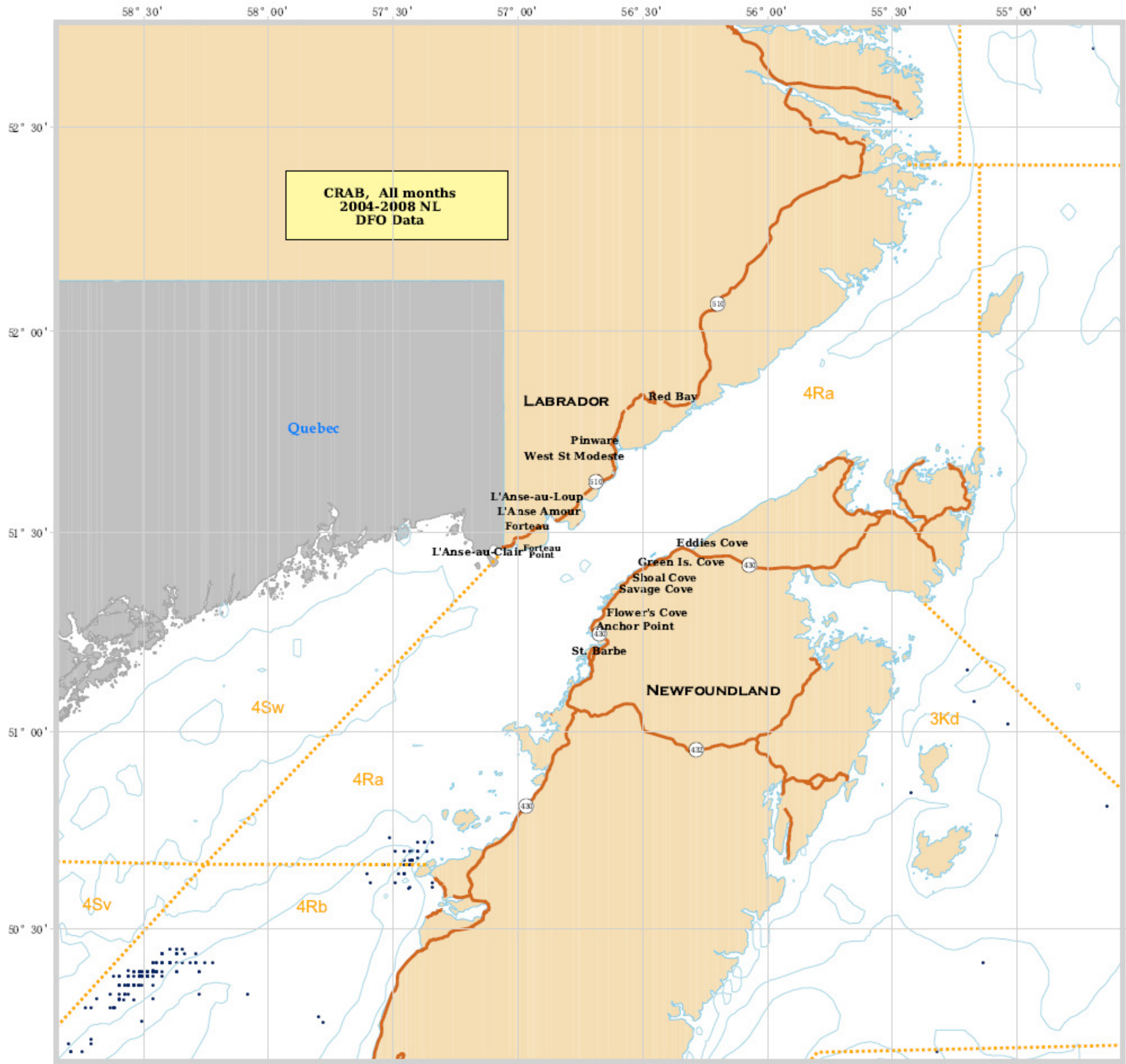


Figure 24. Snow Crab (Georeferenced Data), 2004-2008 Aggregated

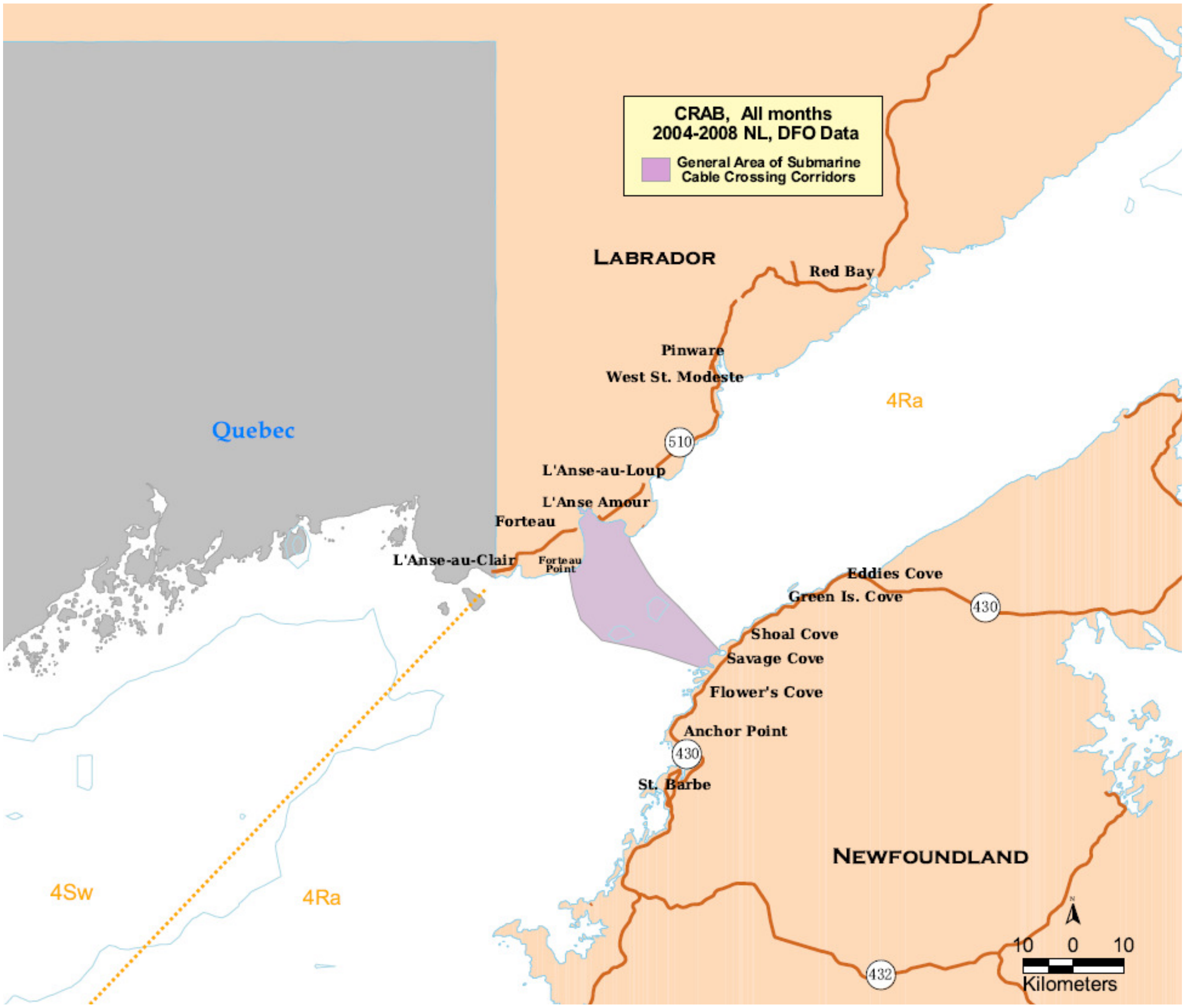


Figure 25. Snow Crab (Georeferenced Data), 2004-2008 Aggregated (Corridor View)

2.5.6 **Shrimp**

Northern shrimp harvests accounted for nearly 10% of the average 4Ra harvest for the 2004-2008 period. As the following graph (Figure 26) shows, landings have been much higher in the last decade than in the previous 10 years, though there has been a fairly high level of variability over the full 20 year period.

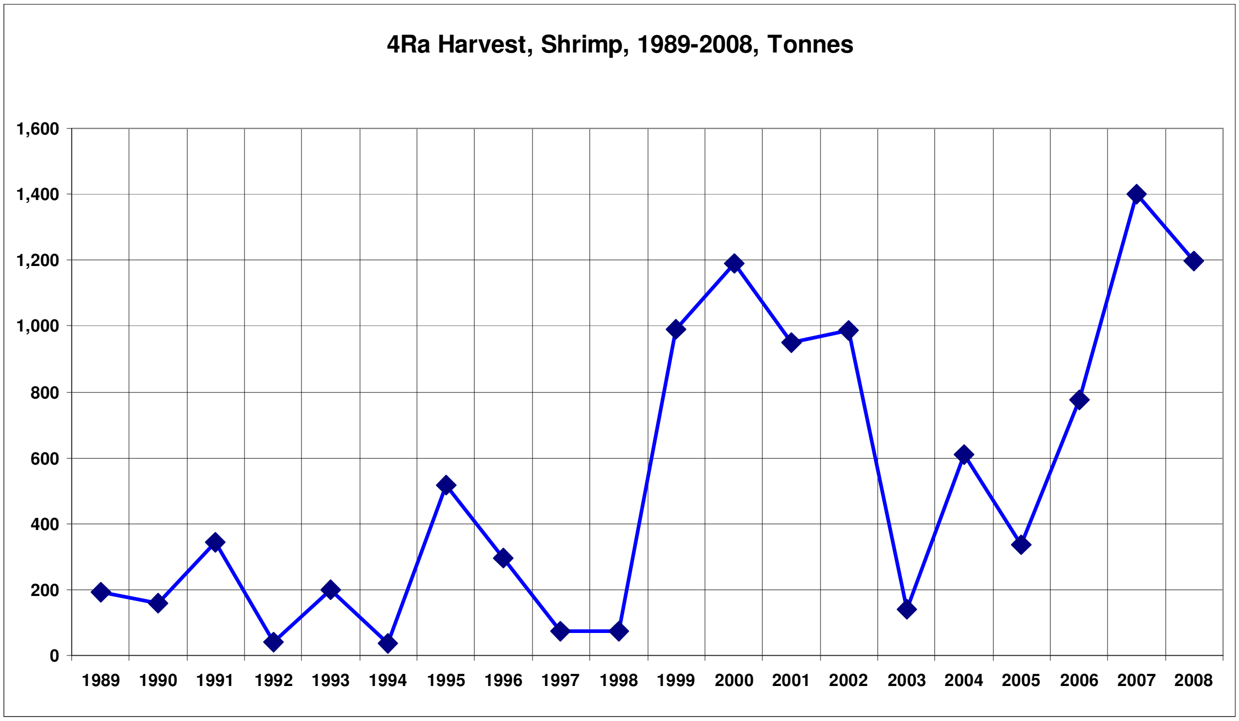


Figure 26. 4Ra Shrimp, Annual Harvest 1989-2008

Although there may be some shrimp harvesting during most months, April to May is the key period, accounting for more than 80% of the catch, 2004-2008.

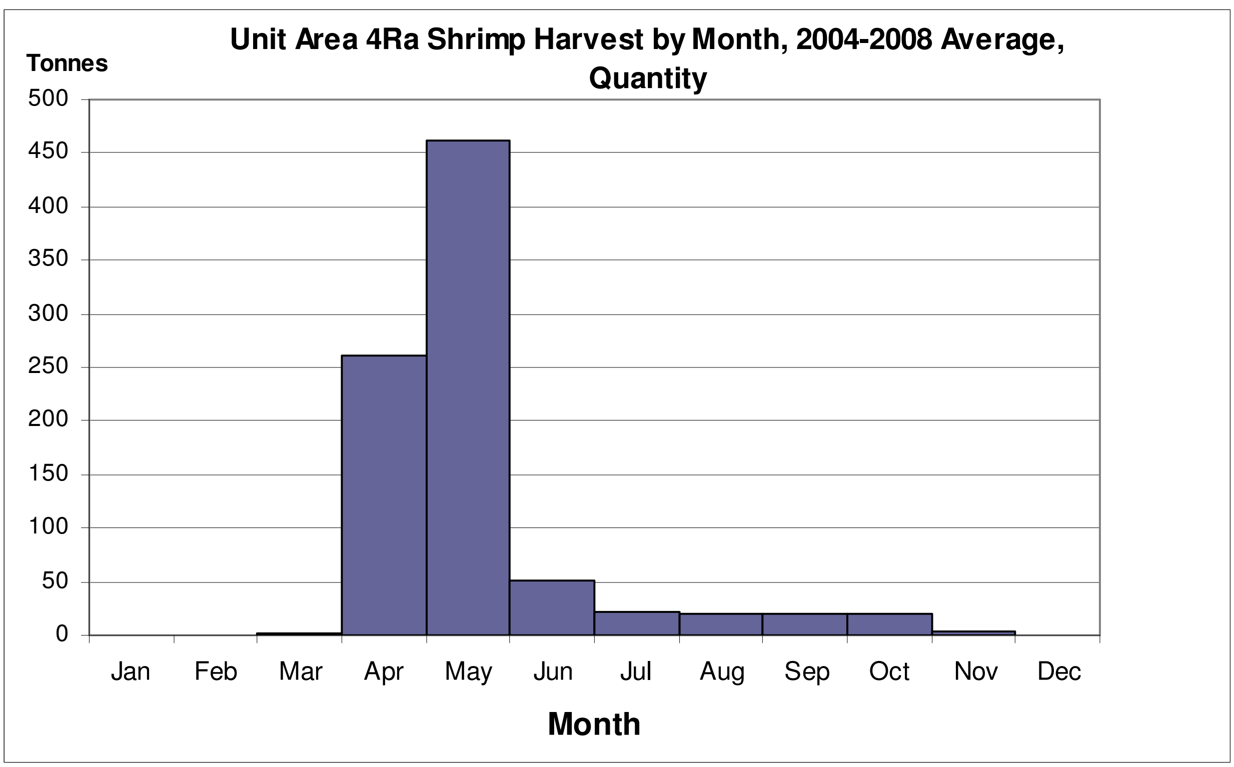


Figure 27. 4Ra Shrimp, by Month, 2004-2008 Average

The following maps of shrimp harvesting locations (Figures 28 and 29) indicate that the 4Ra shrimp harvesting activities are concentrated well to the southwest of the Study Area.

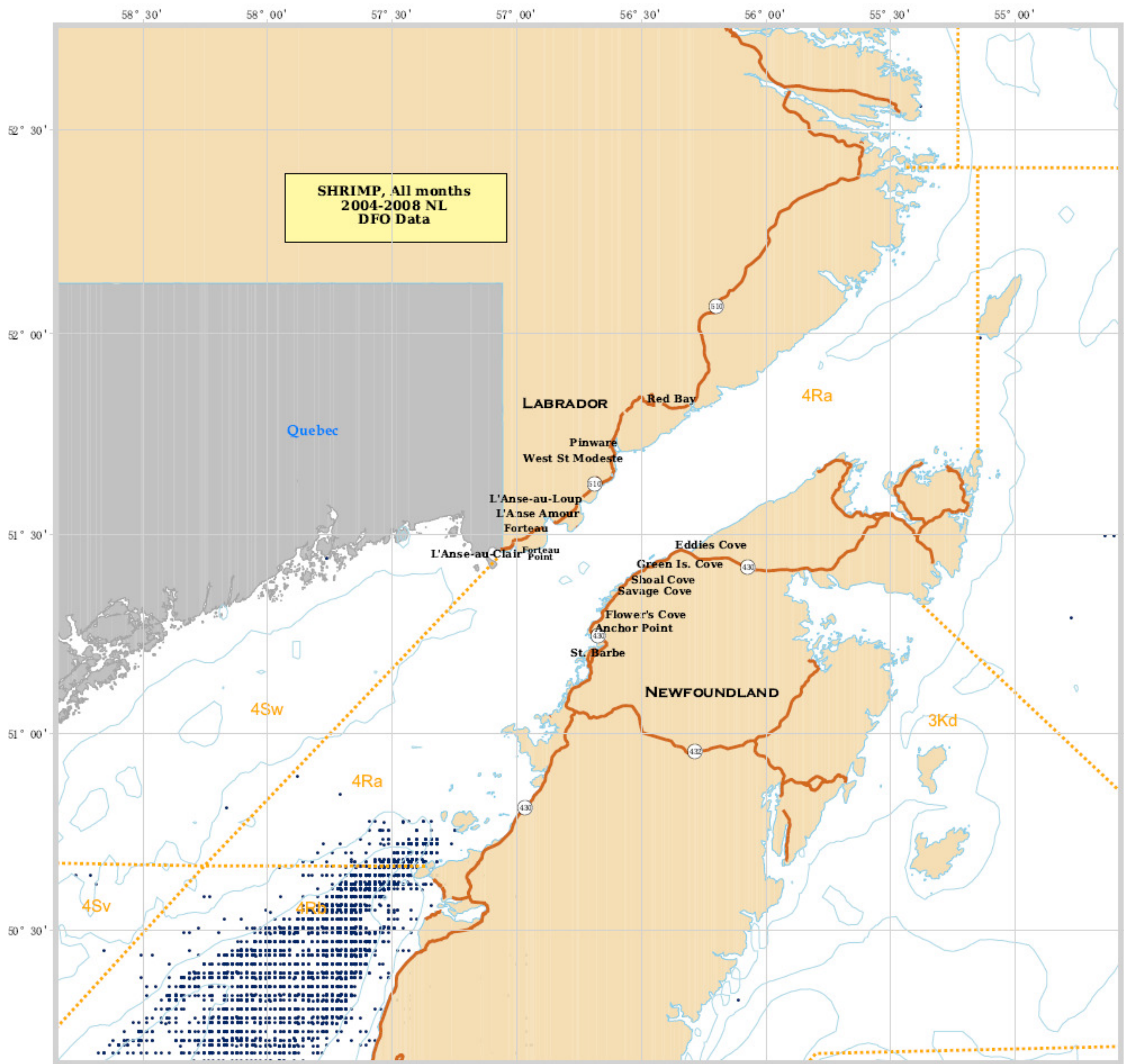


Figure 28. Shrimp (Georeferenced Data), 2004-2008 Aggregated

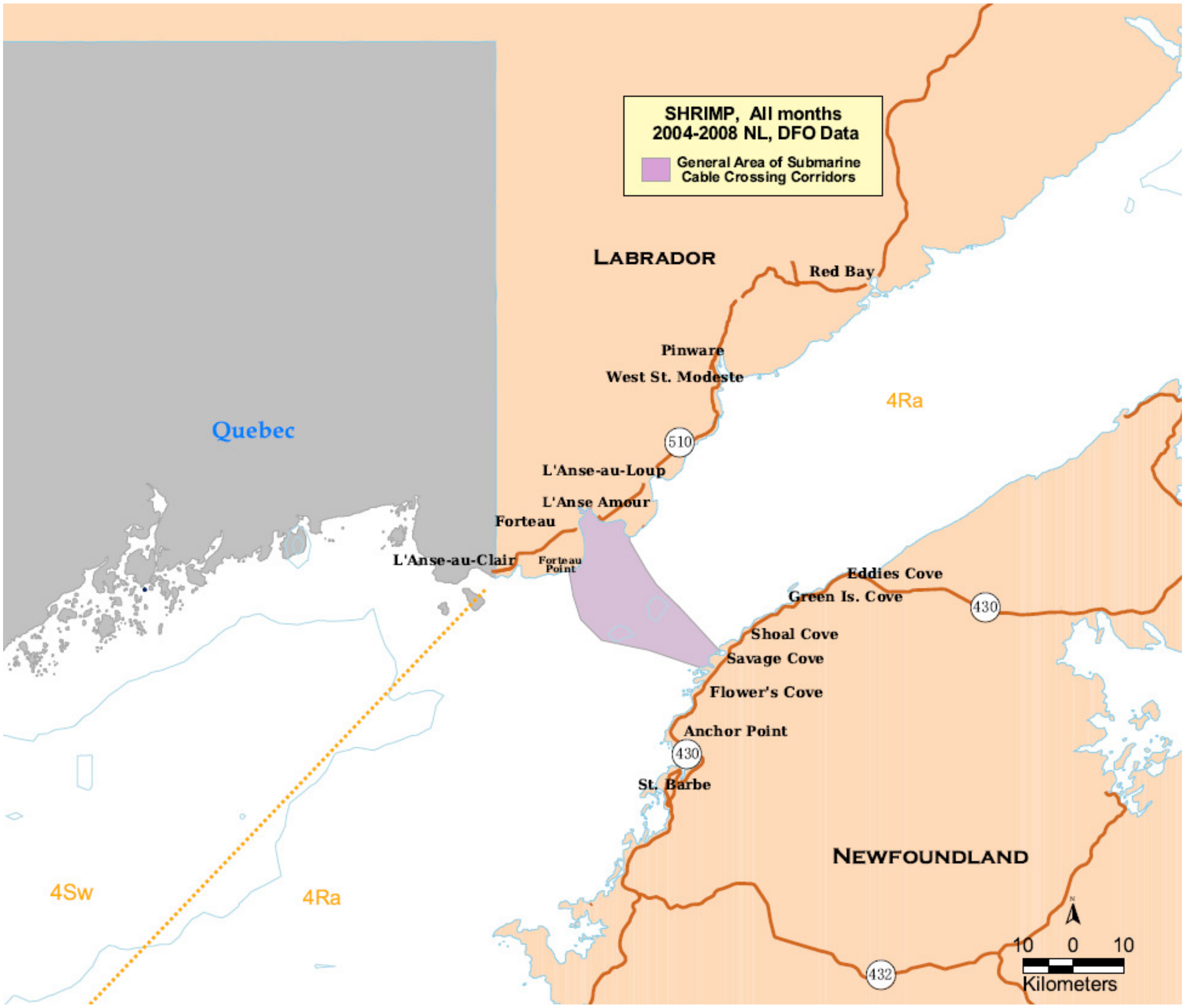


Figure 29. Shrimp (Georeferenced Data), 2004-2008 Aggregated (Corridor View)

2.5.7 **Scallops**

The scallop harvest in 4Ra exhibited a rapid increase in landings during the early 1990s followed by a gradual decline, so that harvests in 2007 and 2008 were at levels similar to those in the period 1989 to 1991 (Figure 30).

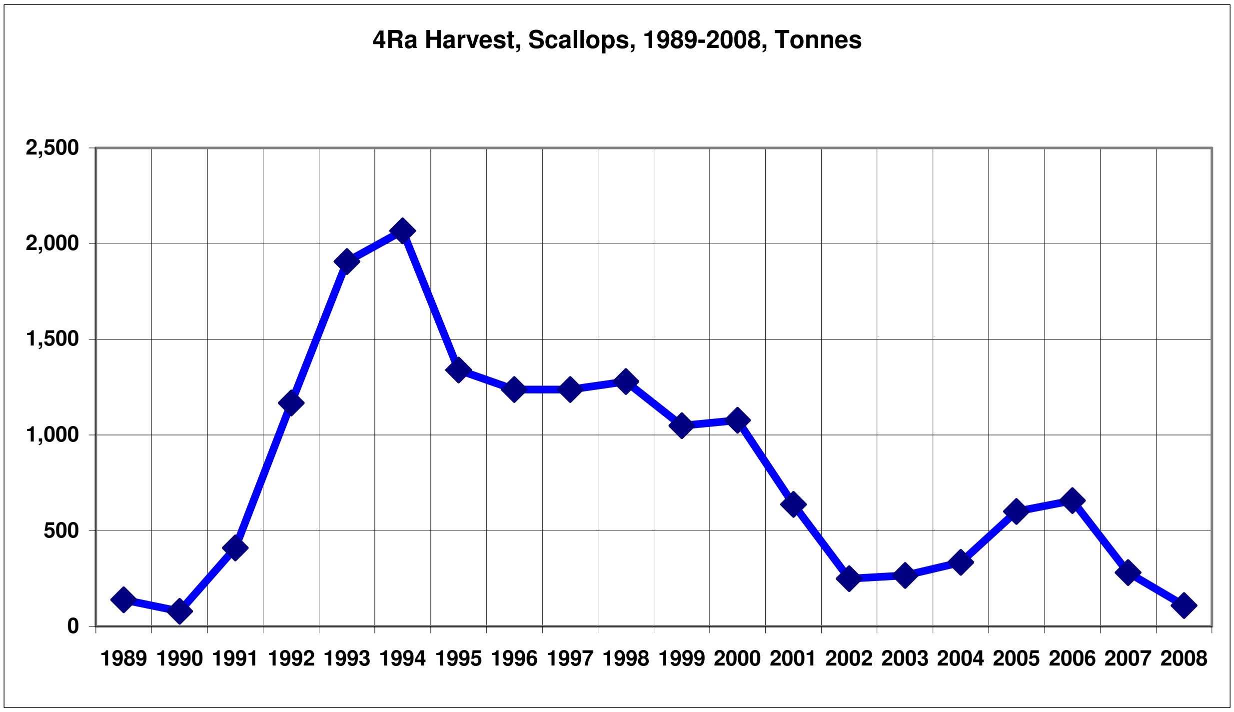


Figure 30. 4Ra Scallops, Annual Harvest 1989-2008

The harvest is typically spread over about six months from May to October, with the largest catches occurring in July and August for the 2004-2008 period (Figure 31).

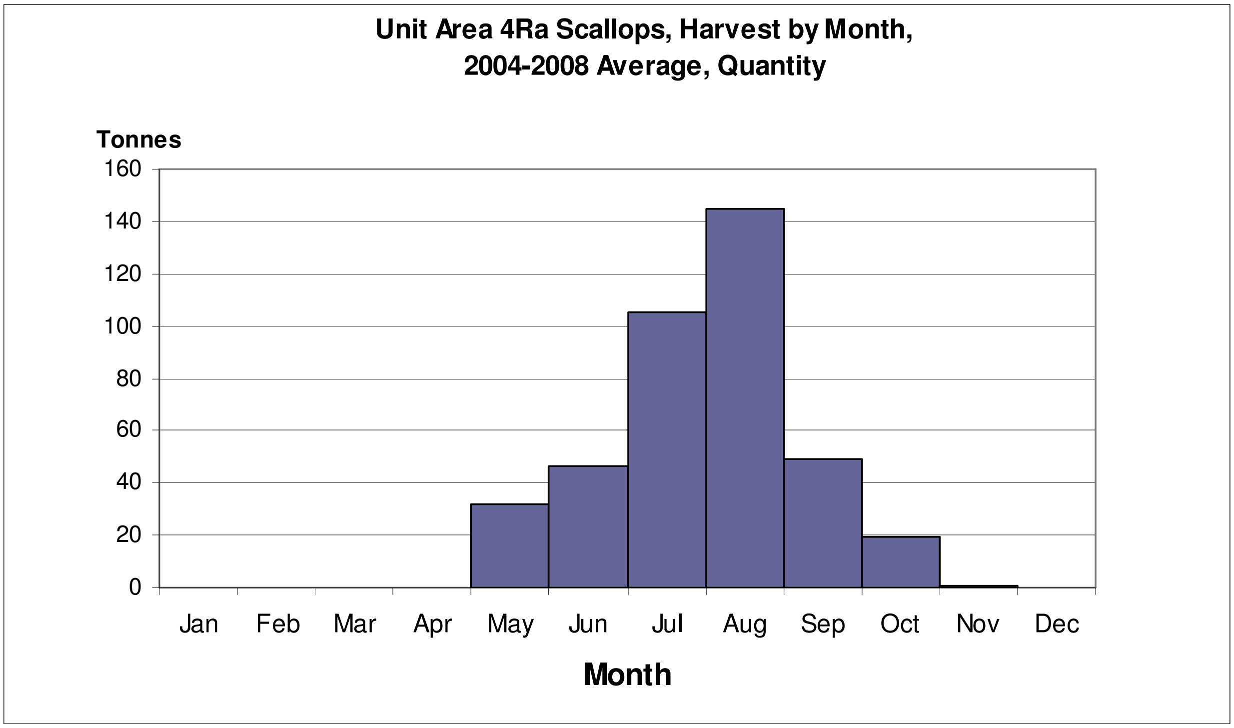


Figure 31. 4Ra Scallops, by Month, 2004-2008 Average

Harvesting locations for scallop draggers are shown on the following maps (Figures 32 and 33). As indicated, there has been little harvesting directly in the vicinity of the proposed cable crossing corridors, but this has likely been influenced by the establishment of a scallop refugium in the area in 2000 (see Section 3.3.1 for details).

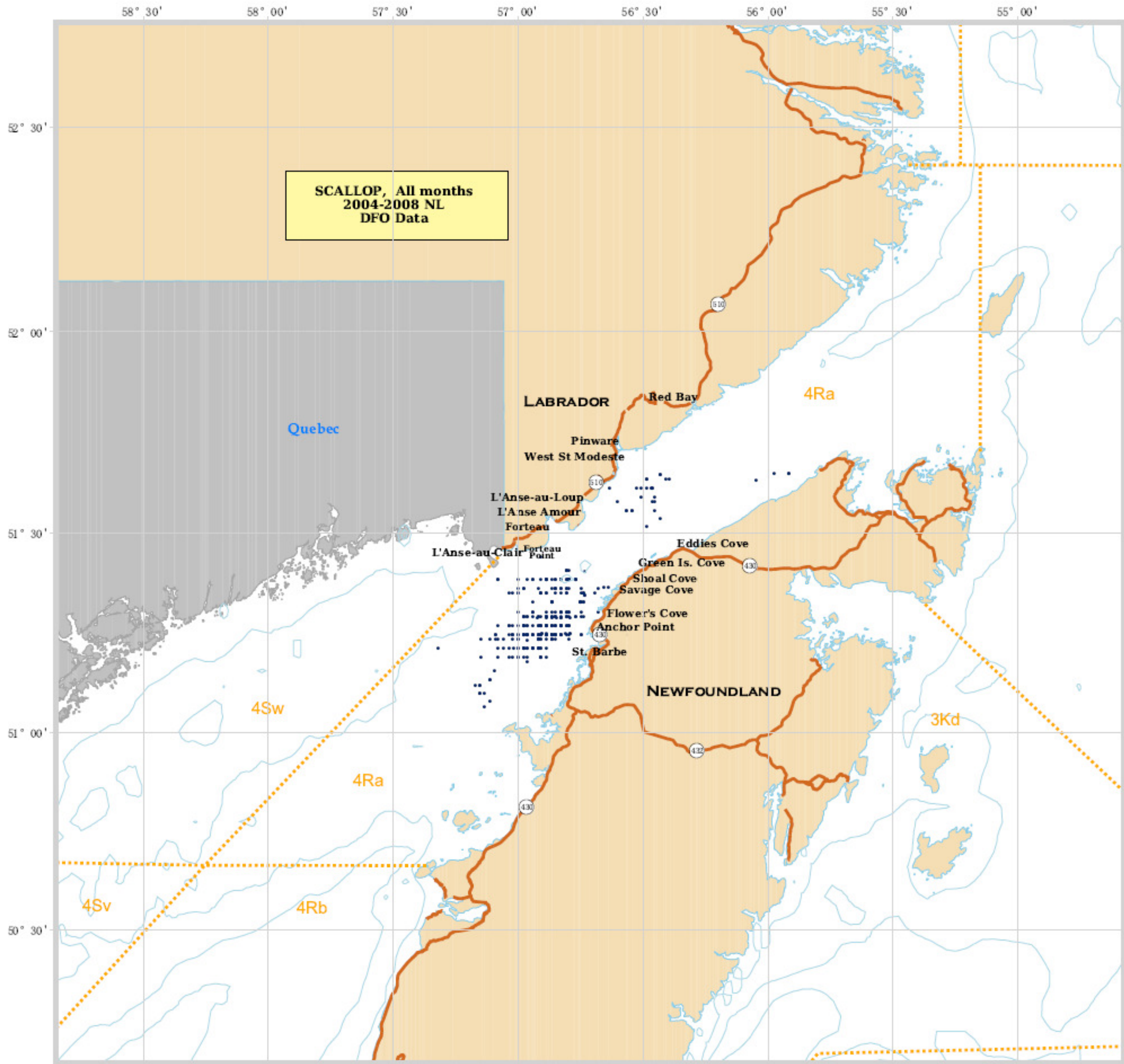


Figure 32. Scallops (Georeferenced Data), 2004-2008 Aggregated

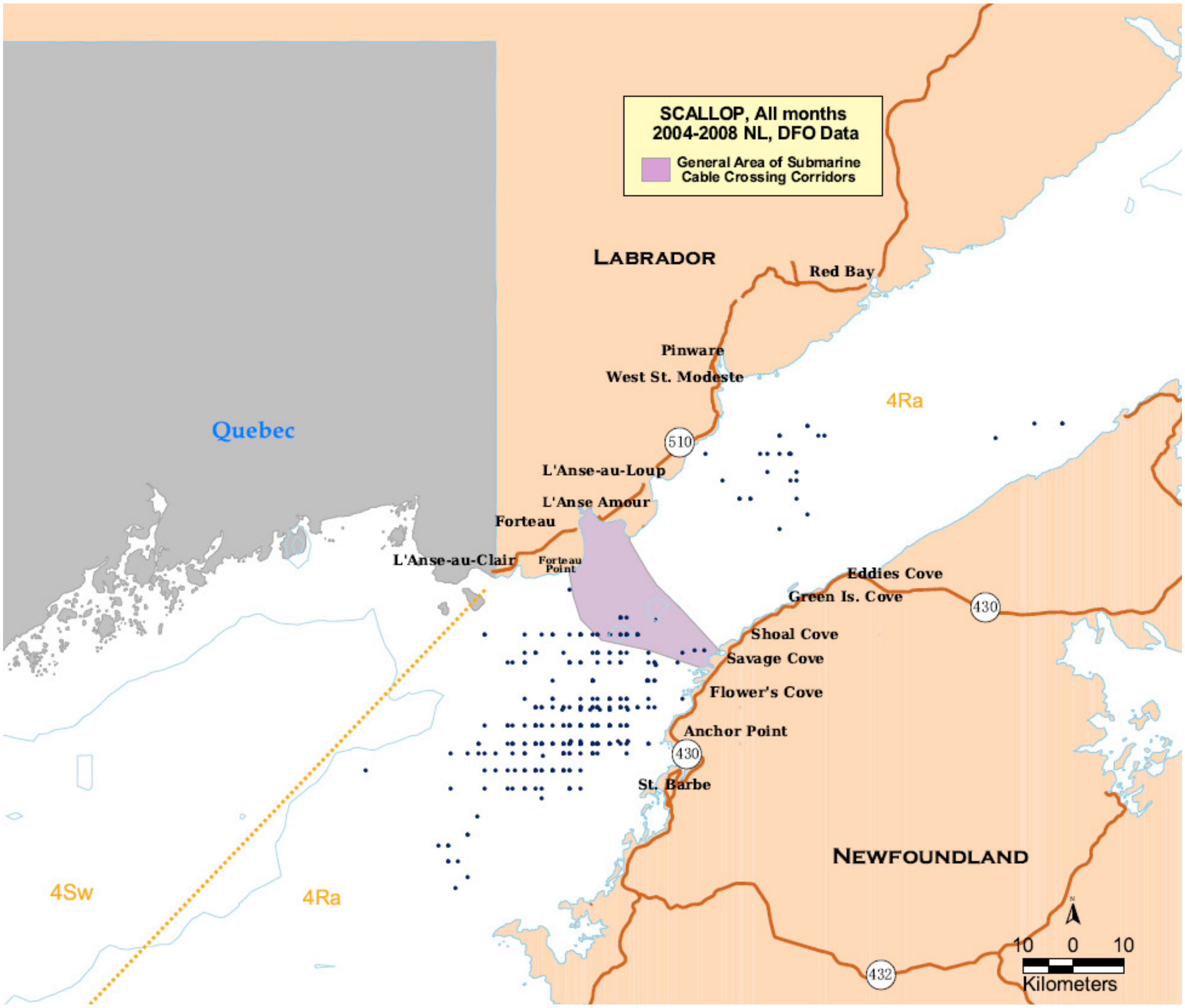


Figure 33. Scallops (Georeferenced Data), 2004-2008 Aggregated (Corridor View)

2.5.8 **Herring**

Herring is an important but relatively lower value species, accounting for just 1.6% of the harvest by value in recent years (2004-2008), though it was more than 8% of the harvest quantity from 4Ra in those years. As the following graph shows, there was a rapid increase in landings during the mid to late 1990s but this pattern was not sustained in subsequent years. As Figure 34 indicates, the 4Ra herring catch has declined from a high of more than 4,000 t in 1998 to a low of about 250 t in 2004.

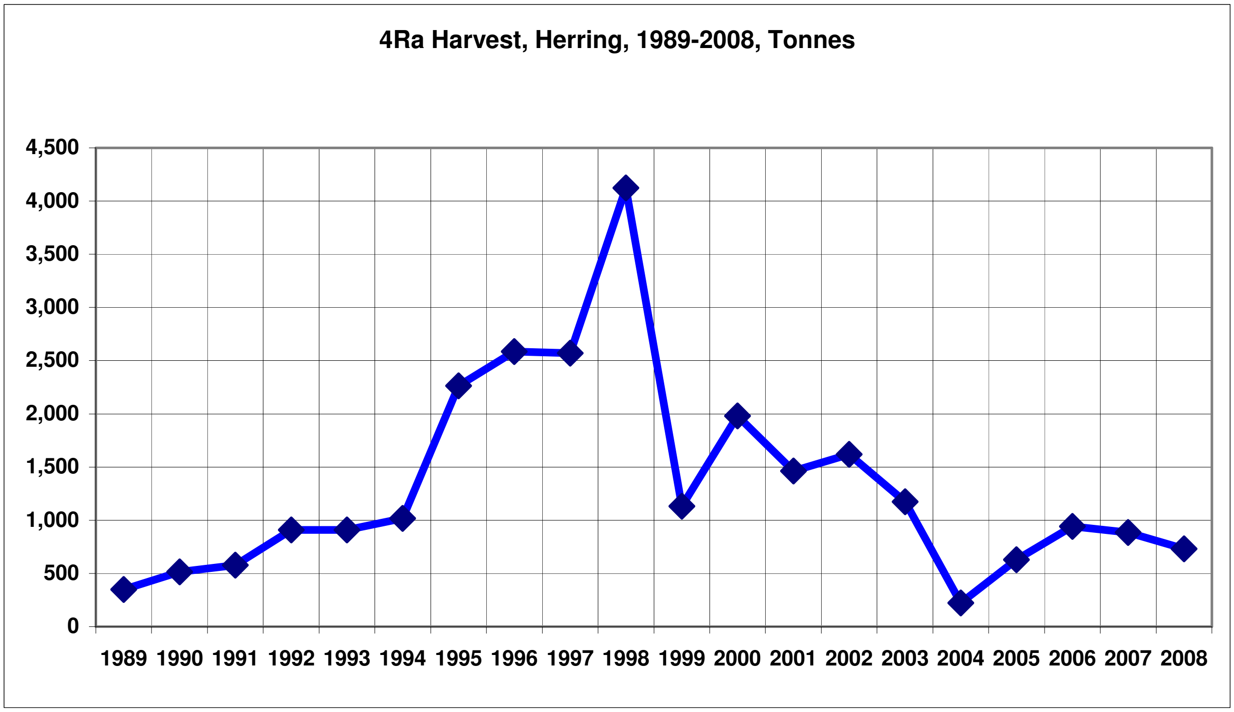


Figure 34. 4Ra Herring, Annual Harvest 1989-2008

The 4Ra data show that the harvest is highest in the late summer and early fall (Figure 35).

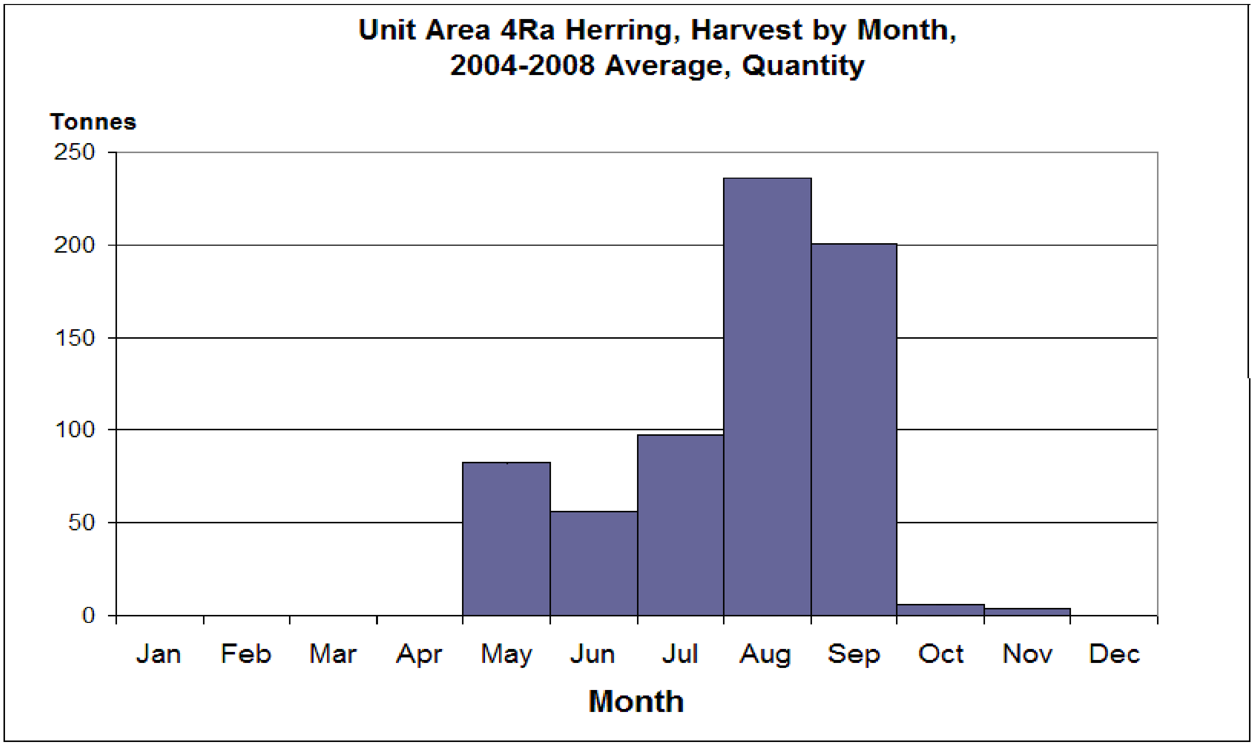


Figure 35. 4Ra Herring, by Month, 2004-2008 Average

The following maps show that there were very few georeferenced catches in 4Ra or the corridor area, but this is also a reflection of the fact that only a small portion of this species catch is georeferenced (Figures 36 and 37).

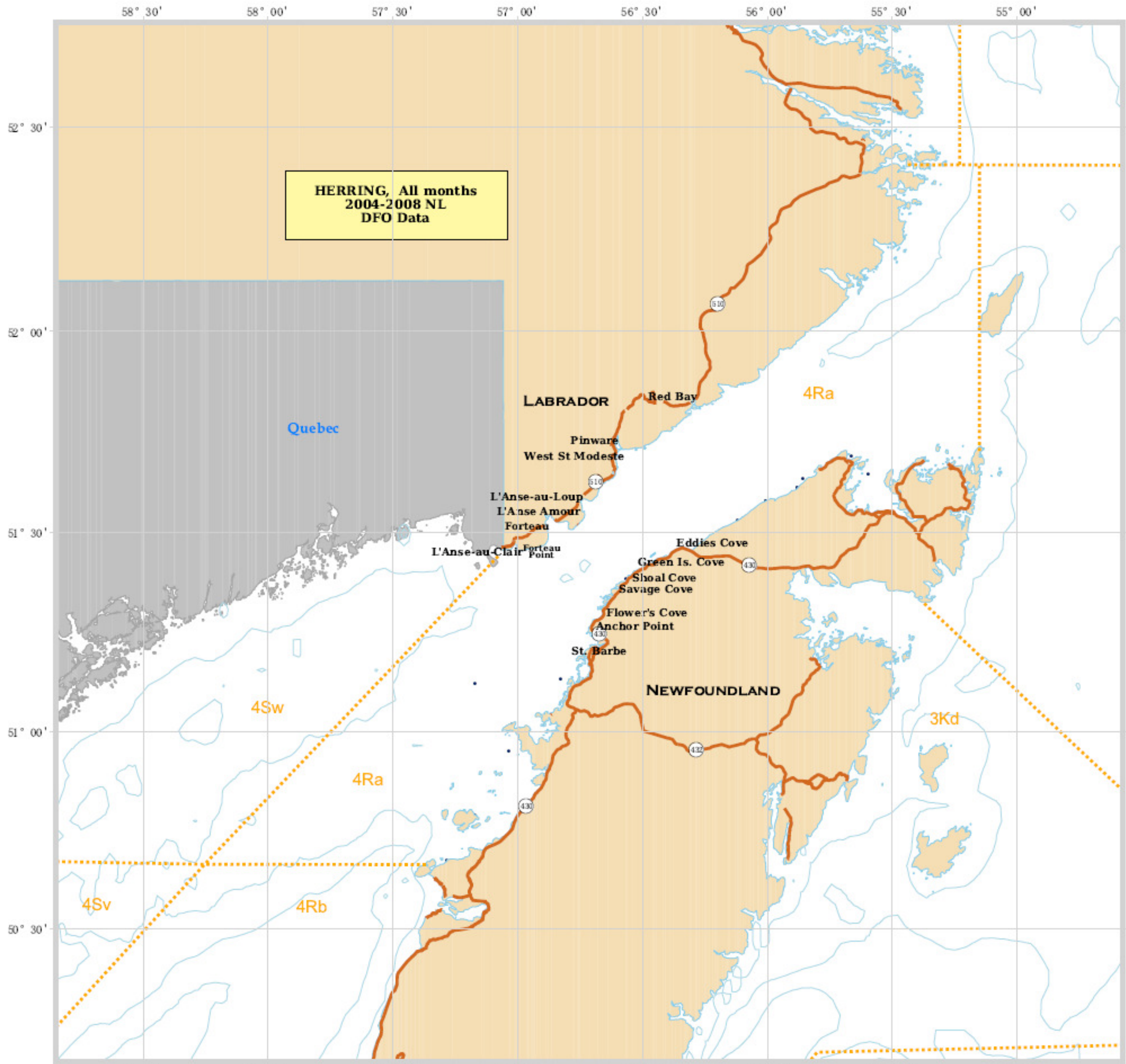


Figure 36. Herring (Georeferenced Data), 2004-2008 Aggregated

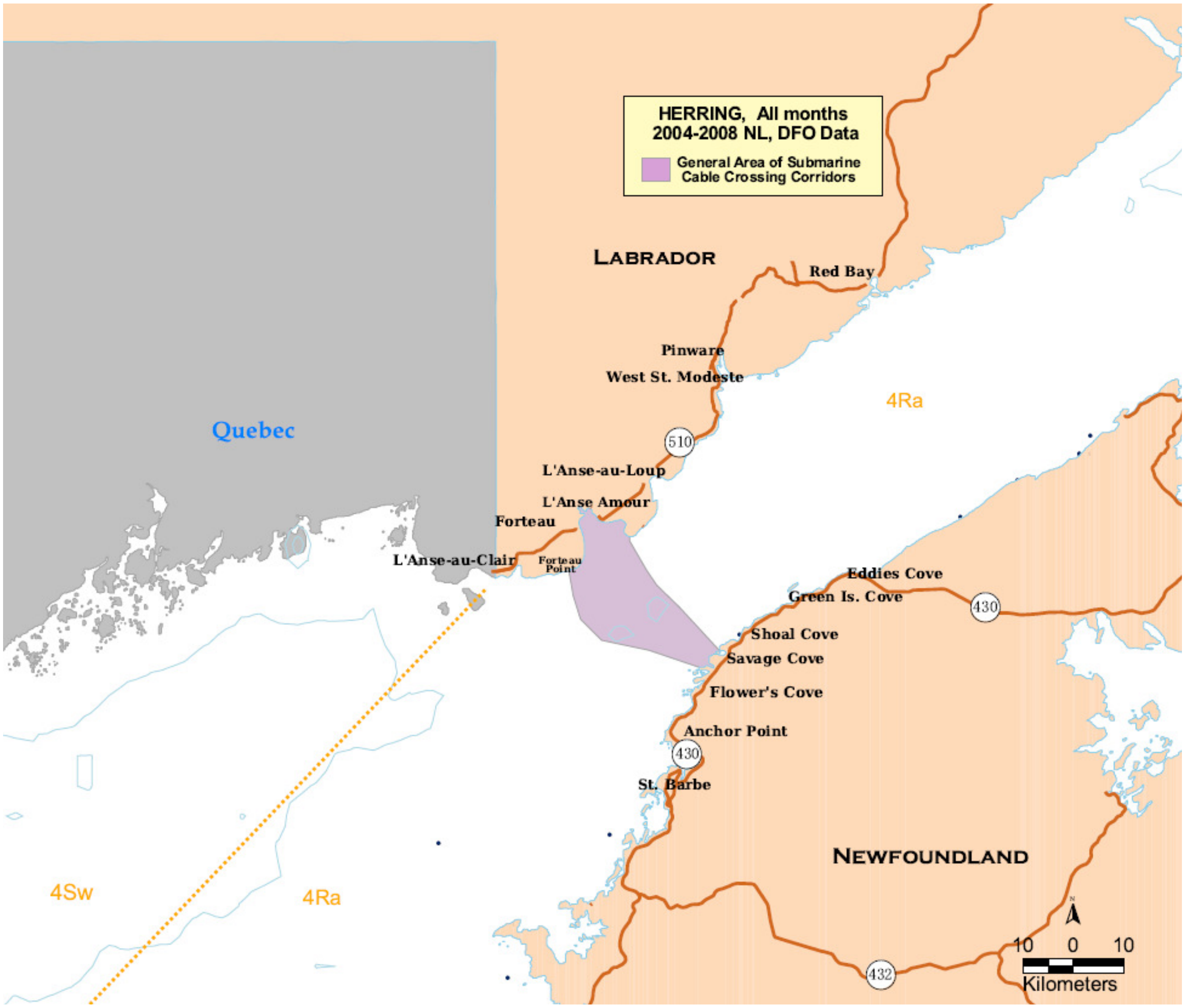


Figure 37. Herring (Georeferenced Data), 2004-2008 Aggregated (Corridor View)

3.0 STUDY AREA FISHERIES

This section focuses specifically on the fisheries in the general vicinity of the proposed submarine cable corridors across the Strait of Belle Isle (Study Area), as described in Section 1.2 and illustrated in Figure 2. It presents data from the DFO catch and effort datasets by homeports as well as additional information on local fisheries from the October 2009 consultations and other sources.

3.1 Fishing Enterprises and Species Licences

The following sections provide information related to the number of fishing enterprises, vessels and species licences on each side of the Study Area.

3.1.1 Enterprises

On the Labrador side of the Study Area, there are a total of 56 Core[3] and non-Core fishing enterprises in the area between L'Anse au Clair and Pinware (Table 4). There are 21 Core enterprise vessels less than 40 feet and 12 greater than 40 feet. All 23 of the non-Core enterprises on this side of the Strait operate vessels < 40 feet.

Table 4: Core and Non-Core Enterprises by Vessel Size, Labrador - L'Anse Au Clair to Pinware, 2009

Homeport	Core (By Vessel Length)		Non-Core (By Vessel Length)	Total
	<40'	>40'	<40'	All Lengths
L'Anse Au Clair	4	1	2	7
Forteau	6	1	5	12
Buckles Point	0	0	0	0
English Point	0	0	0	0
L'Anse Amour	2	1	0	3
Fox Cove	0	0	0	0
Schooner Cove	0	0	0	0
L'Anse Au Loup	5	7	9	21
L'Anse Au Diable	0	0	0	0
Capstan Island	2	1	2	5
West St. Modeste		1	4	5
Pinware	2		1	3
Total	**21**	**12**	**23**	**56**

3 "Core" enterprises are those which are headed by a Core fisher. A Core fisher must be the head of an enterprise, hold key species licences (i.e. - for Newfoundland - groundfish, capelin, lobster, snow crab, scallop, shrimp, and all species caught using purse seine), have a demonstrated attachment to the fishery, and be dependent on the fishery. See *http://www.dfo-mpo.gc.ca/communic/lic_pol/ch3_e.htm*

On the Newfoundland side there are a total of 171 Core and non-Core fishing enterprises in the area between Forrester's Point and Eddies Cove East (Table 5). Most (88) of the Core enterprise vessels are less than 40 feet while 35 have vessels >40 feet. All 48 non-Core enterprise vessels are less than 40 feet.

Table 5: Core and Non-Core Enterprises by Vessel Size, Newfoundland - Forresters Point to Eddie's Cove East, 2009

Homeport	Core (By Vessel Length)		Non-Core (By Vessel Length)	Total
	<40'	>40'	<40'	All Lengths
Forresters Point	9	1	3	13
Black Duck Cove	5	6	0	11
St. Barbe	2		2	4
Anchor Point	9	15	6	30
Deadmans Cove			1	1
Bear Cove	2	4	4	10
Flowers Cove	3	3	11	17
Nameless Cove	3		1	4
Savage Cove	7	4	3	14
Sandy Cove	6		5	11
Shoal Cove East			1	1
Paynes Cove	1	1	1	3
Green Island Cove	15	1	2	18
Green Island Brook	14		5	19
Eddies Cove East	12		3	15
Total	**88**	**35**	**48**	**171**

3.1.2 Species Licences

The following tables show the licences held by Core and non-Core fishers, respectively, on the Labrador side of the Study Area. Core enterprises hold a total of 196 species licences, and non-Core enterprises have a total of 65 species licences.

Table 6: Licences, by Core Enterprises by Fleet, Study Area Homeports, Labrador Side, 2009

Species/Gear Type	Vessels <40'	Vessels >40'	Total
Bait	-	1	1
Capelin	15	8	23
Groundfish	6	12	18
Lumpfish	15	-	15
Herring	20	7	27
Mackerel	14	6	20
Scallop	1	11	12
Seal	21	12	33

Species/Gear Type	Vessels <40'	Vessels >40'	Total
Shrimp	-	7	7
Shark (unsp.)	-	1	1
Snow Crab	1	8	9
Squid	2	-	2
Toad Crab	8	1	9
Whelk	14	5	19
Total	**117**	**79**	**196**

Table 7: Licences, by Non-Core Enterprises by Fleet, Study Area Homeports, Labrador Side, 2009

Species/Gear Type	Vessels <40'	Vessels >40'	Total
Capelin	11	-	11
Groundfish	22	-	22
Herring	8	-	8
Mackerel	1	-	1
Seal	23	-	23
Totals	**65**	**-**	**65**

The number and distribution of species licenses held by Core and non-Core enterprises on the Island side of the Study Area are shown in the following two tables. Core fishing enterprises collectively hold a total of 781 species licences while the 48 non-Core enterprises, all of whom operate vessels <40 feet, hold a total of 160 licences.[4]

Table 8: Licences, by Core Enterprises by Fleet, Study Area Homeports (Newfoundland Side), 2009

Species/Gear Type	Vessels <40'	Vessels >40'	Total
Bait	72	4	76
Capelin	59	7	66
Eels	1	-	1
Groundfish	84	35	119
Herring	77	16	93
Lobster	78	7	85
Mackerel	64	21	85
Scallop	16	23	39
Seal	82	33	115
Shrimp	-	57	57
Snow Crab	-	2	2
Toad Crab	5	-	5
Whelk	35	3	38
Total	**573**	**208**	**781**

4 Only 29 Core enterprises based in the Island portion of the Study Area are licenced to harvest shrimp in the Gulf region (4R). However Table 8 shows a total of 57 shrimp licences held by these fishers. The number of licences is greater than 29 because most of these enterprises hold two shrimp licences: one for the Gulf region and one the NAFO 3K region where they are permitted to catch Northern shrimp.

Table 9: Licences, by Non-Core Enterprises by Fleet, Study Area Homeports (Newfoundland Side), 2009

Species/Gear Type	Vessels <40'	Vessels >40'	Total
Bait	20	-	20
Capelin	14	-	14
Groundfish	40	-	40
Herring	15	-	15
Lobster	19	-	19
Mackerel	5	-	5
Scallop	5	-	5
Seal	41	-	41
Squid	1	-	1
Total	**160**	**-**	**160**

3.2 Homeport Harvesting Data

The data tables in this section are derived from the special-run DFO datasets which capture only Study Area homeport fishing enterprises, as described in Section 2.1. The data include harvest by fishing vessels registered in the Study Area homeport (community) groups indicated, and only for harvest taken from the waters of Unit Area 4Ra. These data are therefore the best available quantification of past catches by Study Area fishing enterprises from local waters.

Although these data may be capturing fish harvested from more distant parts of UA 4Ra to the east and west of the Study Area, the majority of the catches likely come from this general area. This is particularly the case for small-boat enterprises, and for certain fisheries such as lobster and lumpfish, which are almost always harvested near the fishers' homeports.

The following graph (Figure 38) shows the total quantity of harvest for the past decade for each of the homeport groups. As it indicates, the general pattern (in terms of harvesting success) has been somewhat similar for all groups. From a fisheries baseline perspective, it also shows that fish harvesting (in terms of overall quantity) can be highly variable from year to year.

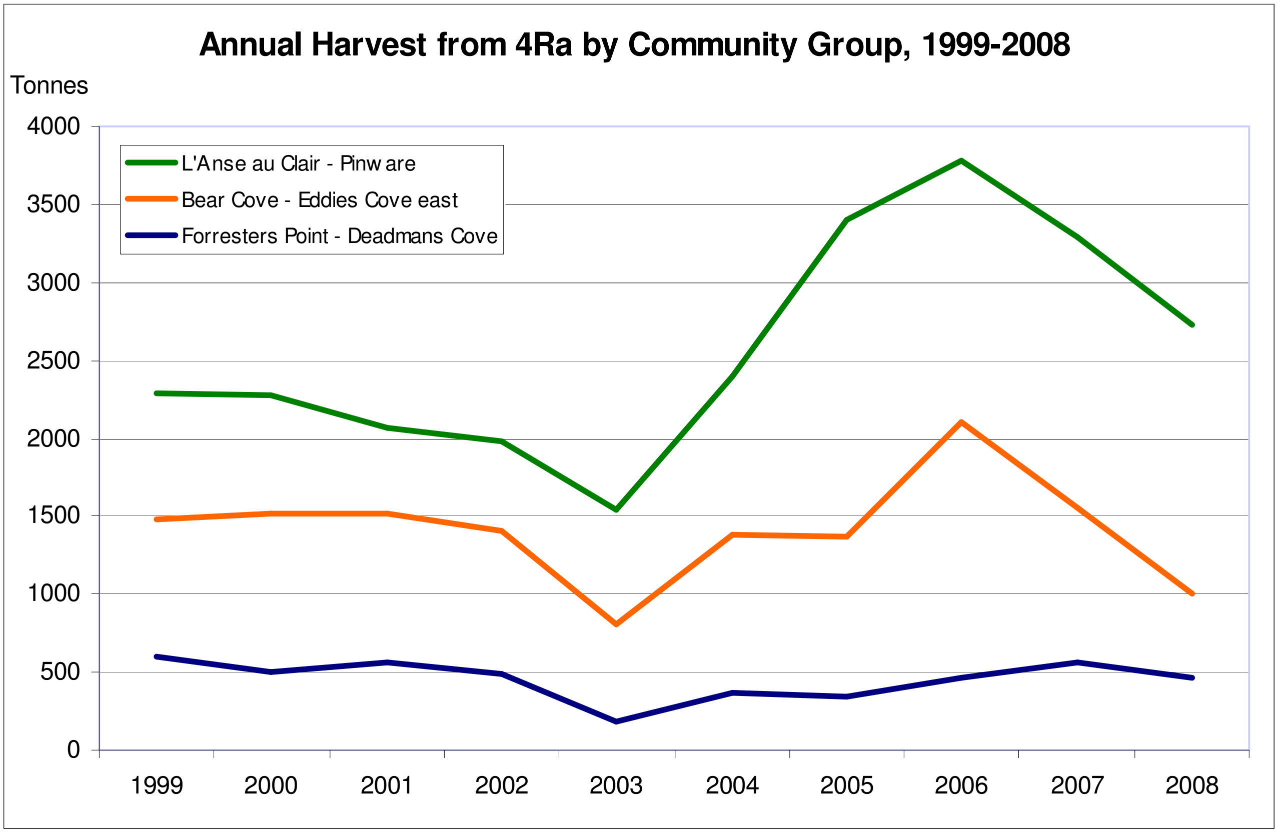


Figure 38. Annual Harvest from 4Ra by Community Group, 1999-2008

The following Table shows the average quantity and value of the harvest for each of the homeport groupings for the period 1999 to 2008. As the data indicate, cod is fairly important in all community groups, as are scallops, shrimp and seals. On the Newfoundland side of the Strait, lobster is very important, however this species is not harvested by enterprises based on the Labrador side. In Labrador, capelin, herring and toad crab have higher relative importance in the harvesting mix.

Table 10: Species Harvests from Study Area Homeport Groups, 1999-2008 Average

Species	Tonnes	Value ($)
Group 1 Forresters Point to Deadmans Cove		
Cod, Atlantic	72.1	97,343
Halibut	2.5	15,865
American plaice	0.2	155
Winter flounder	3.2	1,732
Turbot/Greenland halibut	8.3	14,793
Herring, Atlantic	13.3	3,661
Mackerel	7.3	2,291
Eels	0.0	215
Capelin	6.0	2,217
Scallop, Sea	0.1	131

Species	Tonnes	Value ($)
Whelks	0.6	608
Scallop, Iceland	147.1	203,353
Lobster	20.9	242,421
Crab, spider/toad	6.0	4,855
Shrimp, Pandalus Borealis	159.2	179,653
Seal skins, harp, ragged jacket	--	6,342
Seal skins, harp, beater	--	137,629
Seal skins, harp, bedlamer	--	268
Seal skins, unspecified	--	170
Seal penis	--	79
Seal flippers	--	148
Seal fat	4.0	1,653
Roe, lumpfish	2.3	9,881
Total	**453.1**	**925,463**
Group 2 Bear Cove to Eddies Cove (East)		
Cod, Atlantic	219.2	296,019
Halibut	2.0	12,182
American plaice	0.2	151
Winter flounder	3.4	1,608
Turbot/Greenland halibut	5.2	8,975
Herring, Atlantic	164.3	32,041
Mackerel	4.6	1,275
Capelin	194.0	48,171
Whelks	0.8	700
Scallop, Iceland	185.6	262,240
Lobster	50.4	570,569
Crab, spider/toad	0.0	32
Shrimp, Pandalus Borealis	105.8	117,643
Seal skins, harp, ragged jacket	--	8,107
Seal skins, harp, beater	--	90,179
Seal skins, harp, bedlamer	--	401
Seal skins, unspecified	--	447
Seal meat	0.1	39
Seal fat	0.8	353
Roe, lumpfish	22.4	100,407
Total	**958.8**	**1,551,539**
Group 3 (Labrador) L'Anse Au Clair to Pinware		
Cod, Atlantic	196.3	263,476
Cod, rock	3.5	1,206
Herring, Atlantic	296.0	64,017
Mackerel	8.7	3,654
Capelin	436.4	103,914
Squid, Illex	0.2	56

Species	Tonnes	Value ($)
Whelks	12.0	10,641
Scallop, Iceland	80.4	111,187
Crab, spider/toad	61.1	53,761
Shrimp, Pandalus Borealis	55.9	68,735
Crab, rock	0.0	11
Crab, Queen/Snow	2.4	9,644
Seal skins, harp, ragged jacket	--	2,322
Seal skins, harp, beater	--	112,128
Seal skins, harp, bedlamer	--	182
Seal skins, ringed/jar	--	30
Seal fat	3.2	1,406
Roe, lumpfish	3.3	11,787
Total	**1,159.3**	**818,157**

3.3 Fisher Consultation Results: Harvesting Locations, Seasons & Gear

An important objective of the October 2009 meetings with fishers was to gather some additional, qualitative information about their fish harvesting locations and activities in the vicinity of the proposed corridor area, particularly since the data resolution at that geographical level is somewhat limited.

At each meeting, following the main presentation and discussion, participants and Nalcor Energy and its consultants reviewed large scale maps of the Study Area and, together, identified and recorded the locations of key fishing grounds and areas where various species are usually harvested at different times of the year.

The information gathered during these sessions is summarized and discussed below for each species or species group, and the locations are presented graphically in the figures below.

3.3.1 **Scallop**

Scallops are found throughout much of the Strait of Belle Isle area and fishers report that grounds for this species extend as far as Red Bay (Figure 39). Fishers noted that there are five distinct scallop beds in the entire Strait area but that most of the harvesting activities are concentrated on the three beds identified in relevant DFO Stock Assessment reports (D. Ball, pers comm., October 2008). The most suitable grounds are generally in areas where water depths are greater than 30 fathoms. Fishers noted that scallop drags are usually 1 – 1.5 nautical miles per drag and that dragging operations usually take place in the same direction as the tides.

For the past ten years, scallop fishing has been excluded from a refugium established by DFO in 2000 (Figure 40) to enhance stock recruitment. This area was re-opened to fishing in 2009. In response to a map showing scallop harvesting locations based on DFO logbook information, one fisher pointed out that the latest (2008) geo-referenced data do not indicate any scallop harvesting activities within the refugium because of this. He went on to note that, now that scallop fishing in this area has resumed, the DFO data for 2009 and subsequent years will show scallop fishing activities and harvesting locations within that area.

DFO records show that 56 Study Area enterprises hold scallop licences (see Tables, Section 3.1). However fishers report that at present only 12-14 vessels are actively involved due to poor market conditions, regulatory restrictions and other factors.

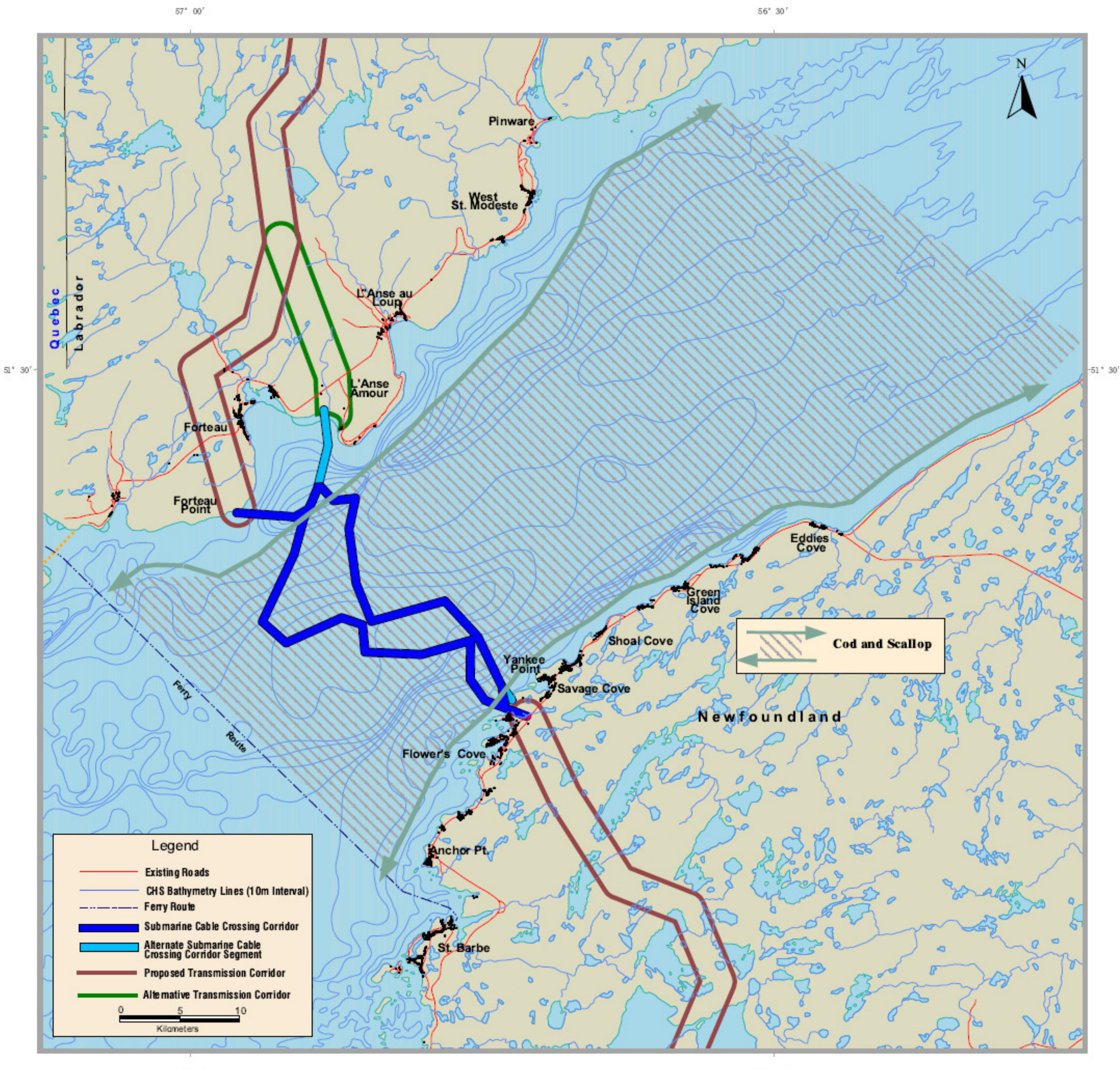


Figure 39. Reported Cod and Scallop Harvesting Locations

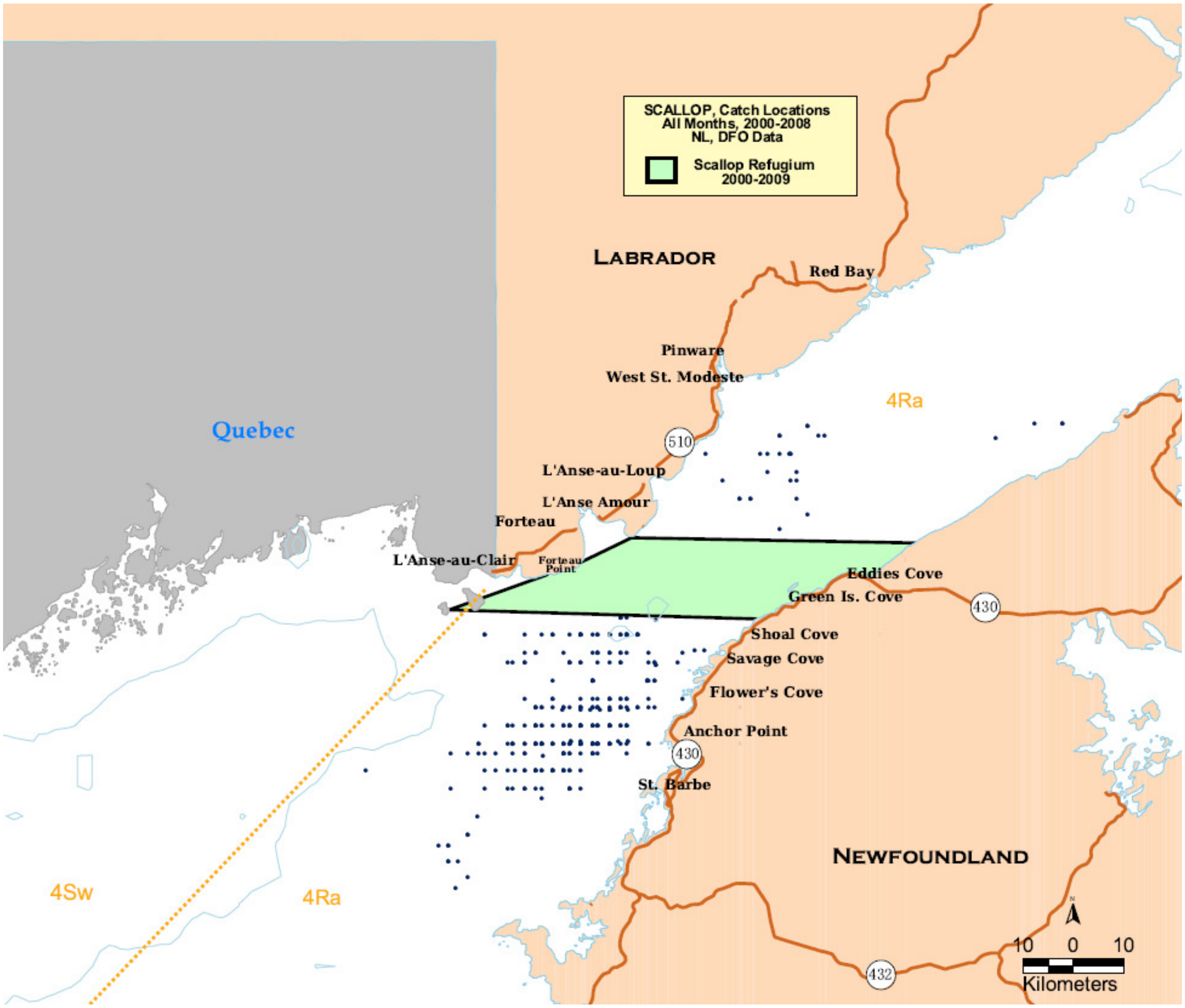


Figure 40. Scallop Refugium and DFO Georeferenced Data, 2004-2008

3.3.2 Cod

Fisher representatives from both the Labrador and Newfoundland coasts of the Study Area report that cod are harvested on suitable grounds throughout this part of the Strait of Belle Isle, in the same general areas where scallop are taken (Figure 39). The annual cod fishery usually opens on 1 July, and continues until the quota is taken. The quota is divided into two seasons: 75% of the quota is allocated to July and August, and the remaining 25% is reserved for September. Fishers noted that if prices are good, and if buyers are available, the July/August portion of the fishery could be completed in three weeks or less; otherwise, cod fishing activities might last ten weeks. At present, given resource conditions, there are no mobile gear (otter trawl) fisheries for cod. All of the cod are taken by fixed gears – nets and hook and line. (Fishers stated that, if there is a significant improvement of the Northern Gulf stock and if the quota rises above 9,000 tonnes, the otter trawl fisheries for this species could resume.)

Fishers also report that recreational cod fishing activities can be conducted anywhere throughout the Study Area, on the same grounds used by commercial fishers. However, because most of the vessels involved in this "food fishery" are less than 20 feet, many recreational participants prefer to stay relatively close to shore.

3.3.3 Capelin, Herring and Mackerel

Fishers on the Labrador side of the Study Area report that these pelagic species are mainly harvested with traps, but herring and mackerel may also be taken in nets. Grounds for these species are located in several different locations along the shoreline between L'Anse au Clair and Pinware (Figure 41). During the last 5-10 years traps have been set in the same, established locations, but nets have been fished in different areas over the same period. Fishers report that capelin are known to spawn in some of the bays on this side of the Study Area, but did not identify any specific spawning locations.

Fishers on the Island side of the Study Area report that capelin and herring are taken in the same general area in which they fish lumpfish and lobster, but in slightly deeper water, i.e. 25 fathoms. These grounds are located between Anchor Point and Yankee Point (Figure 42). Fishers report that very few herring or mackerel are caught in this area. It was noted that most of the capelin are taken by traps and tuck seines; however this species has also been harvested by purse seines in various water depths in grounds off Savage Cove and extending out into the deeper water across the Strait to Forteau Bay. According to fishers, there are no particular "hot spots" for herring, mackerel or capelin in their part of the Study Area.

Fishers noted that vessels in the mobile gear fleet from other parts of the province may also visit this area to harvest various pelagic species using purse seines.

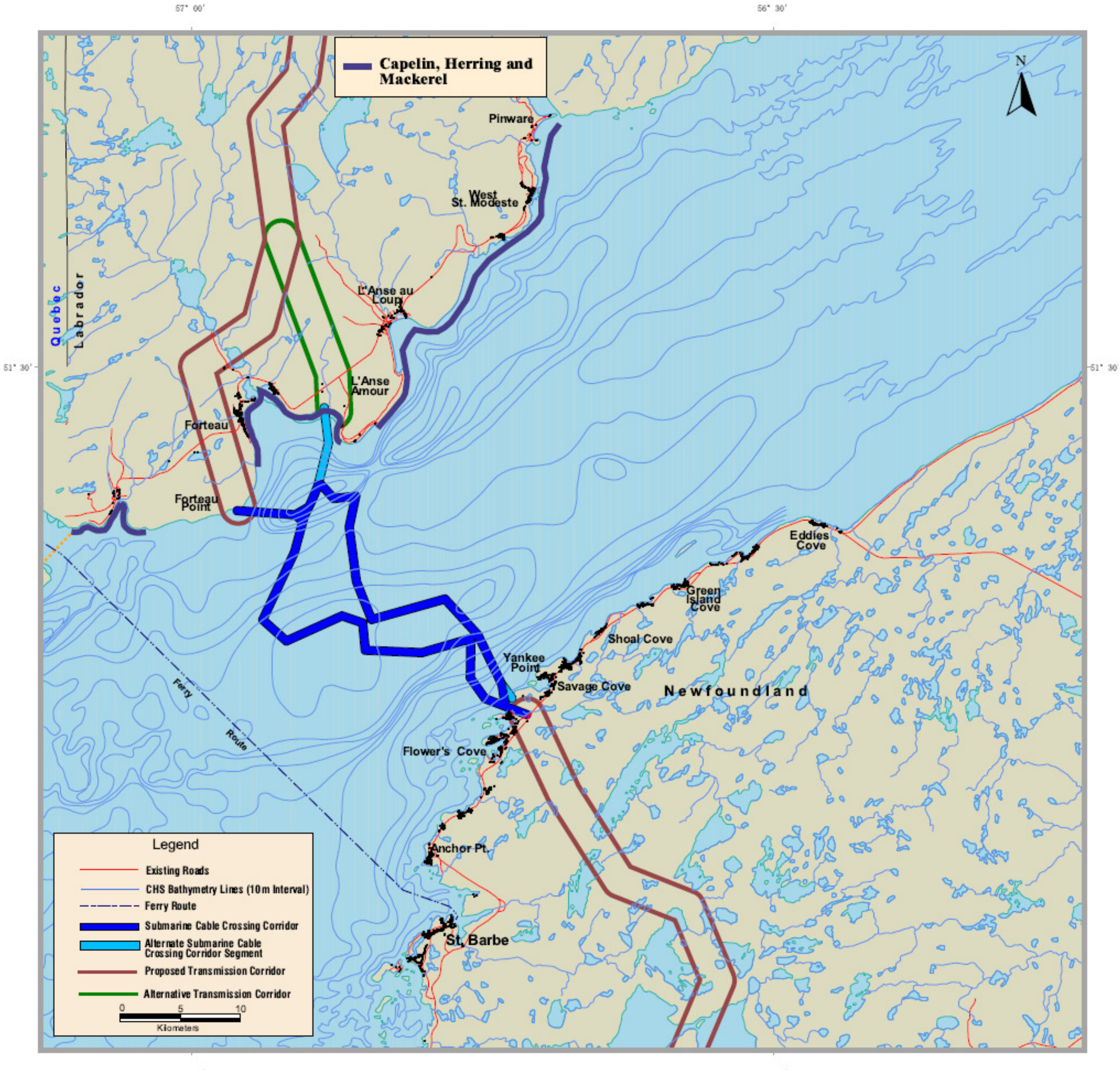


Figure 41. Reported Capelin, Herring and Mackerel Harvesting Locations, Labrador Side

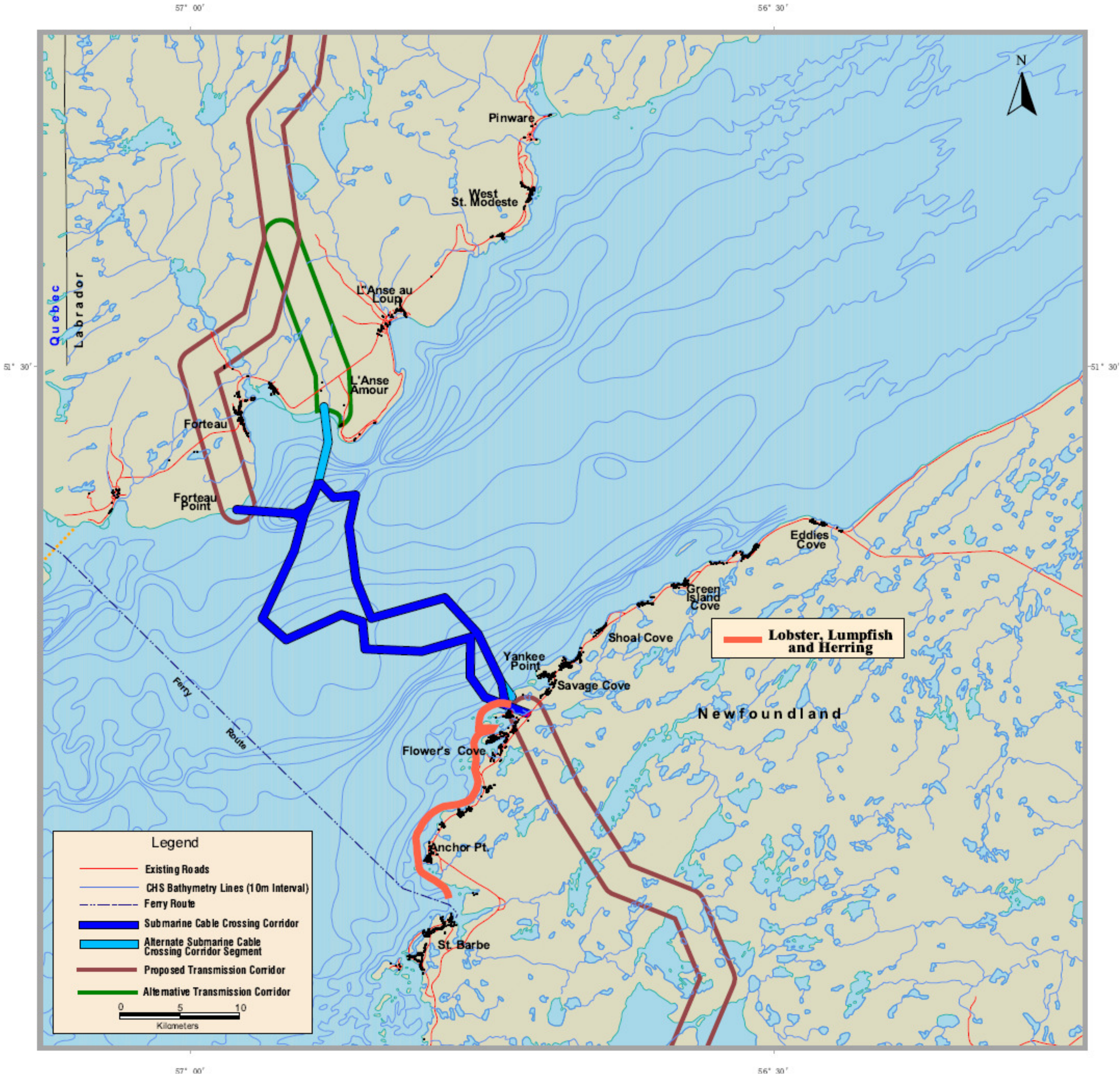


Figure 42. Reported Lobster, Lumpfish and Herring Harvesting Locations, Island Side

3.3.4 **Lobster and Lumpfish**

On the Island side of the Study Area, lobsters are generally harvested in water depths less than 15 fathoms along the shoreline between Anchor Point and Yankee Point (Figure 42). There are reportedly no significant lobster resources on the Labrador side of the Strait. Fishers in this area harvest their lumpfish on grounds along the shoreline between Forteau Point and Pinware (Figure 43).

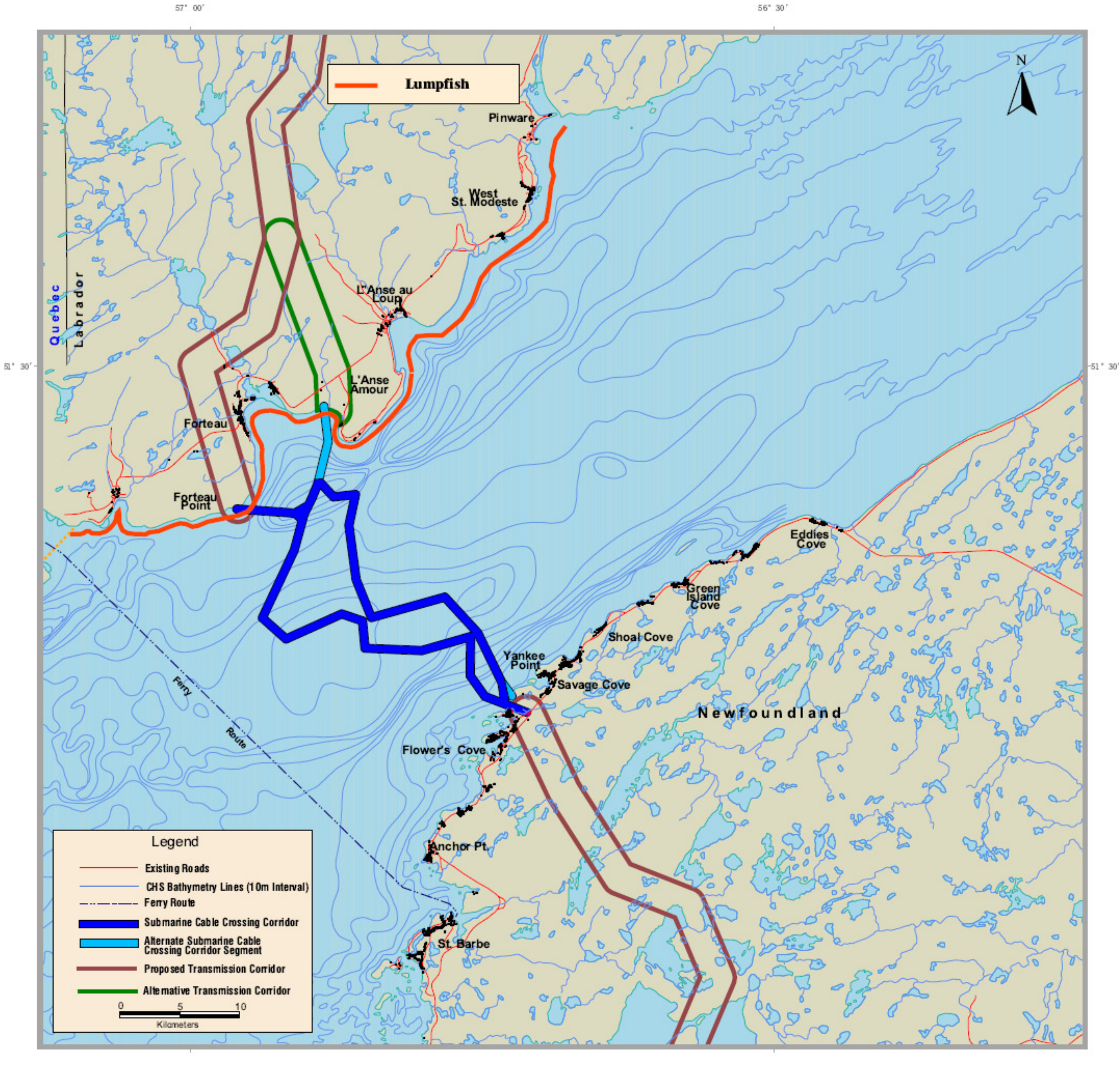


Figure 43. Reported Lumpfish Harvesting Locations, Labrador Side

3.3.5 Halibut

The halibut season is typically a very short one, usually lasting approximately three days. Fishers on the Labrador side of the Study Area travel to the Newfoundland side of the Strait to harvest their halibut. This species is fished with hook and line gear, in water depths of six fathoms and deeper, on grounds located between Anchor Point and Green Island Cove (Figure 44).

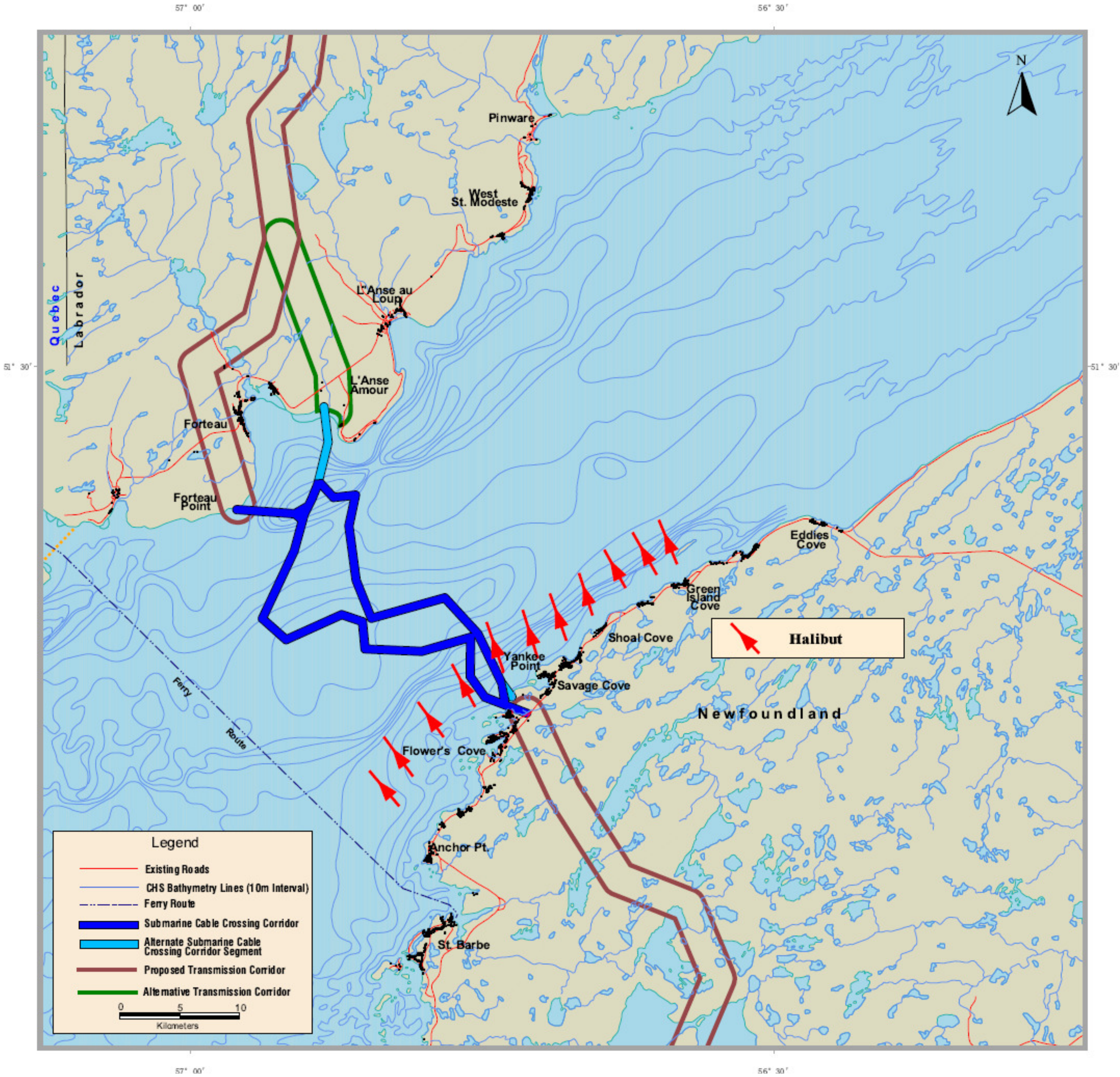


Figure 44. Reported Halibut Harvesting Locations

3.3.6 **Toad and Rock Crab**

These crabs (*Hyas araneus/Hyas coarctatus* and *Cancer irroratus*) are quite abundant in the Labrador side of the Study Area and the species are often caught together. However fishers noted that catches fluctuate from year to year depending on product market prices. In some years fishers can make a good income from this fishery while in other years the catch may be poor. For example, 136 t were reportedly harvested in Forteau Bay three years ago, but very few crab have been taken since then. Toad crab are found along the same shoreline areas inhabited by lumpfish but are taken in deeper water, from 4-5 fathoms out to about 50 fathoms (Figure 45). Rock crabs are generally found in the same grounds inhabited by toad crab.

Fishers on the Island side of the Study Area report that toad crab are relatively abundant on their side of the Strait and are generally found in water depths between 6-60 fathoms, while rock crab tend to inhabit water depths less than 30 fathoms. However fishers noted that both of these crab species are not generally harvested because of lack of markets and did not identify any specific or key harvesting grounds.

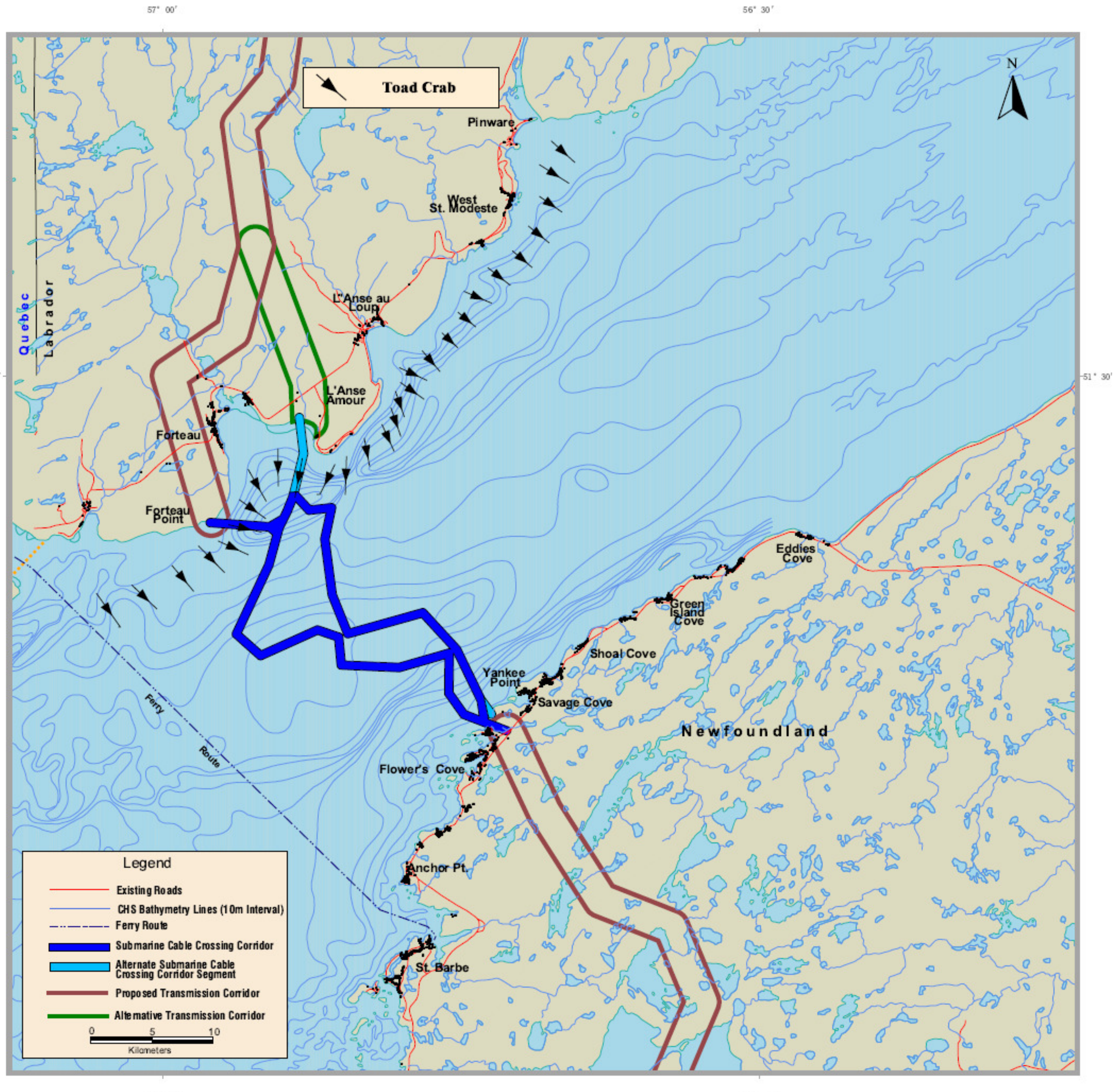


Figure 45. Reported Toad / Rock Crab Harvesting Locations

3.3.7 Whelk

The whelk fishery in the Strait area began in the early 1990s. Harvest usually commences in June and fishing may continue into the fall months. Labrador-based fishers report that whelk are generally taken in the same areas, and at the same water depths (e.g. 10 fathoms and less), in which pelagic species such as herring are taken. It was noted that whelk also inhabit deeper water, but most fishers prefer to fish this species closer to shore given the size of their vessels as well as the strong tides found farther out in the Strait. Whelk fishers on the Island side of the Strait said they generally fish whelk in water depths of 15 fathoms or deeper.

3.3.8 Eels

On the Labrador side, this species is harvested in various freshwater locations, such as Forteau Brook and L'Anse au Loup Brook. Fishers note that product prices have not been high enough to encourage a significant effort for this species. Eels are reportedly not fished on the Island side of the Study Area.

The following table provides summary information about fisheries activities in the Study Area, including the fishing season for various species, use of fishing gears and additional comments about established fishing grounds noted at the fisher meetings.

Table 11: Study Area Fisheries: Species, Seasons, Gear and Locations

Species	Typical Season	Fishing Gear	Fishing Grounds
Scallop	May to October	Dredges / rakes	Scallop is harvested throughout the Strait area usually in water depths greater than 30 fathoms. Most of the scallop grounds are found on gravelly – rocky bottoms
Cod	1 July through to September, depending on how long the quota lasts	Gillnets and hook and line gear	Cod are harvested on suitable grounds throughout the Study Area
Capelin/Herring/Mackerel	The herring season opens in mid-June, but most of the harvest takes place in late July and early August. Mackerel and capelin are harvested in the same period	Traps and nets. (Vessels from elsewhere may occasionally fish pelagic species in the Study Area using purse seines.)	Traps (and nets) are generally set close to shore (within 300-400 m) in water depths of 6-7 fathoms
Toad / Rock Crab	June to August, and in some years into September	Pots	Pots are set in water depths of between 4-5 fathoms and deeper
Whelk	From early Spring (i.e. June) into the Fall months	Pots	Whelk are harvested in the same areas where pelagic species are fished, namely in areas close to

Species	Typical Season	Fishing Gear	Fishing Grounds
			shore in water depths of 6-7 fathoms
Lumpfish	May, June and July	Gillnets	Nets are set along most parts of the shoreline in water depths of about 15-20 fathoms, outside of locations where herring nets are set
Halibut	June (usually a very short season, i.e. three days)	Hook and line gear	This species is harvested mainly on the Island side of the Study Area in water depths six fathoms and deeper
Lobster	5 May to 30 June	Pots	Lobster are only harvested on the Island side of the Study Area

3.4 Aboriginal Fisheries

A number of Aboriginal groups reside in Labrador and Quebec and some undertake land use and resource harvesting activities in the general vicinity of the proposed Labrador-Island Transmission Link. Several of these groups assert aboriginal rights and/or title to portions of these areas, although these claims are at varying stages of review, acceptance and/or negotiation.

The Innu of Labrador currently number about 2,500 and reside primarily in two communities - Sheshatshiu in Central Labrador and Natuashish on the North Coast. The Sheshatshiu and Mushuau Innu comprise separate Bands and Reserves, but are both represented by the Innu Nation in land claims and on other matters of common interest. The Labrador Innu claim aboriginal rights and title to much of Labrador, and land claim negotiations have been ongoing between Innu Nation and the Governments of Newfoundland and Labrador and Canada for several decades. The Strait of Belle Isle waters that comprise the Study Area for this Marine Fisheries study do not, however, overlap with the original Labrador Innu land claim area. Similarly, the specific land areas and locations recently selected by the Innu as part of these on-going land claim negotiations (as outlined in the associated *Tshash Petapen (*"New Dawn") *Agreement* of September 2008), likewise do not include the Strait of Belle Isle area. Labrador Innu are not known to undertake fishing activities in this area.

The Inuit of Labrador are primarily resident on the Labrador North Coast in the communities of Nain, Hopedale, Makkovik, Postville, and Rigolet, as well as in Central Labrador communities of North West River and Happy Valley-Goose Bay and elsewhere. The *Labrador Inuit Land Claims Agreement* of 2005 is a modern comprehensive treaty, and sets out the details of land ownership, resource sharing and self-government in the area covered by the Agreement in Northern Labrador. It also resulted in the establishment of the Nunatsiavut Government, which represents the over 6,000 beneficiaries of the Agreement. The proposed Strait of Belle Isle cable crossings do not extend into the marine waters or land areas covered by the Labrador Inuit Land Claims Agreement.

Quebec aboriginal groups include Innu communities along the Lower North Shore (Natashquan, Mingan, La Romaine, Saint-Augustin, Sept-Iles) and Schefferville, and the land claims of several of these First Nations extend into Labrador. These have not been accepted for negotiation by the Government of Newfoundland and Labrador. Based on the information currently available, they are also not known to overlap with the marine areas crossed by the proposed Strait of Belle Isle submarine cables, and Quebec aboriginal groups are not known to undertake fishing in this general area.

The Labrador Métis Nation (LMN) reports a membership of over 6,000 members, who reside primarily in Central Labrador and along the southern coast of Labrador. The LMN has asserted a land claim which covers much of Labrador and its coastal areas, including the Strait of Belle Isle, but this has not been accepted for negotiation by either the federal or provincial governments. LMN members reside in Labrador Straits area communities, and are certainly involved in the general commercial fishing activity outlined earlier in this report. Any "LMN-specific" fishing activities and associated fishing and management arrangements with DFO are, however, reportedly in the area north of Cape Charles and do not extend into the Strait of Belle Isle itself.

DFO reports that food/social/ceremonial fishing licences have been issued to members of the Innu Nation and the LMN. These are licences to harvest trout, salmon and char within the Upper Lake Melville area and in the coastal area between Fish Cove Point (near Black Tickle) and Cape Charles. There is reportedly no such fish harvesting activities by members of these groups below Cape Charles.

3.5 Aquaculture

There are currently no licenced aquaculture sites in or near the Project area in the Strait of Belle Isle. The closest existing aquaculture operations are over 75 km away from the proposed submarine cable crossings, at the northeastern tip of Newfoundland's Northern Peninsula in the Pistolet Bay - St Lunaire-Griquet area.[5]

3.6 Recreational Fisheries

Responsibility for managing recreational fisheries activities in the Strait of Belle Isle area lies with the Chief of Resource Management at DFO's Corner Brook Area 3 office. This manager reports that the primary recreational fishing activity in the Strait area is for cod. In 2009, recreational cod fisheries took place between July 25 – August 16, and between September 26 and October 4. Future recreational cod fishing activities may have different opening and closing dates.

Other recreational / food fisheries include those for capelin (harvested by hand or with cast nets) and mackerel (which may be taken by rod and reel gear). DFO has also issued 20 recreational scallop licences for all of Division 4R. DFO managers report that most of these recreational scallop harvesting activities are concentrated in the Bay of Islands/Bay St. George area.

5 NLDFA (NL Department of Fisheries and Aquaculture). (2009). "Licenced Aquaculture Sites 2009, Newfoundland and Labrador". *http://www.fishaq.gov.nl.ca/aquaculture/aquasite.pdf*

3.7 Potential Future Fisheries

Environmental assessment (EA) requirements often include the consideration of both existing and potential fisheries. There is, however, no single and clear definition of what constitutes a “potential” fishery in an area, and evaluating this requires consideration of a wide range of factors, including biological (species presence, abundance, status) and socioeconomic (market demand and price, skills and equipment needs) considerations. Moreover, determining whether and when a fishery is indeed a potentially viable one falls within the purview and responsibility of relevant government regulatory and resource management agencies.

Apart from increases in market demand for some of the existing non-traditional species fisheries, such as toad and rock crab, the most likely future fishery in the Study Area could be a re-instatement of the mobile gear (i.e. otter trawl) cod fishery. This, however, would depend on a significant improvement in the Northern Gulf cod stock.

4.0 STUDY AREA FISHERIES SUMMARY

The historical data indicate the significant changes that have occurred in the 4Ra fisheries in the last twenty years, largely because of the collapse of groundfisheries (mainly cod) in the early 1990s. Whereas cod harvesting had accounted for 66% of the 4Ra fisheries by quantity in 1989, by 2008 it represented just 27%, and the total harvest was less than half of what it had been. The principal 4Ra fisheries in recent years (since 2004) have been, by quantity, capelin, cod, shrimp, mackerel and herring, and by value, lobster, cod, seal harvesting (on ice), capelin, shrimp and scallops. Except for seals, the harvesting of these species is primarily concentrated in June and July.

Harvesting locations within 4Ra vary by species. Lobster in the Strait of Belle Isle area occurs on the Newfoundland side, but not along the Labrador shore. Cod and other groundfish harvesting activities are distributed fairly widely in the area, though mainly towards the southwest. Shrimp are heavily concentrated in the southernmost areas, and scallops are harvested mainly in the Strait area, including near the potential submarine crossing corridors.

Labrador-based fishers from the homeports nearest the Study Area (56 enterprises in total) catch mainly - by value - cod, seals, scallops, capelin and toad crab. Newfoundland-based fishers (a total of 171 enterprises) in Study Area homeports harvest primarily lobster, scallops, cod, shrimp and seals. Nearly all the harvesting occurs between April and September but is most concentrated in May, June and July.

Aboriginal fisheries are not known to be conducted in or immediately adjacent to the Study Area. There are also currently no licenced aquaculture sites in or near the Project area in the Strait of Belle Isle.

Recreational fisheries in the study area are managed by the Resource Management Branch of the federal Department of fisheries and Oceans (DFO) who report that the primary recreational fishing activity in this area is for cod. In 2009, recreational cod fisheries took place between July 25 – August 16, and between September 26 and October 4. Future recreational cod fishing activities may have different opening and closing dates. Other recreational / food fisheries include those for capelin and mackerel, as well as a small number of recreational scallop licences.

Potential future commercial fisheries in this area are difficult to predict, given the continuing uncertainties in the Atlantic fisheries. Harvesting of cod by mobile gear could resume in the future if there is sufficient recovery in the stocks. Other underutilized species, such as toad and rock crab, may also develop commercially if stable markets are found.

APPENDIX A: OCTOBER 2009 FISHER MEETINGS

Fisher representatives were invited to meet with Nalcor Energy and its consultants through meetings held on both sides of the Strait of Belle Isle in October 2009. The intention of these meetings was to gather key harvesting information for the baseline analysis from representative and knowledgeable fishers in the local area. These meetings made use of existing forums and mechanisms, such as local fisher committees, and were organized with the much appreciated assistance and cooperation of local committee chairs and other key personnel. This included identifying and inviting key and representative local fishers to attend the meetings, although it was certainly understood that any Study Area fisher was welcome to attend the meeting in his / her area.

In order to ensure further that any fisher wishing to contribute information to the marine fisheries study had an opportunity to do so, following the October 2009 sessions in Flower's Cove and L'Anse au Loup, public notices were also issued regarding the Marine Fisheries Study. These were intended to inform the general public about the purpose and nature of the study, and invited anyone involved in commercial or recreational fishing activity in this area of the Strait of Belle Isle to contact the proponent if they wished to contribute information to the study for use in the EA. The proponent's mailing and email addresses, fax number, and local and toll free telephone numbers were included in the ad. (A copy of this ad is provided in Appendix B, below.)

These public notices were placed in The Northern Pen newspaper during the weeks of 2 November and 9 November 2009, as well as in The Telegram on 7 November 2009. The public notice was also posted on Nalcor Energy's website (nalcorenergy.com/lowerchurchillproject) throughout the period from late 2009 to early 2010.

The following persons attended the October 2009 fisheries consultation meetings

Labrador Side - L'Anse au Loup Meeting, 20 October 2009

Bruce Moores, Chair, Labrador Straits Development Corporation (LSDC) Fisheries Committee

Marcel O'Brien, Fisher, L'Anse au Loup

Chester Davis, Fisher and FFAW Inshore Council Representative, L'Anse au Loup

Shawn Normore, Fisher, L'Anse au Loup

Garry Saulter, Fisher, Forteau

Darrell O'Brien, Fisheries Development Officer, NL Dept. of Fisheries and Aquaculture

Roland Hedderson, FFAW Staff Representative

Newfoundland Side - Flower's Cove Meeting, 21 October 2009

Steve Chambers, Fisher, Bear Cove

Jarvis Walsh, Fisher, Flower's Cove

Ernest George, Fisher, Anchor Point

Bruce George, Fisher, Anchor Point

Loomis Way, Fisher, Green Island Cove

Roland Hedderson, FFAW Staff Representative

The following attended both meetings on behalf of Nalcor Energy:

Steve Bonnell, Environmental Assessment Lead (Transmission), Nalcor Energy

Strat Canning, Canning and Pitt Associates, Inc.

Rob Pitt, Canning and Pitt Associates, Inc.

Other Persons Consulted

Don Ball, Area Chief of Resource Management, DFO Corner Brook

Gladys Tucker, Licensing Officer, DFO Regional Licensing Office, St. John's

Judy Guest, Program Officer, Aboriginal Relations, DFO, St. John's

Patricia Williams, Staff Officer, Aboriginal Relations, DFO, St. John's

APPENDIX B: PUBLIC NOTICE - MARINE FISHERIES STUDY

Public Notice

As part of the environmental assessment of the proposed Labrador-Island Transmission Link, Nalcor Energy is conducting a study of marine fishing activity in the Strait of Belle Isle. This information will be used to better understand current fishing activity in the area of the proposed submarine cable crossings in the Strait (including species, locations, times and gear types) for consideration in the Project's eventual Environmental Impact Statement.

If you are involved in commercial or recreational fishing activities in this area of the Strait of Belle Isle and you would like to contribute information for consideration in this study, please contact Nalcor Energy at:

Labrador-Island Transmission Link EA (Marine Fisheries Study)
Hydro Place. 500 Columbus Drive. P.O. Box 12800
St. John's. Newfoundland and Labrador. Canada A1B 0C9
t. 709.737.1833 f. 709.737.1985
Toll Free 1.888.576.5454 (within Canada)
e. L-ITransmissionLinkEA@nalcorenergy.com

nalcor energy
LOWER CHURCHILL PROJECT

nalcorenergy.com/lowerchurchillproject

Supplementary Report

Marine Fisheries in the Strait of Belle Isle

Fishing Equipment and Activity,
With A Focus on the Scallop Fishery

December 8, 2010

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REVIEW AND ASSESSMENT OF FISHING GEAR AND EQUIPMENT - STRAIT OF BELLE ISLE

Introduction

This report has been prepared for the Engineering Deliverables Team of the Labrador-Island Transmission Link (the Project).

Nalcor Energy is proposing to develop a High Voltage Direct Current (HVdc) transmission system extending from Central Labrador to the Island of Newfoundland's Avalon Peninsula. The Project will include submarine cable crossings of the Strait of Belle Isle.

Project planning and design are currently at a stage of having identified a 2 km wide corridor for the on-land portions of the proposed transmission line, and 500 m wide corridors for the proposed Strait of Belle Isle cable crossings, as well as various alternative corridor segments in particular areas (Figure 1). Project planning is in progress, and it is anticipated that the Project description will continue to evolve as engineering and design work continue. Nalcor is currently preparing an Environmental Impact Statement (EIS) for the Project. In preparation for and in support of the Project's EIS, a Marine Fisheries Component Study was prepared on behalf of Nalcor Energy by Canning & Pitt Associates Inc. in 2009 to provide baseline marine fisheries information for eventual use in the EIS. This present report draws on information presented in the Fisheries Component Study (i.e., baseline analysis).[1]

The proposed Strait of Belle Isle cable crossings will extend under and across the Strait and make landfall on the northwestern side of the Island of Newfoundland's Northern Peninsula. Two potential submarine cable corridors across the Strait have been identified.

A number of methods will likely be used to protect the cables across the Strait of Belle Isle. Primarily, the currently identified corridors make use of natural seabed features to shelter the cables in valleys and trenches to minimize the possibility of iceberg contact or interaction with fishing activity. In order to access these natural deep valleys and ocean bed contours and to provide further required protection, various cable protection techniques are under consideration.

[1] That baseline report - Marine Fisheries in the Strait of Belle Isle Component Study (March 2010) - describes fisheries activities in the area proposed for the submarine cable crossings of the Strait of Belle Isle. The report describes relevant fisheries activities, 1989-2008, for the wider Strait of Belle Isle area (NAFO Unit Area 4Ra) and then focuses on more recent local fisheries near the potential submarine cable corridors that fall within the Study Area for the present report. In addition to fisheries statistical data, the baseline report also drew on consultations with representatives of fishers from ports on both sides of the Strait.

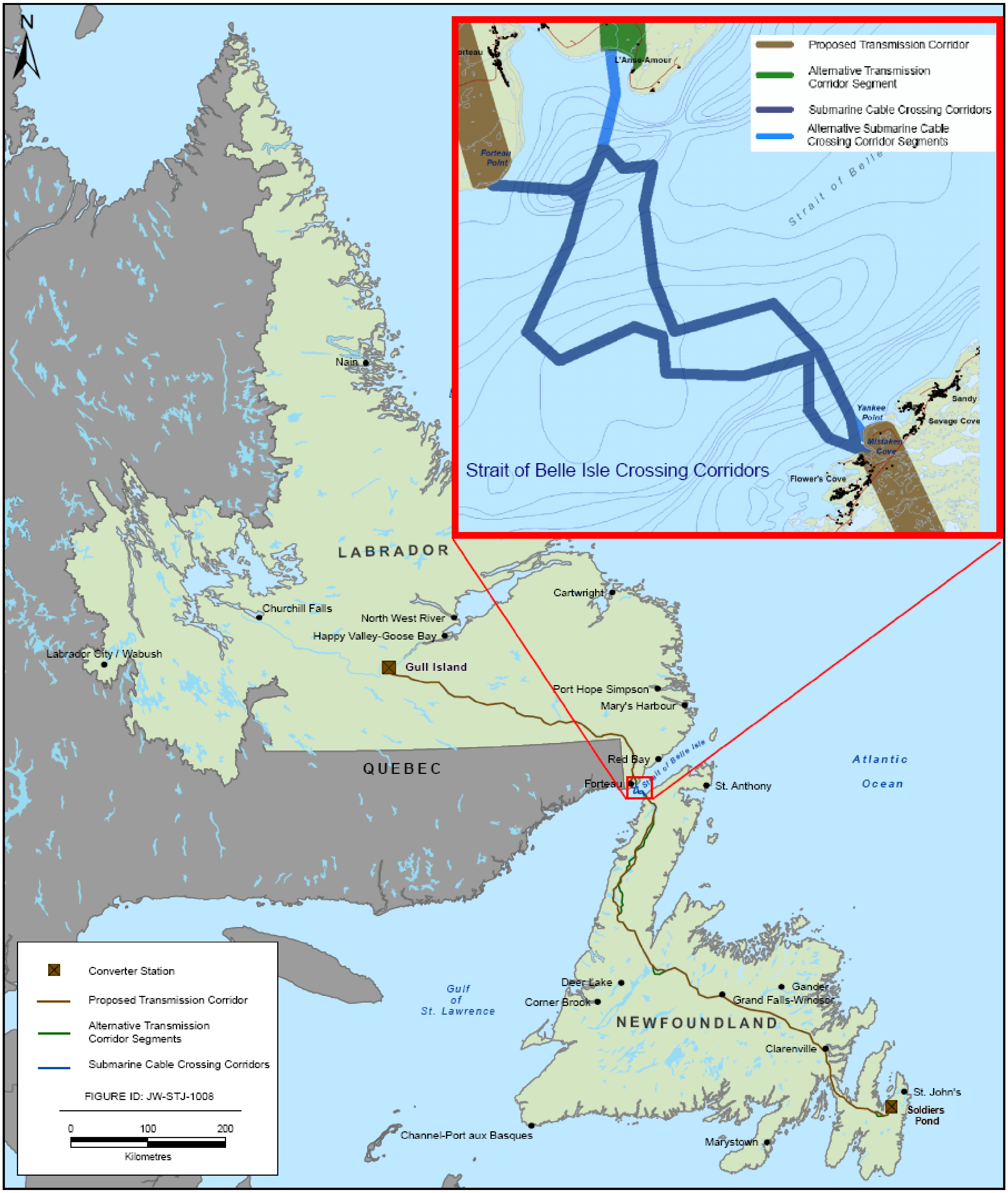

Figure 1. The Labrador-Island Transmission Link.

Engineering analyses are ongoing to assess potential approaches and techniques for protection of the sub-sea cables. The selection of particular approaches and methods for cable protection along the route and specific portions of it is the subject of on-going analysis, and will be based on water depths, terrain and seabed geology, substrate characteristics, risk exposure, and overall technical and economic viability.

Study Objective

The scope of this study is to identify the specific types of fishing gear and related equipment used in the Strait of Belle Isle in the area of the identified cable corridor(s), with a particular focus on those that would come in contact with the seabed, and which may therefore interact with the cables once installed. In addition to identifying and describing relevant fishing gear, the study terms of reference also asked the consultants "to indicate the nominal amount of fishing activities based on gear type summarizing the duration or season of use and the expected number of passes over the study area per season. The intent of this portion is to obtain an order of magnitude value of existing and potential fishing operations and gear utilization in the seabed area where the proposed power cables would be located."

Study Area

The Study Area for the baseline report focused on a relatively large geographic area within the Strait of Belle Isle that encompassed most of the established fishing grounds used by fishers based in relevant communities (i.e., homeports) on both sides of the Strait.[2] However, for various reasons, that analysis did not consider it necessary to identify any specific study area boundaries.

The boundaries of the study area for the present report are shown in Figure 2. This represents just a part of the fishing grounds used by fishers from the same homeports examined in the baseline study. However, given the specific objectives of this study, the analysis is primarily focused on the seabed zone through which the proposed power cable corridors will pass. The consultants have used the term "Gear Assessment Zone" to describe this study area.

The boundaries of this assessment area are approximately 5 km from any point along either one of the corridors. This 5 km "buffer" was selected based on a preliminary review of the geo-referenced catch data which indicated that most of the harvesting activities in the vicinity of both corridors are for scallop.

This species is typically fished by towing the gear along the seabed for a distance of about one nautical mile (Nm). As such, the "buffer" on each side of the corridors captures all of the catch locations which might possibly involve a scallop gear tow over the seabed area on which one of

[2] The homeports considered in the Fisheries Component Study are shown in Figure 3-1 in Appendix 3.

the cables might be located. Catch locations more than 5 km from any point along the corridors would not, in all likelihood, result in a scallop vessel tow across one of the proposed cables.

In this report the term “Gear Assessment Zone” and Study Area are used interchangeably. Gear Assessment Zone appears in the legends on each of the maps, and this term is also be used in the report text where appropriate.

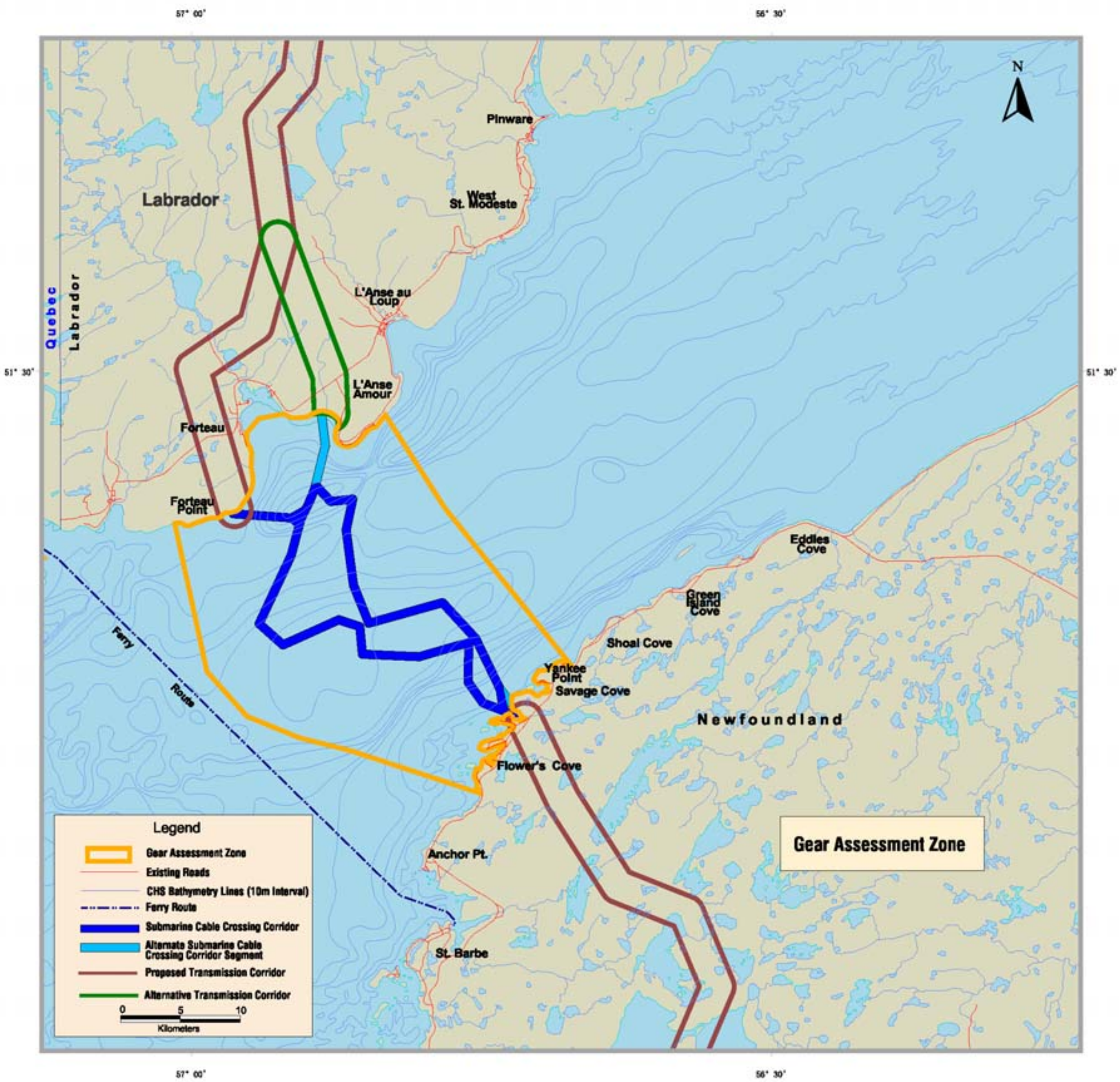

Figure 2. Study Area (Gear Assessment Zone) Location Map.

Statistical Data Sources

The statistical information and analysis used in this study are based on time-series data from Fisheries and Oceans Canada (DFO) Newfoundland and Labrador Region - Statistics Division, Policy and Economics Branch, which describe the quantity, month and location by fisheries management Unit Area (UA) of fish harvesting. The datasets also include information on fishing gear, vessels, and other aspects of the fisheries. They were acquired from DFO in digital form, for the period 1999 to 2009, inclusive. The resulting dataset contains 11 years of data which indicate year, month, species, vessel class, gear type, UA of harvest, quantity of harvest, and value[3] of harvest. A portion of this dataset also indicates the specific location of the catch in degrees and minutes of latitude and longitude, where available.

For the homeport analysis presented in the Fisheries Component Study, a special dataset was prepared and provided by DFO Newfoundland and Labrador Region containing harvesting data by fishing enterprises registered in homeports within the general corridor area. Fishers from these ports typically conduct at least part of their harvest within or immediately adjacent to the proposed submarine transmission corridors. Some of these homeport data are used in this report to describe harvesting activities, catch levels and licences associated with study area fishing enterprises. However most of analysis is based on the geo-referenced data from the larger 1999-2009 times-series dataset from DFO.[4]

Consultations with area fisheries in late 2009 also confirmed that fishing activity in this area of the Strait of Belle Isle is undertaken almost exclusively by fishers based in Newfoundland and Labrador, and that most of these catches are made by fishers based in the homeports located on both sides of the Strait adjacent to the transmission corridors.

Consultations

Baseline Report Consultations

In October 2009, Nalcor Energy's fisheries consultants organized meetings with representatives of the fishing industry from both sides of the Strait of Belle Isle. The main purpose of those meetings was to gather additional baseline information on fisheries resources and established fish harvesting activities in the vicinity of the proposed transmission corridors. The meetings also offered an opportunity to provide fishers with more information about the Project, and for fishers to ask questions about or comment on the proposed cable corridors and their potential effects for consideration in the EA. Some of the information obtained from fishers attending the October 2009 meetings is included in this report.

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[3] It should be noted that the value data reflect several other factors than simple resource availability or fishing effort since value differences from year to year may be the result of price changes and external market factors which are affected by international exchange rates. Prices may even vary within the fishing season. Consequently, much of the historical analysis provided in this report involves quantity of harvests (tonnes of fish landed), which is more directly comparable from year to year.

[4] All of the catch data used in the present study (as well as in the baseline analysis) represent fish landings in the Newfoundland and Labrador Region only. An analysis of the Quebec Region and Gulf Region DFO data for recent years (e.g. 2003 and 2004) indicated that less than 10 tonnes (<0.1%) on average of the fish harvested from UA 4Ra is landed in those two regions combined.

2010 Interviews with Fishers and Agency Managers

Consultations for the present study were undertaken with vessel operators involved in scallop and other fishing activities. Some of these fishers attended the meetings in 2009. Other fisheries participants were identified with the assistance of Darrell O'Brien, Fisheries Development Officer, Newfoundland and Labrador Department of Fisheries and Aquaculture (DFA) and Roland Hedderson, Staff Representative for the Fish, Food and Allied Workers (FFAW). Mr. O'Brien also provided current data on scallop and other fisheries in the Study Area. The study team also consulted with Mr. Don Ball, DFO's Area Chief of Resource Management based in Corner Brook. Mr. Ball has an extensive knowledge of scallop resources, species licensing and harvesting activities in the Strait of Belle Isle area.

The operators of eight separate scallop vessels were interviewed via telephone. Each interview took approximately 45 minutes to complete and covered a variety of topics related to their scallop and other fisheries and more detailed questions about the size, capacity and operating parameters of their fishing gear. The Questionnaire used for these interviews with enterprise operators is included as Appendix 2.

Assessment Methodology

The DFO time-series data were queried to identify the total number of geo-referenced catch records (or "hits") falling within the Study Area over the period 1999 to 2009. These data were then examined in more detail to determine the key species harvested and the catch distribution by vessel size, amongst other parameters. The catch data were then plotted to show their locations within the Study Area. Areas of concentrated harvesting activity were identified using a "cell analysis". This Study Area was divided into a series of grids, or "cells", and the number of catch records falling within each grid was calculated. Cells with the highest number of "hits" (i.e., catch records) were considered to be fishing "hot spots". These data were then combined with other information obtained through study research and fisher consultations to determine an order of magnitude value of existing and potential fishing operations and gear utilization in the seabed area where the proposed power cables would be located.

In the discussion and analysis, which follows, the geo-referenced DFO catch records are used as the primary measure of harvesting activity levels.[5] If a particular area contains a relatively large number of catch records, it is assumed that it is a more important, or more frequented, fishing ground compared to another area with fewer records. An individual fisher, or any number of

[5] All fishers operating vessels larger than 34 feet are required to record the geographic coordinates (i.e., the longitude and latitude) of their species catch. They enter this information in their vessel logbooks each day, along with other information about the catch, such as the species caught, vessel size, the gear used, date and weight, among other parameters. This logbook data is then entered into the DFO catch and effort data base and made available to researchers and consultants, et al. These data can then be plotted on maps using GIS technology and presented in various graphic formats, such as the species maps presented in this report.

fishing enterprises, may return to the same area many times during the fishing season and/or from one year to the next. As such, the number of catch records for a particular geographic area will begin to "stack up" over time so that the geo-referenced database will display multiple "hits" (i.e., catch records), many of them having the exact same longitude/latitude coordinates.

As discussed in the section dealing with statistical sources, the DFO catch data also include the weight of the species harvested, and in some cases it might be important to calculate the weight of the product attached to a particular catch record. However, in this assessment, knowing the weight of the raw material, e.g., scallops, harvested at a specific location is of secondary importance. A more important consideration is the fact that a catch record indicates the presence of a fishing gear that poses a significant risk to valuable/sensitive seabed equipment. In the case of the scallop fisheries, especially considering the number of tows a scallop vessel makes each fishing day, the existence of multiple (i.e., stacked) "hits" at a particular location is a very good indicator of harvesting intensity and of the potential risk to which Nalcor's sub-sea equipment might be exposed to in future.

Findings

Study Area Harvesting Locations

Figure 3 shows the harvesting locations of all species within the study area for the period 1999 to 2009, and Figure 4 shows the geo-referenced catch locations for species other than scallop. The data records shown in Figure 4 (a total of 65 "hits", as indicated in Table 1) represent small catches of cod, other groundfish, herring and capelin harvested some time during the past 11 years. These catches were taken using fishing gears such as handlines, longlines, purse seines and gillnets. With the possible exception of purse seines, none of these fixed fishing gears pose a threat to Nalcor Energy's proposed seabed facilities. The DFO data have no records of catches by other potentially problematic gears such as otter/shrimp trawls.

Principal Species Fishery in the Gear Assessment Zone (GAZ)

Analysis of the DFO catch data clearly demonstrate that scallop has been the dominant fishery in the GAZ for the past 11 years, as shown in Table 1. On average, this species represents almost 84% of the geo-referenced catch records in the study period. In some years, this species has accounted for all the catch records.[6]

[6] Other species, e.g., cod, halibut and capelin are harvested in the Study Area, and are recorded in DFO's catch and effort database as a geo-referenced data record. However some species, e.g., lumpfish, herring, harvested in the area are not part of the geo-referenced dataset because they are caught by fishers using vessels < 34 feet who are not required to record longitude/latitude coordinates of those catches.

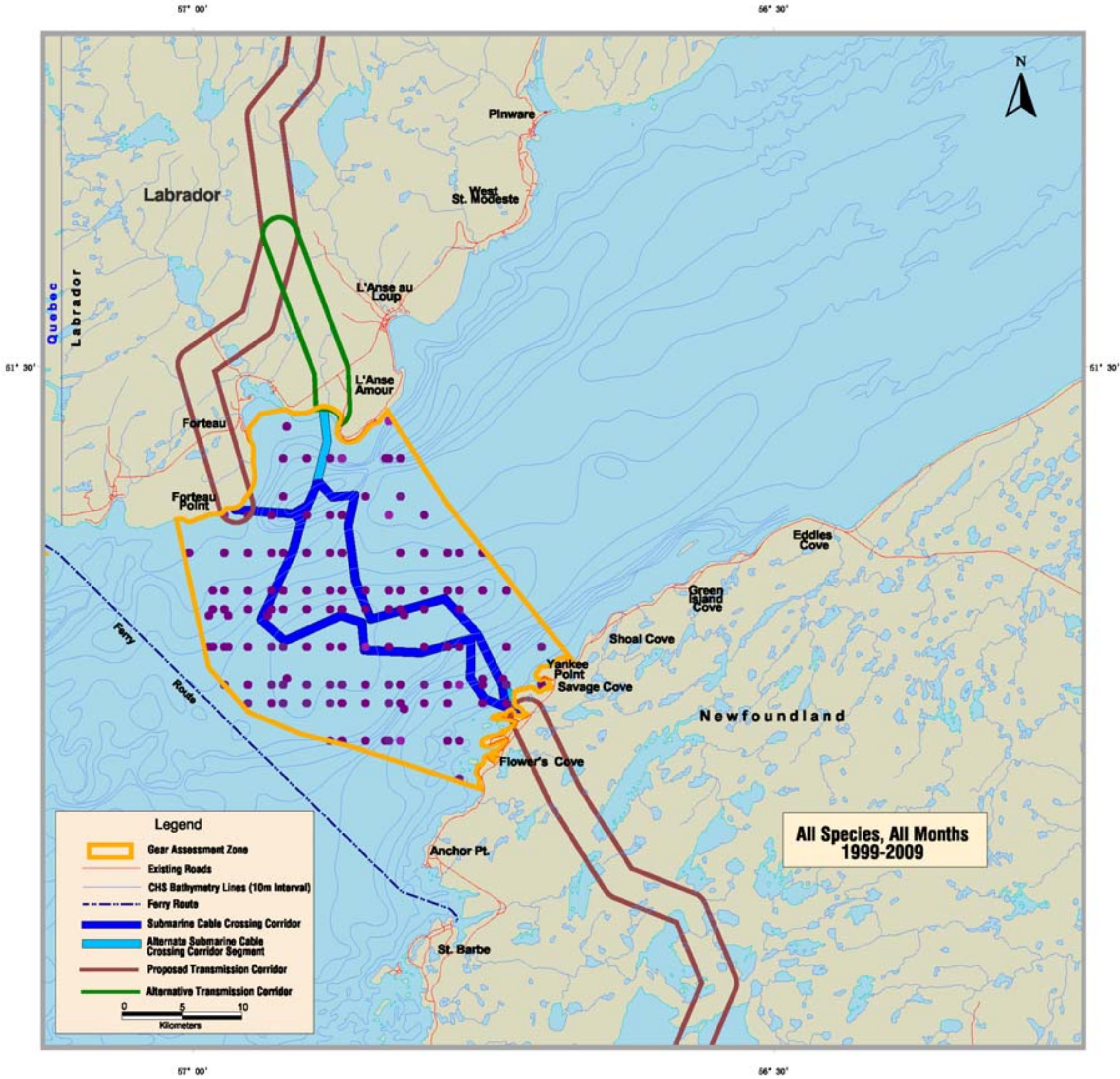

Figure 3. Study Area Catch Locations 1999-2009, All Species.

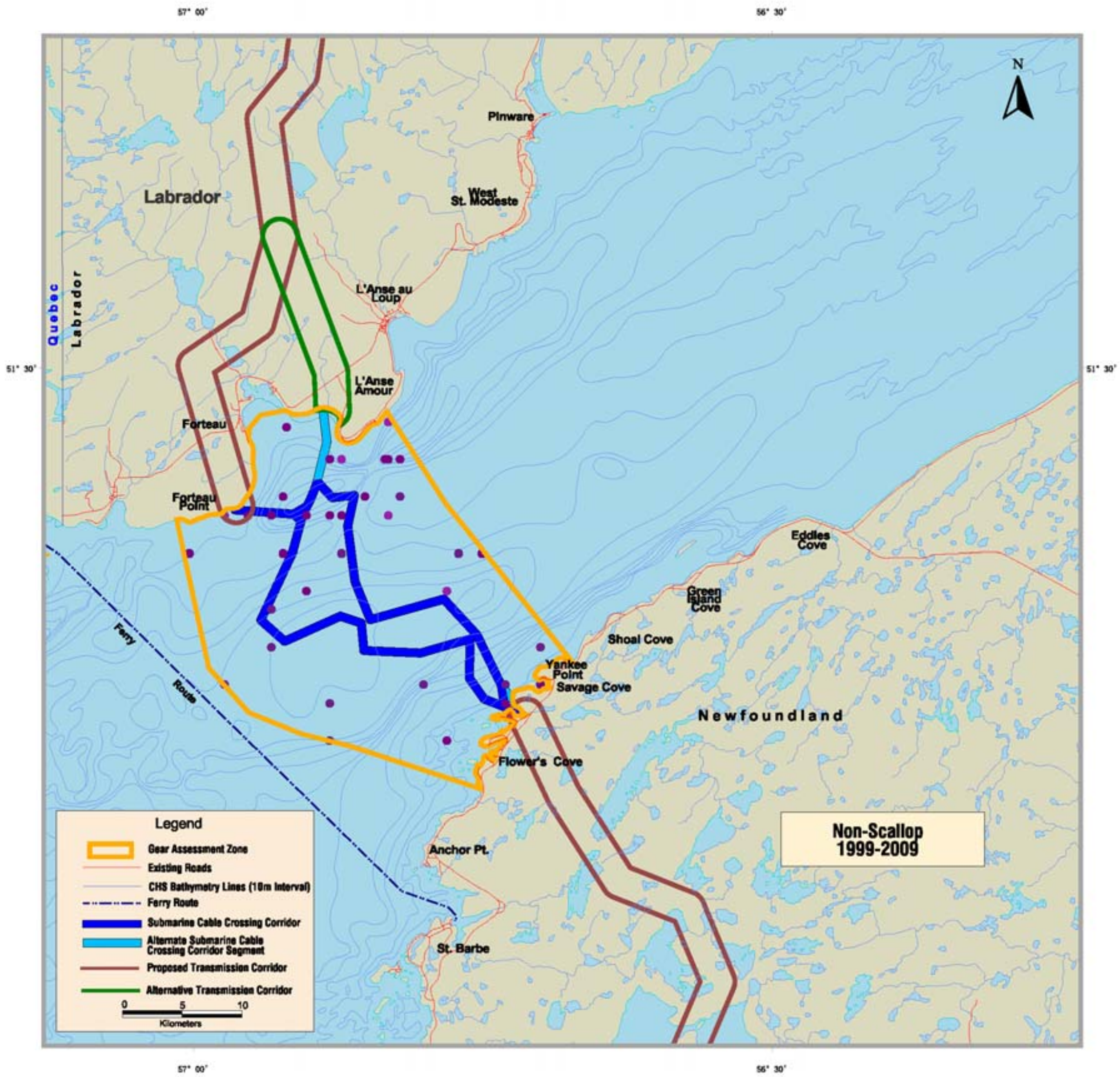

Figure 4. Study Area Catch Locations 1999-2009, All Species Except Scallop.

Table 1. Distribution of Species Catch Records in the Gear Assessment Zone (GAZ) and Unit Area 4Ra by Year, 1999 to 2009.

Year	Scallop Records	All-Species Records	% Scallop Records in GAZ	Scallop Records in UA 4Ra	% 4Ra Scallop Records in GAZ
2009	135	135	100	182	74
2008	13	18	72	39	33
2007	9	25	36	77	12
2006	33	46	72	174	19
2005	8	11	73	45	18
2004	0	2	0	0	0
2003	7	7	100	75	9
2002	4	6	67	129	3
2001	6	7	85	196	3
2000	86	105	82	1284	7
1999	28	32	88	495	6
Total	329	394	84	2696	17

Concentration and Distribution of Scallop Harvesting Locations in the GAZ

Figure 5 shows the distribution of the scallop catch records within the Study Area. For this analysis, the GAZ was divided into 133 cells. The number appearing in each cell of Figure 5 represents the frequency of scallop records within that cell.

Each cell is 1.4 km by 2.3 km and thus represents a surface (or seabed) area of about 3.2 square kilometres.[7] For the purpose of discussion, each cell has been assigned a reference number from 1 to 133 as shown in Figure A3.2, Appendix 3.

If the frequency of catch records in each cell is used to measure fishing intensity, then Figure 5 indicates the location of several scallop fishing "hotspots" within the GAZ. These are as follows:

1. Cells # 67, 83 and 99 have 16, 17 and 15 "hits" respectively. Of these cells, the western corridor passes through Cell # 67 with 16 catch records.
2. The western corridor towards the Newfoundland side is another intensely fished scallop area, falling within Cells # 104 and 105, each of which has 11 catch records.
3. In the middle of the Strait, the eastern corridor passes through another fishing "hotspot" encompassed by Cells # 69, 70 and 71, with cell frequencies of 13, 13 and 10, respectively.

Further examination of the catch frequency data in Figure 5 shows that many of the GAZ cells have no catch records. This is particularly the case for the cells located north of a line drawn east-west across the Strait from a point just below Green Island Cove. This portion of the Study Area has very low, or zero, catch record frequencies because it was a designated scallop

[7] Some of these cells extend beyond the Study Area because they contain one or more catch records that fall within this zone, either very close to, or on top of, one of the GAZ boundary lines (shown in yellow).

"Refugium" for about eight years starting in 2001.[8] DFO closed the area to scallop fishing as a conservation measure; it was re-opened to scallop fishers just before the start of the 2009 fishing season (Appendix 3, Figure A3.3).

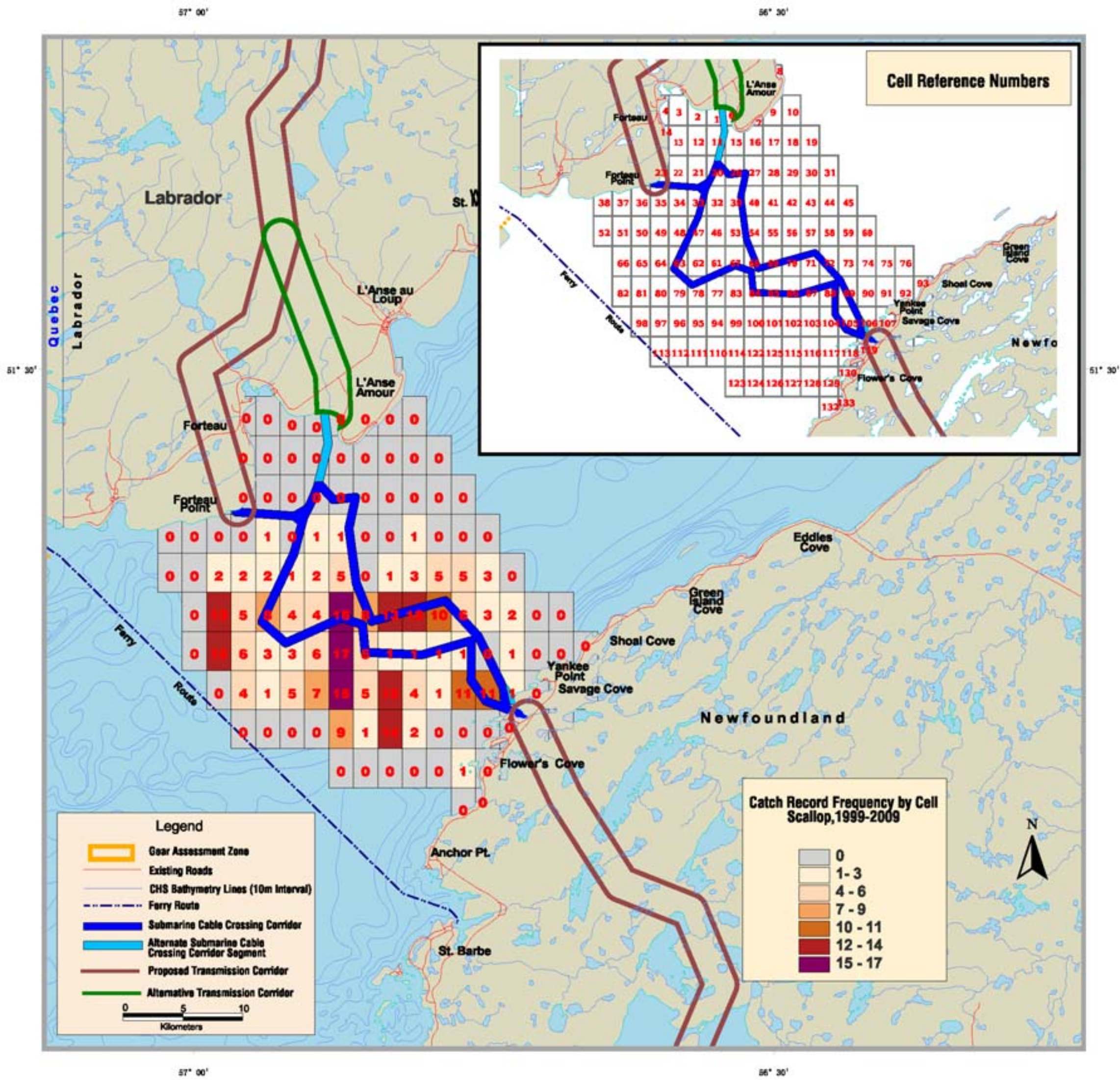

Figure 5. Scallop Catch Record Frequency by Cell, 1999-2009.

Scallop Catches by Vessel Size

Table 2 shows the distribution of scallop catch records by vessel size class. Vessels less than 44 feet in length have generated most (82%) of the harvesting activities (Table 2). In recent years, 2007 to 2009, vessels in the 35 to 44 foot class have dominated this fishery accounting for about 64% of the catch records.

[8] The location of the Scallop Refugium in relation to the Study Area and the cell frequency grid is shown in Appendix 3 as Figure A3.3.

Table 2. Distribution of 1999-2009 Scallop Catch Records in GAZ by Vessel Class.

Year	Class 1-34ft	Class 35-44ft	Class 45-54ft	Class 55-64ft
2009	30	84	13	8
2008	2	11	0	0
2007	3	5	1	0
2006	3	13	17	0
2005	8	0	0	0
2004	0	0	0	0
2003	1	6	0	0
2002	4	0	0	0
2001	6	0	0	0
2000	60	14	12	0
1999	12	7	9	0
Total	129	140	52	8
% of Total	39%	43%	16%	2%

Number of Scallop Enterprises and Active Licences

Fishers based in Study Area homeports hold a total of 56 scallop licences. Twelve licenced scallop enterprises are based on the Labrador side, and there are 44 licence holders on the Newfoundland side. The scallop fleet includes 35 vessels > 40 feet and 21 vessels < 40 feet. For a variety of reasons (primarily market related) only a small number of licence holders have been involved in this fishery during the past several years. Fisher representatives report that, currently (August 2010) only 12 vessels are actively fishing this species; 10 on the Newfoundland side and two on the Labrador side. DFO managers confirmed this information noting that only 12 scallop licence holders participated in the 2009 fishery.

Data on Scallop Gear Utilization and Harvesting Operations

This section presents the information obtained via the telephone interviews with each fishing enterprise, and supplemented with additional related information and observations from agency and industry managers (DFO, DFA and FFAW). Table 3 provides a summary of relevant key operating parameters and factors, and the following section – Other Comments – summarizes more general comments and qualitative information from fishers and agency managers in response to topics addressed in the Questionnaire.

Table 3. Description of Scallop Enterprise Fishing Gear and Operating Parameters.

Operating Parameter	Ent # 1	Ent # 2	Ent #3	Ent #4	Ent # 5	Ent # 6	Ent # 7 and # 8*
Vessel Length (ft)	42	63	45	45	38	34' 11"	58 and 45
Engine Size and Type	335 hp GM	500 hp Cummings CT1150	400 hp Cat.	365 hp Volvo	300 hp Cummings	300 hp Cummings	58-ft vessel: 400 hp Cummings; 45-ft vessel: 230 hp GM
Rake Length Overall (ft)	10	12	11	10	9	9	10
Estimated Rake Weight Empty (lbs)	2,200-2,500	3,000-3,500	800-1,000	1,500-2,000	2,000	2,000	1,500-1,800
Estimated Rake Weight Loaded (lbs)	3,400-3,700	5,000 + (if rocks are incl.)	1,100-1,300 (scallop only, no rocks)	approx. 2,200 (more if rocks are also raked up)	4,000 (incl. rocks and scallops)	3,000-4,000	2,500-2800
Cable size (in.)	1/2 or 9/16	9/16	5/8	1/2 or 9/16	1/2	1/2	9/16
Warp to depth ratio (or usual cable length)	3:1	3:1	uses about 120 fath. of cable	uses about 175 fath. of cable	3:1	usually has 100-125 fath. of cable out	3:1 (usually 150 fath. of cable deployed)
Winch type/model	"Howbolt"	"Howbolt"	not available	"PL 5" (5,000lb cap.)	"Howbolt" 1426"	"PullMaster PL4"	"Howbolt"
Shackles/Swivel Size (in.)	1	5/8 – 3/4 for shackle at the end of the cable	5/8 for chain shackle and 1 for shackle at cable end	1/2 and 5/8	5/8 for chains and 1.25 on ring attch. to cable	Uses two ¾" shackles at end of cable; and swivel is attch. to tow bar with two 1" shackles	1 - 1.25 in. shackle attached to swivel, and four 5/8" shackles attach. to the tow bar ring
Tow speed (knots)	3.5-3.7	2.5-3.0	3.5-3.8	3.8-4.0	4.2	4.0	58-ft vessel: 4.7-4.8 45-ft vessel: 4.1-4.2
Tow length (Nm)	1	0.6	1	1	1.1 – 1.4	1.3-1.5	1-1.5
Tow duration (min.)	15	10-12	12-15	12-15	15-20	20	15-20
Usual Tow Direction	E to W and NE to SW	al directions	E to W and NE to SW	usually E-W	all directions	all directions but usually E-W	all directions
Average No. Tows/day	30	35-50	at least 20-25	25	25-30	25-30	30-35
Water Depths (fath.)	20-60	35-45	30-50	35	28 - 60	30-40	35-45
No. Fishing days / week	6	6	6	6	3-5	4-5	4-5
Operating Season	May-Oct.	May-Sept.	May-Oct.	May-Sept.	Late June to mid-Oct.	May-end of Sept.	May-Oct.

Note: * Enterprise # 7 and Enterprise # 8 are separate scallop dragging operations, but both of these licenced vessels are owned by the same person. The data in this column apply to both vessels except where noted.

Other Comments

Other comments and qualitative information obtained from fishers during the course of the interviews are discussed below under various headings:

Scallop gear. All of the fishers interviewed used the same basic gear - generally referred to as the “Labrador (scallop) Rake” - and they reported that this was the standard gear used throughout the Strait. This equipment is made/assembled locally using a variety of readily available materials, such as chains, shackles, flat steel bar, rubber matting and heavy netting. (Three views of a typical Labrador Scallop Rake are presented in Appendix 4.)

This gear - described in more detail in the next section - consists of two, and sometimes three, buckets linked together and affixed to a heavy “tow bar” via a number of chains and shackles. The buckets are attached to the tow bar with heavy chains linked together at a heavy shackle (e.g., 1 inch), or ring. This ring is then attached to the vessel via another shackle which has been spliced onto the end of the cable. Most fishers also use a heavy-duty swivel attached to the tow bar which helps keep the gear aligned with the warp as it is towed across the seabed.[9]

As noted, most fishers prefer to use a number of buckets - either two or three - attached in tandem, versus one long bucket; this makes it easier to unload the gear when it is hauled on board. Thus, if a fisher is using a 10 foot rake, it would consist of two five-foot buckets; if it is a 9 foot rake, he would use two 4.5 foot buckets, and so on. The overall length of a scallop rake is limited to a maximum of 13 feet by DFO.

The weight of an individual Labrador Scallop Rake will vary depending on the number and size of buckets being used and the thickness of the tow bar and the shackles. Fishers noted that the tow bar alone comprises a significant portion of the overall weight of the gear; one fisher noted his tow bar weighed about 1,000 lbs. Based on the interview data, when empty, scallop gear currently used in the Study Area will range in weight from 800-1,000 lbs to 3,000-3,500 lbs.

Loaded/towing weight. Most fishers report that considerable quantities of rock, gravel, bottom debris, etc., accumulate in the net end of the gear as it is being dragged along the seabed. This material accounts for most of the extra weight of the gear when it is hauled at the end of each tow. One fisher noted his rake weighs about 2,000 lbs when empty but often 4,000 lbs when hauled, with the catch often comprising as little as 150 lbs of the “fully-loaded” gear weight.

Cable breakage, snagging and lost gear. Fishers report very few cases where their warp snapped when the gear got snagged on the bottom, even in cases where a ½ inch cable was being used. In cases where a cable did break, it was primarily because it was old and/or worn out. There were

[9] These swivels are readily available from most local fishing gear supply outlets, e.g., IMP Group Ltd., Mercer’s Marine Equipment Ltd.

other cases where gear was lost because the shackles attached to the end of the cable broke; the fisher in question resolved this problem by using stronger (i.e., heavier) shackles. Another case was mentioned in which the gear could not be hauled because the winch broke under the strain.

In all cases where fishers reported snagging their gear, there were no reports of the cable snapping as the operator attempted to disentangle the gear by continuing to steam ahead, usually at a higher throttle level. They noted that what usually happens when the gear becomes snagged is that the vessel will start to slow down and shortly come to a halt as any slack in the warp is taken up. The skipper will then take the vessel out of gear, or put it in reverse, and proceed to pull up the cable using his winch. As the cable is shortened - thereby decreasing the warp to depth ratio, the gear usually comes free from the bottom. There were reports of gear being lost and not recovered, but in all cases this was due to a failure of the shackle spliced into the end of the cable and attached to the ring joining the chains going back to the tow bar.

Recording of scallop catch locations. As discussed above (see Footnote 5, Assessment Methodology), all fishers operating larger (> 34 feet) are required to record the longitude/latitude coordinates of their catches in their logbooks. In the case of fixed gear, e.g. a string of crab pots, the operator will identify and record the longitude/latitude position of the catch when the gear is hauled onto the vessel. At the same time, he will usually record the quantity of the catch harvested at that same location. As such, subsequent users of the DFO geo-referenced catch data will be able to look at an individual catch record and conclude that a certain weight of a species catch was harvested from a seabed area located at a specific set of coordinates.

Using GIS technology, researchers can then plot geo-referenced data points on maps and proceed to make some observations about the location, timing, and intensity of fish harvesting activities within a particular marine area, for example the GAZ considered in this report.

Scallop fishers use a variety of procedures to record their catch locations, as discussed with vessel operators during the interviews. The procedure differs from the one described above used by other (e.g., fixed-gear) fishers, and this fact is of some relevance to the assessment of potential impacts on the proposed power cables across the Strait, as briefly explained below.

As Table 3 suggests scallop vessels usually aim to complete an average of 25 to 35 tows per day in order to obtain their desired daily catch levels. The general practice is for the vessel to deploy its gear as soon as it has reached a known/potential scallop ground. If the ground yields a good catch from the first tow, the vessel will deploy the gear and tow it back over the exact same route. The operator may make 10 to12 similar tows, or more, as long as the yield from each haul is adequate. Or, he may shift his tow line 20 to 30 m to the side of the first set of tow lines and then proceed to tow over that ground for the rest of the day. Or, after completing 10 tows along a line, he may decide to move to another fishing area a kilometre or two away.

Regardless of how many tows he may complete in any one day, or the distance between one set of tows completed in the morning and another later in the afternoon on a different ground, the standard logbook entry practice of all Study Area fishers is to record ***only two*** sets of coordinates for the entire day's fishing. In other words, a fisher's logbook will show only two geo-referenced data records, despite the fact that his scallop catches were actually harvested (i.e., hauled out of the water) at the end points of as many as 30 to 50 tow lines.

As such, when one plots these geo-referenced logbook catch data, it appears that the vessel harvested scallops at just two points on the ocean during the course of a single day. In actual fact, this vessel could well have been operating in and around a very much larger marine area, perhaps covering an area of 7-8 square Nm.

Another potential "data distortion" related to these catch location recording procedures could arise if the DFO data contain a number of catch records "stacked" on top of one another, i.e. catch records with the exact same geo-referenced data point. But, in this case, we would get the inverse of the above-noted discrepancy. For example, if there were ten catch records stacked up at a location with the same longitude/latitude coordinates, one might reasonably conclude that there were only ten hauls of raw material made at that location. In actual fact, each of those data points could represent the activities of ten different operators, each of whom ended 20 (or even 30) of their tows at the same geographic end point. In other words, those ten scallop catch records could conceivably represent harvesting activities associated with 200 to 300 scallop tows; i.e., 10 different fishers each of whom ended 20 of their tows at that particular point but were only required to enter one catch record and associated longitude/latitude coordinates in their logbook for those 20 tows.

In actual practice, as fishers reported in the interviews, most operators will attempt to fish the entire day on the same tow line. In other words, they will only move to another location if the catches on that line start to drop off. Many fishers noted that they quite often strike a good scallop ground and stay in that same location the entire day. In such cases, the two logbook entries - one in the morning and one at the end of the day – are an accurate record of the fishing ground utilized that particular day.

Direction of tows. Though some fishers report towing their gear in all directions, most of the tows are made from NE to SW or E to W, and vice versa. Fishers report that the tow direction is heavily influenced by the tides and wind conditions found in the Strait.

Number of fishing days per week. The number of days fished per week ranges from three to six days; on average, about 5.2 days a week for the eight scallop enterprises consulted for this report. Fishers noted that, in reality, the number of days they are able to fish is very dependent on the weather. DFO has also imposed a weekly catch limit, or quota, which in some cases may restrict the number of operating days per week for a scallop vessel. If a vessel catches more than 18,872 lbs of shell-on scallops (equal to about 2,700 lbs of meat) in any one week, it must cease fishing for that week. The fisher cannot resume harvesting until the start of the next quota week. Fishers report that, given resource conditions in the SOBI, it would be rare for any vessel to reach its weekly catch limit.

Current and potential/future activity levels. At present, only 12 of the 56 licence holders are actively involved in the Study Area scallop fishery. This low level of participation is due primarily to low product prices and unfavourable market conditions in the past several years. However fishers also note that scallop dragging is very difficult work and is also hard on the vessel and the equipment. Nevertheless, fishers report that they will continue to maintain their scallop licences because this species is something of a "safety net", i.e., an alternative they can pursue if they need to "top up" their annual income if required. As such, the number of enterprises involved in future years could increase significantly if product markets and prices improved, or if there is a turndown in other species fisheries.

DESCRIPTION AND ANALYSIS OF POTENTIAL PHYSICAL IMPACTS OF SCALLOP GEAR

Scallop Dredge/Rake Harvesting Operations

Icelandic scallops are harvested in the Strait of Belle Isle between Southern Labrador and the Northern Peninsula. Because they are bottom dwellers, they are harvested by dragging the gear - dredges, or rakes - over the seabed. The gear type and method have remained relatively unchanged for many years. The most commonly used gear is the modified Labrador rake (see Figure 6). It has a heavy, rectangular steel mouth and weighs about three tonnes when full. The front section is fitted with a diving plate on top and a cutter bar along the bottom, and consists of netting, rings, and rubber circles that make up the collector bag. A cutting bar is located at the front of the rake, and the mouth may be fitted with rock chains/bars to keep large rocks from entering the rake and netting. Behind this opening are steel links that attach to the collector bag. The bag is then connected to a sweep chain on the bottom terminating in a dump bar.

Modified Labrador rakes are usually towed at speeds of between 2.0 - 4.0 knots with most scallop tows (or sets) lasting approximately 15 to 20 minutes. The rakes are fished in water depths between 120 and 360 ft and use a 3 to 1 warp to depth ratio (e.g. 30 feet of warp to every 10 feet of water depth). Scallop fishers usually complete approximately 30 to 50 tows per day and each tow covers 0.5 to 1.5 nautical miles (speed dependent).

Figure 6. Typical Modified Labrador Scallop Rake used in the Strait of Belle Isle.

A large modified Labrador rake does not normally exceed 12 feet in width; this is the largest possible size that can be used safely onboard a smaller vessel. Most rakes range between 4 – 10 feet in width. Inshore scallop fisheries such as Bay, Calico and Icelandic scallops can be caught with smaller versions of the Labrador rake. This means that, in many areas, the width of the gear will vary. Depending on their vessel characteristics, harvesters will fish one or two rakes in a line attached to a tow bar. The Labrador rake and Digby bucket can be attached to a bar in succession to make up a large dredge (see Figure 7). This type of rigging is used in the Eastern Canadian and U.S fisheries. The size of rake used depends on vessel size, type of bottom and species harvested.

Labrador rakes used in the Strait of Belle Isle weigh approximately between 800 and 3,000 lbs depending on vessel size and on the number of rakes fished in tandem. The gear is attached to the vessel by a warp and attached to a winch with a 3,000 – 8,000 lb capacity range. The winch lowers and raises the dredge before and after fishing.

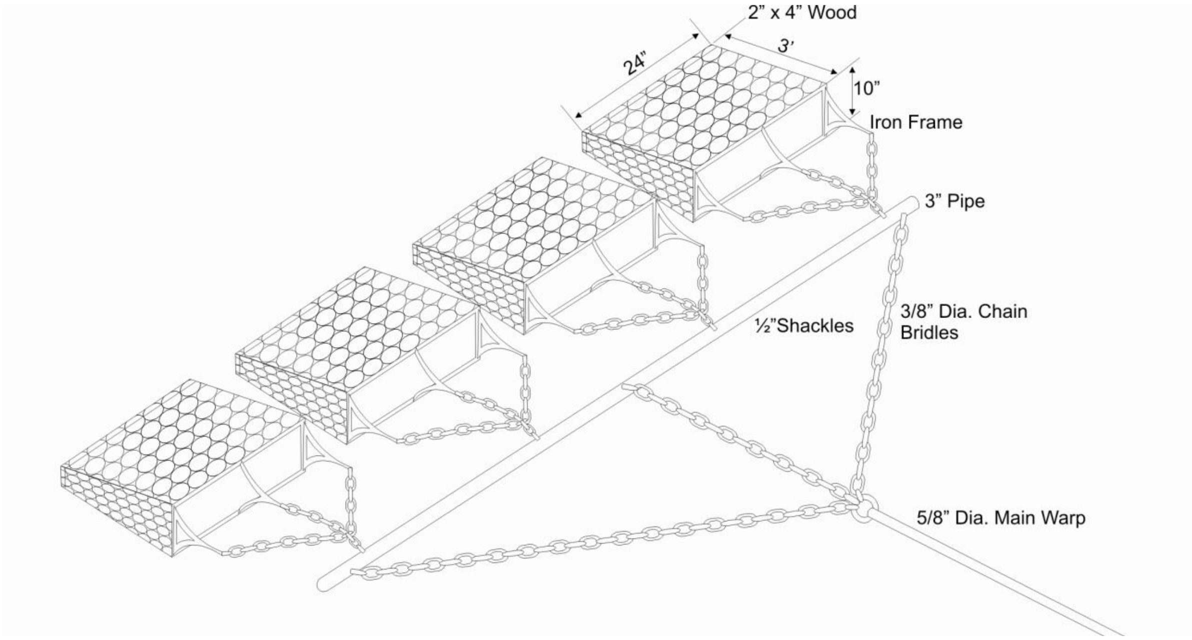

Figure 7. Typical Scallop Dredge (with four rakes attached in tandem).

The warp has a fibre core insert and typically consists of 6 strands with 19 wires in each strand (see Figure 8). Warp diameters range from ½ inch to $^{9}/_{16}$ inch. The warps are attached to the rakes using chain, a swivel and ½ to ¾ inch hammerlocks. Table 4 shows the recommended loads and minimum breaking strengths of warps typically utilized in the scallop fisheries.

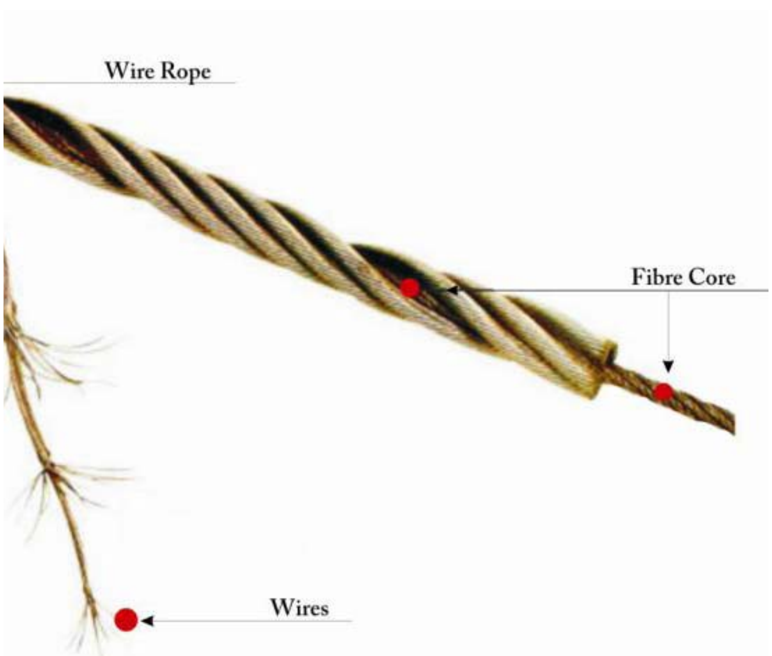

Figure 8. Components of the Wire Rope used in Labrador Scallop Rake Towing Warps.

Table 4. Minimum Breaking Strength of Wire Rope Diameters used in the SOBI Scallop Fisheries.

Warp Diameter		Minimum Breaking Strength		Weight	
(in)	*(mm)*	*(lb)*	*(kg)*	*(lb/ft)*	*(kg/m)*
1/4	6.4	5480	2440	0.11	0.16
5/16	8	8520	3790	0.16	0.24
3/8	9.5	12200	5430	0.24	0.36
7/16	11.5	16540	7360	0.32	0.48
1/2	13	21400	9520	0.42	0.63
9/16	14.5	27000	12000	0.53	0.79
5/8	16	33400	14900	0.66	0.98
3/4	19	47600	21200	0.95	1.41
7/8	22	64400	28600	1.29	1.92
1	26	83600	37200	1.68	2.50

Forces Generated by Labrador Rake Scallop Gear

Forces generated by dredges/rakes can potentially cause damage to sub-sea cables. These forces are different than drag forces produced during harvesting operations and are usually a result of the fishing gear coming in contact with, or snagging, obstacles on the seafloor during dragging operations.

Horizontal Impact: This is the initial impact loading when a part of the fishing gear (i.e. the rake) makes contact with some part of a sub-sea structure/installation. This force is instantaneous - lasting less than a second - and usually causes damage at the point of impact. The loads are a transfer of energy from the fishing gear component to the sub-sea structure and are calculated as follows:

$$E = \frac{1}{2} m_t V^2$$

Where: E = Impact energy (kilojoules kJ)
m_t = steel mass of dredge/rake (kilograms kg)
V = effective impact velocity (metres per second m/s)

The following Table 5 shows the approximate impact forces generated by the towing of various size study area scallop rakes at typical vessel speeds.

Table 5. Impact Energy Generated by Towing Different Size Scallop Gear at Typical Speeds.

Size of Rake	Approximate Gear Weight (kg)	Typical Speeds Knots / m/s		Impact energy KJ
8 feet	700	3.7	1.90	1.27
9 feet	905	4.2	2.16	2.11
10 feet	1045	3.5	1.8	1.69
12 feet	1500	2.8	1.44	1.55

Horizontal Snag: This occurs when part or all of the fishing gear becomes caught or tangled in the sub-sea structures. If this situation occurs, a large force equal to the breaking strength of the fishing component snagged or the sub-sea structure will be experienced. If the gear becomes fastened to a sub-sea structure, the loads/forces will depend on the breaking strength of the component snagged (i.e. trawl warp) and the bollard pull of the vessel (Table 6).

Table 6. Typical Snag Loads that could be Generated Based on Size of Study Area Scallop Vessels.

Vessel Type	Warp Diameter Mm/inches		Warp Max Breaking Load tonnes
45 ft Scallop dragger	13	½	9.45
65 ft Scallop dragger	14.5	$^{9}/_{16}$	12.2

Summary Assessment

Scallop dredges/rakes present a potential and significant threat to proposed study area power corridor installations. Dredges can dig 1 to 10 inches into the seabed depending on bottom types and thus have the potential to get snagged in equipment lying on the seafloor.

As such, in order to protect the equipment and to prevent/minimize any snagging of fishing gear, forces exerted by dredges should be considered in the design of cables and in the application of associated protection philosophies and methodologies.

CONCLUSIONS

1. ***Risk from scallop fishing gear***. Scallop gear poses the primary, and most significant, potential threat to the proposed power cable installations. This fishery utilizes a very heavy mobile gear which is dragged/towed along the seabed. Contacts between scallop rakes (even the smaller, lighter ones) and a sub-sea power cable have the potential to damage this equipment.

2. ***Potential impacts from other species harvesting operations.*** Although scallop harvesting operations have dominated Study Area fishing activities during the past decade or so, other species have been caught, and other potentially problematic gears have been utilized, in this zone. However, based on data analysis and consultations with industry participants and agency managers, future fishing activities associated with these species and gear types are not expected to present a significant problem for the cable crossing installations. In the past, otter trawls have harvested cod and other groundfish in the Study Area. However, there has not been a directed otter trawl cod fishery since a moratorium on the harvesting of this species was imposed almost two decades ago. Fishers and agency managers agree that such a fishery is very unlikely to resume in the future. Purse seines have some potential to become entangled with seabed equipment such as cables. However, within the Study Area, this gear has only been utilized on an occasional basis during the past 11 years; the DFO data show just 9 catch records (herring and capelin) since 1999, and none at all since 2006.

3. ***Potential interactions with other fisheries-related activities***. Both the FFAW and DFO conduct regular annual research surveys in the Strait of Belle Isle region. These are stratified random sample surveys that take place in designated research stations, some of which are probably located in the Study Area. The FFAW mobile gear sentinel survey takes place over a two-day period each July and the DFO Research Vessel survey occurs in August. These surveys are conducted with mobile fishing gears (essentially modified otter trawls) and, as such, might present a problem if they were to come in contact with a sea-bed power cable. The mobile sentinel research data, and a map showing the research stations from the 2009 survey, are displayed at the following DFO web-site: http://ogsl.ca/en/sentinel/data/mobile.html. A scan of the site data indicates that only one of the annual stratified random research stations from the 2009 survey fell within the study area. See Appendix 3, Figure A3.5.

4. ***Future importance of the Study Area as a scallop fishing zone in the SOBI region.*** Based on recent catch trends and industry consultations, the Study Area will continue to be an important scallop fishing zone within the larger region (see Figure A3.4). As Table 1 indicates, the GAZ has become an increasingly more important component of the overall 4Ra scallop fishery in the last few years; since 2006, the GAZ has accounted for 40% of the total number of catch records in UA 4Ra, and in 2009 catches in the Study Area accounted for almost 75% of the overall total in 4Ra as a whole. This situation is likely to prevail over the next several years.

5. ***Changes expected in the future distribution of scallop catch locations within the Study Area.*** The distribution pattern of catch locations within the Study Area as depicted in Figure 3 and Figure 5 will gradually change over the next few years as fishers continue to re-occupy and re-use former scallop grounds that were closed via the Refugium during the eight year period 2001-2008. In other words, the distribution of scallop catches illustrated in Figure 5 is somewhat skewed, because fishers were excluded from the Refugium and thus

concentrated more of their harvesting effort on grounds to the south of the Refugium. As conditions gradually return to "normal", one may expect to see a more "evenly" spread pattern of harvesting effort over more of the cells shown in Figure 5.

6. ***Possible closure of the entire Study Area to scallop harvesting.*** Fishers and FFAW representatives stated that they would rather not see the entire Study Area being closed to scallop fishing operations in the future as the only way to avoid potential negative interactions between scallop rakes and power cables on the sea bed. Scallop fishers noted that they could likely manage to "work around" and could easily avoid any power cables if these seabed installations were clearly marked on the relevant marine chart. Their preference, however, would be to have this equipment buried or covered.

7. ***Current (2009) levels of gear utilization***. One of the study objectives was to quantify existing and future/potential levels of gear utilization, or fishing intensity levels, in order to consider what the impacts of harvesting operations on sea-bed equipment might be. Nalcor Energy asked the consultants to estimate "order of magnitude values of gear usage" within the Study Area. Given the information and analysis presented above, the number of scallop towing operations per year is considered to be an appropriate measure of fishing intensity levels.

   As such, the current (2009) level of fishing intensity in the Study Area may be calculated using the following operational parameters and assumptions, based on information obtained during consultations:

   <u>Operational Parameters (based on data from eight enterprises)</u>

   1. Number of scallop enterprises actively fishing: 12
   2. Number of scallop licence holders: 56
   3. Number of scallop catch records in the GAZ: 135
   4. Number of scallop catch logbook entries per day: 2
   5. Average number of scallop harvesting tows per day: 30
   6. Average length of one tow: 1.1 Nm

   <u>Assumptions</u>

   1. Number of tows associated with each catch record logbook entry: 15

   <u>Calculation of 2009 "Fishing Intensity"</u>

   Each of the 135 catch records represents 15 tows of a scallop rake. As such, the total number of scallop tows in the GAZ in 2009 was 135 x 15 = 2,025. Since each tow is, on average, 1.1 Nm long, these scallop harvesting operations generated about 2,228 Nm of towing activity.

(As discussed earlier, the distribution of these towing activities within the Study Area over the past 11 years is shown in Figure 5.)

The concentration of fishing intensity at any particular portion of the GAZ, and/or along a specific portion of the proposed cable crossing corridors, can be roughly estimated by looking at the number of catch records in each of the cells shown in Figure 5, as long as one remembers that these data are for an 11-year period. Cell # 67 (see Figure A3.2), for example, shows 16 catch records for the 11 years, or about 1.5 records per year. As such, the average annual level of fishing intensity within Cell # 67 is calculated at about 23 tows (1.5 catch records times 15 tows per record. Based on our assumptions, it is reasonable to conclude that a scallop vessel would be towing a scallop rake back and forth over this part of the cable corridor about 23 times a year.

8. Future levels of gear utilization

Future/anticipated levels of fishing intensity may be calculated using the same operational parameters described above and several alternate assumptions scenarios about future scallop harvesting activities in the area. A variety of "fishing intensity" scenarios can be articulated depending on what assumptions are used.

Scenario Assumptions

1. The GAZ will continue to be an important scallop fishing area.
2. Harvesting activities in the GAZ will continue to increase as scallop fishers continue to seek out and exploit re-opened grounds in the Refugium portion of the Study Area. As such, annual harvesting levels will be more similar to those that occurred in the non-Refugium years (1999, 2000 and 2009) than to those that occurred during the period 2001 to 2008.
3. Any significant improvement in market conditions or product prices would encourage more licence holders to resume their scallop fisheries.
4. There will not be any significant changes in scallop fishing practices or in the type and size of mobile scallop gear currently in use.
5. Resource/stock conditions and DFO management policy will remain unchanged.

"Fishing Intensity" 2015 (Sample Scenario)

Scallop markets increase and product prices improve significantly. As a result, the number of licence holders actively involved in harvesting scallop resources is double the current (2009) level. The total number of scallop tows in the GAZ increases to an annual level of about 4,050 scallop towing operations.

Appendix 1. Persons Consulted

The following persons were consulted during the study research process.

Fishers - Labrador Side

- Information removed from this version for confidentiality purposes

Fishers - Newfoundland Side

- Information removed from this version for confidentiality purposes

Other Agencies and Organizations

Darrell O'Brien, Fisheries Development Officer, Department of Fisheries and Aquaculture, L'Anse au Loup

Roland Hedderson, FFAW Staff Representative (Union agent for the SOBI area prior to 2010), Clarenville

Jason Spingle, current FFAW Staff Representative for the SOBI area, Corner Brook

Don Ball, Area Chief of Resource Management, DFO Corner Brook

APPENDIX 2. SOBI FISHING GEAR ASSESSMENT QUESTIONNAIRE

Name of Fisher and homeport:

Gear Used – Scallop Drag/Rake:

1. Vessel
- Type/size vessel used:
- Vessel weight (tonnes):
- Engine type, size/capacity (hp)
- What is the typical size vessel involved in the area's scallop fishery?
- Do you expect to see any change over time in the size of vessels being used?

2. Scallop gear description
- Type/name, model number/supplier name (if known)
- Dimensions
- General description of the gear;
- Weight (kgs) when empty;
- Weight (kgs) when full;

3. Towing equipment
- cable size, type (e.g. 5/8" steel);
- no. of cables used;
- cable length (from boat to gear) i.e., the "warp to depth ratio"
- winch used – capacity, type and model number;

4. Equipment (winch/cable) breaking strength
- what is the usual practice regarding hauling the gear? Is it hauled when you think it is fully loaded, i.e., when a specific tug/load weight is felt? Or is the gear hauled after one tow is completed? Or is the tow based on a certain time that the rake has been on the bottom, i.e. fishing?
- what is the cable breaking load? (Have you ever had a cable snap? If so, what weight was on the cable?
- What is the breaking point (i.e., the "maximum load limiter setting") of the winch?
- What size (dimension) shackles do you use to attach the wire (cable) to the rake?

5. Operational parameters
- normal water depths in scallop fishing areas
- what bottom type is fished
- operating speed (usual towing speed)
- typical length of each tow (or do they vary depending on bottom, resource conditions?)

- what is the usual direction of your scallop tows (e.g., NE to SW, or E to W, depends on other factors, i.e., the direction of the tides)?
- how long does one tow usually last, or take to complete?
- Average number of tows per trip/day, or per fully loaded vessel. i.e., do you fish until you have enough raw material on board, or when a certain number of tows are completed?
- How many days per week, month or season do you usually operate?
- How long does the scallop season generally last?

6. Recording the position of the catch

- How or when do you record the location (long/lat) of your catch when you haul the rake on board? Do you record the location at the start of the tow, or at the end of the tow?
- Do you sometimes tow one way and then -- maybe because there is not enough scallop to haul the rake on board -- turn the boat around and tow back over the same ground and – only then, at the end of the 2^{nd} tow - record your catch location?

7. Other parameters or data

- Of the total number (SOBI Area = # licences) of scallop licences held by fishers, how many are presently active (or have been active in the past several years)?
- Where do you usually fish your scallop (long/lats, distance from shore, etc.) Do you usually fish in the same general area each year, and during the season
- Did you once fish in the closed area or in the seabed area where the proposed cable crossing is planned? If not, will you be fishing more in the Refugium area now that it is re-opened?
- Do you expect to see any change over time in the number of fishers/vessels involved in this fishery?

APPENDIX 3. SUPPORTING/ADDITIONAL INFORMATION

Figure A3.1 shows the homeports considered in the Fisheries Component Study.

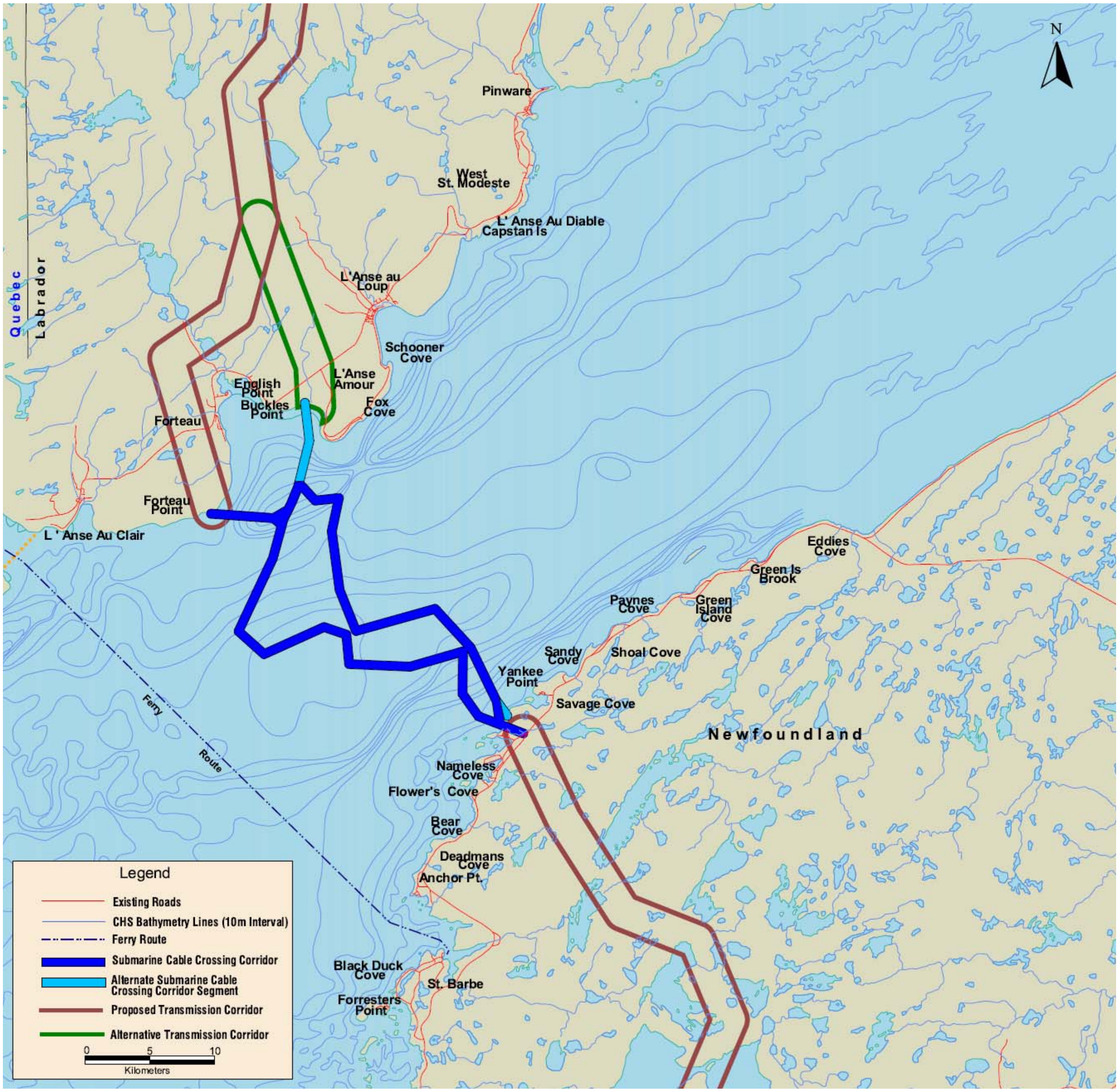

Figure A3.1 Fisheries Component Study Area Homeports

Figure A3.2 shows the division of the GAZ into a grid pattern and the Cell Reference Numbers (1-133).

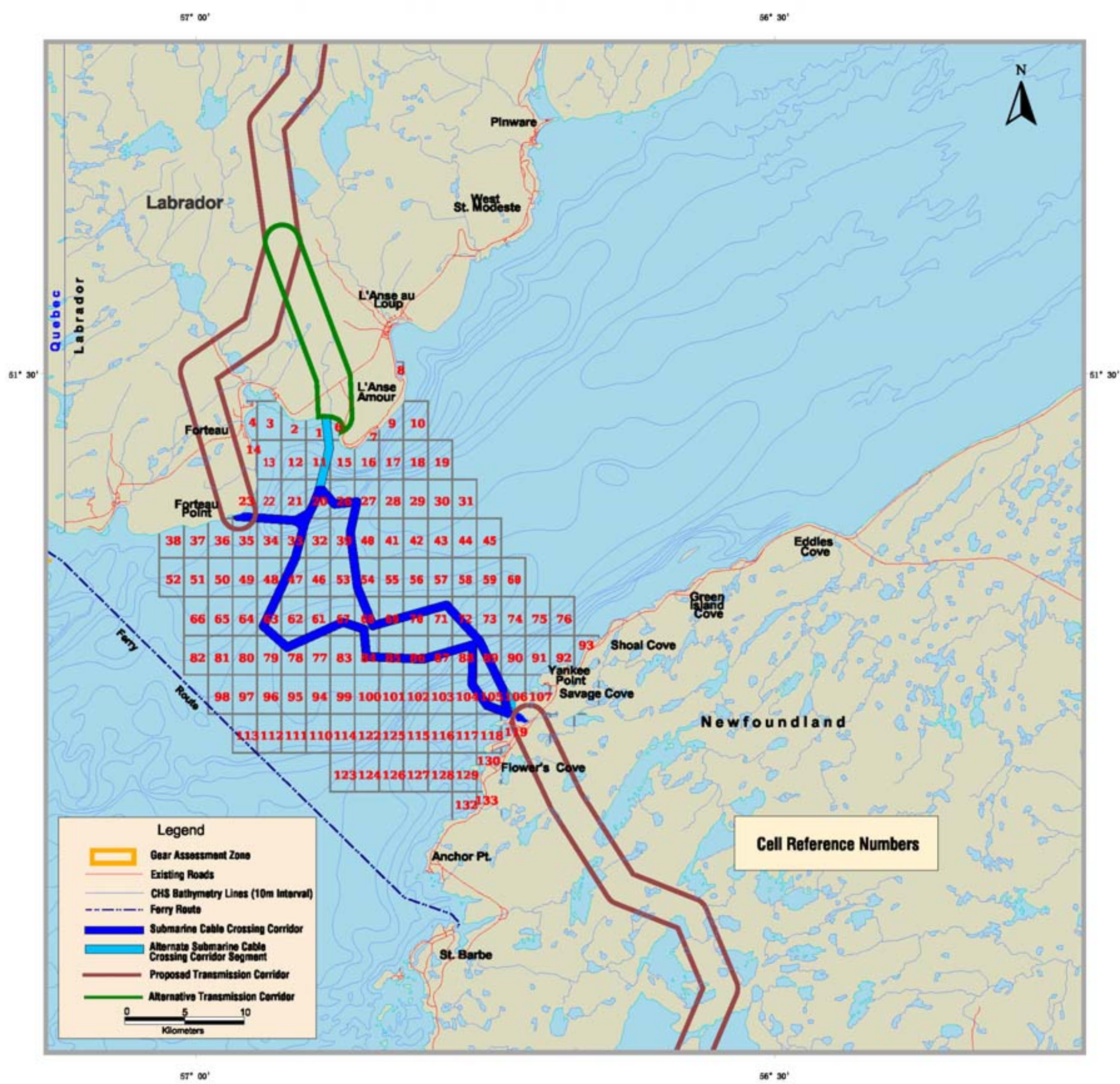

Figure A3.2 GAZ Grid Pattern and the Cell Reference Numbers

Figure A3.3 shows the location of the Scallop Refugium (shown in pale green) in relation to the GAZ.

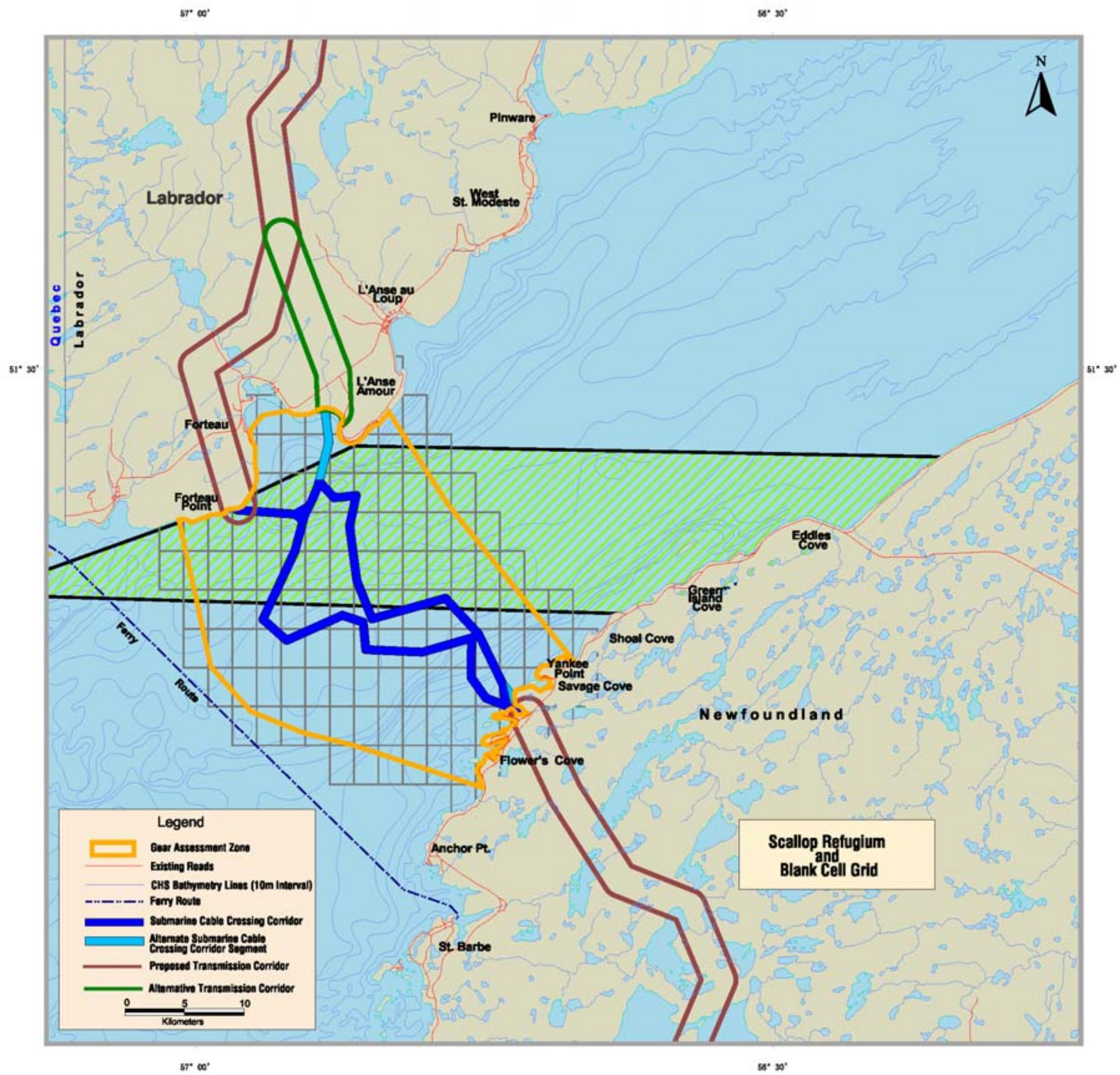

Figure A3.3 Study Area, Scallop Refugium and Blank Cell Grid

Figure A3.4 shows the regional context of the Study Area scallop fisheries vis a vis species harvesting locations within Unit Area 4Ra.

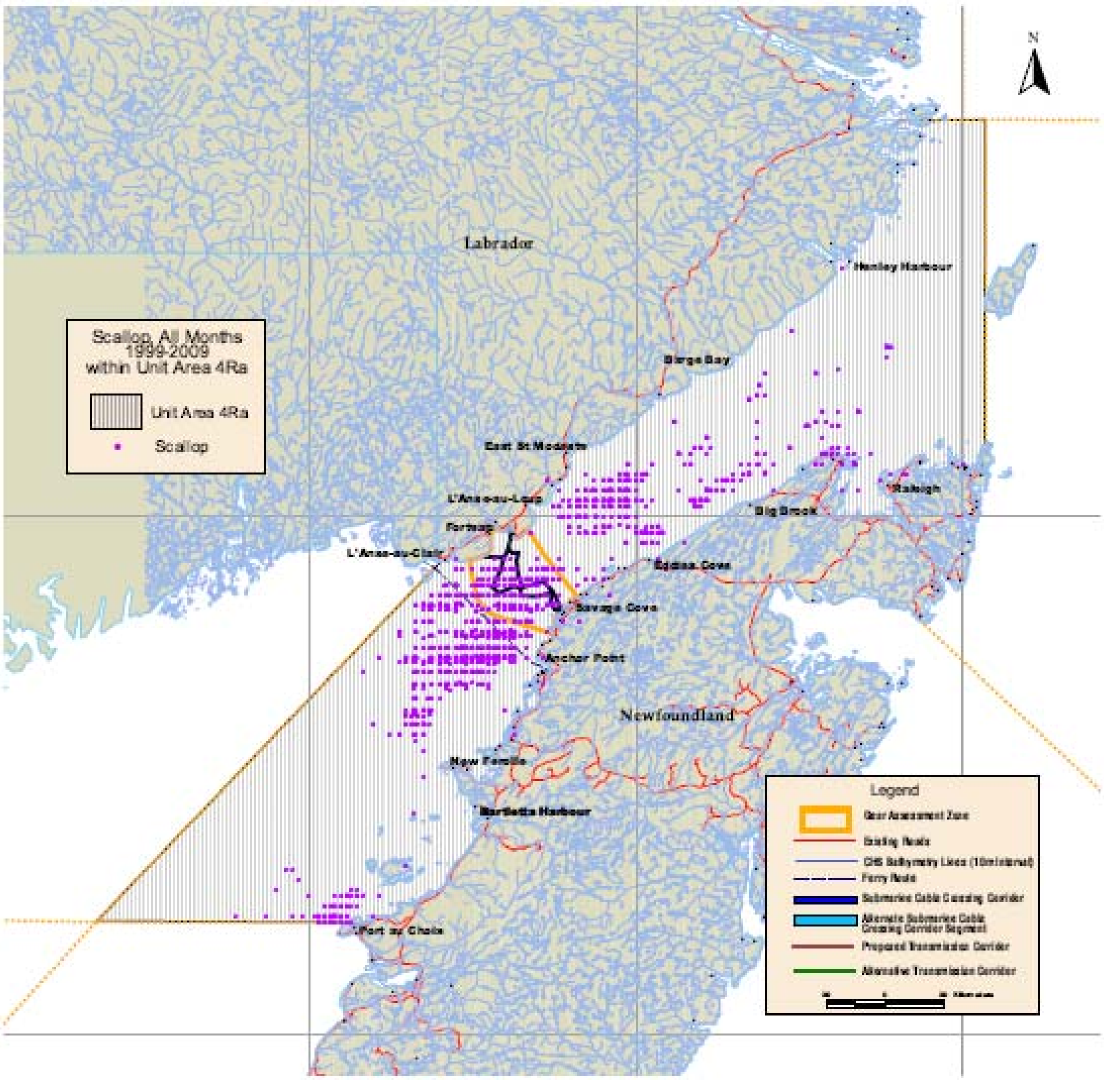

Figure A3.4 Distribution of Scallop Harvesting Locations within NAFO Unit Area 4Ra and the Nalcor Gear Assessment Study Area

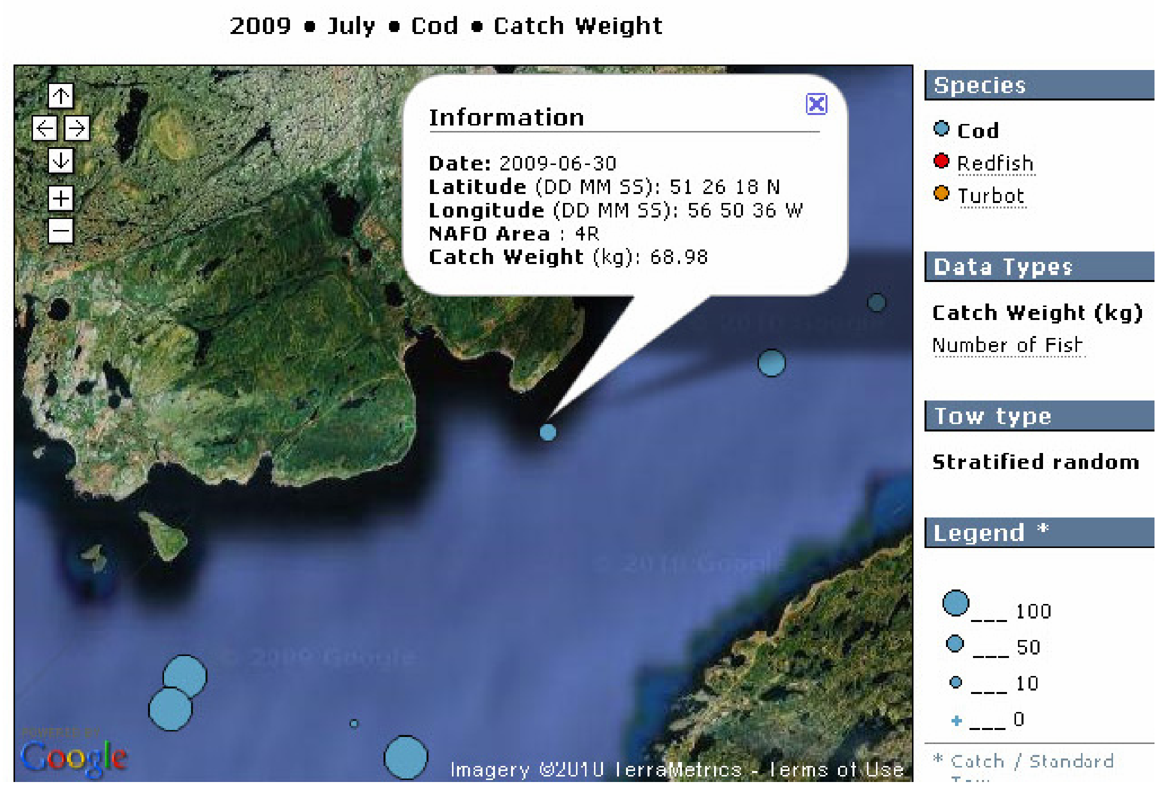

Figure A3.5 Mobile sentinel research stations in the vicinity of the Study Area, 2009 DFO RV Survey

APPENDIX 4. PHOTOS OF A TYPICAL LABRADOR SCALLOP RAKE

The following digital images of a scallop rake currently being used in the Study Area were provided to the consultant by Mr. Darrell O’Brien, Fisheries Development Officer, Department of Fisheries and Aquaculture.

Image 1 – Side View

Image 2 – Front View

Image 3 – Rear view