Polarcus UK Ltd.

Environmental Assessment Eastern Newfoundland 2D/3D/4D Seismic Survey Program 2016 – 2022
Addendum addressing general and specific comments

Date: **February 27 2018**

Prepared for Polarcus UK Ltd.

By RPS

February 27, 2018

Table of Contents

1 Introduction

Polarcus UK Ltd., is proposing to conduct two dimensional (2D), three dimensional (3D) and / or four dimensional (4D) seismic surveys in the Newfoundland Labrador Offshore Area (the Project). The Project area identified in Figure 1.1 is in Eastern Newfoundland. The project was scoped on the basis of Polarcus conducting seismic surveys over one or more years between 2016 and 2022. As part of the required regulatory review, Polarcus submitted an Environmental statement on the 31st December 2016, in compliance with the EA requirements and processes of the C-NLOPB.

Comments from the C-NLOPB have been received on the 30th June 2017. This document intends to address general and specific comments that have been raised as part of the review process.

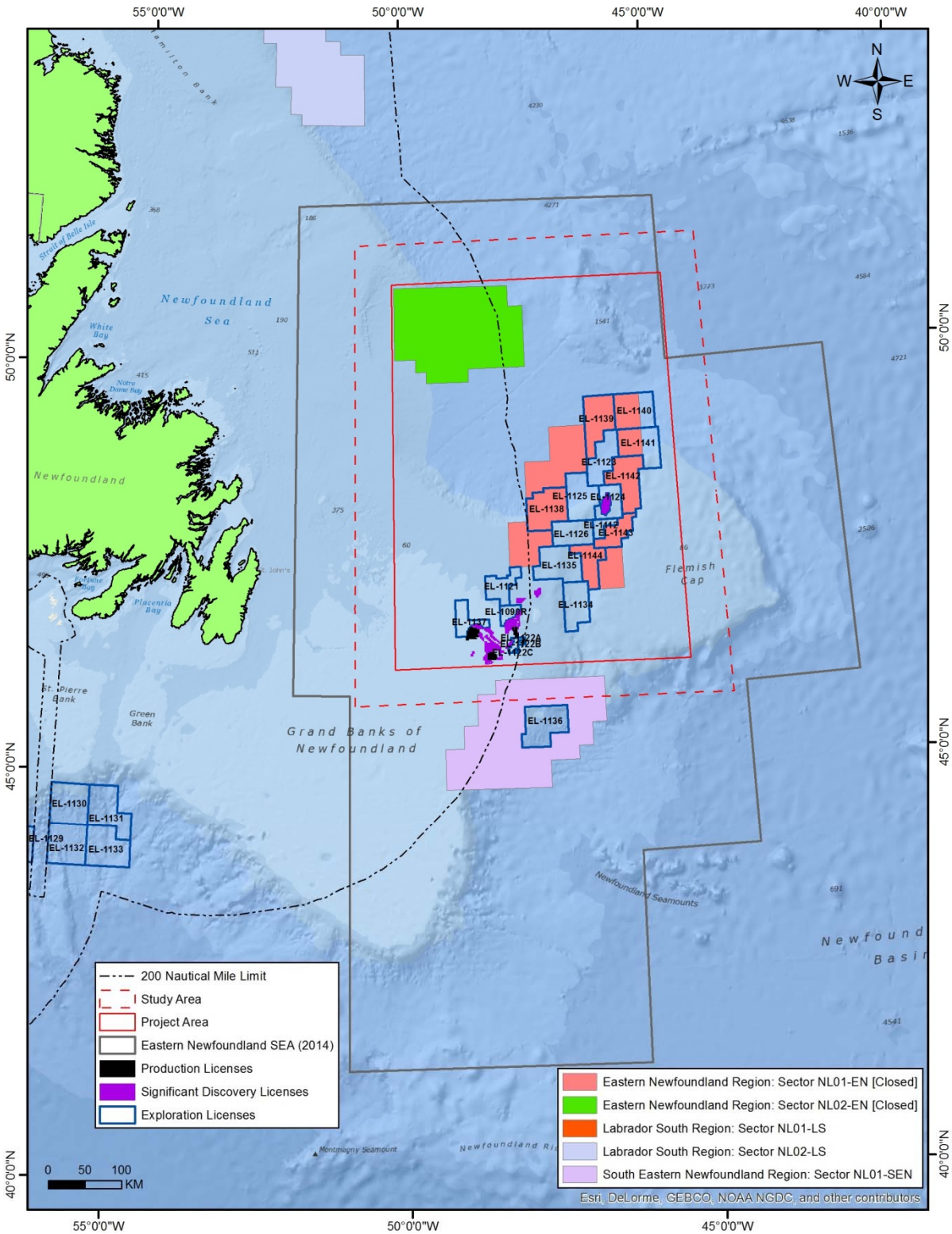


Figure 1.1 Eastern Newfoundland Project Area and Study Areas

2 General Comments

2.1 Canada-Newfoundland and Labrador Offshore Petroleum Board

"In light of the recently released publication, Widely Used Marine Seismic Survey Air Gun Operations Negatively Impact Zooplankton (McCauley, R. et al. Nature Ecol. Evol. 1, 0195 (2017)), please report on the implications of the study results for the conclusions of the environmental assessment and the mitigation measures that are described therein."

Response:

The recent study identified above highlights, and provides better understanding of the impact of offshore seismic source (air gun) operation on zooplankton. Replicated experiments were conducted over 2 days, offshore Tasmania, Australia in water depths of 34-36 metres. The air guns used in the study were in the same pressure range as for the Polarcus survey (2000 psi), towed at a similar depth. Measurements undertaken during the tow showed a decrease in abundance zooplankton and an increase in mortality along the prevailing track of the tow line, with this impact zone spreading over a wider area for the first 78 minutes following the passing of the air gun, when corrected for drift. The maximum range of this measured (by sonar) reduction in zooplankton was 1.2 kilometres. On the second day of the experiment, zooplankton abundance was lower before airgun firing, which meant that a similar zone of impact could not be visualised by sonar, however a statistically significant reduction in abundance and increase in mortality were found after air gun passage.

It should be noted that there are a number of uncertainties in the study results. It is not possible to draw any conclusions as to the cause of the drop in abundance of zooplankton on Day 2 of the survey without detailed information on mixing, advection, currents etc. In addition, there was an increase in the water column on Day 2. The study has made no attempt to examine the impact mechanism of the air gun, although it does present a hypothesis. Seismic activities and impact on plankton is deemed to be negligible when compared to the effect of storms and vessels propeller (Mc Cauley, 1994); nevertheless, it is part of the cumulative impact on plankton abundance.

This research paper does not change the conclusions of the assessment, mitigation measures remain the same: limit seismic acquisition to the strict minimum necessary, as well as taking into account plankton bloom period (highlighted in Section 4.9, Table 4.8) when planning for seismic activities.

2.2 Environment and Climate Change Canada (ECCC)

"Please note that our previously submitted comments (sent on 27 January 2016) are still applicable.

Due to the recent change in name of Environment Canada to Environment and Climate Change Canada, references to the departmental name and associated acronyms (i.e. EC-CWS to ECCC-CWS) should be updated accordingly."

Response:

Comment noted.

2.3 Department of National Defence (DND)

"Please identify a specific individual or office to serve as a Point of Contact (POC) for MARLANT queries and concerns"

Response:

Polarcus can confirm that a highly experienced Single Point of Contact will be in place for the duration of the program and contact details will be provided to Department of National Defence (DND) ahead of any operations.

"Please ensure the appropriate Notice to Mariners will be issued for all underwater activities and any significant surface ventures, such as use of flares, buoys, and unconventional lighting; "

Response:

Polarcus can confirm that an appropriate Notice to Mariners will be issued for the program.

"Please ensure the appropriate Notice to Airmen will be issued for all activities that could affect air safety, such as use of balloons, Unmanned Aerial Vehicles (UAVs) or tethered airborne devices; "

Response:

Polarcus can confirm that there will be no activities that could affect air safety, such as use of balloons, Unmanned Aerial Vehicles (UAVs) or tethered airborne devices; this equipment is not part of Seismic Surveys.

"Please ensure engagement of CTF 84, through Director General Naval Strategic Readiness (DGNSR), to ensure de-confliction with possible Allied submarine activities. "

Response:

Contact details to be provided to Polarcus for "Director General Naval Strategic Readiness" (DGNSR) so that project details can be shared to ensure no conflict with possible Allied submarine activities.

2.4 Groundfish Enterprise Allocation Council (GEAC)-Canadian Association of Prawn Producers (CAPP)

"We note that the study area overlaps substantially with shrimp and groundfish harvesting activities undertaken by our membership. The timing of the project activities (May 1st to November 30th) will certainly lead to some overlap between our harvesting activities and potential seismic activity.

The fishery avoidance mitigation measures described by the document are inadequate to address our past negative experiences with the seismic exploration. The document suggests that no fisher will be required to relocate based on the exploration activities. We do not share this conclusion, especially given that we have observed substantial reduction in catch rates of both

shrimp and groundfish as a result of seismic testing within the general vicinity. This means that although a seismic survey vessel may not force us to immediately relocate to avoid the survey vessel, the resultant impacts of fish distribution from the seismic pulses will cause us to significantly alter our fishing plans – even leading us to abandon some areas for several months. We request that the EA include some parameters on the avoidance of activity, to be determined through direct discussion with us. This avoidance should include both a spatial and temporal element to allow our harvesting activities to continue without reductions in catch rates.

We take special notice to the effects assessment presented in Section 5.8 of the document. The effects assessment seems limited to direct mortality or injury, and any reference to behavioural changes is only mentioned in passing. We took special interest in Figure 5-2 which suggests that a behavioural threshold from the noise assessment may extend out beyond 9 km from the acoustic energy source – this is consistent with our observations whereby species change distribution according to survey activities and will distribute themselves in a fashion unavailable for harvest. It is our experience that this effect is large in magnitude and requires a prescribed avoidance protocol and advance planning to avoid negative impacts on our harvesting activities. This should be described in the mitigation of these perceived significant effects and be negotiated with fishing industry participants.

We suggest that there is not sufficient information in this document to adequately assess the impacts of seismic exploration on shrimp and groundfish behaviour and distribution.

We submit these comments based on our past experience with seismic exploration near our harvesting grounds. This experience has generally not been positive and we seek to improve our relationships with the oil and gas exploration."

Response:

It is imperative that there is a two way flow of information between all parties involved. The spatial and temporal element of the survey programme will be communicated to stakeholders. Through early engagement plans can be adapted. Polarcus will work closely with GEAC-CAPP to minimize potential effects on both parties. We thank GEAC-CAPP for their comments and commitment to ongoing communication.

2.5 Fish, Food and Allied Workers (FFAW)

"While fisheries data for the current principal commercial species (Section 4.8.1 and page 5-6) were reviewed in the document there is no discussion regarding the regime shift (discussed at the most recent shrimp and crab assessments) that is currently underway in our dynamic marine environment. This shift was discussed for Atlantic cod at the industry consultation in February 2016 (page A-34). Increased fishing activity is anticipated for all groundfish species (e.g. Atlantic cod, turbot, Atlantic halibut, grey sole, redfish, yellowtail flounder, etc.) during the temporal scope of this EA. This is particularly relevant for the company when planning annual survey layouts and locations (Section 5.6.1). It is critical that effective and regular communication ensue with the fishing industry throughout the EA lifespan so that the seismic company is kept apprised of ongoing developments with fisheries in the project area. "

Response:

It is noted that increased fishing activity is anticipated and agreed that efficient two way communication is key for informed decisions to be taken and for planning to be adjusted where relevant. Our objective is to schedule ongoing seismic surveys to have no impact on commercial fishing. We understand the two way flow of information between all parties involved is imperative so that active fishing gear can be avoided. Polarcus can ensure on-going communication through weekly meetings with fisheries groups and the provision of look ahead maps for the coming week's seismic acquisition. Polarcus thanks FFAW/Unifor for committing to continue regular dialogue.

Response Section 5.6.1

It is noted and agreed that the following should be added to this section;

> "Our objective is to schedule ongoing seismic surveys to have no impact on commercial fishing".
>
> "It is critical that effective and regular communication ensue with the fishing industry throughout the EA lifespan so that Polarcus is kept apprised of ongoing developments with fisheries in the project area".

3 Specific Comments

3.1 Environment and Climate Change Canada (ECCC)

"Section 5.6.5 Marine Mammal / Wildlife Protection, page 5-21 *- The link to the "C-NLOPB Guidelines 2016" should be typed out so that it can be used from a printed document. "*

Response:

Acknowledged. http://www.cnlopb.ca/pdfs/guidelines/ggegpg.pdf

"Section 5.6.5 Marine Mammal / Wildlife Protection, page 5-21 *- Quote: "For seabird monitoring, the Canadian Wildlife Service (CWS) has developed a pelagic seabird monitoring protocol that should be used when undertaking seabird observations. Copies of the Eastern Canada seabirds at Sea (ECSAS) standardized protocol for pelagic seabird surveys from moving and stationary platforms..."*

This paragraph is incomplete, and should be further described. "

Response:

(Gjerdrum C., 2012). This sentence was meant to show the reference to the Seabird Monitoring Protocol followed by Marine Mammal Observers.

"Section 5.6.5 Marine Mammal / Wildlife Protection - Seabird Strandings, page 5-22 *- It is not clear how stranded seabirds will be detected onboard the ship. ECCC-CWS recommends at minimum a daily search of the ship, with attention given to small, dark areas that would be missed in routine ship safety checks. "*

Response:

Section 2.3 Project Overview of the original EA states

"MMSOs will conduct seabird surveys during the project period; the Survey method will follow the Eastern Canada Seabirds at Sea (ECSAS) Standardized Protocol for Pelagic Seabird Surveys from Moving and Stationary Platforms (Gjerdrum C., 2012). One of the MMSOs will check the decks for stranded birds and dead birds each day, with close attention to dark and protected areas under machinery. Deckhands will be instructed to alert the MMSO on duty if stranded birds were found. If stranded birds were recovered and released it would follow the handling methods devised by Williams and Chardine (Chardine, 1999). Any dead birds will be disposed of at sea."

Response for further clarity:

Marine Mammal Seabird Observers will be onboard the seismic vessel and will conduct daily searches of the vessel, with attention given to small, dark areas that would be missed in routine ship safety checks, for stranded seabirds. The seabird handling and release protocol devised by Williams and Chardine (Chardine, 1999) will be followed in the event of a stranded bird.

"Section 5.6.5 Marine Mammal / Wildlife Protection - Wildlife Data Collection, page 5-22 *- ECCC-CWS has a mobile version of the Eastern Canada Seabirds at Sea (ECSAS) database that can be provided to the proponent, which will facilitate data entry. The MMO or delegated personnel can enter data into the database while undertaking observations, with little to no need for post-processing. "*

Response:

A copy of the mobile version of the ECSAS database will be obtained. In the event that the MMSO cannot enter the information directly into the data base at sea, it can be entered in upon completion of the project from the shore to assist ECCC-CWS.

"Table 5-11 Assessment of Residual Environmental Effects on the Seabird VEC, page 5-41 *- Recommend changing magnitude of "Unplanned Events" from Low to Medium. "*

Response:

As marine diesel oil is a light hydrocarbon, the majority of spilt oil will evaporate rapidly, therefore the chance of contact with bird species is low, and is much reduced when compared to a similar spill of more persistent crude oil. It is therefore felt that it is unlikely that 10 to 25 percent of individuals/habitat in the Study Area (as defined by the "Medium" magnitude criteria) would be affected. It is proposed that the magnitude definition "low" best describes the level of likely residual environmental effects of unplanned events on the seabird VEC and this should not be amended.

3.2 Canada-Newfoundland and Labrador Offshore Petroleum Board (C-NLOPB)

"***Section 1.2 Regulatory Context and Relevant Legislation, page 1-4*** *– the Geophysical, Geological, Environmental and Geotechnical Program Guidelines were updated in April 2017."*

Response:

Noted. The new citation for C-NLOPB (2017) as follows:

C-NLOPB. 2017. Geophysical, Geological, Environmental and Geotechnical Program Guidelines, April 2017. 57 p.

"Section 2.1 Introduction, page 2-1 *– Polarcus has assessed conducting one or more 2D, 3D and/or 4D seismic surveys within its proposed Study Area. As stated in Section 5.1.1 of the Scoping Document, the* ***Project Area****, not the Study Area, is the area in which seismic survey activities are to occur, including the area of the buffer zone normally defined for line changes "*

Response:

Noted. Propose that the sentence is edited to read as follows: "Polarcus has assessed conducting one or more 2D, 3D and/or 4D seismic surveys within its proposed Project Area."

"Section 2.1 Introduction, page 2-1 *– There is the possibility that Polarcus could conduct more than one survey in any given year. Please identify the maximum number of surveys in any given year, as well as the activities and equipment that constitute the Project, to ensure that potential environmental effects, including cumulative effects, are assessed for the full 2016 to 2022 time period. "*

Response:

The possible combinations of concurrent seismic survey types that may be conducted by Polarcus in any given year during 2018-2022 are 2D-2D, 2D-3D, and 3D-3D. This means two 2D surveys or one 2D survey and one 3D survey or two 3D surveys in any given year. Thus no more than two surveys in the project area in any given year.

The activities are 2D and or 3D seismic surveys, no more than two of any of the above combinations in any given year. The equipment is the research vessel, streamers and airgun array. Polarcus could collect Gravity data and Gravity equipment would be onboard. There will be a supply and support vessel for the project.

"Section 2.2 Spatial and Temporal Boundaries, 1st para, page 2-1 *– Please provide more clarity on the combination of surveys each year (i.e. the maximum number and type of survey each year). "*

Response:

See response to above comment.

"Section 2.3 Project Overview, page 2-2 *– Please confirm the number of MMSOs that are to be onboard the seismic vessel. Also, marine mammal observations are to be continuous and checking for stranded/dead birds are a separate activity. "*

Response:

Polarcus can confirm that not less than two MMSOs are to be onboard the seismic vessel and the MMSOs will conduct continuous marine mammal observations. It is noted that checking for stranded/dead birds is a separate activity.

"Section 2.3.2 Project Scheduling, page 2-3 *– If the scope of work includes activity....information will be submitted. What information and where will it be submitted? "*

Response:

Seismic surveys will be conducted between 1 May and 30 November of any year, from 2018 until 2022. If the scope of work includes activity occurring simultaneously in close proximity to other marine installations or structures or other vessels, a SIMOPS Plan will be submitted to the C-NLOPB in the Safety Plan, as a part of the Geophysical Program Authorization to demonstrate that activities ongoing in the field will be properly coordinated and that affected parties have agreed documented protocols to manage the coordination of activities.

"Section 2.3.3, Supply and Support Vessel, page 2-3 *– Please confirm that a scout vessel will accompany the seismic vessel when acquiring data.*

Response:

As it is stated in the original EA in Section 5.6.3 "Use of Support / Guard Vessel";

"If there is a possibility of the survey program working in areas adjacent to active fishing, Polarcus will use a support vessel to scout ahead, usually along the planned route of a survey line, to make sure there are no fishing boats or gear in the area. Information about any sightings or radio communications will be relayed back to the survey ship and the FLO."

Section 3.1 Bathymetry, pg 3-1 *– The Eastern Newfoundland Strategic Environmental Assessment (C-NLOPB August 2014) should be properly cited and referenced in the report. "*

Response:

Noted. The citation is stated as follows:

The Eastern Newfoundland Strategic Environmental Assessment (C-NLOPB August 2014). http://www.cnlopb.ca/sea/eastern.php

"Section 2.3.5 Gravity and Magnetic Survey, pg 2-3 – *Polarcus will collect gravity and magnetic data and it has been assessed as part of the potential project interactions, but not listed as separate project activities in the environmental interactions table. They should be listed as separate project activities in the environmental interactions table."*

Response:

Noted. Table 5-2 amended to include gravity and magnetic survey as separate activities as follows.

Table 5-2 Potential Interactions between Project Activities and VECs

Project Activities	Fish and Fish Habitat VEC					Fisheries and Other Ocean Users VEC			Seabirds VEC	Marine Mammals VEC and Sea Turtles VEC				Species at Risk VEC	Sensitive Areas VEC
	Water and Sediment Quality	Eggs and Larvae	Juveniles	Pelagic Fish	Bottom dwelling fish	Mobile Invertebrates and Fishes (e.g. gillnet and trawls)	Sedentary Benthic Invertebrates (e.g. crab pots	Research Surveys (e.g. trawls and crab pots		Toothed Whales	Baleen Whales	Seals	Sea Turtles		
Underwater Noise															
Airgun Array															
Seismic Vessel															
Supply / Support															
Physical Presence of:															
Seismic Vessel															
Supply Vessel															
Helicopter1															
Onshore2 facilities															
Vessel Lights															
Sanitary/Domestic Waste															
Liquid Waste															
Atmospheric Emissions															
Garbage3															
Gravity and Magnetic Survey Equipment															
Unplanned Events															
Other Projects and Activities															
Offshore Oil and Gas Activities															
Fisheries															
Marine Transportation															

"Section 2.3.9 – Seismic Streamers, page 2-9 – *Please confirm the maximum streamer number for future years (2018-2022). "*

[1] Crew change will occur via ship to ship transfer, helicopters will only be used in the event of an emergency situation.
[2] There will be no new onshore facilities as existing infrastructure will be used.
[3] Not applicable as garbage will be brought onshore

Response:

The maximum streamer length for future years (2018-2022) will be 12,000m. The maximum number of streamers is 14.

"Section 4.8.3 Shipping, page 4-68 *- The description provided is not adequate and requires additional details / information (e.g. numbers of vessels per port, numbers of cruise ships, ferry services). Only with this information combined with a prediction of future activity, can the statement in Section 6.2 (page 6-2) "Thus, potential for cumulative effects with other shipping is predicted to be low and not significant" apply. "*

Response:

We reviewed this data set. A search for vessel traffic data and reports revealed that the majority of information available had limitations in relation to the study area. A summary of the relevant findings from the search is provided below.

The Canadian Year-Round Shipping Traffic Atlas for 2013: Volume 1, East Coast Marine Waters (Simard et al. 2014) contains monthly vessel traffic density data for 2013 derived from CCG's AIS database. However, the data does not extend eastwards beyond 49°W and therefore most of the Polarcus Study Area is not included in the Atlas. The traffic density maps do indicate that during May to November 2013, the highest traffic density occurred nearshore east and north of Newfoundland's Avalon Peninsula, particularly in the vicinity of St. John's, and south of the island of Newfoundland (and south of the Study Area). Offshore vessel tracks (within the field of view presented in Simard et al. 2014) were predominantly located south of 48°N during May, June, October and November and overall vessel traffic increased during July, August and September (see Figures 118, 141, 164, 187, 210, 233 and 256 in Simard et al. 2014).

No information was found to suggest that the potential cumulative effects with other shipping in the study area would be anything other than low and not significant.

"Section 5.5 Effects Assessment, page 5-8 *– It is not clear to what extent data gaps noted within the Eastern Newfoundland Offshore SEA have been acknowledged / identified / addressed and whether any new information is included. This should be clarified and amended accordingly."*

Response:

The data gaps mentioned in the SEA and particularly in Section 4.3.4.1 of the SEA have been considered. The information provided in Section 4.8 of Polarcus Environmental Assessment encompasses data up to 2014 whilst data collect from the SEA are presented until 2012.

"Section 5.6.5 Marine Mammal / Wildlife Protection, Reporting, page 5-22 – *The final environmental report submitted to the C-NLOPB on January 31st should be accompanied by the marine mammal and seabird observation data (GGEG Guidelines – Appendix 2, C-NLOPB 2017)."*

Response:

Noted. The Final Environmental report submitted to the C-NLOPB as per C-NLOPB Guidelines (GGEG Guidelines – Appendix 2, C-NLOPB 2017) will include the marine Mammal and Seabird Observations data).

"Section 5.6.3 Fisheries Avoidance, page 5-19 *– If there is a possibility of the survey program working in areas adjacent to active fishing; Polarcus will use a support vessel to scout ahead.... For any geophysical, geological, environmental and geotechnical program authorized in the offshore area, the use of a standby/picket/guard/chase vessel is considered best practice in this respect (GGEG Guidelines – Appendix 2, C-NLOPB 2017).*

The use of a guard vessel, also known as a scout, picket, or chase vessel, has been identified as a mitigation measure to prevent negative interactions with fishers and others. The primary purpose of a guard vessel is to increase the forward looking range (both radar and visual surveillance) of the seismic vessel by travelling ahead on the planned data acquisition route. This action increases the amount of time available for gear/vessel avoidance by the seismic vessel and thus reduces the likelihood of a negative interaction between the seismic program and fishers.

When the absence of a guard vessel is unavoidable and prior to that absence, Polarcus will risk assess the conduct of the operation without the guard vessel present and plan and implement appropriate measures to reduce the likelihood of a negative interaction with fishers. The following mitigation measures are considered appropriate in the absence of a guard vessel and may be implemented, as required, to maintain safe operations and avoid negative interaction with fishers:

- *maximize communication with commercial fishers in the area via the Fisheries Liaison Officer (FLO);*
- *maintain vigilant visual and radar watch from the seismic vessel;*
- *scout ahead with the guard vessel as far as appropriate and practical, prior to departure;*
- *plan the absence, when possible, for a time when the seismic vessel is operating in an area of least commercial fishing activity;*
- *move to an area of lesser fishing activity until the guard vessel returns; and/or*
- *suspend data acquisition and recover seismic equipment until the program can proceed without potential negative interaction with fishing activities.*

In cases where an absence is unplanned [ex. medical evacuation or other emergency], the seismic vessel will, as a minimum, maximize communication with fishers and maintain a high level of vigilance for visual and radar observation. Once the situation is under control, Polarcus will complete a risk assessment to determine what other mitigations, if any, are appropriate. "

Response:

This will be adhered to and documented in the Polarcus Safety Plan in the Geophysical Program Authorization application.

"Section 5.6.5 Marine Mammal/Wildlife Protection, Reporting, page 5-22 *– Please note that the Geophysical, Geological, Environmental and Geotechnical Program Guidelines (April 2017) require that the marine mammal and seabird observations are to be submitted to the C-NLOPB within six months after the completion of the seismic survey.*

Section 5.8.6 Sensitive Areas VEC, page 5-51 – Please revise in consideration of the new information requested in review comments. "

Response:

Noted.

*"**Section 6.2 Vessel Traffic and Research Surveys**, page 6-2 – See comment on Section 4.8.3."*

Response:

Noted. See response to comment on *Section* 4.8.3

Related changes

*"**Section 6.4 Summary, page 6-3** – Please revise in consideration of the new information requested in review comments. "*

Response:

Section 6.4 Summary has been reviewed considering the new information requested in review comments and it is felt that the summary accurately reflects the findings of the EA and that the project is not likely to result in significant adverse effects to any VEC.

*"**Section 7 Assessment Summary and Conclusions,** page 7-1 – Please review and update the summary and conclusion taking into consideration the new information added to the environmental assessment report based on review comments."*

Response:

Section 7 Assessment Summary and Conclusions has been reviewed considering the new information requested in review comments and it is felt that the summary and conclusions made still stand and accurately reflect the findings of the EA and that the overall residual impact post mitigation measure remains localized, short-term and transient.

3.3 Fisheries and Oceans Canada (DFO)

"Section 1.2 Regulatory Context and Relevant Legislation, Page 1-4 - the first bullet in the second paragraph should be amended to read "Fisheries and Oceans Canada (DFO). "

Response:

Noted.

***"Section 2.3.8 Seismic Source Parameters, page 2-8, first paragraph** - "two arrays consisting of three-gunstrings each" and "three arrays consisting of two gunstrings each" it is not clear what this terminology refers to - is "gunstring" analogous to "acoustic source", if so then this should be clarified accordingly. "*

Response:

An array consists of sub-arrays which are also called gunstrings. The gunstrings contain a string of individual airguns. The configurations assessed include two arrays with each array consisting of three gunstrings and three arrays with each array consisting of two gunstrings. This is depicted in Figure 2.5.

"Section 3.1 Bathymetry, page 3-1, 2nd paragraph, first sentence *- a reference to the "Eastern Newfoundland Offshore SEA" the wording / reference to the SEA should be made and consistent throughout not only this but other sections of the EA that provide reference to this SEA. "*

Response:

Noted. The citation will be stated as follows:

The Eastern Newfoundland Strategic Environmental Assessment (C-NLOPB August 2014). http://www.cnlopb.ca/sea/eastern.php

Reference and wording to the SEA will be amended throughout the EA so it is consistent.

"Section 3.2.1 Air Temperature, page 3-3, 3rd paragraph, last sentence *- "…during the summer months the coldest observed temperatures were around 4.4 degrees Celsius in June (Figure 3.2)…", data for the month of June is not shown in Figure 3.2. It is felt that the data for air temperature should be described for all 12 months. "*

Response:

Noted. A new Figure 3.2 as follows.

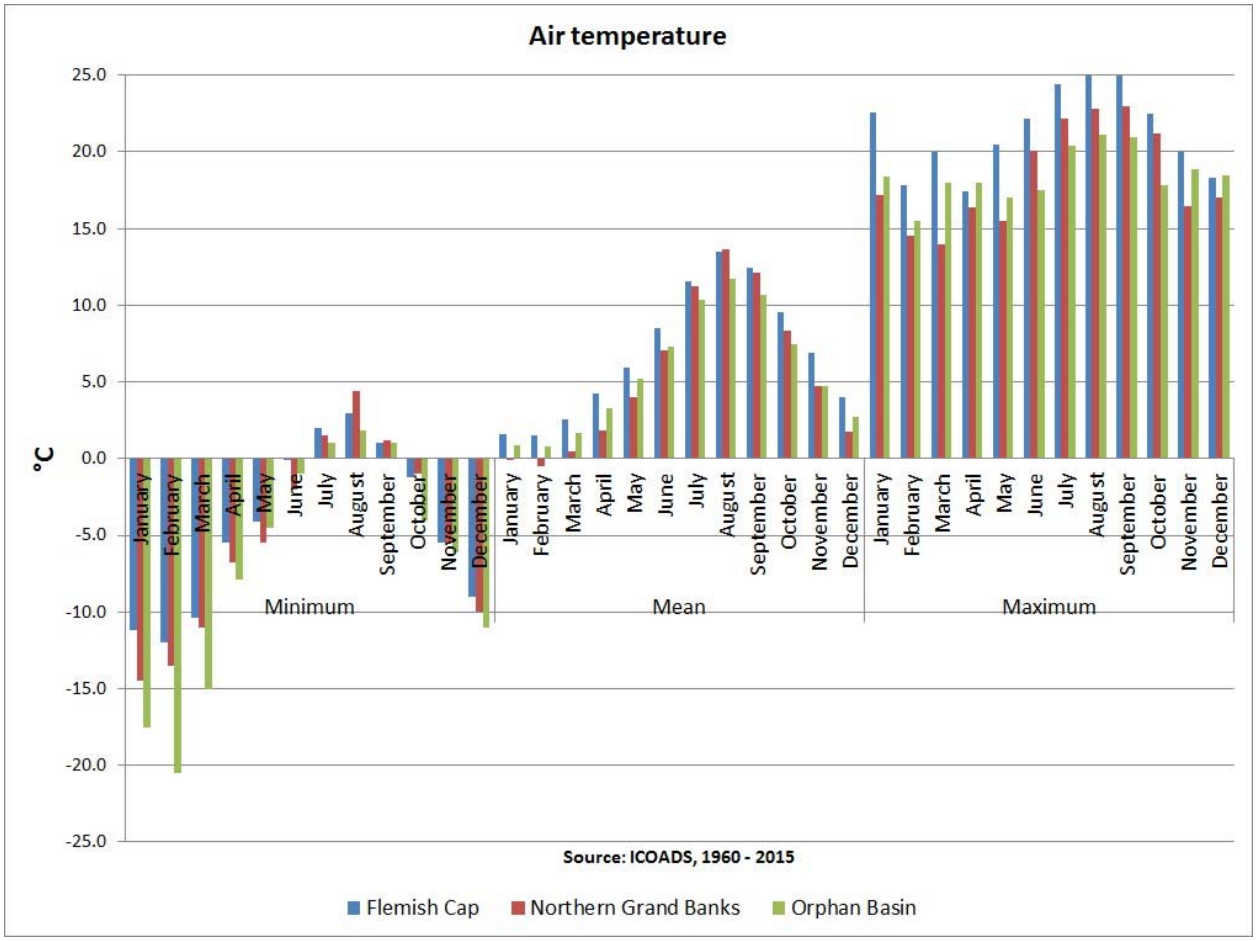


Figure 3.2 Air Temperature

"Section 3.2.2 Wind, page 3-4, Figure 3.3 *- should be amended to reflect wind speed for all 12 months".*

Response:

Noted. A new Figure 3.3 as follows.

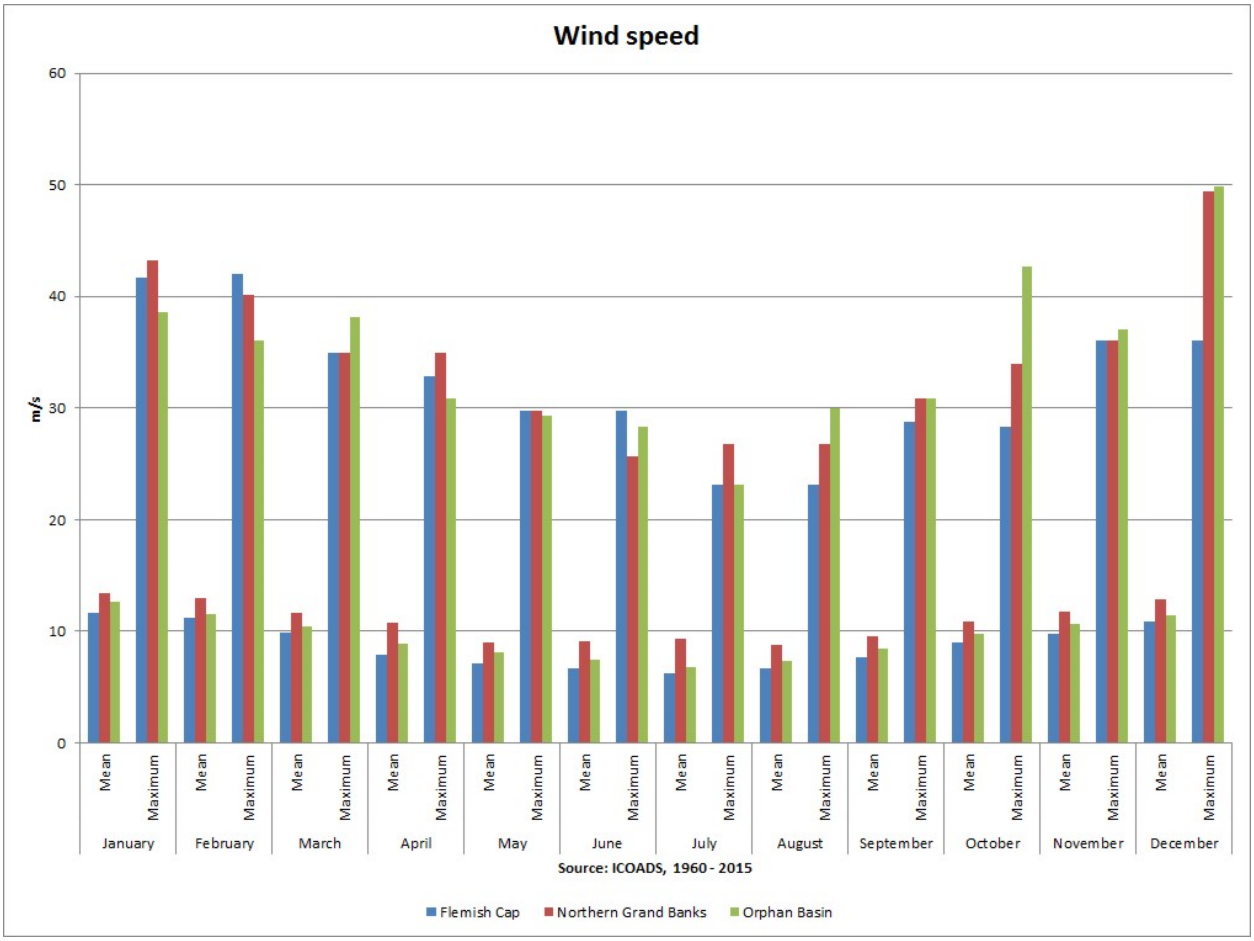


Figure 3.3 Wind Speed

"Section 3.2.3 Precipitation and Visibility, page 3-6 & 3-7, Table 3.2 and Table 3.3 *– these should be amended to provide data for all 12 months for precipitation and visibility respectively.*

Response:

Noted. A new Table 3.2, Figure 3.4, Table 3.3 and Figure 3.5 as follows.

Table 3.2 Precipitation within the Study Area (ICOADS, 1960 – 2015)

Precipitation Type	Percentage Occurrence		
	Flemish Cap	Northern Grand Banks	Orphan Basin
Freezing Rain / Drizzle	Percentage Occurrence		
January	43	18	0
February	29	25	32
March	14	29	32
April	0	10	16
May	14	4	0
June	0	1	0
July	0	0	0
August	0	0	0
September	0	1	0
October	0	1	0
November	0	3	0
December	0	8	20
Rain	Percentage Occurrence		
January	10	8	9
February	8	6	6
March	7	8	6
April	8	8	8
May	7	9	7
June	9	8	7
July	5	6	7
August	7	7	7
September	9	8	10
October	11	10	13
November	10	11	13
December	9	9	8
Snow	Percentage Occurrence		
January	24	26	26
February	27	26	26
March	17	20	22
April	8	7	5
May	3	2	1
June	0	0	0
July	0	0	0
August	0	0	0
September	0	0	0
October	1	1	1
November	6	4	5
December	14	14	14

Table 3.3 Visibility within the Study Area (ICOADS, 1960 – 2015)

Region	Very Poor (<0.5 km)	Poor (0.5 – 2 km)	Fair (2 – 10 km)	Good (> 10 km)
Flemish Cap	Percentage Occurrence			
January	1	6	46	47
February	1	7	47	45
March	1	10	41	48
April	3	15	40	43
May	5	20	36	39
June	10	26	33	31
July	13	32	28	27
August	9	20	30	42
September	4	12	36	48
October	2	9	38	51
November	2	7	45	45
December	1	8	49	42
Northern Grand Banks	Percentage Occurrence			
January	4	10	43	44
February	4	12	44	40
March	5	13	42	40
April	9	17	41	32
May	12	21	35	32
June	17	24	31	27
July	24	28	27	22
August	12	16	33	39
September	6	9	33	52
October	4	7	36	53
November	4	9	37	50
December	3	9	39	48
Orphan Basin	Percentage Occurrence			
January	1	8	54	36
February	1	9	51	39
March	2	13	49	36
April	3	15	42	40
May	4	12	43	41
June	8	19	35	38
July	13	27	33	27
August	7	17	37	39
September	3	9	38	50
October	2	7	43	48
November	1	8	46	45
December	1	7	49	43

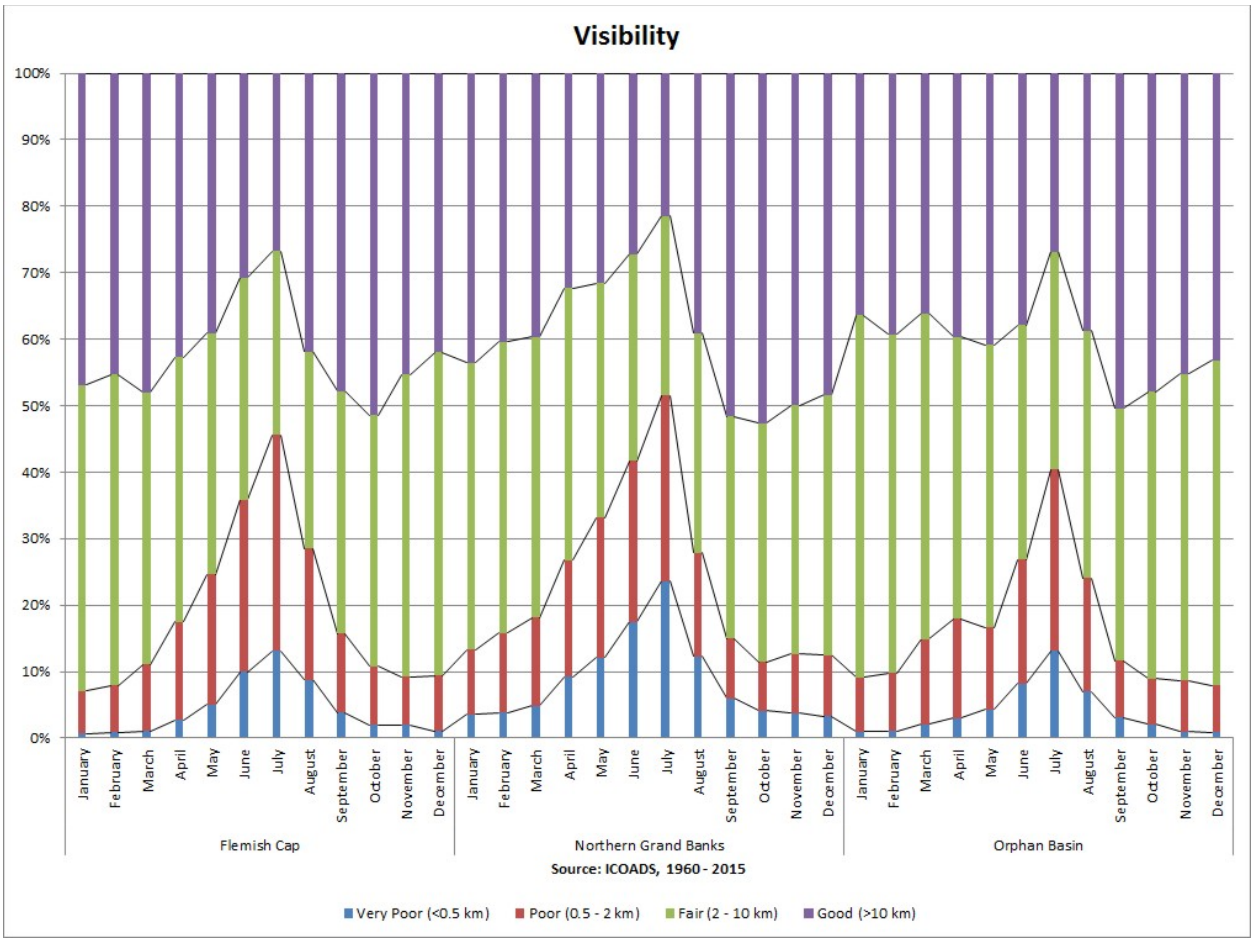


Figure 3.4 Visibility for ICOADS Regions (1960 – 2015)

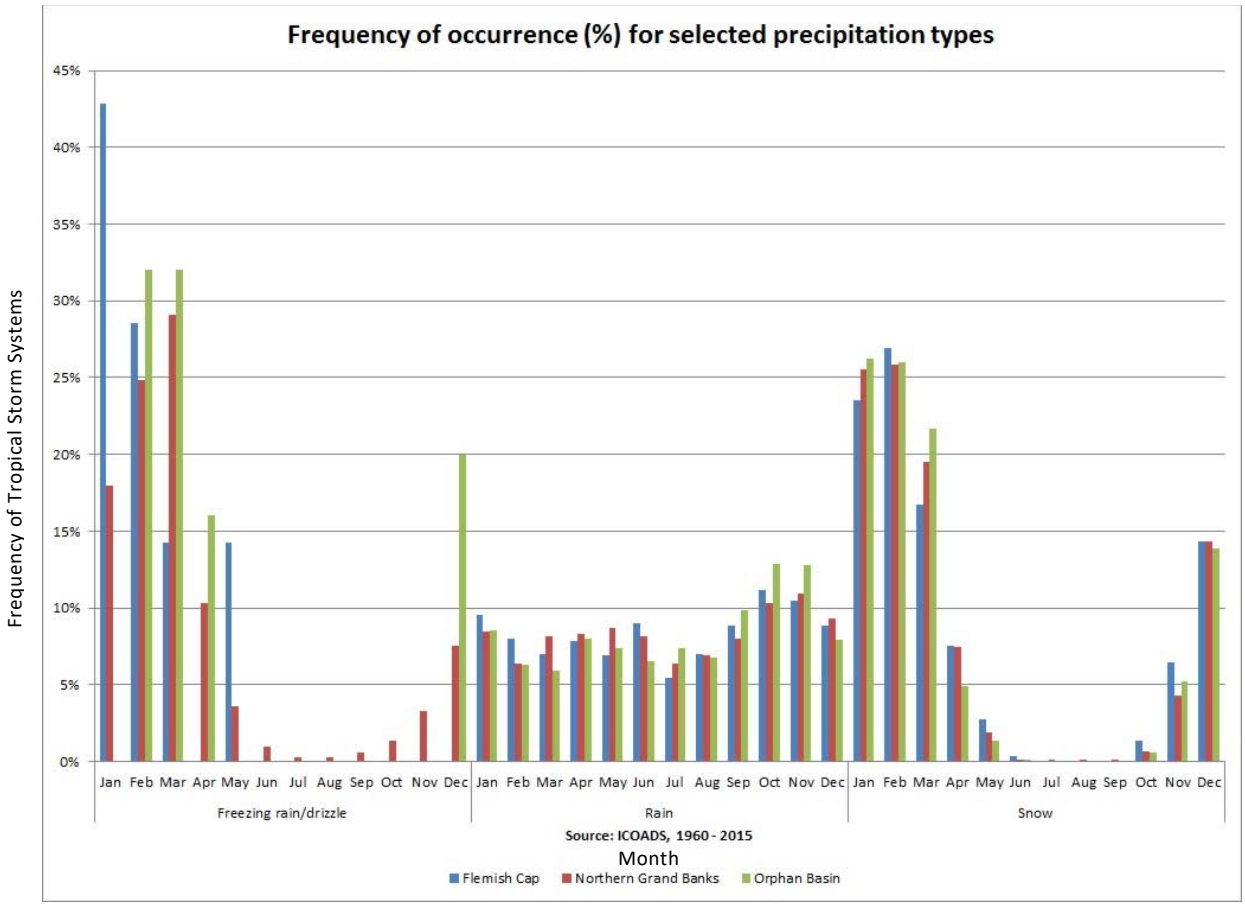


Figure 3.5 Frequency of occurrence for selected precipitation types within the Study Area (ICOADS, 1960 – 2015)

"Section 3.2.4 Storms, page 3-8, Figure 3.5 *- this should be amended to provide information / data on extreme wind speed for all 12 months, also it is noted that Figure 3.5 requires a description of the x- and y-axis. "*

Response:

Data on extreme wind speed for all 12 months is now presented in Figure 3.3 above.

A new Figure 3.5 is on prior page with X and Y axis labelled.

"Section 3.3.1 Waves, page 3-8 *– this section should be amended to provide a definition of significant wave height as well Figure 3.6 should provide data for significant and maximum wave height for all 12 months."*

Response:

Noted. The following text should be included in Section 3.3.1.

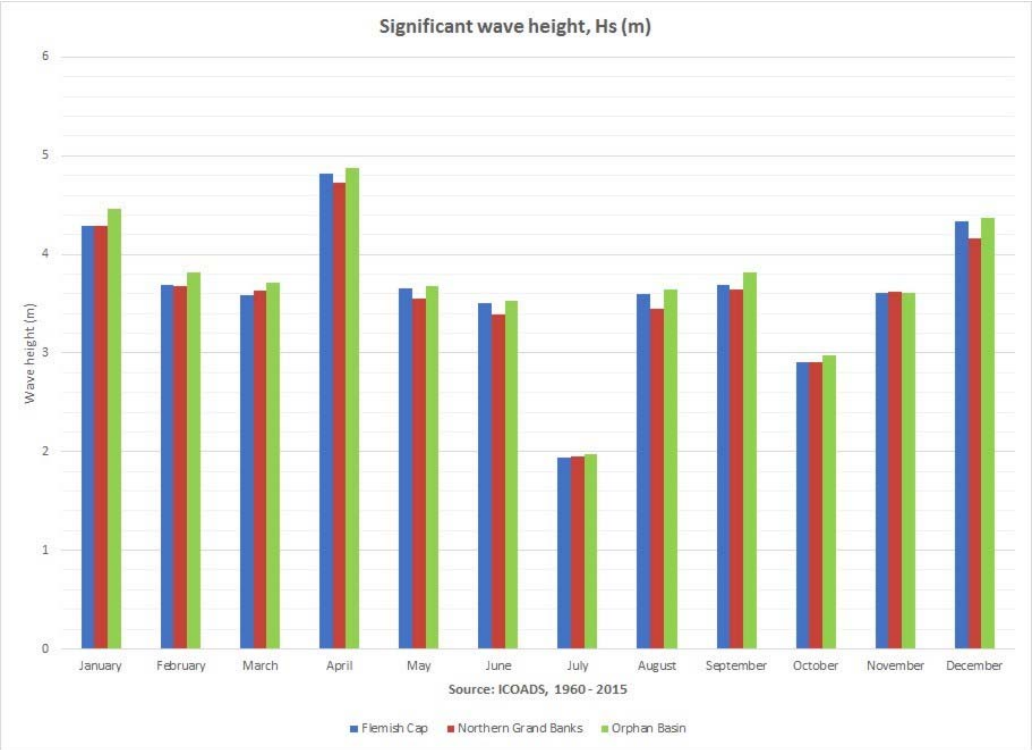
Three general regions were defined for the purposes of this EA to cover the Study Area, and these were used to query the ICOADS for 1960 to 2015 and assemble statistics of meteorological and marine conditions across this region.

The significant wave height (Hs) is traditionally defined as the mean wave height of the highest third of the waves (H 1/3) (*Holthuijsen et al. 2007)*. It is also defined as four times the standard deviation of the surface elevation – or equivalently as four times the square root of the zeroth-order moment (area) of the wave spectrum.

A summary of monthly significant wave height (Hs) and maximum wave heights (absolute) is presented in Figure 3.6 (data from NCDC et al., 2015) for the three ICOADS regions comprising the Study Area.

The largest seas are observed farthest offshore, in the Orphan Basin region. Significant wave (Hs) heights range from 2.0 m (July) to 4.9 m (April). Maximum wave heights range from 7.0 m (July) to 15.0 m (January, October and December).

A new Figure 3.6 as follows.



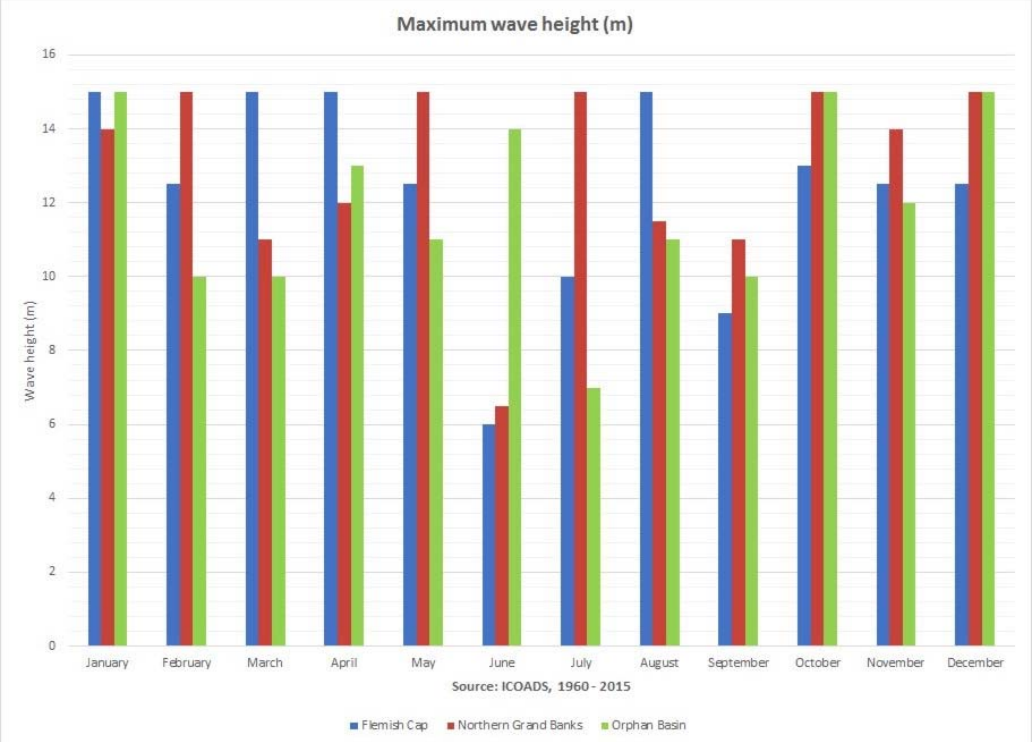


Figure 3.6 Significant wave height (Hs) and maximum wave heights for the Study Area

"Section 3.3.2 Currents, page 3-9 *– it is felt that this section would benefit from the inclusion of a figure depicting the major ocean currents in the study / project area. "*

Response:

A new figure 3.8 follows.

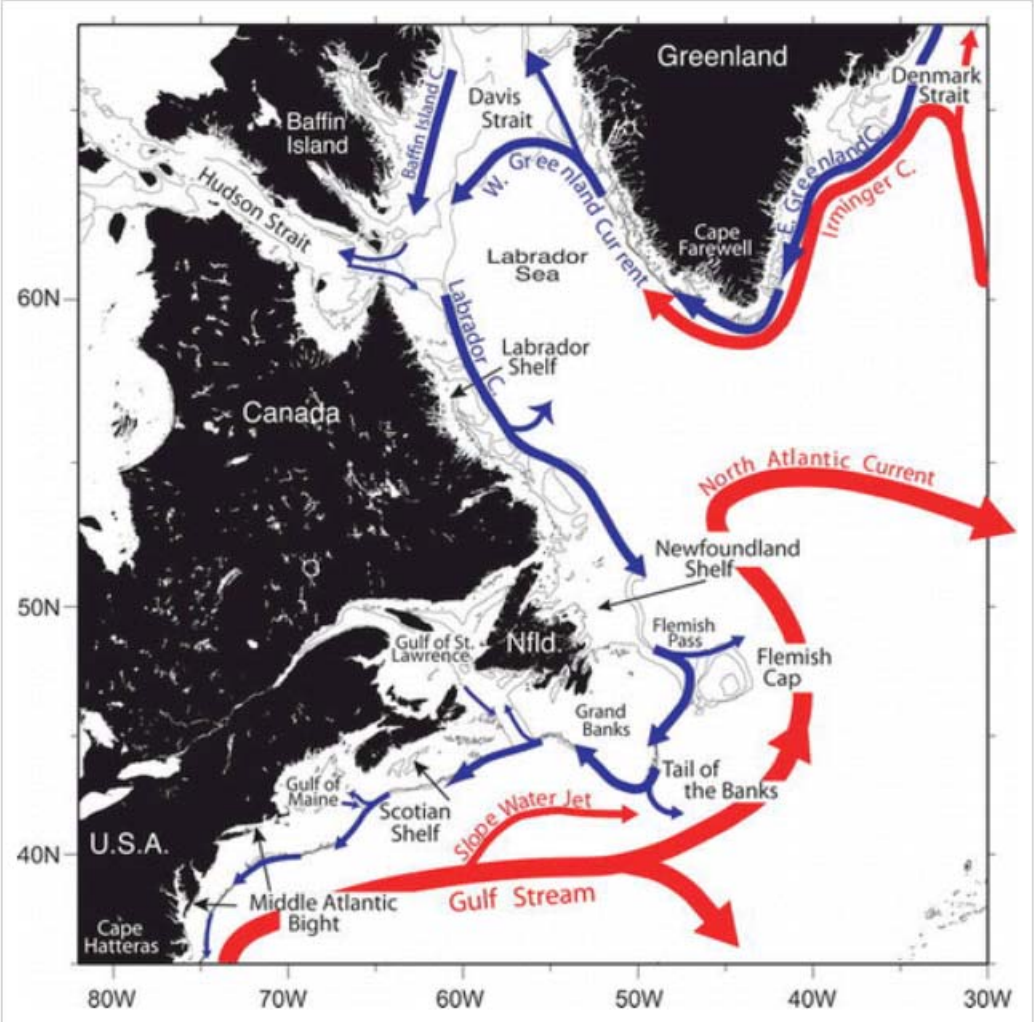
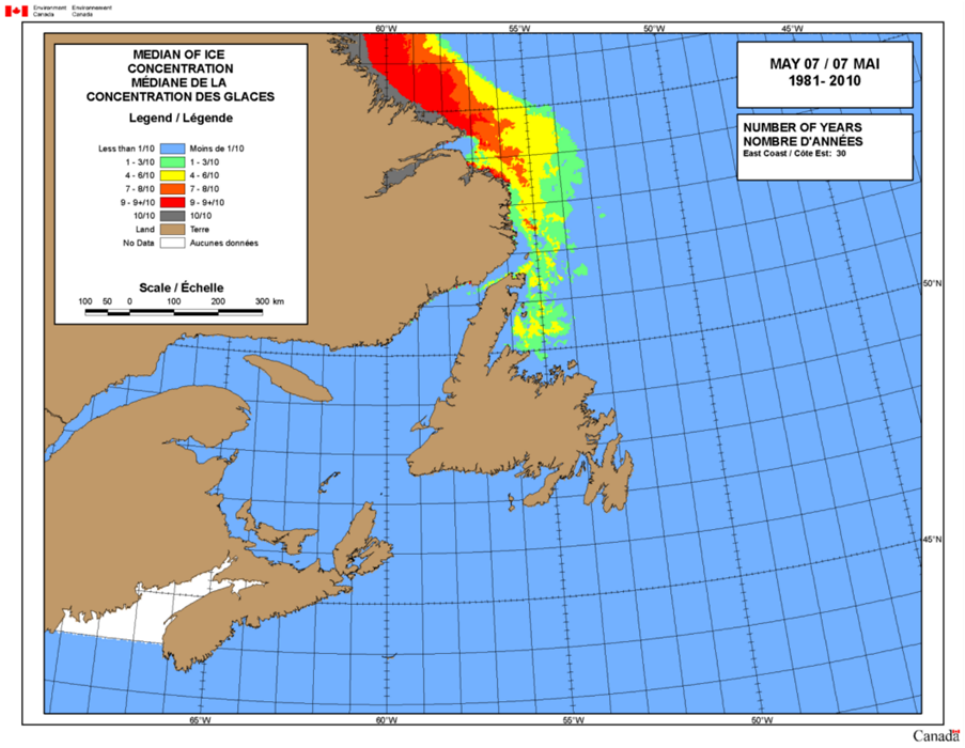


Figure 3.8 Major Ocean Currents and Surface Circulation Features in the Northwest Atlantic Ocean (Frantantoni and Pickart, 2007)

"Section 3.4.1 Sea Ice, page 3-10 *- Figures showing 30-year median sea ice coverage within the study area can be found in the Canadian Ice Service 30-Year Ice Atlas, and should be included in this section."*

Response:

Noted. The 30-year median sea ice coverage within the Study Area shown below for start to end of potential seismic operations (May and November). Open water throughout Study Area in 30 year based on median sea ice coverage (Figure 3.9) and Break-Up/Freeze-Up (Figure 3.10).



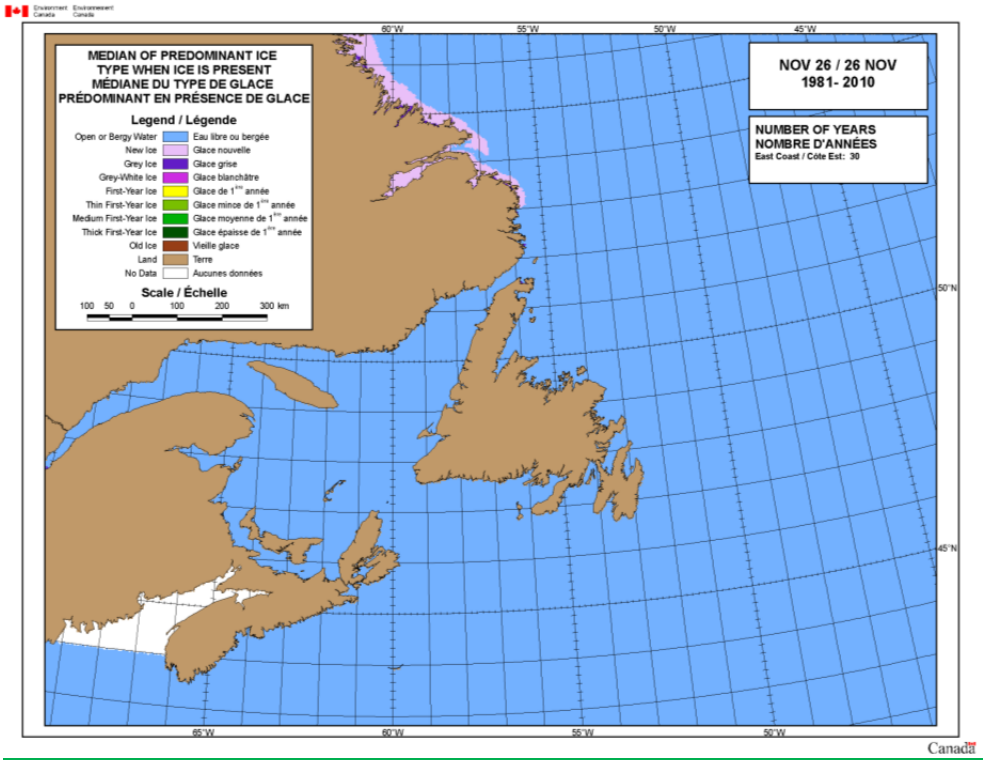
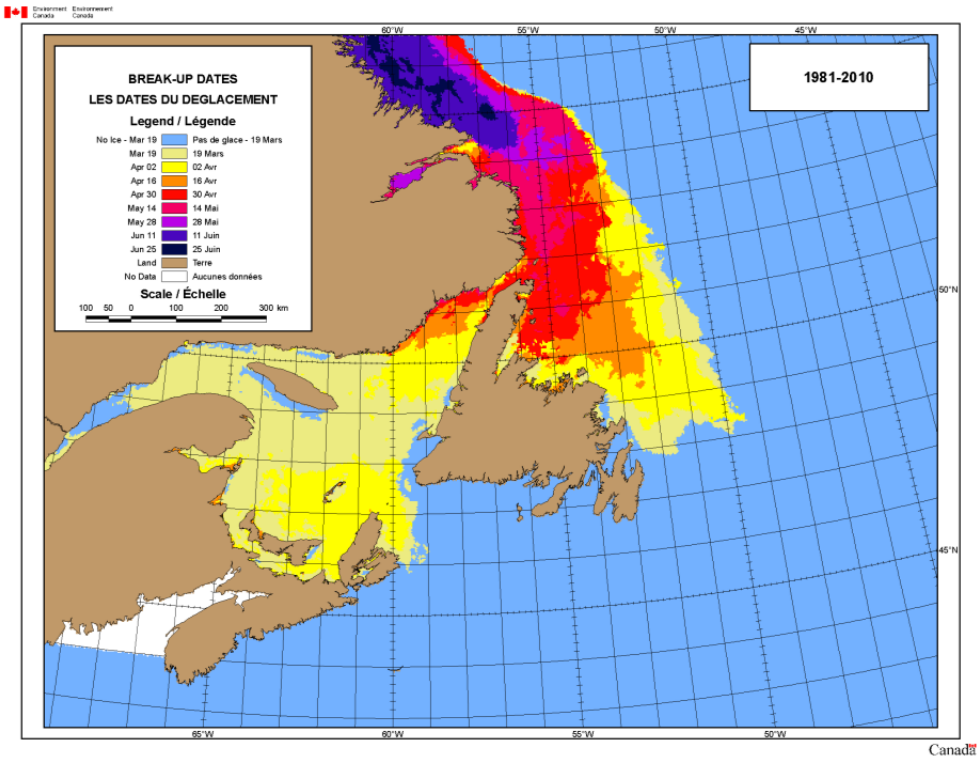


Figure 3.9 30-Year Median Concentration of Sea Ice in East Coast Waters, 1981-2010 (first week May (top) and last week November (bottom)) (CIS, 2011)



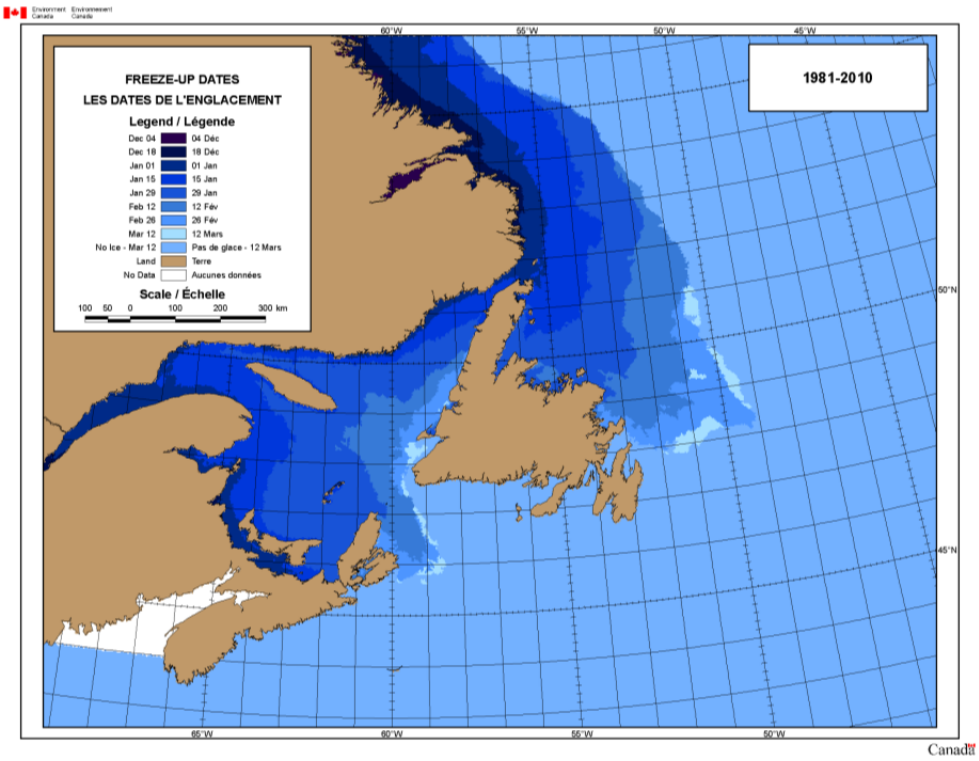


Figure 3.10 30-Year Break-Up and Freeze-Up dates Sea Ice in East Coast Waters, 1981-2010 (Break-Up (top) and Freeze-Up (bottom)) (CIS, 2011)

***"Section 3.4.2 Icebergs, page 3-10, Figure 3.7** – this requires amendment to provide a description for the x- and y-axis".*

Response:

The data presented in the original EA Fig 3.7 is from the SEA (2014). The X- axis should read ICOADS data regions and the y-axis should read frequency of iceberg type.

***"Section 4 Biological and Socioeconomic Environment, page 4-1** - As a general comment it is felt that the description of the biological and socioeconomic environment should be organized to reflect the accepted VECs e.g. Fish and Fish Habitat VEC; Seabirds and Migratory Birds VEC; Marine Mammals and Sea Turtles VEC; Sensitive and Protected Areas VEC; and Fisheries VEC. This structure would then flow to the description of Environmental Effects (i.e. Chapter 5)".*

Response:

Noted.

***"Section 4 Biological and Socioeconomic Environment, page 4-1, Table 4-3** - it is not clear whether the updated baseline information relative to species at risk noted in Table 4.1 includes information available from the Species at Risk Registry available on the national DFO website. This should be clarified with proper reference to same in Table 4.1 and it must also be ensured that the relevant sections of Chapter 4 of the EA that describe the various Species at Risk also include updated information that is available from the above noted registry. Also with respect to description of commercial fisheries, Table 4.1 only references DFO commercial fishery / landing data. A portion of the study area is located outside of the 200 mile EEZ and in such areas proponents should utilize NAFO catch data and information that may be available to describe commercial fishing / landings. Table 4.1 should include reference to this data/information and subsequent descriptions of commercial fishing provided in later sections of Chapter 4 should also make use of any relevant NAFO data / information."*

Response:

Table 4.1 amended as follows to reflect that the species at risk registry from the DFO website has been used.

Table 4.1 Baseline Data Updated Since the Eastern Newfoundland SEA (August, 2014).

Data	Section	Eastern Newfoundland SEA (August, 2014)	Polarcus Project-Based EIA	Data Source
High density areas and protection zones for corals, seamounts and sponges (Section 4.3)	4.3	2013 (Coral and sponge distribution); 2014 (Coral areas closed to bottom fishing)	2014 (Coral and sponge distribution); 2015 (Coral areas closed to bottom fishing)	NAFO (Northwest Atlantic Fisheries Organization)

Top 10 for measures of abundance and biomass (DFO Research Vessel (RV) Fisheries Surveys) (Section 4.4)	4.4	2005-2009	2010-2014	Fisheries and Oceans Canada Research Vessel (RV) Fisheries surveys conducted spring and fall, offshore Newfoundland by DFO Newfoundland
Fish species at risk and otherwise of special conservation concern (DFO Research Vessel (RV) Fisheries Surveys) (Section 4.4.2)	4.4	2005-2009	2010-2014	Fisheries and Oceans Canada Research Vessel (RV) Fisheries surveys conducted spring and fall, offshore Newfoundland by DFO Newfoundland **Species at Risk Public Registry - DFO**
Seabird seasonal distribution and abundance (Section 4.5.1)	4.5.1	2010 to 2013	2006 to December 2015	Environment Canada, Canadian Wildlife Service, Eastern Canada Seabirds at Sea database **Species at Risk Public Registry - DFO**
IBAs and seabird colony sites (Section 4.5.2)	4.5.2	IBA 2013; EC-CWS 2013	IBA 2016; EC-CWS 2016	Bird Studies Canada. 2016. Important Bird Areas of Canada Database. Port Rowan, Ontario: Bird Studies Canada. http://www.ibacanada.org; Atlantic Canada Colonial Waterbird database (EC-CWS, 2016)
Marine mammal sightings (Section 4.6.1)	4.6.1	Up to 2014	Up to 2015	Fisheries and Oceans Canada Marine Mammals Sightings Database
Ecologically and biologically sensitive areas (EBSAs) (Section 4.7.1)	4.7.1	DFO (2007 – 2013)	DFO (2007, 2013); CBD (2016)	Fisheries and Oceans Canada; Convention on Biological Diversity
Distribution of other species of commercial importance (DFO Research Vessel (RV) Fisheries Surveys) (Section 4.8.1)	4.8.1.1	2005-2009	2010-2014	Fisheries and Oceans Canada Research Vessel (RV) Fisheries surveys conducted spring and fall, offshore Newfoundland by the Fisheries and Oceans Canada.
DFO Fisheries catch data by weight and value (Section 4.8.1)	4.8.1.2	2008-2012	2010-2014	Fisheries landings (catch) data analysed by Fisheries and Oceans Canada Ottawa
DFO Commercial fishing locations (Section 4.8.1.1)	4.8.1.2	2008-2012	2010-2014	Fisheries landings (catch) data analysed by Fisheries and Oceans Canada Ottawa
DFO Key fisheries landed by species (Section 4.8.1.2)	4.8.1.2	2008-2012	2010-2014	Fisheries landings (catch) data analysed by Fisheries and Oceans Canada Ottawa

DFO Fish harvests by gear types (Section 4.8.1.3)	4.8.1.3	2008-2012	2010-2014	Fisheries landings (catch) data analysed by Fisheries and Oceans Canada Ottawa
Sealing (Section 4.8.1.4)	4.8.1.4	2011-2013	2015	Fisheries and Oceans Canada
Shipwrecks, UXO (Section 4.8.4)	4.8.4	2013	2016	The Department of National Defence

Response:

The titles of Tables 4.3, 4.4, 4.5 and 4.6 amended as follows to reflect that the species at risk registry from the DFO website has been used.

Table 4.3. Species Selection Rationale (Canadian RV Surveys, 2010-2014, Species at Risk Public Registry – DFO, 2017)

Table 4.4. Marine Fish Species at Risk within the Eastern Newfoundland Offshore Area (C-NLOPB, 2014, Species at Risk Public Registry – DFO, 2017)

Table 4.5. Bird Species at Risk within the Eastern Newfoundland Offshore Area (C-NLOPB, 2014, Species at Risk Public Registry – DFO, 2017)

Table 4.6. Marine Mammal and Turtle Species at Risk that are Known to or May Occur within the Study Area (C-NLOPB, 2014, Species at Risk Public Registry – DFO, 2017).

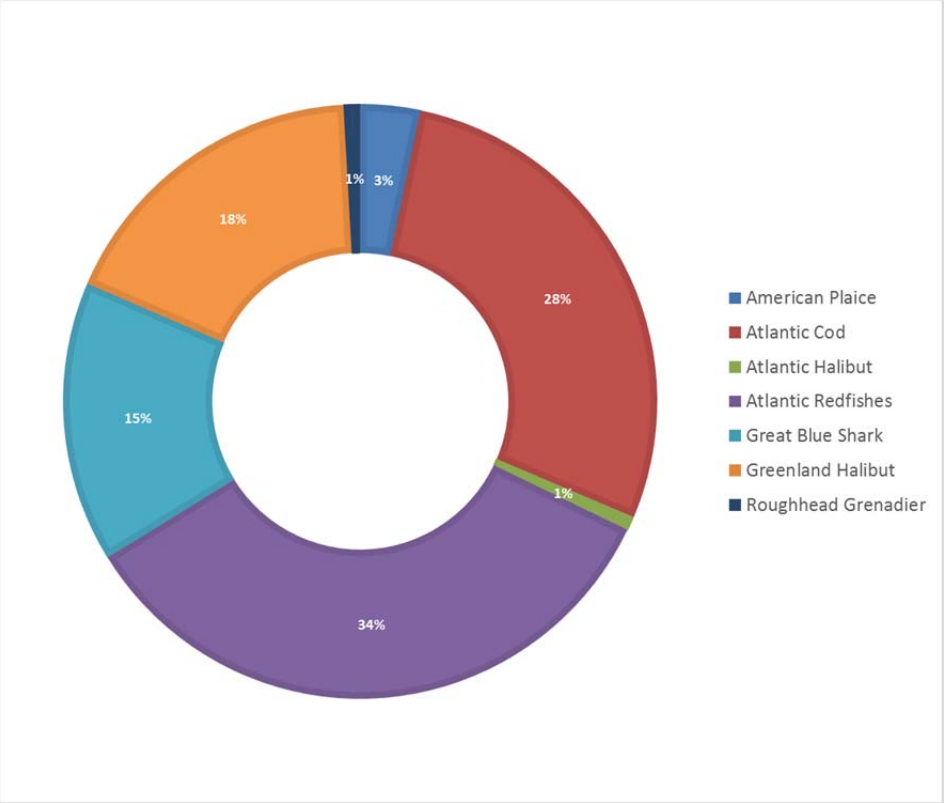
Section 4.8.1.2 does not present the output of NAFO catch data as NAFO catch data was not used for fishing outside the 200 mile EEZ. DFO catch landings data was the source for commercial fishing locations. These are two different data sources, but the NAFO specific data source was not used so the total catch weight and values presented are from DFO catch landings only, not NAFO. NAFO specific data has been used to prepare total catch weight and value tables related to fishing outside the 200 mile EEZ as follows.

Foreign (non-Canadian) Fishing Activity by NAFO Division (tonnes) (2010 – 2014) (NAFO Statlant 21A)

NAFO Division	2010	2011	2012	2013	2014	Total
3K	1	8				**9**
3L	14,204	12,948	11,687	10,659	10,068	**59,566**
3M	20,583	24,725	25,885	27,596	25,795	**124,584**
3N	12,424	12,441	12,899	13,704	8,617	**60,085**
Total	**47,212**	**50,122**	**50,471**	**51,959**	**44,480**	**244,244**

Foreign (non-Canadian) Fishing Activity by Species (2014) (NAFO Statlant 21A)

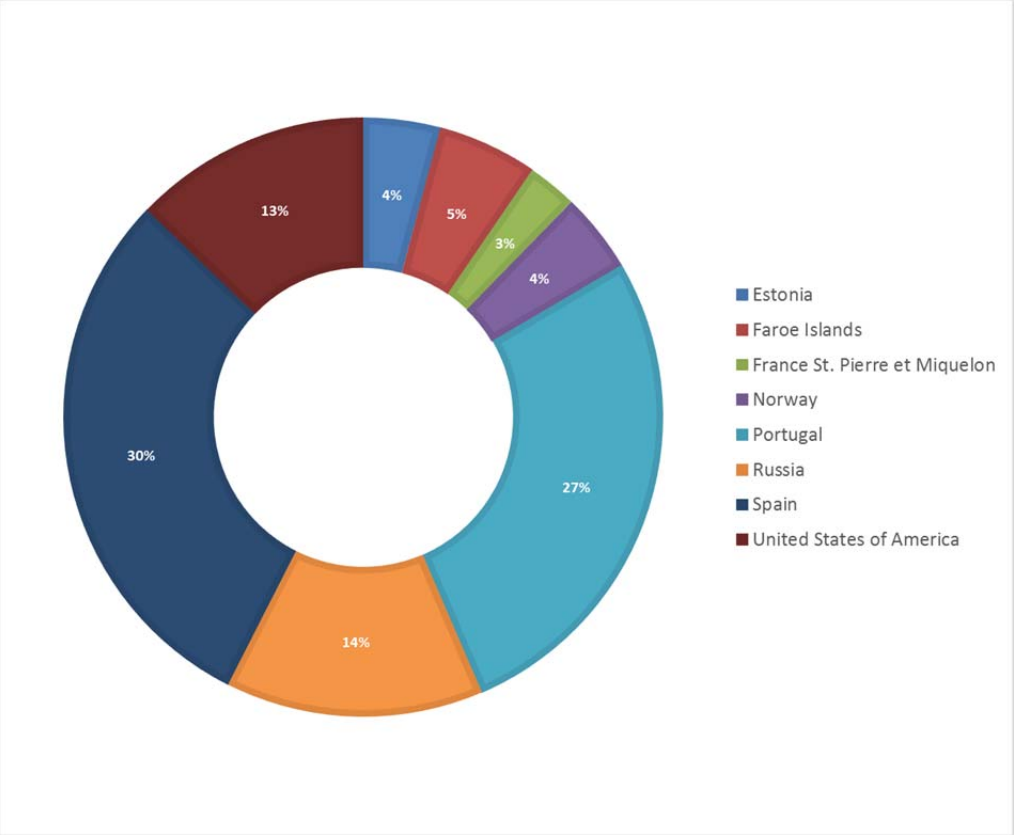
Species	Total Catch (tonnes)
American Plaice	2,162
Atlantic Cod	18,500
Atlantic Halibut	500
Atlantic Redfishes	22,433
Great Blue Shark	10,073
Greenland Halibut	11,613
Roughhead Grenadier	569
Total	**65,850**



***Most Landed species by percentage weight (tonnes) for foreign (non-Canadian) vessels, 2014* (NAFO Statlant 21A)**

Foreign (non-Canadian) Fishing Activity by Country (2014) (NAFO Statlant 21A)

Country	Total Catch (tonnes)
Estonia	2,716
Faroe Islands	3,530
France St. Pierre et Miquelon	1,756
Norway	2,827
Portugal	17,662
Russia	9,129
Spain	19,431
United States of America	8,394
Total	**65,445**



Total catch by percentage weight (tonnes) for foreign (non-Canadian) vessels, 2014 (NAFO Statlant 21A)

"Section 4.1 Plankton, Section 4.2 Benthos and Section 4.3 Deep-water Corals and Sponges, pages 4-2 to 4-4 *- similar to the comment made above these sections should all be included within a larger more inclusive Fish and Fish Habitat VEC. Also the descriptions seem to lack information to describe species that may be (or that may be expected to be) present, their relative abundance, relative distribution and relative variability. It is also not clear to what extent any data gaps within the Eastern Newfoundland Offshore SEA have been acknowledged /*

identified / addressed and whether any new information has been brought to bear in the description. This should be clarified and amended accordingly. For example there maybe new and updated distribution data relative to coral and sponge presented in the 2016 CSAS report 'Delineation of Coral and Sponge Significant Benthic Areas in Eastern Canada Using Kernel Density Analyses and Species Distribution Models' (CSAS, Research Document 2016/093) which may have relevance to appropriate sections of this project EA."

Response:

Noted. An occurrence of the various species summary table is already presented in Section 4.4.

The Eastern Newfoundland Offshore SEA has been a detailed source of information in preparation of the EA report. It is acknowledged that data sourced from the Eastern Newfoundland Offshore SEA could have been more clearly highlighted across the EA report, as per an above comment. Various additional sources of data have also been used in order to compile the EA report and are referenced in Section 4 the Table 4.1.

Data gaps have been taken into account during the assessment, however it is noted that the data gaps identified in the Eastern Newfoundland Offshore SEA have not been presented in the EA in relation to Fish and Fish Habitat, Fisheries and Other Ocean Users, Seabirds, Marine Mammals, Sea Turtles, species at Risk and Sensitive Areas.

***"Section 4.4 Fish, page 4-4** – this section and the related Appendix A should include reference to important marine macro-invertebrate species (e.g. Snow crab, Northern shrimp etc.) that may be present within the project / study area. Despite the risk of duplication it is felt that some of the key information presented within the noted Tables in Appendix A should / could be brought forward into the main body of this section of the project EA. Also similar to the comment provided earlier it is not clear to what extent Data gaps associated with Fish and Fish habitat VEC noted within the Eastern Newfoundland Offshore SEA have been acknowledged / identified / addressed and whether any new information has been brought to bear in the description provided in Section 4.4. This should be clarified and amended accordingly."*

Response:

It is felt that bringing the information presented within the Tables in Appendix A forward into Section 4.4 would not add value to the EA overall.

The following text is added to Section 4.4:

Snow crab (*Chionoecetes opilio*) and Northern shrimp (*Pandalus borealis*) are generally found in waters from inshore regions to the edge of the continental shelf. Both species occur within the south and west of the Study Area (Figure 4.43 and Figure 4.44) and are commercially significant within the region. Within NAFO Divisions 3KLMN, snow crab was the most landed commercial species between 2010 and 2014 representing 52.3 percent of the total weight. Shrimp were the third most landed species representing 14.3 percent of the total weight (refer to Section 4.8.1.2).

The Eastern Newfoundland Offshore SEA has been a detailed source of information in preparation of the EA report. Various additional sources of data have also been used in order to compile the EA report and are referenced in Section 4, Table 4.1.

"Section 4.4 Fish, page 4-7 *with respect to information presented within Table 4.3 and the 4th paragraph on page 4-7 and Figure 4.4 (page 4-11) reference to "broadhead wolffish" is confusing. Is the broadhead wolffish the same species as the Northern wolffish (Anarhichas denticulatus) if so then Table 4.3, Figure 4.4 and the noted sentence should be amended accordingly. Care should be taken when using common names to ensure that the "correct" common name is used throughout the document. "*

Response:

The Northern Wolffish (*Anarhichas denticulatus*) referenced in the Table 4.4 (Page 4-25) is indeed also commonly called "*broadhead wolffish*" Noted that care should be taken when using common names.

"Section 4.6 Marine Mammals and Sea Turtles, page 4-40 *- these sections are inadequate a more detailed description of marine mammals and sea turtles is required including among other things the likelihood of occurrence of the various species within the study area. Despite the risk of duplication it is felt that some of the key information presented within the noted Tables in Appendix A as well as within the noted DFO marine mammal sightings database should / could be brought forward into the main body of this section of the project EA. Also similar to earlier comments it is not clear to what extent data gaps associated with marine mammals and sea turtles VEC noted within the Eastern Newfoundland Offshore SEA have been acknowledged / identified / addressed and whether any new information has been brought to bear in the description provided in Section 4.6. This should be clarified and amended accordingly".*

Response:

It is felt that bringing the information presented within the Tables in Appendix A forward into Section 4.6 would not add value to the EA overall. The likelihood of occurrence of the various species within the study area is presented in the Tables in Appendix A.

More detail for Section 4.6 as follows.

North Atlantic Right Whale (*Eubalaena glacialis*)

Concentrated in the western North Atlantic, the North Atlantic Right Whales is considered to be the most endangered large whale in the world, with approximately 300 to 350 individuals remaining (C-NLOPB, 2014). The species has 'Endangered' COSEWIC status and is listed as 'Endangered' on SARA Schedule 1 (Table 4.6).

An Adult North Atlantic right whale averages 13 to 16 metres in length and 40,000 to 70,000 kilogrammes in weight. The mean age at first reproduction is ten years for females and is likely similar for males. Females typically give birth every three to five years, while a likely gestation period of over a year. North Atlantic Right whales are plankton feeders, with primary prey being the copepod *Calanus finmarchicus*, which they capture by filtering seawater through the baleen plates in their mouths.

North Atlantic Right whales are generally found in waters with surface temperatures ranging from 8 to 15 degrees Celsius, in areas that are 100 to 200 metres deep. Shifts in the distribution and abundance of their primary prey items can dramatically affect right whale distribution within their range. Right whales are only rarely sighted within the Study Area, with a peak occurrence between August and October (Table 4.8) (C-NLOPB, 2014).

Humpback Whale (Megaptera novaeangliae)

In Canada, Humpbacks are found on both the east and west coasts, and belong to separate populations. The range of the Western North Atlantic population of Humpback Whales extends north to Labrador. This Western North Atlantic population was assessed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and was designated as Not at Risk.

Humpback whales are highly migratory, with seasonal movements between temperate to arctic feeding areas and low-latitude breeding areas. In the North Atlantic six distinct feeding areas: Gulf of Maine, Gulf of St Lawrence, Newfoundland and Labrador, West Greenland, Iceland and North Norway. Humpback whales are often sighted singly or in groups of two or three, except during breeding and feeding times, where groups can be as large as 15 individuals. Humpback whales feed on small schooling fish and krill. They often feed cooperatively in groups.

Adult humpback whales average 13 to 16 metres in length with females growing larger than males. The average age at sexual maturity is nine years. Calving occurs between January and April after a gestation of approximately 12 months. The inter-calving interval for humpback whales is approximately two years.

Humpback whales are considered to be relatively common within the Study Area (Figure 4.28) (C-NLOPB, 2014), although specific occurrence data is limited.

Blue Whale (Balaenoptera musculus)

The blue whale is widely distributed throughout the world's oceans and occurs in coastal, shelf and oceanic waters. The Atlantic Population, occurring in the Study Area, is listed as 'Endangered' on SARA Schedule 1.

An adult blue whale can reach up to 30 metres in length. The species reaches sexual maturity at between 5 and 15 years old for both sexes. The mating and calving season occurs from late fall to mid-winter in Northern hemisphere, with a gestation period of 10 to 11 months. Females have an inter-calving interval of 2 to 3 years.

In the western North Atlantic, blue whales occur in the Gulf of St. Lawrence and east of Nova Scotia in spring, summer and fall and off southern Newfoundland in winter. Blue whale usually occur alone or in small groups. Distribution during feeding seasons is largely dependent on the areas of high concentrations of krill (euphausiids), their primary prey. The North Atlantic population of blue whales was severely depleted by whaling, and sightings of this species anywhere within its range are quite uncommon. Within the Study Area, blue whale are thought to occur October to April (Table 4.8) (*C-NLOPB, 2014*).

Fin Whale (Balaenoptera physalus)

Fin whale are widely distributed in all the world's oceans but typically occur in temperate and polar regions. The Atlantic population is listed as 'Special Concern' by SARA (Schedule 1) and COSEWIC.

The fin whale is one of the fastest whales on earth, and can sustain speeds of up to 37 kilometres per hour and burst speeds of over 40 kilometres per hour. An adult fin whales

average 18 to 20 metres in length and reaches sexual maturity at 6 to 7 years for males and 7 to 8 years for females. Mating and calving generally occurs in temperate waters during winter, before the whales migrate to northern latitudes during the summer to feed. The primary prey of the fin whale is small schooling fish such as capelin, as well as krill.

Fin whales typically occur in coastal and shelf waters, as well as in oceanic waters. They have been observed alone and in pairs but groups of up to 20 individuals are often seen on feeding grounds. The fin whale is common in the Grand Banks and the Study Area, particularly during the summer months, and its distribution is associated with the presence of abundant food supply (e.g. capelin) (Table 4.8, Figure 4.28) (C-NLOPB, 2014).

Sei Whale (*Balaenoptera borealis*)

Sei whales can reach up to 18 metres in length. They reach sexual maturity at between 5 and 15 years of age. The species has a gestation period of between 10.5 to 12 months. Mating and calving typically occur during winter months. Sei whale generally feed on copepods, euphausiids, and small fish.

The Atlantic population considered 'Data Deficient' by COSEWIC. The species migrate between tropical to subtropical latitudes in winter and temperate and subpolar latitudes in summer, staying mainly in water temperatures of eight to 18 degrees Celsius. Winter distribution seems to be widely dispersed and is not fully mapped; summer distribution is highly variable, but in the western North Atlantic it is generally north of southern Nova Scotia.

Sei whale typically occur in offshore, pelagic habitats; appear to be associated with the continental shelf edge in the northwest Atlantic. Although it has a relatively wide distribution overall, this species is considered uncommon in the Eastern Newfoundland Offshore Area and the Study Area (Table 4.8, Figure 4.28) (*C-NLOPB, 2014*).

Minke Whale (*Balaenoptera acutorostrata*)

Adult minke whales average seven to ten metres in length, the smallest of the baleen whales. Minke whales are assessed as 'Not at Risk' by COSEWIC and minke whale populations are considered to be more secure than other baleen whales. Both male and female whales reach sexual maturity at about seven to eight years. The gestational period for minke whale is 10 to 11 months, with calves birthed every two years on average.

The preferred prey items of the minke whale are sand lance and capelin, although other small schooling fishes, copepods, and krill also likely make up a large part of their diet.

Very little information is available on winter distribution of minke whale (see Marine Mammals Data Gaps Section TBC), however, the species has been reported along the western North Atlantic south of 40 degrees latitude. Minke whale migrate northward from calving grounds during spring and summer. They are a relatively solitary species; usually seen individually or in small groups of two or three. Larger groups have been observed in areas of concentrated feeding (*C-NLOPB, 2014*).

Minke whale appear to prefer shallow water (less than 200 metres). They are commonly observed on the Grand Banks and within the Study Area in the spring and summer,

associated with the presence of their prey species (*Piatt et al., 1989*) (*C-NLOPB, 2014*) (Figure 4.28).

Sperm Whale (*Physeter macrocephalus*)

The sperm whale has a worldwide distribution and is the largest of the toothed whales, growing to a length of approximately 20.5 metres with a worldwide distribution. The species is considered to be 'Not At Risk' by COSEWIC.

Adults reach reproductive maturity at between 7 and 13 years of age, and have a gestation period of 14 to 16 months. The interval between births is typically three to six years. Sperm whale routinely dives to depths of hundreds of meters and may occasionally dive as deep as 3000 metres. Their primary prey item is squid (*C-NLOPB, 2014*).

Sperm whale range as far north and south as the edges of the polar pack ice, although they are most abundant in tropical and temperate waters where temperatures are higher than 15 degrees Celsius. Distribution is linked to social structure; adult females and juveniles generally occur in tropical and subtropical waters, whereas adult males are commonly alone often occurring in higher latitudes outside of the breeding season. They generally distributed over large areas that have high secondary productivity and steep underwater topography (*C-NLOPB, 2014*).

Sperm whales were observed in small numbers in the waters off Eastern and Southern Newfoundland during aerial surveys conducted in the summer of 2007 (two and nine individuals, respectively *(Lawson and Gosselin, 2009))* and have been sighted across the Study Area (Figure 4.29) (*C-NLOPB, 2014*).

Northern Bottlenose Whale (*Hyperoodon ampullatus*)

Adult northern bottlenose whales grow to approximately ten metres in length. Their pronounced beak is white on males and grey on females.

The Davis Strait-Baffin Bay-Labrador Sea population is listed by COSEWIC as a species of 'Special Concern', while localized Scotian Shelf population considered 'Endangered' by SARA (Schedule 1) and COSEWIC. The Scotian Shelf population is believed to be non-migratory, while the Labrador population migrates north to south seasonally.

The Labrador population Northern Bottlenose whale mate and give birth during April. Females reach reproductive age at between 8 to 13 years. Single offspring are produced every two years. The primary prey item of the Northern bottlenose whale is squid (*C-NLOPB, 2014*).

Northern bottlenose whales live in deep water areas of the North Atlantic and are rarely found in waters less than 800 metres deep. They are capable of remaining submerged for over an hour (*C-NLOPB, 2014*).

There are two areas of northern bottlenose whale abundance in the western North Atlantic: Davis Strait off northern Labrador and "the Gully" on the Scotian Shelf. Northern bottlenose whales are known to occur in the Grand Banks and within the Study Area, and were sighted in the waters off Eastern and Southern Newfoundland during aerial surveys conducted in 2007 (*Lawson and Gosselin, 2009*) (Figure 4.29).

Killer Whale (*Orcinus orca*)

Killer whales are large members of the dolphin family. Adult male killer whales can reach a length of 6 to 8 metres while females can reach a length of 5 to 7 metres. Males reach sexual maturity at about 13 years, and females at 14 to 15 years. Calving occurs from autumn to spring, with an average inter-calving period of approximately five years. Killer whales have a wide range of prey species including marine mammals, fish and squid.

Killer whales are globally fairly abundant and have been observed in all oceans of the world. They prefer warm waters but have been reported in cold waters as well and are not known to be reliably migratory. The greatest abundance of killer whales is found within 800 kilometres of major continents and they often travel in close-knit matrilineal groups of a few to tens of individuals (C-NLOPB, 2014).

The Northwest Atlantic / Eastern Arctic population is assessed as being of 'Special Concern' by COSEWIC. Killer whales occur year-round in small numbers within the SEA and Study Area (Figure 4.29) (Lien et al., 1988).

Long-finned Pilot Whale (*Globicephala melas*)

Long-finned pilot whales are members of the dolphin family. Adult long-finned pilot whales reach a length of approximately 3.5 to 4.5 metres, with males somewhat larger than females. Calving occurs year-round, but typically during the summer months. Calves have a gestation period of 12 to 15 months.

Long-finned pilot whales feed primarily on squid but known to consume octopus, cuttlefish and some fish species as well (*C-NLOPB, 2014*).

Widely distributed throughout the world's oceans, and abundant throughout the North Atlantic as far north as 70 degrees north, long-finned pilot whale are considered 'Not at Risk' by COSEWIC.

There is no evidence for marked north-south migration, but long-finned pilot whales may migrate inshore or offshore seasonally in response to prey availability.

During aerial surveys conducted in summer of 2007, ten observations totalling 65 individual long-finned pilot whales were recorded off Southern Newfoundland, although none were observed in the Eastern Newfoundland Offshore Area (*Lawson and Gosselin, 2009*, *C-NLOPB, 2014*).

Small Dolphin Species

In addition to killer whale and long-finned pilot whale, five dolphin species may be found in Study Area: 1) Atlantic white-sided dolphin, 2) White-beaked dolphin, 3) Common bottlenose dolphin, 4) Risso's dolphin and 5) Short-beaked common dolphin (Figure 4.30).

All five species have been assessed by COSEWIC and populations were considered 'Not at Risk'. Atlantic white-sided dolphins are considered abundant throughout their range.

Diet for most small dolphin species consists of a variety of small schooling fishes and squid; Risso's dolphin feeds almost exclusively on squid.

All species occur in temperate to warm waters in the North Atlantic. The Atlantic white-sided dolphin and white-beaked dolphin also inhabit sub-Arctic portions of the North Atlantic. The short-beaked dolphin also inhabits southern waters off the coast of Venezuela and the Gulf of Mexico. Seasonal migration patterns for these species are poorly understood.

Most commonly found in groups of 30 to 70 individuals; however, larger groups numbering several hundred individuals are also observed. Small dolphin species often associate and feed with large baleen whales, and are known to form mixed dolphin species groups.

Atlantic white-sided dolphins may be found throughout the SEA Area, and have been recorded within 30 kilometres of the White Rose site during vessel-based surveys (*Wiese and Montevecchi, 1999, C-NLOPB, 2014*).

Harbour Porpoise (*Phocoena phocoena*)

The harbour porpoise is a small compared to other cetaceans, growing to a length of 1.2 to 1.4 metres. The species is most commonly observed near the coast and will enter small bays and estuaries.

Harbour porpoises in the Western North Atlantic Population have been divided into three different subpopulations: The Bay of Fundy/Gulf of Maine, the Gulf of St. Lawrence and the Newfoundland populations. The boundaries between these sub-populations are not well defined as there is some genetic overlap.

Most mature females reproduce each year after they reach sexual maturity at 3.5 years old. The gestational period is 10 to 11 months. Harbour porpoises feed on small schooling fish. Harbour porpoise are found in shelf waters throughout the northern hemisphere, usually in waters colder than 17 degrees Celsius. They are usually seen in small groups of one to three animals often including at least one calf (C-NLOPB, 2014).

Harbour porpoise are present in northern coastal waters during the summer months. Off Eastern Newfoundland, harbour porpoises are most likely to be found in the shallower waters of inshore areas (C-NLOPB, 2014).

Harp Seal (*Pagophilus groenlandicus*)

The harp seal is the most abundant pinniped in the northwest Atlantic, with an estimated population size of 7.7 million (2012). Populations are considered secure in the SEA region, having increased by 400 percent since the 1970s (*C-NLOPB, 2014*).

Adult harp seals may reach a length of approximately 1.7 to 2.0 metres, with both sexes similar in size. Pups are born in late February or March on the ice and females will nurse their pups for approximately 12 days, then mate and disperse. Their diet varies considerably with age and season and includes a variety of fish species, predominantly capelin, sand lance, Arctic cod, and flatfish such as halibut. Other fish and invertebrates such as crustaceans, krill, squid and shrimp are also taken.

Older harp seals form large moulting concentrations on the sea ice off north-eastern Newfoundland and in the northern Gulf of St. Lawrence during April and/or May. Following the moult, seals disperse and eventually migrate northward. Small numbers of harp seals

may remain in southern waters throughout the summer while a portion of the population remains in the Arctic (*C-NLOPB, 2014*).

Hooded Seal (*Cystophora cristata*)

Populations of hooded seal are considered secure in the SEA region; a recent study estimated the population at approximately 592,100 individuals (*C-NLOPB, 2014*). The species has been assessed by COSEWIC as 'Not at Risk'.

Adult hooded seals can reach a length of approximately 2.0 metres for females and 2.6 metres for males. They have a very short breeding season and congregate to breed on pack ice in mid-March. The largest whelping concentration in the Northwest Atlantic occurs off the coast of southern Labrador or northern Newfoundland (the 'Front'), as well as in the Davis Strait and the Gulf of St. Lawrence. After breeding, they move to moulting areas off Greenland.

Hooded seals feed in the Canadian Arctic and Greenland during the summer months, migrating to the Gulf of St. Lawrence in December and January and leaving the area in April to May. Their diet includes a variety of fish species, including cod, haddock, herring and mackerel. Crustaceans, krill, squid, shrimp and other invertebrates are also taken.

Hooded seals are highly pelagic; it is not uncommon to see them outside of their normal range. They are relatively common in the SEA Area in the winter and spring, and small numbers may be found in the summer as well (*Andersen et al., 2012, Lesage et al., 2007*, *C-NLOPB, 2014*).

Grey Seal (*Halichoerus grypus*)

Adult grey seals can grow to a length of approximately 1.6 to 2.0 metres for females and 2.5 to 3.3 metres for males.

Populations of grey seal are considered secure in the region of the Study Area. The Canadian population is estimated at 250,000 individuals and grey seals have been assessed by COSEWIC as 'Not at Risk'.

Grey seals give birth between September and March, with peak pupping occurring in January. Their diet includes a variety of fish species, including capelin, sand lance, herring and Atlantic cod. They are largely demersal and benthic feeders (*C-NLOPB, 2014*).

Grey seal Inhabit cold temperate to sub-Arctic areas in North Atlantic waters over the continental shelf. The largest colony of grey seals is found off Nova Scotia. They have been recorded year-round in the SEA Area, however, are primarily present in the summer months (*Lesage et al., 2007*).

Turtles

There are three species of sea turtles that occur within the Study Area; Leatherback turtle, Loggerhead turtle and Kemp's ridley turtle.

Leatherback

The Atlantic population of leatherback turtles is listed as 'Endangered' under Schedule 1 of SARA, while the loggerhead is considered endangered by COSEWIC.

The leatherback is the largest living turtle, measuring up to 2.19 metres in length. Leatherbacks nest on open beaches in the tropics. Females lay an average of six clutches per season. The preferred prey for leatherbacks is jellyfish and other gelatinous organisms.

Leatherbacks range throughout the Atlantic, Pacific and Indian oceans. In Atlantic Canadian waters they are present from April to December and most numerous from July to September. They are predominantly pelagic, typically inhabiting coastal shelf waters to a depth of less than 200 metres (*C-NLOPB, 2014*).

Population estimates for leatherbacks in the North Atlantic range from 34,000 to 94,000 individuals, and they are thought to be a regular (albeit uncommon) part of the Newfoundland marine fauna in the summer and fall (*COSEWIC, 2012b; Goff and Lien, 1988*). The south coast of Newfoundland, in particular the Placentia Bay area, is a relatively high-use habitat for this species (*Templeman, 2007; COSEWIC, 2012b*).

Loggerhead

The loggerhead is the largest hard-shelled turtle in the world, typically reaching 0.85 to 1.0 metres in length. Loggerheads nest in the southern United States and in tropical areas, laying four clutches per season, and will go two to three years between breeding seasons. Their main prey is crustaceans, molluscs and jellyfish (*C-NLOPB, 2014*).

Loggerheads are the most abundant sea turtle in North American waters. They wander widely in their range from coastal areas to more than 200 kilometres from shore. In Eastern Canada, they are seldom found in nearshore waters. Loggerheads are less common than leatherbacks in Eastern Canadian waters (*Breeze et al., 2002*).

Kemp's ridley

Kemp's ridley is the smallest sea turtle, at 0.6 to 0.7 metres in length. They are only rarely found in Canadian waters and they are considered an accidental visitor. The species is considered 'Critically Endangered' by the IUCN.

Kemp's ridley turtles nest exclusively in the Gulf of Mexico where they lay an average of 2.5 clutches per season. Sex determination of marine turtle hatchlings is temperature dependent (*C-NLOPB, 2014*).

Adult Kemp's ridley turtles rarely range beyond the Gulf of Mexico, but juveniles can be found as far north as Newfoundland. The number of Kemp's ridley turtles that visit the Eastern Newfoundland Offshore Area is unknown, but this species is likely to be extremely rare in the Study Area.

The Eastern Newfoundland Offshore SEA has been a detailed source of information in preparation of the EA report. Various additional sources of data have also been used in order to compile the EA report and are referenced in Section 4, Table 4.1.

"Section 4.6.3 Species at Risk, page 4-40 *- as noted above it is felt that the Species at Risk VEC should be discussed in its own section and include fin fish, marine mammals and sea turtle Species at Risk. This section makes no reference to the role, purpose and information available within the various Recovery Strategies, Action Plans and/or Management Plans that have been developed for Species at Risk – all of which are available from the Species at Risk public registry. This section requires amendment accordingly specifically noting the recent development of an Action Plan for the Northern Bottlenose Whale (Hyperoodon ampullatus), Scotian Shelf population and a Management Plan for the Sowerby's Beaked Whale (Mesoplodon bidens). Also it is not clear to what extent data gaps associated with the species at risk VEC noted within the Eastern Newfoundland Offshore SEA have been acknowledged / identified / addressed and whether any new information has been brought to bear in the description provided in Section 4.6.3. For example information on presence/ likelihood of occurrence of northern bottlenose whales from the Scotian Shelf population which has come out of surveys completed in 2016 by Dalhousie University in the Flemish Cap / Flemish Pass areas. This section should be clarified and amended accordingly."*

Response:

Noted. The following action / management plans could not have been referenced as these reports were not published at the time of EA submission.

- Management Plan for the Sowerby's Beaked Whale (Mesoplodon bidens) in Canada, published in 2017
- Action Plan for the Northern Bottlenose Whale (Hyperoodon ampullatus), Scotian Shelf population, in Atlantic Canadian waters- published in 2017.

"Section 4.7.1 Ecologically and Biologically Significant Areas, page 4-44 *– with respect to the 1st paragraph we no longer reference the Placentia Bay Grand Banks Large Ocean Management Area as it is now considered to be part of the Newfoundland and Labrador Shelves Bioregion. As such it is felt that the first sentence should be reworked to indicate that "A number of EBSAs have been identified in the Newfoundland and Labrador Bioregion (Templeman 2007, DFO 2013b)". With respect to the second sentence it should be amended to note that EBSAs are more than important areas for marine mammals and turtle species, they are also geographically or oceanographically discrete areas that provide important services to one or more species/populations of an ecosystem or to the ecosystem as a whole, compared to other surrounding areas or areas of similar ecological characteristics".*

Response:

A number of EBSAs have been identified in the Newfoundland and Labrador Bioregion (Templeman 2007, DFO 2013b). These EBSAs are identified as geographically or oceanographically discrete areas that provide important services to one or more species/populations of an ecosystem or to the ecosystem as a whole, compared to other surrounding areas or areas of similar ecological characteristics. Among the criteria for the identification, evaluation and selection of these important areas was their importance to marine mammals and seabirds in terms of biodiversity, density and importance for reproduction and survival.

"Section 4.7.1.1 EBSA Within the Study Area, page 4-45 *– only three EBSA have been identified / described by DFO within the project study area; the Northeast Shelf and Slope, the Virgin Rocks, and the Orphan Spur. The Orphan Knoll and the Slopes of the Flemish Cape and Grand Bank are coral and sponge and/or seamount closures that have been identified by NAFO and may be better suited to include within Section 4.7.2 Other Protected Areas. It is felt that these sections should be amended accordingly."*

Response:

Noted. It is acknowledged that a cross reference to Section 4.3 Deep-water corals and sponges could have been added to Section 4.7.2; however, the presence of coral and sponge and/or seamount closures has been presented in the EA and considered during the assessment process.

"Section 4.7.2 Other Protected Areas, page 4-47 *– as noted above it is felt that this section should be amended to include the noted NAFO coral and sponge closures and seamount closures areas. This section should also note that Ecological Risk Assessments (ERA) designed to evaluate the risk posed by bottom contact fisheries on significant coral and sponge communities have been carried out on a number of offshore areas identified in the above noted 2016 CSAS report (2016/093) including Tobin's Point. The areas covered by the ERA are being proposed as fisheries closures and extensive consultations on each area are currently underway."*

Response:

Noted. It is acknowledged that a cross reference to Section 4.3 could have been added to Section 4.7.2. NAFO coral and sponge closures and seamount closures areas are presented in Figure 4.1. It is acknowledged that there are areas covered by the ERA that are subsequently being proposed as fisheries closures.

"Section 4.7.2 Other Protected Areas, page 4-47, 2nd paragraph, first line *– the proponent should also indicate that MPAs may also protect important fish and marine mammal habitat and endangered aquatic species. The 2nd line of this paragraph should be amended to reflect that the correct name for the noted MPA is the "Eastport MPA" rather than the "Eastport Duck Island MPA" as written. With respect to the 4th paragraph as noted above the Placentia Bay Grand Banks Large Ocean Management Area is currently acknowledged to be a part of the Newfoundland and Labrador Shelves Bioregion and it was never considered an "offshore protected area". As such it is felt that this paragraph should be amended accordingly."*

Response:

We propose the following edits to the paragraphs in question in Section 4.7.2 Other Protected Areas:

An Oceans Act Marine Protected Area (MPA) is a protective designation that protects fish and marine mammal habitat, endangered aquatic species and the health of marine ecosystems and their resources. The Eastport MPA site is currently the only MPA located in Eastern Newfoundland (Figure 4.31), and therefore there are no designated sites within or close to the Study Area. The Eastport site protects two marine and coastal areas of the Eastport Peninsula *(DFO, 2013d).*

The Placentia Bay Grand Banks Large Ocean Management Area (LOMA), which covers NAFO areas 3LNOPsPn, and therefore the Grand Banks, Flemish Cap, and Orphan Knoll is within the vicinity of the study area. This area was identified because it possesses important living and non-living marine resources, areas of high biological diversity and productivity and increasing development pressures and competition for ocean space and resources. In addition, Representative Marine Areas (RMAs) are identified by Parks Canada for each of their 29 marine regions. Four preliminary RMAs exist within the Grand Banks marine region, of which two are offshore and within the Study Area (Figure4.31). Hydrocarbon exploration and exploitation are prohibited within National Marine Conservation Areas (*Parks Canada, 2008*).

"Section 4.8.1.1 Commercial Fishing Locations and Effort, page 4-47 to 4-64 *- the figure provided on page 4-48 requires a number and title. Also with respect to description of commercial fishing locations and effort a portion of the study area is located outside of the 200 mile EEZ. In these areas proponents are encouraged to utilize NAFO catch data and information that may be available to describe commercial fishing / landings. It is not clear if this section makes use of such data this should be clarified and the section amended if necessary. It is also that in addition to the information presented (e.g. see Section 4.8.1.2 Table 4.7) this section should provide additional information including catch weight by species and value".*

Response:

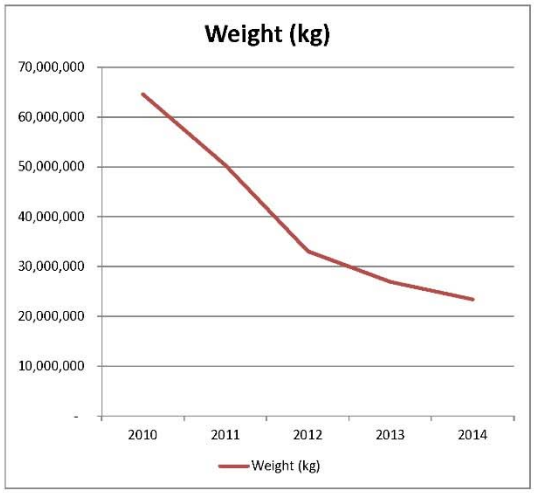
In the provided EA report, the Figure on page 4-48 is referenced as Figure 4.32 with the title "*NAFO subdivision*", a formatting error has allowed the title to be on a different page to the figure. Page 4-47 acknowledges the repartition of jurisdiction: "*The Government of Canada has jurisdiction over fish stocks and fishing activities within a 200 nautical mile limit and for sedentary species across the entire continental shelf. Beyond that 200 mile limit, the North Atlantic Fisheries Organization (NAFO) manages groundfish activities and other resources"*.

Section 4.8 presents the output of DFO catch landings data and DFO was the source for commercial fishing locations. It is acknowledged that this may not be clear to the reader.

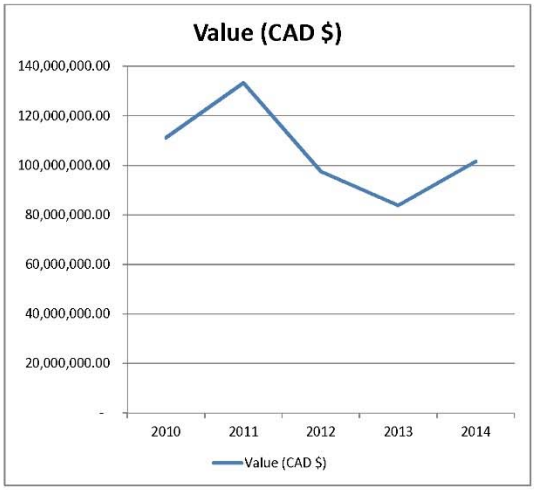
The total catch weight and value by species from NAFO data for the years 2010 to 2014 in relation to the study area is presented as follows.

Year	Weight (kg)	Value (CAD $)
2010	64,542,895	111,149,913.85
2011	50,344,786	133,244,275.60
2012	33,064,150	97,466,424.21
2013	26,912,258	83,761,775.98
2014	23,395,345	101,514,889.69
Total	**198,259,434**	**527,137,279.33**
Average	**39,651,887**	**105,427,456**

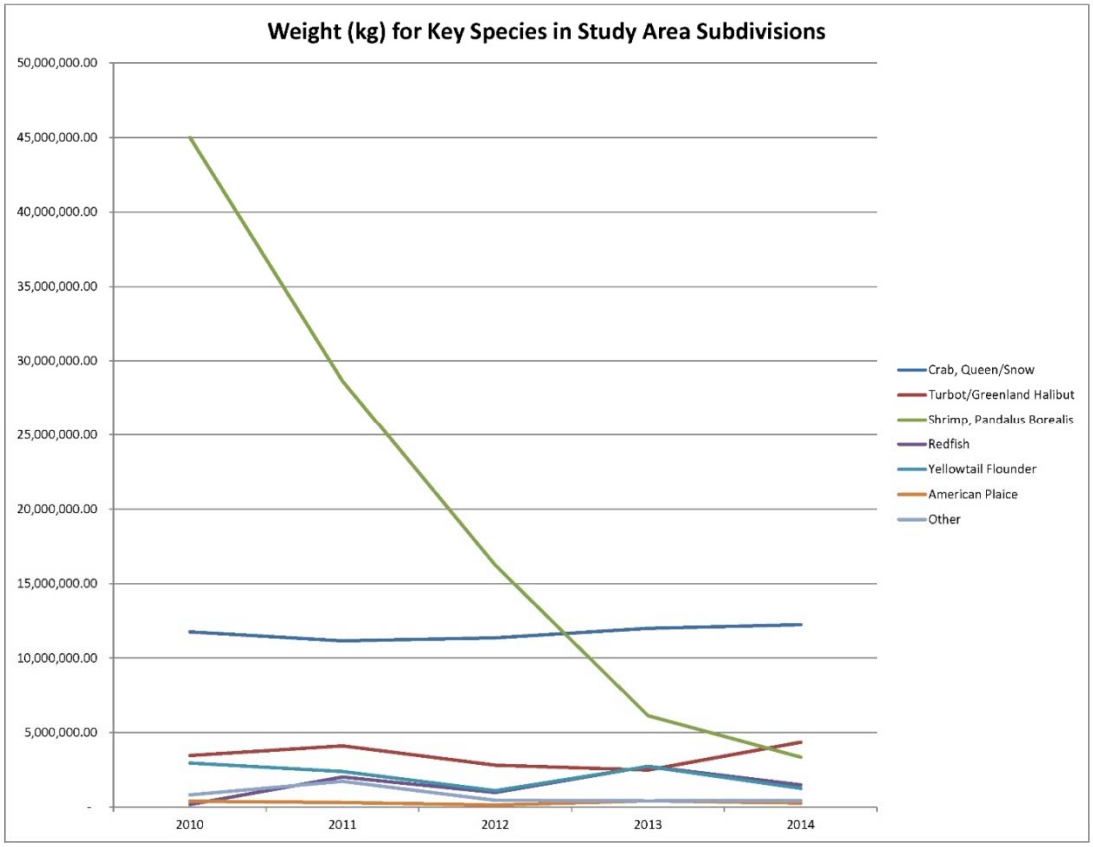
Table:
Fish Harvest by Weight and Value (All species, 2010-2014, All Study Area NAFO Subdivisions)

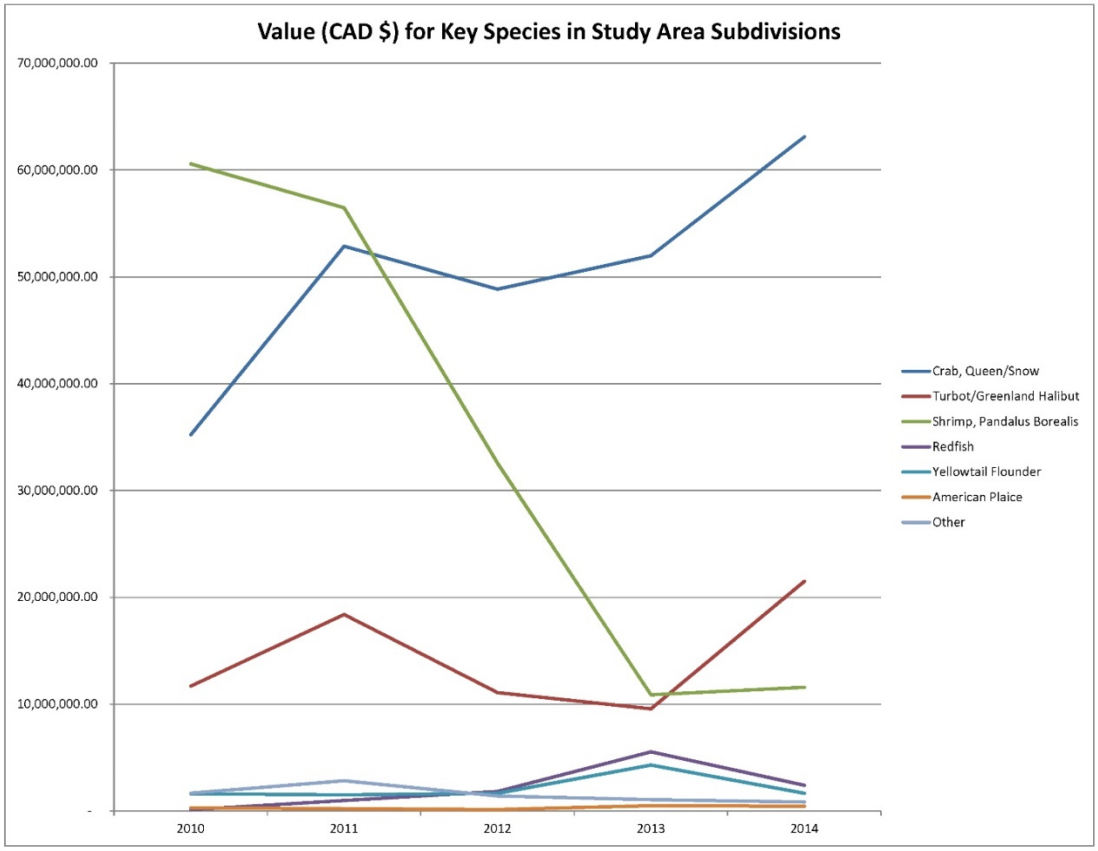


Graph:
Fish Harvest by Weight (All species, 2010-2014, All Study Area NAFO Subdivisions)



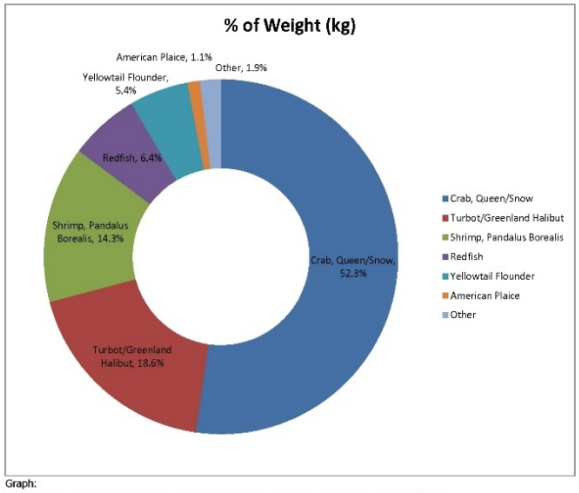
Graph:
Fish Harvest by Value (All species, 2010-2014, All Study Area NAFO Subdivisions)



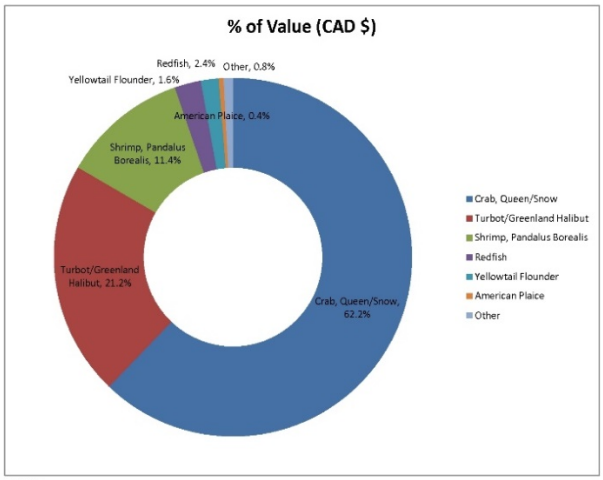


Species	% of Weight (kg)
Crab, Queen/Snow	52.3%
Turbot/Greenland Halibut	18.6%
Shrimp, Pandalus Borealis	14.3%
Redfish	6.4%
Yellowtail Flounder	5.4%
American Plaice	1.1%
Other	1.9%

Species	% of Value (CAD $)
Crab, Queen/Snow	62.2%
Turbot/Greenland Halibut	21.2%
Shrimp, Pandalus Borealis	11.4%
Redfish	2.4%
Yellowtail Flounder	1.6%
American Plaice	0.4%
Other	0.8%



Graph:
Fish harvests by weight (kg), by species (2014, All Study Area NAFO Subdivisions)



Graph:
Fish harvests by value (CAD $), by species (2014, All Study Area NAFO Subdivisions)

"Section 4.8 Fisheries and Other Ocean users, page 4-47 *– this section requires mention of recreational, traditional and aboriginal fisheries that may occur in or near the project study area.*

Response:

Noted. Propose that the following text is included in Section 4.8.

Recreational Fisheries

Recreational fisheries in Newfoundland are presented in Section 4.3.4.4 of the Eastern Newfoundland SEA (C-NLOPB 2014). In 2017, the Newfoundland and Labrador recreational groundfish fishery will be open for a total of 46 days, beginning with the first weekend in July and ending in the beginning of October (DFO 2017). The recreational groundfish fishery occurs in all NAFO Divisions around Newfoundland, including 2GH, 2J3KL, 3Ps, 3Pn and 4R, with the exception of the Eastport and Gilbert Bay Marine Protected Areas (MPA) (DFO 2017). None of these NAFO Divisions overlap with the Study Area and therefore recreational fisheries will not be found within the Study Area.

Traditional and Aboriginal Fisheries

According to the Eastern Newfoundland SEA (C-NLOPB 2014), there are no known Aboriginal fisheries that occur within the Study Area.

"Section 4.8.1.3 Commercial Fishing Gear, page 4-64 *- the description provided is not adequate and would benefit from additional details / information e.g. species associated with each gear type; catch statistics associated with each gear type; type of fisheries / fish species associated with each gear used by month."*

Response:

Noted. Propose that Section 4.8.1.3 could include a new table that presents the total study area catch weight by gear type (fixed vs mobile) per species (see Table 4-7 below). Propose Section 4.8.1.3 reads as follows.

Various types of fishing gear are used to harvest fish and shellfish offshore Eastern Newfoundland. Both mobile and fixed gear types are utilized during commercial fishing Figure 4.48 and Figure 4.49), with predominant gear types in the region consisting of bottom otter trawls, shrimp trawls, gillnets, longlines, and pots. Shrimp trawls are the most commonly used gear type.

Catches of Greenland Halibut and Snow Crab dominate the total fixed gear catch, accounting for 7.76% and 23.91% of landings in the study area from the years 2010 to 2014. Catches of Northern Shrimp account for the highest percentage (34.38%) of landings associated with mobile gear in the study area from the years 2010 to 2014, followed by Greenland Halibut (4.48%) (see new proposed Table 4-7 below).

Fixed gear types are most commonly used during the spring and summer months, and are concentrated within the southwest and northwest edge of the Study Area Figure 4.48). Conversely, mobile gear types are used all year round offshore Newfoundland and within the southwest and northwest edge of the Study Area, with a peak utilization during the summer months (Figure 4.49). As mobile gear types are used all year round they accounted

for 60.10% of the total landings compared to 39.9% of total fixed gear landings from the years 2010 to 2014 (see new proposed Table 4-7 below).

Relevant information on previous location of fixed gear is provided by season to cover the proposed survey period (Figure 4.48). This will enable Polarcus to plan their operations accordingly and use this information as part of their decision making process. To present this data per month will have a limited added value to the impact assessment and decision making process.

New proposed Table 4-7 Total study area catch weight by gear type (fixed vs mobile) per species (DFO commercial landings database, 2010 – 2014).

Table 4-7. Total study area catch weight by gear type (Fixed vs Mobile) per species

Species	Fixed Gear		Mobile Gear	
	mt	% of Total	mt	% of Total
Atlantic Cod	0.4	0.17%	6.4	2.57%
Haddock	0.0	0.03%	0.0	0.62%
Redfish	23.4	2.98%	26.3	3.37%
Atlantic Halibut	0.1	0.84%	0.3	2.50%
American Plaice	0.0	0.24%	0.8	4.28%
Yellowtail Flounder	-	0.00%	5.9	2.85%
Greysole/Witch	1.3	1.15%	3.7	3.24%
Greenland Halibut	1,073.0	7.76%	619.7	4.48%
Skate	0.0	1.04%	-	0.00%
Pollock	-	0.00%	-	0.03%
White Hake	0.0	0.04%	-	0.00%
Cusk	-	0.03%	-	0.00%
Monkfish (American Angler)	-	0.00%	-	0.00%
Roughhead Grenadier	2.2	1.66%	1.3	0.94%
Striped/Wolffish	0.0	0.01%	0.0	0.01%
Atlantic Herring	0.0	0.01%	0.1	0.05%
Mackerel	-	0.00%	0.0	0.01%
Argentine	-	0.00%	0.0	0.12%
Capelin	-	0.00%	0.0	0.05%
Mako Shark	-	0.00%	-	0.00%
Stimpson'S Surf Clam	-	0.00%	0.1	0.08%
Sea Scallop	-	0.00%	0.0	0.00%
Whelk	0.0	0.00%	-	0.00%
Cockle	-	0.00%	1.0	0.10%
Icelandic Scallop	-	0.00%	0.0	0.01%
Northern Shrimp	-	0.00%	31,105.7	34.38%
Snow Crab	13,826.9	23.91%	-	0.00%
Pink Shrimp	-	0.00%	0.0	0.01%
Clams, Stimpson'S Surf, Mantle	-	0.00%	0.0	0.05%
Groundfish Heads	-	0.00%	0.5	0.37%
Subtotal	**14,927.4**	**39.90%**	**31,771.9**	**60.10%**
Grand Total (mt)				**46,699.3**

"Section 5.3 Valued Environmental Components, page 5-6 *– with respect to the Fish and Fish Habitat VEC the description requires addition of pelagic fish to the description / characterization of the Fish and Fish Habitat VEC provided in the 1st bullet. This would be consistent with the information presented within Table 5.2 which identifies potential interactions between project activities and pelagic fish".*

Response:

Noted. Acknowledge that the 1st bullet point in the EA should include reference to pelagic species.

"Section 5.2.2 Stakeholder Consultations, page 5-6, first sentence *- on page 5-6 makes reference to the "Freshwater Habitat Section" (of DFO) it is felt that this is an error and needs to be amended to refer to the "Fisheries Protection Program" of DFO, rather than the Freshwater Habitat Section".*

Response:

Noted. Acknowledge the more appropriate reference would be to the "Fisheries Protection Program" of DFO, rather than the Freshwater Habitat Section".

"Section 5.5.1 Identification of Interactions, page 5-10, Table 5-2 *– this table does not include the Species at Risk VEC. The note at the bottom of the table is odd and not acceptable. Table 5.2 should be amended to include the Species at Risk VEC."*

Response:

Noted. Propose Table 5-2 is amended to include Species at Risk VEC and the note is removed.

Table 5-2. Potential Interactions between Project Activities and VECs

Project Activities	Fish and Fish Habitat VEC					Fisheries and Other Ocean Users VEC			Seabirds VEC	Marine Mammals VEC and Sea Turtles VEC				Species at Risk VEC	Sensitive Areas VEC
	Water and Sediment Quality	Eggs and Larvae	Juveniles	Pelagic Fish	Bottom dwelling fish	Mobile Invertebrates and Fishes (e.g. gillnet and trawls)	Sedentary Benthic Invertebrates (e.g. crab pots	Research Surveys (e.g. trawls and crab pots		Toothed Whales	Baleen Whales	Seals	Sea Turtles		
Underwater Noise															
Airgun Array															
Seismic Vessel															
Supply / Support															
Physical Presence of:															
Seismic Vessel															
Supply Vessel															
Helicopter4															
Onshore5 facilities															
Vessel Lights															
Sanitary/Domestic Waste															
Liquid Waste															
Atmospheric Emissions															
Garbage6															
Unplanned Events															
Other Projects and Activities															
Offshore Oil and Gas Activities															
Fisheries															
Marine Transportation															

"Section 5.6.7 Monitoring, page 5-14 *– it is felt that an important component of project related monitoring and follow up includes monitoring to assess compliance with project specific*

[4] Crew change will occur via ship to ship transfer, helicopters will only be used in the event of an emergency situation.
[5] There will be no new onshore facilities as existing infrastructure will be used.
[6] Not applicable as garbage will be brought onshore

mitigation and regulatory commitments/obligations. It may be necessary to add same to the 1st sentence of the 2nd paragraph in this section."

Response:

Noted. This comment is referring to Section 5.5.7. We propose the paragraph in question reads as follows:

However, there will be a need for monitoring (See Section 5.6.5) during the course of the Project to ensure effects are as predicted within the assessment and to assess compliance with project specific mitigation and regulatory commitments/obligations. The on board monitoring to assess compliance with project specific mitigation and regulatory commitments/obligations will be carried out by the qualified MMO's permanently on board. If observations during project activities indicate evidence of an unanticipated effect on a VEC or an accidental release of fuel, then there may be the need for follow-up monitoring and other actions. The need for such actions will be assessed in consultation with the C-NLOPB.

"Section 5.6 Mitigation Measures, page 5-15 *– the last part of the 3rd bullet should read "…Marine Environment (DFO 2008 available from the DFO website as well as from the above noted CNLOPB Geophysical, Geological, Environmental, and Geotechnical Program Guidelines)."*

Response:

Noted. We propose the 3rd bullet reads as follows:

- DFO's Statement of Practice with respect to the Mitigation of Seismic Sound in the Marine Environment (DFO 2008 available from the DFO website as well as from the above noted C-NLOPB Geophysical, Geological, Environmental, and Geotechnical Program Guidelines);

"Section 5.6.4 Fishing Gear Damage Program, page 5-20, 4th bullet *- it should be noted that in accordance with Sections 26 and 27 of the Fishery (General) Regulations CFV numbers have been replaced with Vessel Registration Numbers (VRN). The 4th (and other similar bullets with reference to CFV number (see page 5-17)) should be amended accordingly".*

Response:

Noted. It is proposed reference to CFV numbers will be removed where relevant and replaced with VRN.

"Section 5.6.5 Marine Mammal / Wildlife Protection, page 5-21 *– this section should also reference / note the Marine Mammal Regulations (under the Fisheries Act). While these regulations are currently undergoing amendment it should be noted that Schedule 11 of the proposed amended Marine Mammal Regulations (MMR) provide approach distances for marine mammals based on species, vehicle (vessel, aircraft, etc), area and timing. Given that the proposed seismic survey(s) are scheduled to run from 2017 to 2022 it is recommended that the proponent be aware of any potential implications that may arise if any proposed amendments to MMR are accepted during the timeframe covered by the proposed survey program".*

Response:

Noted. Polarcus continues to monitor applicable environmental legislation and regulations that are relevant to its activities, and will plan and implement the various components and activities that are associated with this Project in compliance with the relevant provisions of the *Fisheries Act* and *Marine Mammal Regulations* as current at the time.

"Section 5.6.5 Marine Mammal / Wildlife Protection, page 5-21, 2nd paragraph, last line *- the link for the noted ESRF report has not been provided, the last line should add the following link* http://www.esrfunds.org/sites/www.esrfunds.org/files/pdf/publications/Report156.pdf*"*

Response:

Noted. We propose the last line reads as follows:

The report is available on the internet at the following link: (http://www.esrfunds.org/sites/www.esrfunds.org/files/pdf/publications/Report156.pdf").

"Section 5.8.1 Fish and Fish Habitat VEC, page 5-28 to 5-29 *– 1st sentence on top of page 5-28 it is felt that this sentence would be clearer if it read "…physical (e.g. injury or mortality), physiological (e.g. primary and secondary stress responses), or behavioural…" With respect to Table 5-7 on page 5-28, should the SEL cum of >216 dB re 1µPa2 for recoverable injury be lower than the peak SPL of >213 dB re 1 µPa this should be clarified. With respect to the 3rd sentence 2nd paragraph on page 5-29 "There is no recorded evidence that energy sources have killed or caused injuries during seismic survey operations (Turnpenny and Nedwell, 1994)." Is there a more recent reference supporting / refuting this statement, if so it should be noted".*

Response:

Noted. We propose the first sentence on top of page 5-28 reads as follows:

The effect of noise on fish may be either physical (e.g. injury or mortality), physiological (e.g. primary and secondary stress responses), or behavioural, and criteria for the assessment of both of these impacts are discussed below.

Propose Table 5-7 is presented as follows:

Table 5.7 Thresholds for Impulsive Noise Exposure to Fish (adopted from Popper et al., 2014)

Type of Fish	Mortality and Potential Mortal Injury	Impairment	
		Recoverable Injury[1]	Temporary Threshold Shift (TTS)
Type 1 - no swim bladder (particle motion detection)	>219 re 1uPa2 (SEL cum) >213 dB re 1uPa (SPL peak)	>216 dB re 1uPa^2 (SEL $_{cum}$) or >213 dB re 1uPa (SPL $_{peak}$)	>186 dB re 1uPa^2 (SEL $_{cum}$)
Type 2 - Swim bladder is not involved in hearing (particle motion	210 re 1uPa2 (SEL cum) >207 dB re 1uPa (SPL peak)	>203 dB re 1uPa^2 (SEL $_{cum}$) or >207 dB re 1uPa (SPL $_{peak}$)	>186 dB re 1uPa^2 (SEL $_{cum}$)

Type of Fish	Mortality and Potential Mortal Injury	Impairment	
		Recoverable Injury[1]	Temporary Threshold Shift (TTS)
detection)			
Type 3 - Swim Bladder involved in hearing (primarily pressure detection)	207 re 1uPa2 (SEL cum) >207 dB re 1uPa (SPL $_{peak}$)	203 dB re 1uPa^2 (SEL $_{cum}$) or >207 dB re 1uPa (SPL $_{peak}$)	186 dB re 1uPa^2 (SEL $_{cum}$)

Note 1: Recoverable injury: injuries, including hair cell damage, minor internal or external hematoma, etc. None of these injuries are likely to result in mortality. Note: that the same peak levels are used both for mortality and recoverable injury since the same SEL ss was used throughout the pile driving studies. Thus, the same peak level was derived (Halvorsen et al. 2011).

The addition of SEL cum figures to the column titled "Mortality and Potential Mortal Injury" allows values to be directly comparable across the columns of Table 5-7.

A more recent reference supporting / refuting this statement is not available.

"Section 5.8.1 Fish and Fish Habitat VEC, page 5-29 to 5-32 *– the 1st and 4th sentences of 4th paragraph require suitable references. With respect to Figure 5.1 on page 5-30 the term "On Axis" should be defined. The 1st sentence of 2nd paragraph (Underwater Noise page 5-32) requires a suitable reference. Also it should be clarified is the noise level (i.e. 190 dB re 1 µPa") peak SPL or SEL and how was it determined that stunning "may occur" at this distance, if it is based on modelling this should be noted accordingly."*

Response:

We propose the 4th paragraph in question reads as follows:

A considerable amount of research (*Popper and Clarke, 1976; Scholik and Yan, 2001; Amoser and Ladich, 2003; Amoser et al., 2004; Smith et al., 2004a and 2004b, McCauley et al., 2003*) has been conducted on the effects of offshore seismic surveys (including various sound types and intensities) and other anthropogenic activities on marine fish. This has included scientific research, monitoring studies and anecdotal reports of observed reactions by various fish species. Although overall knowledge and understanding of the effects of seismic and other anthropogenic noise on marine fish and invertebrates remain incomplete in some areas, the effects of seismic activities and other noise sources have been documented in a variety of fish and invertebrate species in numerous studies. It should be noted, however, that many of the studies occur within a laboratory setting with captive animals, and the documented effects may not replicate natural conditions (*Popper and Clarke, 1976 and Pearson et al., 1992)*. An overview of the research and studies on seismic noise and fish is presented below broken down by the possible effect it may have on the Fish and Fish Habitat VEC.

The term "On axis" from the Figure 5.1 page 5-30 should read Sound Pressure Level (dB re 1µPa associated with seismic survey airgun array. Propose this text is added to Figure 5.1.

We propose *Underwater Noise page 5-32 paragraph* in question reads as follows:

Transient stunning of fish species (noise greater than 190 dB re 1µPa SPL) may occur within 630 metres of the acoustic energy source when operating at full power (see Figure 5-2). This impact is therefore localized to the vicinity of the survey vessel during operations.

"Section 5.8.4 Marine Mammals and Sea Turtles VEC, Acoustic Masking, page 5-43 *- with respect to the first sentence in the 3rd paragraph "… given the frequency range of the seismic sound source (between 10 and 200 hertz)…." it is felt that the frequency range provided should be consistent with other sections in the report. For example, Section 2.4.1 Underwater Noise (page 2-11) "The noise generated by these processes tends to be of low frequency in the range of <1 to 250 hertz…", and "…the sound from seismic operations is primarily low frequency (between <1 to 200 hertz)…." is also on page 5-45. There should be consistency or clarification on what is being discussed with respect to frequency range and all other measures of sound energy".*

Response:

Noted. The frequency range being discussed should be between 10 and 200 hertz.

"Section 5.8.5 Species at Risk VEC, page 5-49 to 5-51 *– as noted in an earlier comment Table 5.2 (page 5-10) does not include the Species at Risk VEC, as such both the first sentence of Section 5.8.5 and (as previously noted) Table 5.2 must be amended accordingly. This section should also be amended to include a discussion of the interactions for each Species at Risk, since not all species will have the same potential interactions. With respect to the bullets on page 5-50 it is felt that the listing should include the population names for the species at risk where applicable e.g. Blue whale (Atlantic population)."*

Response:

Noted. See page 3-48 above for proposed Table 5.2.

It is felt that the potential project interactions are reflected for the species at risk and if species were to be presented individually there would be a lot of unnecessary repetition without adding value to the section.

Noted. Population names for the relevant species at risk are provided as follows:

- White shark (Atlantic population), and northern, spotted, and Atlantic wolffish;
- Harlequin Duck (Eastern population), Barrow's Goldeneye (Eastern population), Ivory Gull, Red Knot (*rufa subspecies*), Piping Plover (*melodus subspecies*), Peregrine Falcon, Olive-sided Flycatcher, and Short-eared Owl.
- Blue whale (Atlantic population), north Atlantic right, northern bottlenose, Sowerby's beaked whales (Scotian Shelf population), fin whale (Atlantic population) and killer whales; harbor porpoise; and
- Leatherback (Atlantic population) and loggerhead sea turtle.

"Section 5.8.5 Species at Risk VEC Environmental Effects Assessment, page 5-50 *– The last sentence of the 2nd paragraph in this section indicates "The mitigation measure of ramping-up the airgun array (over a minimum 20 min period) is expected to minimize the potential for impacts on these marine mammals and turtles". While this is an important measure there are*

additional measures discussed in the Mitigations Section of the EA including adherence to the "CNLOB Guidelines" and the DFO "Statement of Canadian Practice with respect to the Mitigation of Seismic Sound in the Marine Environment". This paragraph requires amendment accordingly. The last sentence on page 5-50 requires amendment the table reference should be Table 5-14 rather Table 5-10."

Response:

We propose the paragraphs in question read as follows:

As per the detailed effects assessment in Section 5.8.4, the predicted effect of the Project on the Blue, north Atlantic right, northern bottlenose, Sowerby's beaked, fin and killer whales; harbor porpoise; and leatherback and loggerhead sea turtles is not significant. The mitigation measures presented in Section 5.6.5 are expected to minimize the potential for impacts on these marine mammals and turtles.

A summary of the predicted (residual) environmental effects of the project on the Species at Risk VEC is provided in Table 5.14.

3.4 Fish, Food and Allied Workers (FFAW)

"Section 5.6.2 Communications and Liaison, page 5-16 *-It is important to note that the Fisheries Liaison Officer is best placed on the seismic survey vessel, not the guard vessel, where s/he can work most effectively. This is considered an industry best practice in the Newfoundland and Labrador region, as discussed on page 5-19".*

Response:

Noted. Polarcus will keep with best industry practice in the Newfoundland and Labrador region.

"Section 5.6.2 Communications and Liaison, page 5-17 *- Note that VMS data is provided by Fisheries and Oceans Canada, not FFAW/Unifor. Please revise the text to reflect this. It is recommended that the company consult with DFO on the availability of this information as discussed on page 2-2".*

Response:

We propose the paragraph in question reads as follows:

Information Exchange. Obtain detailed and up-to-date information about the fisheries likely to be active in specific parts of the Project Area at specific times.

Mapping of past fish harvesting activities (see Section 4.8) are a valuable planning tool, but exact times and locations change somewhat from year to year. To be accurate, the information flow about current fishing activities will need to be a continuing process that is updated as fishing seasons open and close, and as quotas are taken. This information will be accessed through continuing information exchanges with the relevant fishing organizations on a regular basis, including through the mechanisms described below, such as the FLO, direct contacts with representatives of the Newfoundland fisheries organizations, and with DFO (for fisheries survey/research information and access VMS.). Operational details of these communications will be finalized with the relevant organizations as the fishing season information and plans are known.

Noted. Polarcus will consult with DFO on the availability of this information.

"Section 5.6.3 Fisheries Avoidance, page 5-19 *- It should be noted that the post-season crab survey is a collaborative program between DFO and FFAW/Unifor and as such should also involve communication with FFAW/Unifor. The survey is undergoing changes in terms of the location and number of survey stations. However, changes have not been confirmed for 2017. It is therefore crucial that the seismic company maintain effective communication with FFAW/Unifor and DFO to receive accurate information on the post-season crab survey going forward."*

Response:

Avoidance of Fisheries Science Surveys. As with the commercial fishery, those involved in DFO and joint DFO/Industry research surveys will need to exchange detailed locational information with those involved in the seismic surveying. For previous NL surveys, a temporal and spatial separation plan has been implemented (on DFO advice) to ensure that seismic operations did not interfere with the research survey. Seismic surveys will be scheduled, to the extent possible, to reduce potential for impact or interference with Fisheries and Oceans Canada (DFO) science surveys. Spatial and temporal logistics should be determined with DFO to reduce overlap of seismic operations with research survey areas, and to allow an adequate temporal buffer between seismic survey operations and DFO research activities. The post-season crab survey is a collaborative program between DFO and FFAW/Unifor and Polarcus will ensure that FFAW/Unifor are included in the two way exchange of detailed locational information regarding the seismic survey and the latest changes in terms of the location and number of survey stations for the crab surveys.

References

CIS (Canadian Ice Service), (2011). *Sea ice climatic atlas, East Coast, 1981-2010.* Retrieved from http://www.ec.gc.ca/Publications/default.asp?lang=Enandxml=8DFED3F9-4BD6-49F3-9ACA-F9AA9F52A96D.

DFO. 2017. Decisions for Atlantic Canada, Quebec and the Arctic – 2017. Government of Canada. Available at http://www.dfo-mpo.gc.ca/decisions/fm-2017-gp/atl-06-eng.htm

Halvorsen MB, Casper BM, Woodley CM, Carlson TJ, Popper AN (2011) Predicting and mitigating hydroacoustic impacts on fish from pile installations. NCHRP Res Results Digest 363, Project 25–28, National Cooperative Highway Research Program, Transportation Research Board, National Academy of Sciences, Washington, D.C. http://www.trb.org/Publications/ Blurbs/166159.aspx . Accessed 29 Jan 2013

Holthuijsen, Leo H. (2007). Waves in Oceanic And Coastal Waters. Cambridge University Press. p. 70. ISBN 978-0-521-86028-4.