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In all correspondence,
please refer to:

GFS/14-131

16 April 2014

Canada-Newfoundland and Labrador Offshore Petroleum Board
5th Floor, TD Place
140 Water Street
St. John's, NL A1C 6H6
Email: information@cnlopb.nl.ca

Dear Madam/Sir,

Subject: NAFO response to the C-NLOPB SEA draft report

Attached is the response of the Northwest Atlantic Fisheries Organization (NAFO) to the invitation for comments to the draft Eastern Newfoundland Strategic Environmental Assessment (SEA) Report recently released by the Canada-Newfoundland and Labrador Offshore Petroleum Board (C-NLOPB). Although the NAFO Secretariat offered to provide information to the SEA process at a stakeholder workshop in September 2013, no requests for dialogue were received. Recognizing the implications of oil and gas exploration (e.g. seismic surveys), oil and gas development (e.g. location and exclusion zones) and the possibility of spills (e.g. immediate effect on fisheries and productivity), NAFO wishes to bring a range of information on fisheries, habitat and research that occur on the high seas outside of the Canadian exclusive economic zone to the attention of C-NLOPB, to inform its SEA.

The attached NAFO response focuses on the following areas:

1. There is **extensive fishing activity in the NAFO Regulatory Area** (NRA – the NRA is that part of the Northwest Atlantic high seas adjacent to Canada's 200-mile Exclusive Economic Zone), missing from the draft SEA Report, which overlaps with current leases and exploration areas. Fishing activity in the NRA targets a range of species (mainly cod, redfish, Greenland halibut, shrimp, skates and other flatfish). The approximate first sale (landed) value is $200M annually across all members. Fishing activity is not distributed uniformly across the NRA and some areas are particularly important for certain stocks. As the objective of the SEA is to develop information for future licencing decisions by the C-NLOPB for this region, NAFO believes that the impacts of possible future oil and gas exploitation on fishing activities in the proposed new licensing areas must be considered in the SEA report.

2. The **proposed oil and gas licensing areas significantly overlap with already-recognized Vulnerable Marine Ecosystems (VME) protection areas in the NRA**. The international obligation to protect vulnerable marine ecosystems (VMEs) is referred to in numerous United Nations General Assembly Resolutions (UNGA Resolution 61/105 of 2006, Resolution 64/72 of 2009 and Resolution 66/68 of 2011). These most vulnerable ecosystems are easily damaged and have a very slow recovery or may never recover, even from occasional disturbances. NAFO has already implemented extensive management actions to protect VMEs in the NRA. These measures take into account the nature of fishing activities (e.g. tow length and orientation of trawl tracks) in order to manage responsible fishing and minimize the risk of significant adverse impacts on VMEs. NAFO has also decided to close these areas for fisheries.

3. The possibility that **oil and gas exploration activities could interfere with ongoing fishery research.** In 2013 a seismic vessel - MV *Sanco Spirit* - undertaking geoscientific surveys in the context of the SEA, heavily disturbed the work of a fisheries research vessel carrying out a biological survey. During its research activities around the Flemish Cap the research vessel was forced to modify its research plan a number of times (a stratified-random sample) as the seismic vessel was a huge source of noise. Fisheries research vessels are specially designed to reduce noise and interference with the marine ecosystem. Operating a research vessel is costly and having to modify plans at the last minute undermines the quality of the research. Fishery surveys also need to be conducted in a consistent manner from year to year to produce comparable results and a perturbation during a particular survey may considerably bias the results, undermining scientific advice and fisheries management.

One area which we need to consider urgently is a mechanism to share information between the operators/licence holders and NAFO. This is particularly important in the short-term for the operation of our research vessel surveys that will occur between June and August. We believe it is important that adequate arrangements are found in order to ensure a mutual exchange of information between NAFO and the organizations behind the seismic surveys taking place in the NRA. Furthermore, it would be important to reflect on mitigation measures. In particular, an appropriate mechanism should be put in place to reduce the risk of loss or damage and to provide compensation for any such loss or damage to NAFO Contracting Parties.

This letter forms an integral part of our submission (Annex 1).

Sincerely yours,

[redacted]

On behalf of

[redacted]

NAFO President and
Chair of the General Council

VV:ll
Encl.: NAFO response to the C-NLOPB SEA draft report (32 pgs.)

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Northwest Atlantic Fisheries Organization submission in response to the Canada Newfoundland and Labrador Offshore Petroleum Board Eastern Newfoundland Strategic Environmental Assessment

Overview

NAFO is an organization comprising 12 Contracting Parties (members) from North America, Europe, Asia and the Caribbean. Among them are four coastal states bordering the Convention Area: USA, Canada, France (in respect of St. Pierre et Miquelon), and Denmark (in respect of Faroe Islands and Greenland).

NAFO is an intergovernmental fisheries science and management body. NAFO's overall objective is to contribute through consultation and cooperation to the optimum utilization, rational management and conservation of the fishery resources of the NAFO Convention Area.

Within its regulatory area, NAFO manages a wide range of fisheries including groundfish, shrimp, skate, and squid. It does not manage fisheries for salmon, tunas/marlins, whales, and sedentary species such as crabs.

As well, NAFO is implementing an ecosystem approach to fisheries management that includes approaches to implement the United Nations General Assembly resolution 61/105 (and subsequent resolutions) on managing the impact of bottom fishing on the benthic environment (e.g., corals and sponges) (UNGA, 2006). This has occurred through the identification and management of fishing on vulnerable marine ecosystems. The United Nations General Assembly regularly reviews implementation of 61/105 and NAFO provides a report on actions it has taken.

As an organization, we want to bring four distinct areas of information to your attention, which have not been widely considered in your current draft SEA:

1. Significant fishing activity beyond Canada's exclusive economic zone.
2. The existence of vulnerable marine ecosystems.
3. Annual scientific surveys to assess fishery resources and ecosystem state.
4. Scientific assessment of fish stocks.

1. Significant fishing activity beyond Canada's exclusive economic zone

Introduction

Bottom fisheries (i.e., fishing which involves catching fish close to the seabed), dominates the type of fishing activity in the NAFO Regulatory Area (NRA, the high seas outside Canada's EEZ).

There are currently 160 fishing vessels that are authorized to fish in the NRA. In 2013, 64 vessels fished in the NRA. These vessels are large fishing vessels (30 to 100 metres) and some will fish up to 20 hours per day (two 10 hour tows, each of which could extend over 20 kilometres.

The total allowable catches are presented in Table 1. NAFO does not collect economic data on the fishery but based on fishing opportunities available for stocks managed by NAFO for Divisions 3L, 3N and 3O, and the approximate value of the TAC available, the first-hand value amounts to more than $200M a year.

Table 1. Total allowable catches (TACs) and quotas (metric tons) for 2013 of particular stocks in Subareas 1-4 of the NAFO Convention Area. The values listed include quantities to be taken both inside and outside the 200-mile fishing zone, where applicable.

Species	**Cod**				**Redfish**					**American plaice**	
Division/Contracting Party	**3L**	**3M**	**% of 3M Cod TAC**	**3NO**	**3LN**	**% of 3LN Redfish TAC**	**3M**	**3O**	**Sub-area 2 and Div. 1F+ 3K**	**3LNO**	**3M**
Canada	-	113	0.80	0	2 769	42.60	500	6000	0	0	0
Cuba	-	522	3.70	-	637	9.80	1 750	-	0	-	-
Denmark (Faroe Islands and Greenland)	-	3 154	22.35	-	-		69	-	0	-	-
European Union	-	8 049	57.03	0	1 185	18.23	7 813	7 000	0 0	0	0
France (St Pierre et Miquelon)	-	-	-	-	-	-	69	-	0	-	-
Iceland	-	-	-	-	-	-	-	-	0	-	-
Japan	-	-	-	-	-	-	400	150	0	-	-
Korea	-	-	-	-	-	-	69	100	0	-	-
Norway	-	1 305	9.25	-	-	-	-	-	0	-	-
Russian Federation	-	913	6.47	0	1 870	28.77	9 137	6 500	0	-	0
Ukraine	-		-		-	-		150	0		-
United States of America	-	-	-	-	-	-	69	-	0	-	-
Others	-	57	0.40	0	39	0.60	124	100	-	0	0
TOTAL ALLOWABLE CATCH	**-**	**14113**	**100**	**0**	**6500**	**100**	**6500**	**20000**	**0**	**0**	**0**

Fishing Vessel Monitoring System (VMS) data

Fishing Vessels operating in the NRA are required to have installed a fishing Vessel Monitoring System (VMS) which reports position and time at location via satellite to a designated national data management centre, and from there to the NAFO Secretariat. Since 2008, VMS data records have been consistently recorded for all vessels operating in the NRA. NAFO has conducted an analysis of the VMS records for the period 2008 – 2012 to identify the nature and extent of all fishing activities in the NRA (WGEAFM, 2012), the output of this analysis are shown in Figure 1. During this period a number of historically important stocks were under moratorium to fishing, and it could be expected that the fishing pattern would change substantially as more stocks rebuild and open to directed fishing.

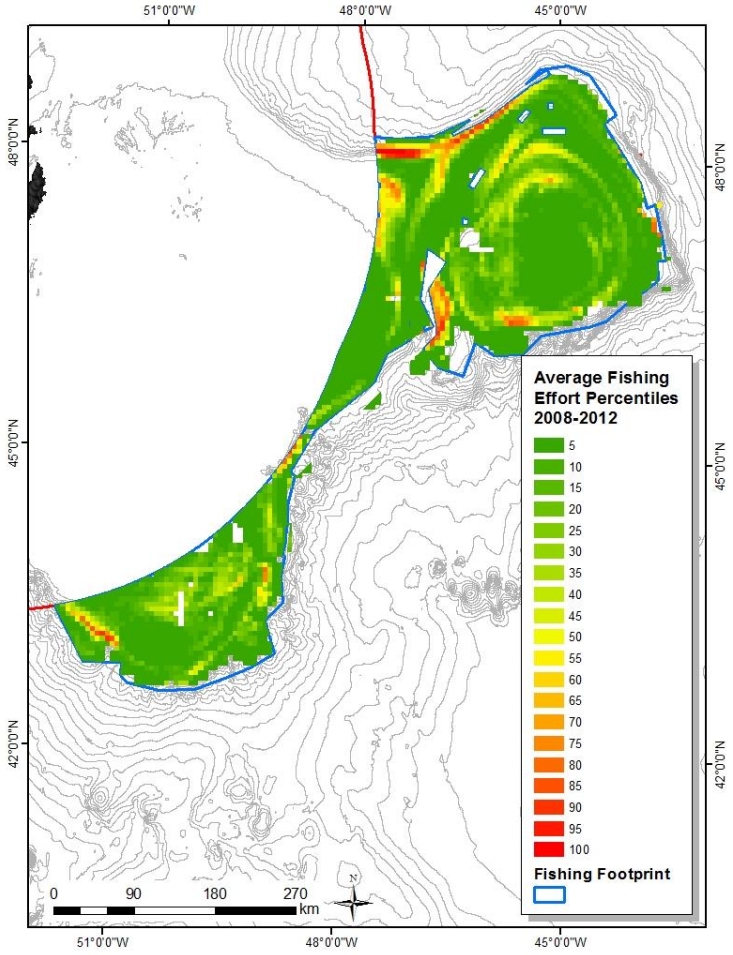

Figure 1. Average fishing effort in 5th percentile categories using gridded VMS data between 2008 and 2012.

The analysis reveals that some areas in the NRA are especially important in terms of fishing activity, such as some parts of the Sackville Spur and Flemish Pass (depicted in red in Figure 1).

In addition, to the assessment of fishing intensity maps, it is possible to analyse VMS data to depict fishing tracks which provides information about the orientation of individual fishing sets. Figure 2 shows bottom trawl tracks derived from 2011 VMS data. The orientation of trawl tracks reveals that fishing sets are conducted at the same depth, following the depth contours (isobaths). The average distance of a set is about 13 km, conducted at speeds between 3 and 5 knots. The range of depths at which fishing sets occur also varies, e.g. 45 m on top of the Grand Banks to near 1,300 m on the Northern slope of the Sackville Spur. Fishing operations were an important component of the design of the network of closed areas to manage the fisheries impact on vulnerable marine ecosystems present in the NRA.

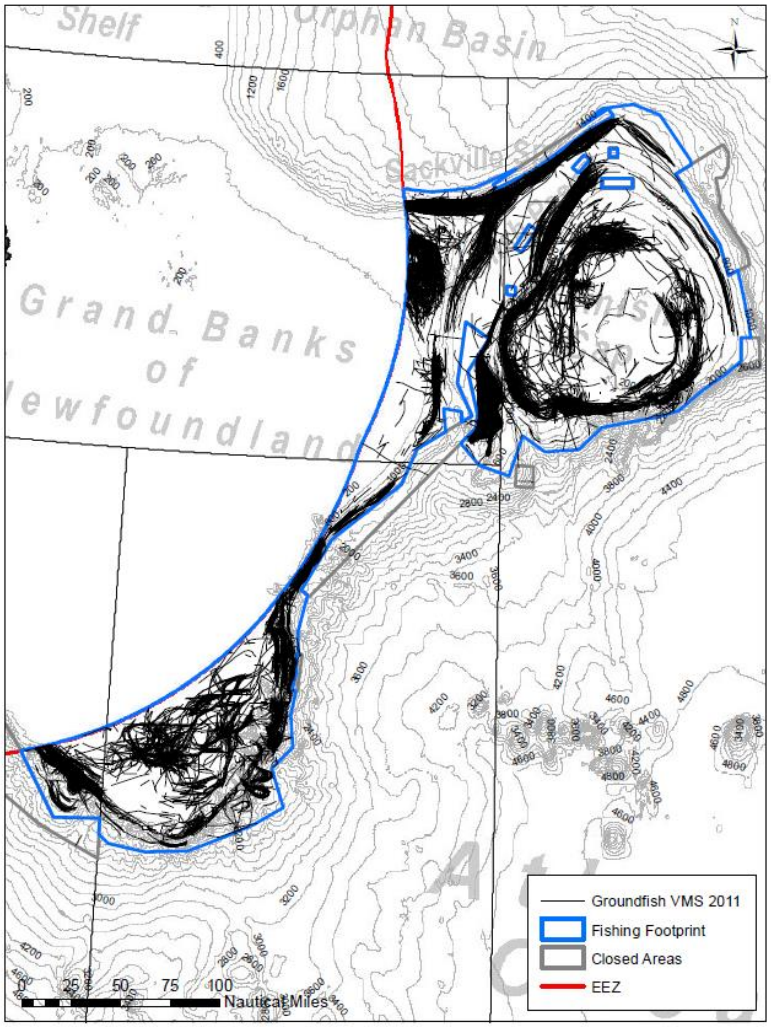

Figure 2. Bottom trawl tracks derived from 2011 VMS data.

Commercial Fishing Activity

Vessels fishing in the NAFO regulatory area (NRA) are required to report their daily catches, enabling a detailed picture of the spatial distribution of fisheries to be built up (Figure 3). During 2013, 88% of fishing activity within the NRA, accounting for 80% of total catches, takes place within the area considered by the current SEA. The area covered by Area 13-01 (Flemish Pass) contains 3.5% of total effort, including 409 t of Greenland halibut and 1435t of prawn catches (4.7% and 82.0% of respective totals). A catch of 190t of Greenland halibut (2.2%) was taken from the areas covered by the Carson Basin, by 0.7% of total effort.

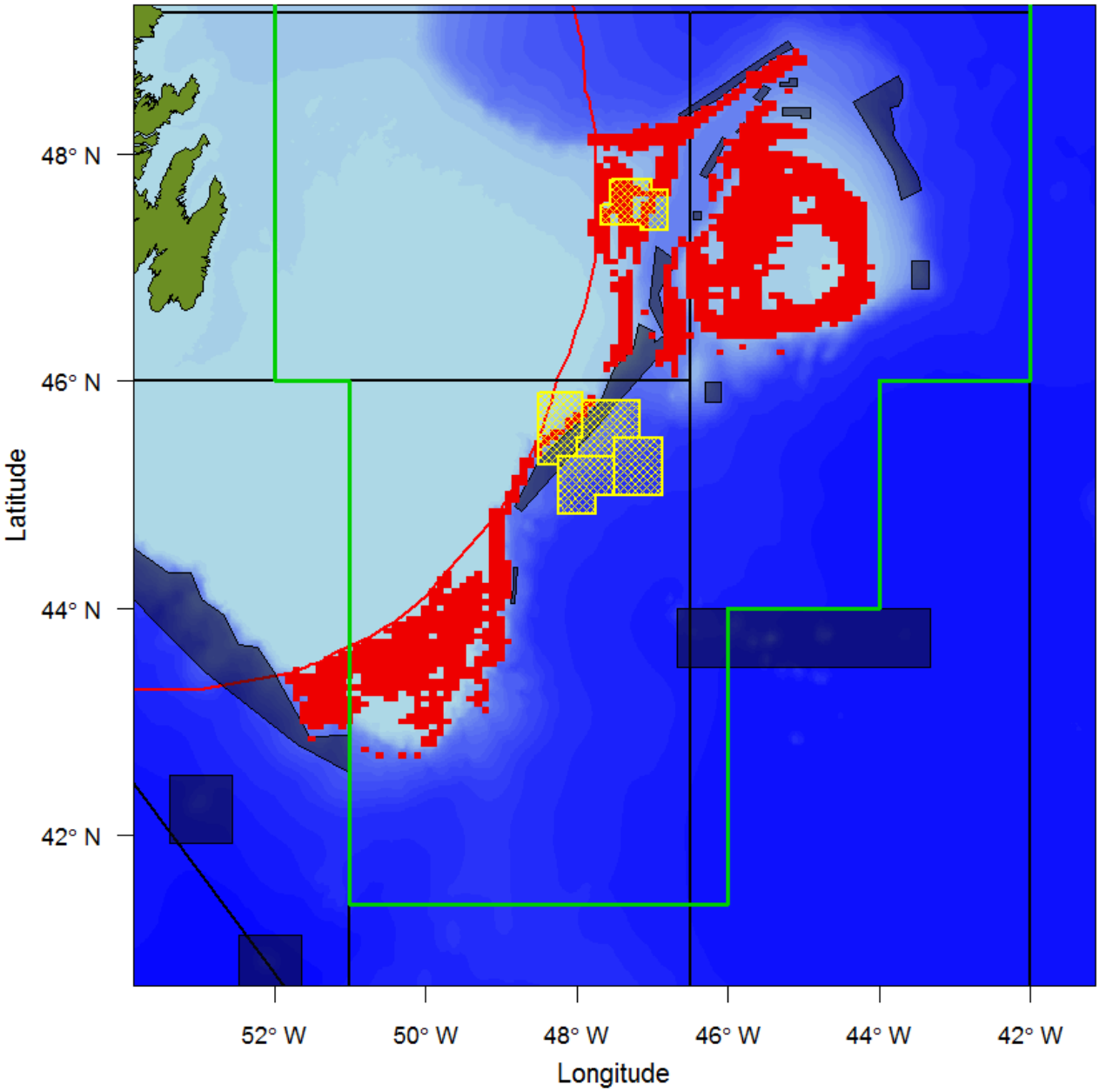

Figure 3. Fishing activity in the NAFO regulatory area based on VMS data, encompassing 95% of respective effort in the cod, redfish, Greenland halibut skate/yellowtail , and shrimp fisheries (red cells), with respect to areas closed to fishing for the protection of vulnerable marine ecosystems (grey polygons), areas covered by the current calls for bids (yellow hashes), and the extent of the current SEA exercise (green lines).

The importance of VMEs in supporting commercial fisheries

Most of the fishing effort in the NRA occurs in relatively close proximity to known VME (closed areas). The relationship between VME closed areas and fishing effort is shown in Figure 4.

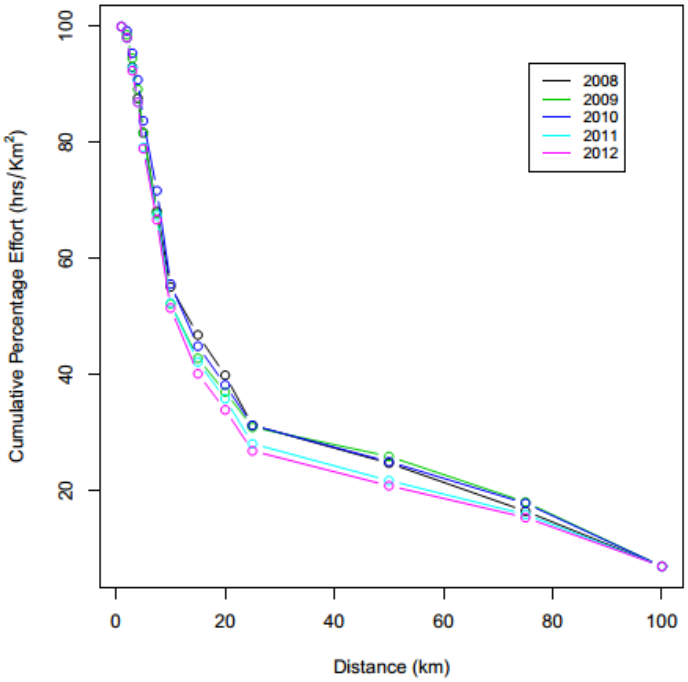

Figure 4. Cumulative fishing effort as a function of distance from VME closed areas (km) in the NRA.

2. The existence of vulnerable marine ecosystems.

Review of VMEs and VME elements in the NRA

As noted, starting in 2006, Flag States and RFMOs have taken concerted action to implement UNGA sustainable fisheries resolution 61/105 and subsequent reviews by the UN General Assembly. The closed areas that NAFO has created, relevant to the SEA, are shown in Figure 5.

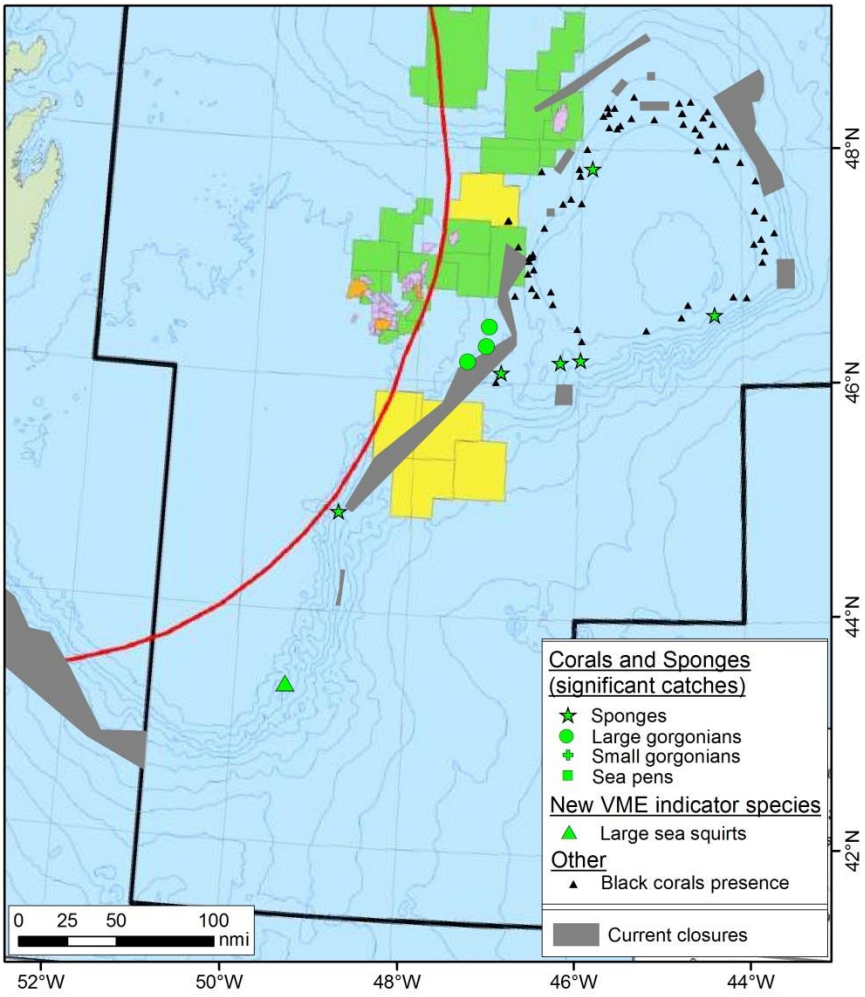

Figure 5. Location of areas closed to fishing to protect corals and sponges, other records of significant encounters with VME indicator species and locations where black corals have been reported.

NAFO has closed 12 areas for the protection of VMEs inside of the fishing footprint in the regulatory area and is further reviewing their boundaries in 2014. The Scientific Council has used the FAO International Guidelines for the Management of Deep-sea Fisheries in the High Seas (FAO, 2009) to identify large-sized sponges, large and small gorgonian corals, sea pens, bryozoan beds, sea squirts, crinoids and cerianthid anemones as VME indicators. The distributions of these taxa were mapped using the RV trawl by-catch and

significant concentrations identified. More recently species distribution models of sponge grounds, black corals, sea pens, and large gorgonian corals have been used to extrapolate into near-by data poor areas. These models use a set of environmental predictor variables to produce probability of occurrence surfaces of the response variable. Areas with significant concentrations were ground-truthed using in situ benthic photographs and/or independent sampling with rock dredges or box cores. Final boundaries of the areas closed to protect the VME were formulated by the Fisheries Commission.

Summary of Data Sources

Data available were obtained from research vessel trawl surveys (Table 2), benthic imagery collected through the NEREIDA program (Table 3 and Table 4) and from NEREIDA box cores samples (Table 5) and rock and scallop dredges (Table 6).

Table 2. Data sources from contracting party research vessel surveys; EU, European Union; DFO, Department of Fisheries and Oceans; NL, Newfoundland and Labrador; IEO, Instituto Español de Oceanografia; IIM, Instituto de Investigaciones Marinas; IPMA, Instituto Português do Mar e da Atmosfera.

Programme	Period	NAFO Division	Gear	Mesh size in codend liner (mm)	Trawl duration (min)	Average wingspread (m)
Spanish 3NO Survey (IEO)	2002 – 2013	3NO	Campelen 1800	20	30	24.2 – 31.9
EU Flemish Cap Survey (IEO, IIM, IPIMAR)	2003 – 2013	3M	Lofoten	35	30	13.89
Spanish 3L Survey (IEO)	2003 – 2013	3L	Campelen 1800	20	30	24.2 – 31.9
DFO NL Multi-species Surveys (DFO)	1995 – 2012	3LNO	Campelen 1800	12.7	15	15 - 20

During the CCGS Hudson NEREIDA cruise in 2009, 9 benthic imagery transects were conducted on the Sackville Spur and western Flemish Cap slope/Flemish Pass region using the 4K camera (4KCam) and Campod (Beazley et al., 2013). Although video footage of the seabed was continuously recorded on the 'Campod' transects, only images have been analyzed to date.

Table 3. Summary of the benthic imagery collected and analyzed from the CCGS Hudson NEREIDA 2009 cruise to the Flemish Cap area.

Location	Transect ID	Inside closure?	Gear	Transect length (m)	Depth range (m)	# Photos
Sackville Spur	11	Mostly	4KCam	6 211	1080 – 1545	167
	12	Yes	4KCam	6 343	1313 – 1723	172
	18	Yes	4KCam	5 238	1336 – 1478	92
	24	Yes	4KCam	4 974	1290 – 1427	145
	26	Yes	4KCam	3 212	1381 - 1409	38
Flemish Pass area	28	No	Campod	2 431	461 - 479	92
	29	No	Campod	3 197	444 - 471	132
	30	No	4KCam	6 101	455 - 940	174
	38	Yes	4KCam	2 978	1328 - 1411	75

Table 3 summarizes the details of the analyzed transects that were collected using the ROV ROPOS during the CCGS Hudson NEREIDA 2010 cruise to the Flemish Cap. Downward- and forward-facing video was continuously recorded for each ROPOS dive (only downward-facing video has been analyzed to date). Due to their different objectives, the method used to analyze each transect varied. The ROV operated in two modes. In transect mode it kept a near constant speed and distance from bottom, did not stop and travelled to a predetermined waypoint. In explorer mode it stopped to collect specimens and although end waypoints were set the route to the waypoints was directed by the investigators and was biased towards interesting observations. Speed varied as did distance from the bottom. For instance, for transect 1335 and the explorer mode portions of transect 1337, only those megafauna that were large (~10 cm) and clearly visible were recorded. Transect 1336 was not analyzed in detail after its collection, and thus only the megafauna recorded during the in situ recording of the dive was summarized. For transect 1338, three sections of the transect (one trawled line, two untrawled lines; ~ 3 km in total) were analyzed every 10 m for corals and sponges only, but non-coral and sponge VME indicators were extracted from the in situ collection of the video. All visible megafauna were analyzed from the entire length of transect 1339.

Table 4. Summary of the benthic video collected and analyzed using the ROV ROPOS in 2010 during the CCGS Hudson NEREIDA cruise to the Flemish Cap (FC) area.

Location	Transect ID	Inside closure?	Transect length (m)	Depth range (m)	Analysis details
Southern FC slope	1335	No	8,292	873 – 1,853	Explorer mode. Analyzed in detail; frame by frame.
	1336	No	11,555	2,212 – 2,970	Explorer mode. Transect not analyzed in detail ('live' recordings summarized).
Southeast FC slope	1337	No	14,475	1,011 – 2,191	Transect and explorer mode. Explorer mode analyzed frame by frame; every 10 m analyzed for transect modes.
	1338	Yes	11,195	1,029 – 1,088	Explorer and transect. Three lines were analyzed (1 trawled, 2 untrawled) every 10 m for the abundance of sponges and corals. Non-coral and sponge observations extracted from 'live' recordings.
Northeast FC slope	1339	Yes	8,624	1,344 – 2,462	Explorer mode. Data extracted from 10 m intervals.

Table 5. Summary of the box cores samples collected and analyzed from the NEREIDA Programme on board the RV Miguel Oliver.

Programme	Period	NAFO Division	Gear	Data extracted	Number of samples
NEREIDA	2009-2010	3LMN	Box-corer	Epibenthos visible on box-corer surface photograph	331

Table 6. Summary of the rock dredge and scallop gear sets collected and analyzed from the NEREIDA Programme on board the RV Miguel Oliver.

Programme	Period	NAFO Division	Depth range (m)	Gear	N valid sets	Trawl duration (min)
NEREIDA	2009 – 2010	3LMN	502 - 1991	Rock dredge	88	15
NEREIDA	2009	3M	870 - 1137	Scallop gear	7	15

Significant Concentrations of Large-sized Sponges

Sponges are the dominant benthic taxon in the NRA constituting 95% of benthic biomass. The extensive sponge grounds in the NAFO NRA likely play important roles in ecosystem function, although only their role in provision of habitat has been directly looked at in any detail (Beazley *et al*., 2013). Kernel density estimation has been used to identify VMEs (Figure 6) and a species distribution model (SDM) shows those areas to have a high probability of occurrence (Figure 7). The SDM also indicates potential sponge grounds in the deep water on the Tail of Grand Bank (Knudby *et al*., 2013). In situ benthic camera surveys have supported the occurrence of significant concentrations of sponges in Flemish Pass and on Sackville Spur as

well as on the northeast slope of Flemish Cap. Kutti *et al.* (2013) examined water pumping and respiration rates of *Geodia barretti*, an often dominant taxon in North Atlantic sponge grounds including the NRA. They found that within the 300 m^2 area studied on the Norwegian continental shelf, the population of *G. barretti* was capable of filtering 250 million m^3 of water and consuming 60 t of carbon daily, highlighting the importance of sponges in the cycling of carbon and other nutrients and also indicating their potential vulnerability to contaminants in the water column.

Significant Concentrations of Sea Pens

Aggregations of sea pens, known as "fields", provide important structure in low-relief sand and mud habitats where there is little physical habitat complexity. These fields provide refuge for small planktonic and benthic invertebrates which in turn may be preyed upon by fish. They also alter water current flow, thereby retaining nutrients and entraining plankton near the sediment. Sea pens form extensive fields on Flemish Cap. Kernel density estimation has been used to identify VMEs (Figure 8) and a species distribution model (SDM) shows those areas to have a high probability of occurrence (Figure 9). Rock dredge data collected under the NEREIDA programme independently confirmed the presence of sea pens in the areas of significant concentrations identified above. There were no underwater imagery stations coincident with the significant concentrations of sea pens in the NRA, however, congruence between in situ observations of sea pen fields and locations of high research vessel trawl catches has been observed in the nearby Laurentian Channel. The SDMs produced for sea pens in the study area show agreement with the kernel density surface. Both highlight a horse-shoe shaped distribution on Flemish Cap and significant concentrations and areas of high probability of occurrence on the Tail of Grand Bank.

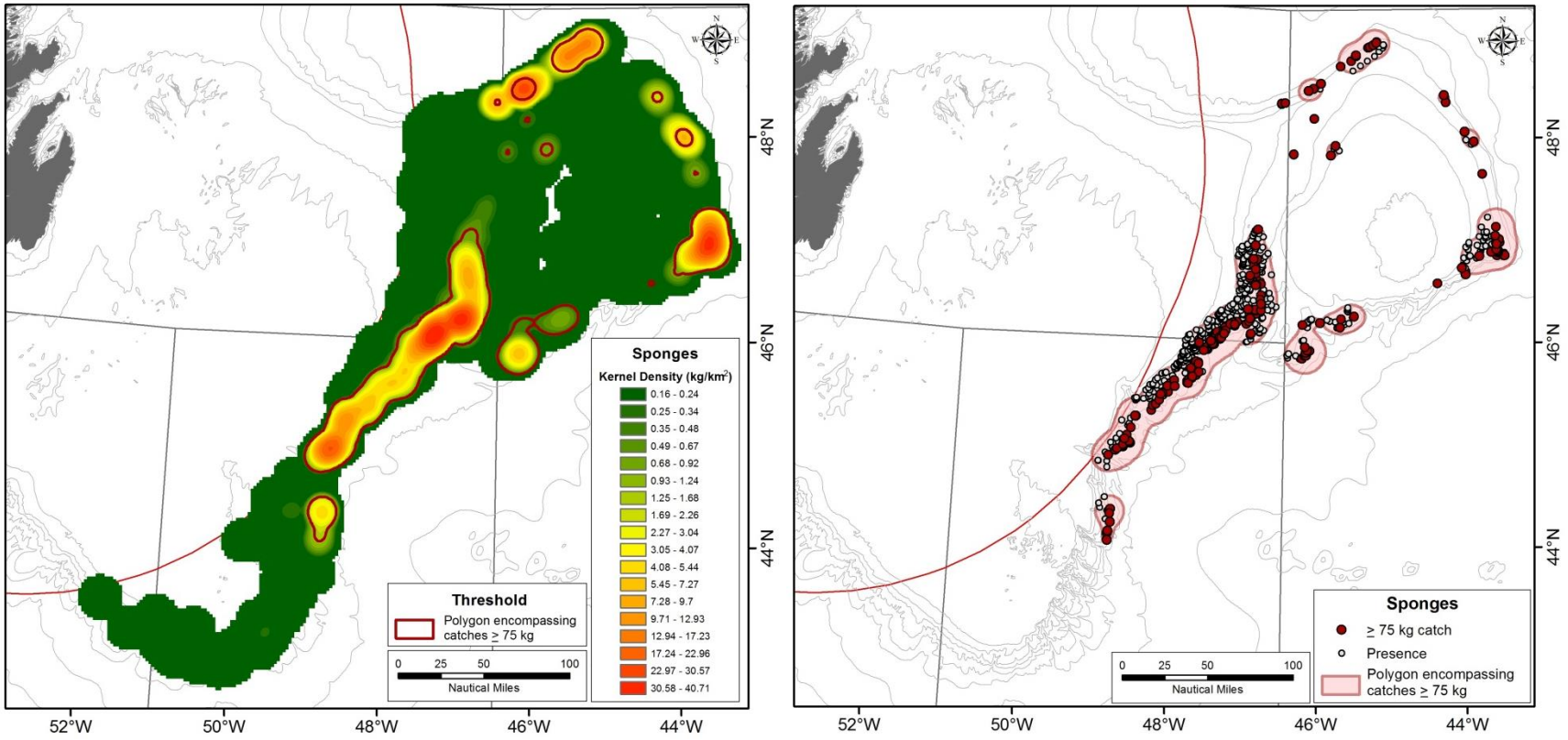

Figure 6. Kernel density distribution of sponges in the NAFO Regulatory area with the 75 kg density polygons defining the sponge ground VMEs superimposed in red. The green areas represent low sponge densities while the red areas indicate high sponge densities. Right panel: The location of catches greater than 75 kg (red circle) and smaller sponge catches (open circles) within the 75 kg density polygons defining the sponge ground VMEs.

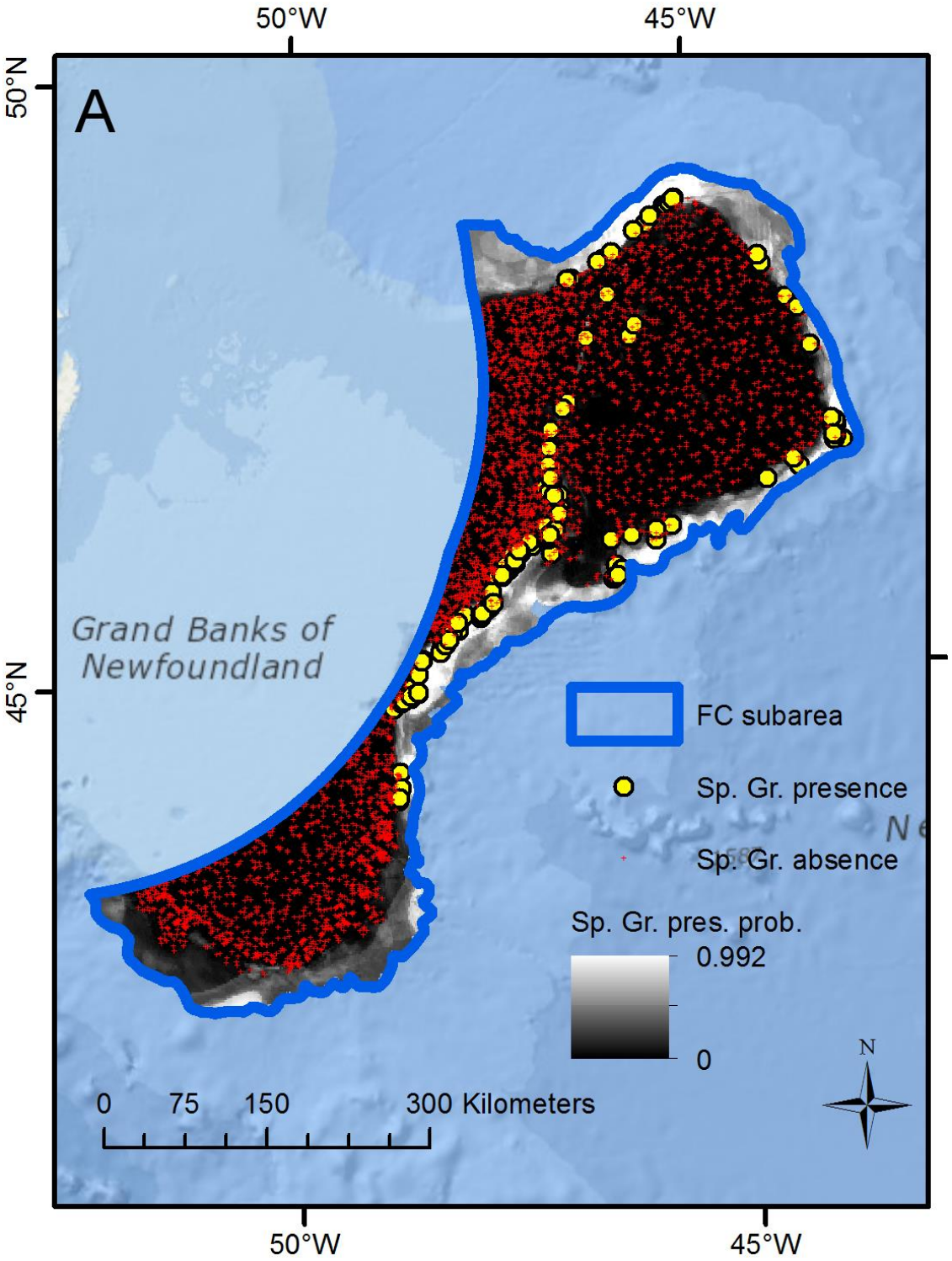

Figure 7. Sponge ground presence/absence observations and predictions of presence probability for the NRA. (from Knudby et al., 2013).

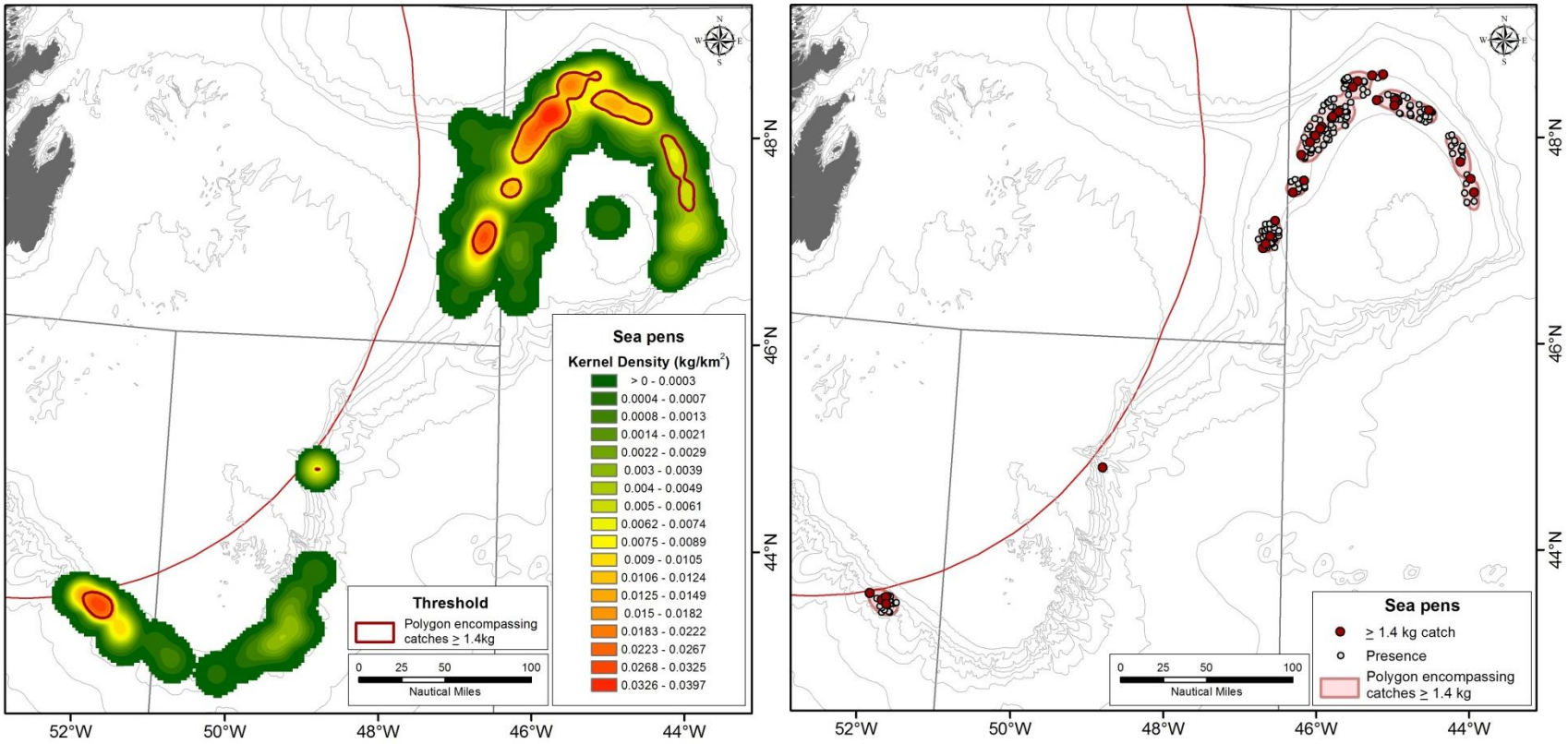

Figure 8. Left panel: Kernel density distribution of sea pens in the NAFO Regulatory area with the 1.4 kg density polygons defining the sea pen field VMEs superimposed in red. The green areas represent low sea pen densities while the red areas indicate high sea pen densities. Right panel: The location of catches greater than 1.4 kg (red circle) and smaller sea pen catches (open circles) within the 1.4 kg density polygons defining the sea pen field VMEs.

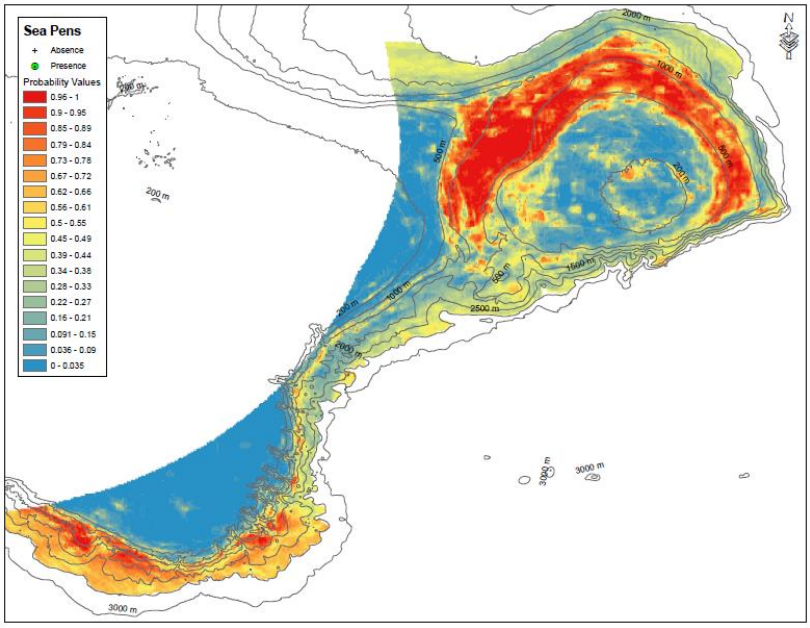

Figure 9. Sea pen presence prediction surface for the NRA based on random forest species distribution modelling of the presence/absence data from the RV surveys and the analysis of 23 environmental variables.

Significant Concentrations of Small Gorgonian Corals

The functional role that corals play in the deep-sea benthic ecosystem, especially structure- or reef-forming corals, has been well documented in terms of their benefits for other species. The structural complexity of these organisms creates additional microhabitat that may be utilized by other organisms as refuge from predators, as spawning and nursery grounds, and as attachment substrate for sessile invertebrates. As a result, coral habitat may exhibit different and/or more diverse and abundant assemblages of fauna compared to surrounding non-biogenic habitat. Although small, the highly-branched nature of small gorgonian corals such as *Acanella arbuscula*, and their ability to form dense aggregations deems them habitat-forming, especially in areas of low topographical relief. Edinger *et al.* (2007) examined the association between groundfish and 5 classes of corals, including large gorgonians, small gorgonians, seapens and/or cup corals, soft corals, and the total absence of corals. They found that of all five groups, groundfish species richness was highest in sets containing small gorgonians (*Acanella arbuscula* and *Radicipes gracilis*), highlighting the potential importance of this group as fish habitat. Kernel density surfaces showed significant concentrations of small gorgonian corals on the Tail of Grand Bank, although some appear to be single records (Figure 10). There has been no ground-truthing of the models for this group.

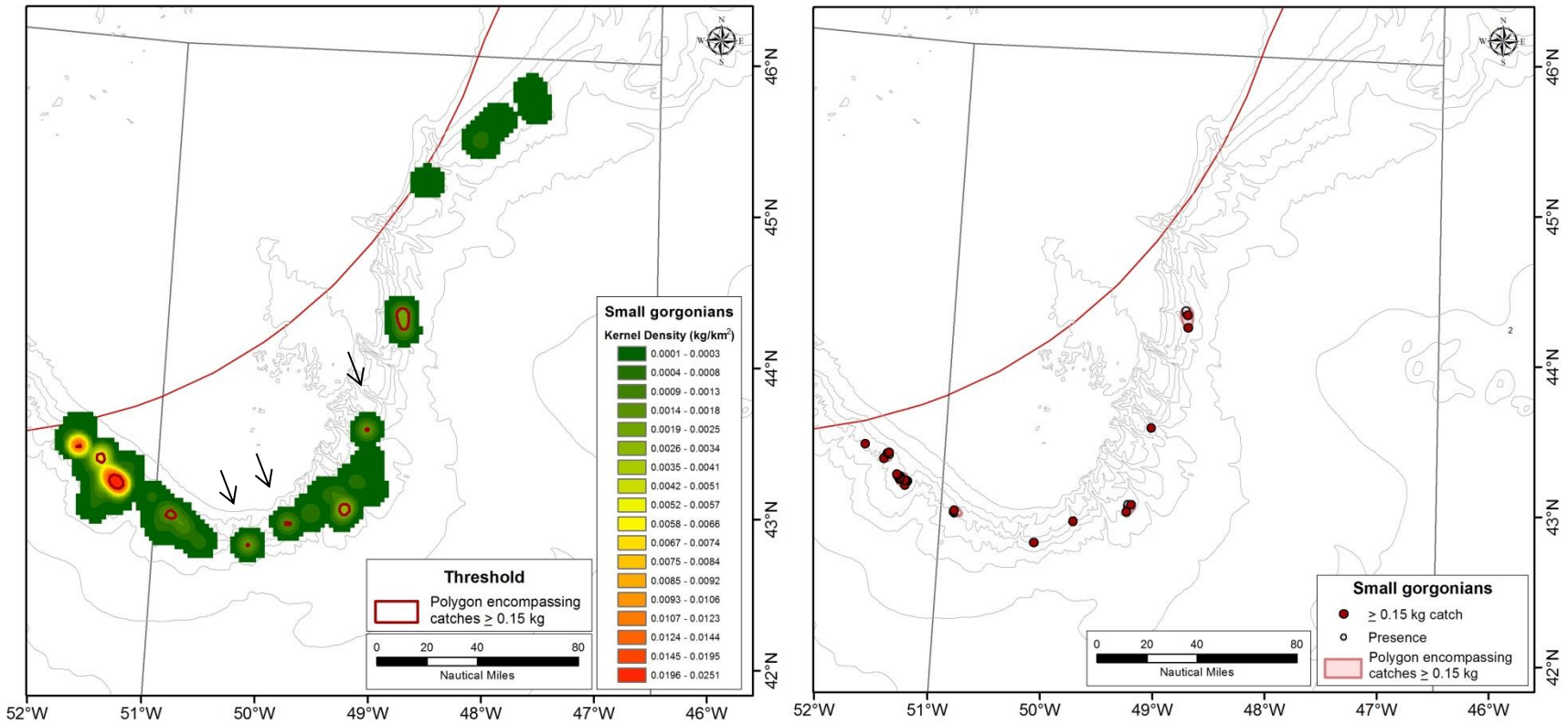

Figure 10 Left panel: Kernel density distribution of small gorgonian corals (primarily *Acanella arbuscula*) on the tail of Grand Bank in the NAFO Regulatory area with the 0.15 kg density polygons defining the small gorgonian coral VMEs superimposed in red. The green areas represent low small gorgonian coral densities while the red areas indicate high small gorgonian coral densities. Arrows point to catches that are not considered to be VME as they are single catches. Right panel: The location of catches greater than 0.15 kg (red circle) and smaller small gorgonian coral (open circles) within the 0.15 kg density polygons defining the small gorgonian coral VMEs.

Significant Concentrations of Large Gorgonian Corals

Gorgonian corals, also known as fan corals, are comprised of a hard or consolidated internal skeleton constructed of either proteinaceous gorgonin, calcium carbonate (calcite or aragonite) or a mixture of the two. In the northwest Atlantic, colonies of *Paragorgia arborea* can exceed 3 m in height, weigh 100s of kilograms, and grow perpendicular to rock walls and overhangs. They require hard substrates of significant size in order to anchor the colony and to strategically orient perpendicular to current flow in order to maximize feeding. Large gorgonian corals found in the study area are very fragile and their representation in the catch is most often in the form of coral fragments rather than whole colonies. The kernel density estimation analyses identified large gorgonian coral catches in Flemish Pass, on Beothuk Knoll and on the southeastern corner of Flemish Cap (Figure 11). The SDM prediction surface identifies the area of significant concentrations of large gorgonian corals in Flemish Pass identified using the kernel density analyses but the area of highest probability of occurrence is along the deep south and eastern slopes of Flemish Cap where there is little data available from the surveys (Figure 12). This is consistent with the influence of the North Atlantic Current. The SDM also predicts that large gorgonian corals will be present in the deeper water of the Sackville Spur area. Although underwater cameras have confirmed the presence of large gorgonian corals in the eastern portion of this Sackville Spur area they did not appear in the western transects.

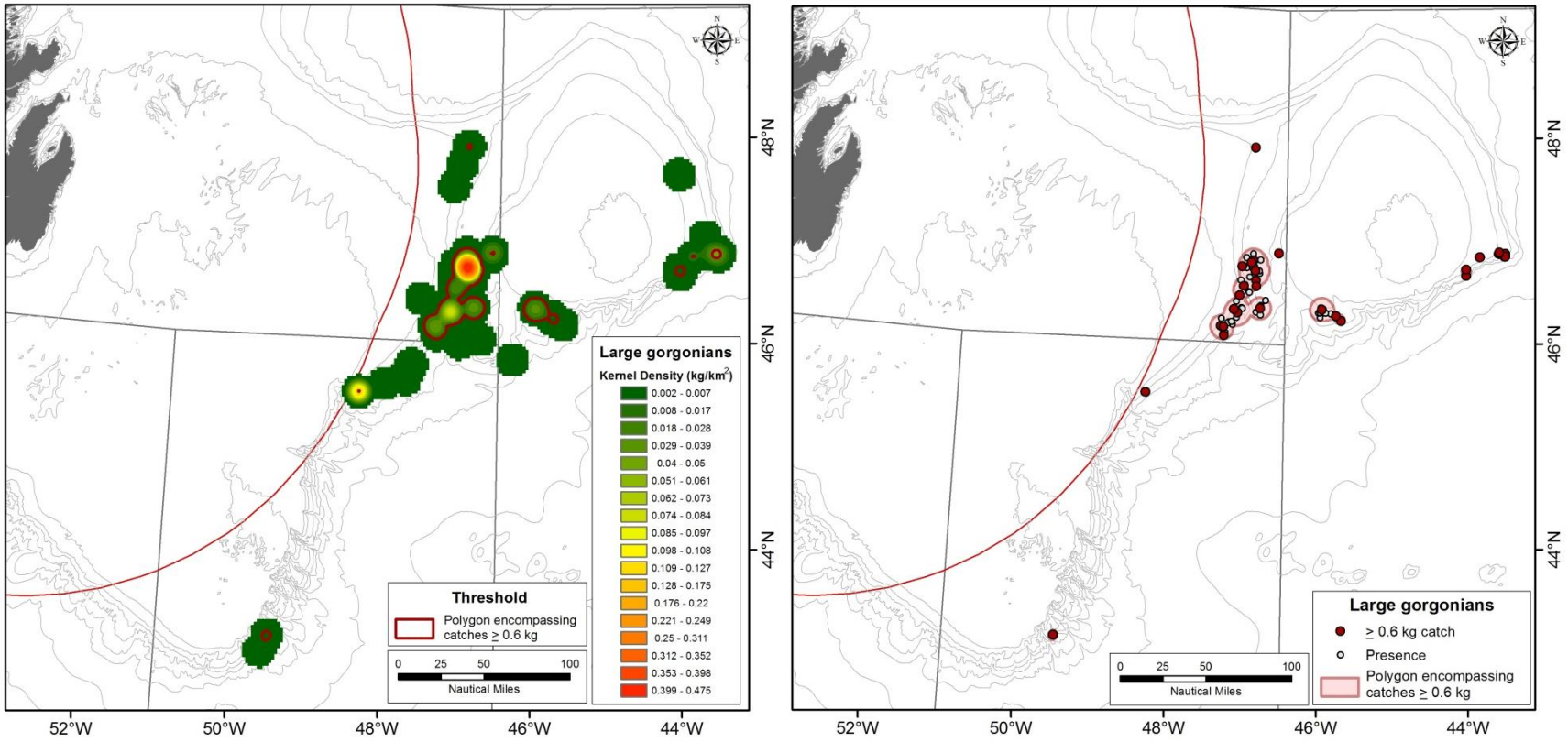

Figure 11 Left panel: Kernel density distribution of large gorgonian corals in the NAFO Regulatory area with the 0.6 kg density polygons defining the large gorgonian coral VMEs superimposed in red. The green areas represent low coral densities while the red areas indicate high coral densities. Right panel: The location of catches greater than 0.6 kg (red circle) and smaller coral catches (open circles) within the 0.6 kg density polygons defining the large gorgonian coral VMEs.

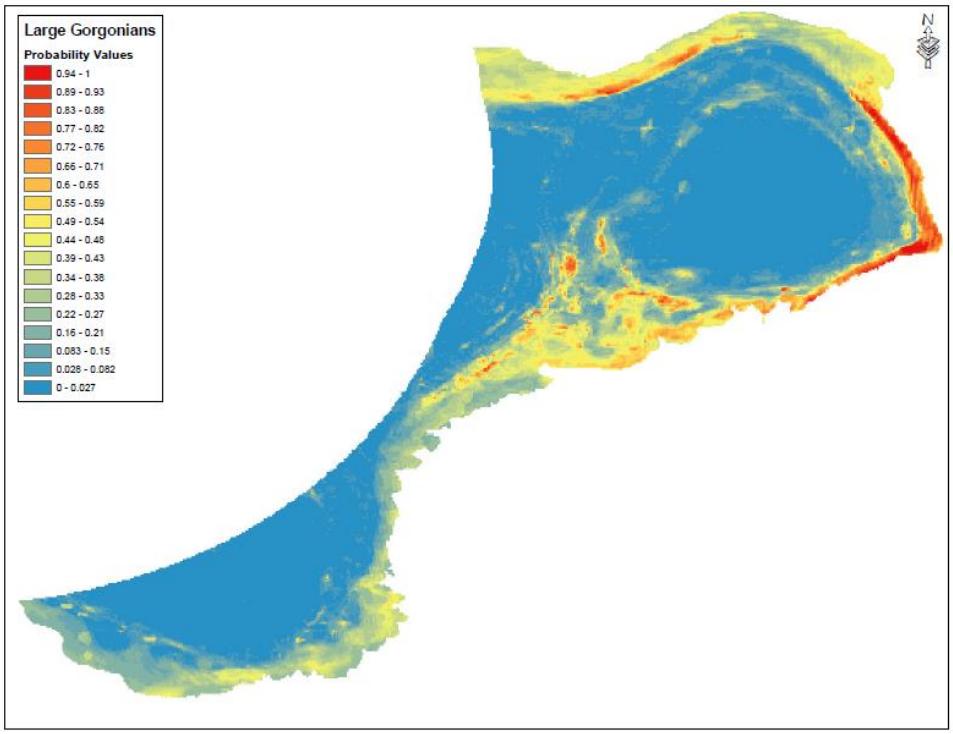

Figure 12. Large gorgonian coral presence prediction surface for the NRA based on random forest species distribution modelling of the presence/absence data from the RV surveys and the analysis of 23 environmental variables.

Significant Concentrations of Tube-dwelling Anemones

Tube-dwelling anemones were observed on several *in situ* photographic transects across the Flemish Cap (Figure 13). The lack of taxonomic details from the photographs and video prevented the identification of these organisms past the family level (Cerianthidae). However, these cerianthids were not large, erect species, and do not appear to be the VME indicator species listed in the WGEAFM Report (2012), *Pachycerianthus borealis*. Although their ability to form habitat for other species may be limited, these cerianthids formed dense fields (Beazley *et al*., 2013) on the southern Flemish Cap slope that may indicate VMEs, particularly if their bioturbation activities significantly affect infaunal community structure. Similarly the data from the RV surveys and NEREIDA rock and scallop dredge samples were only identified to Order (Ceriantharia) and may contain non-VME cerianthid species.

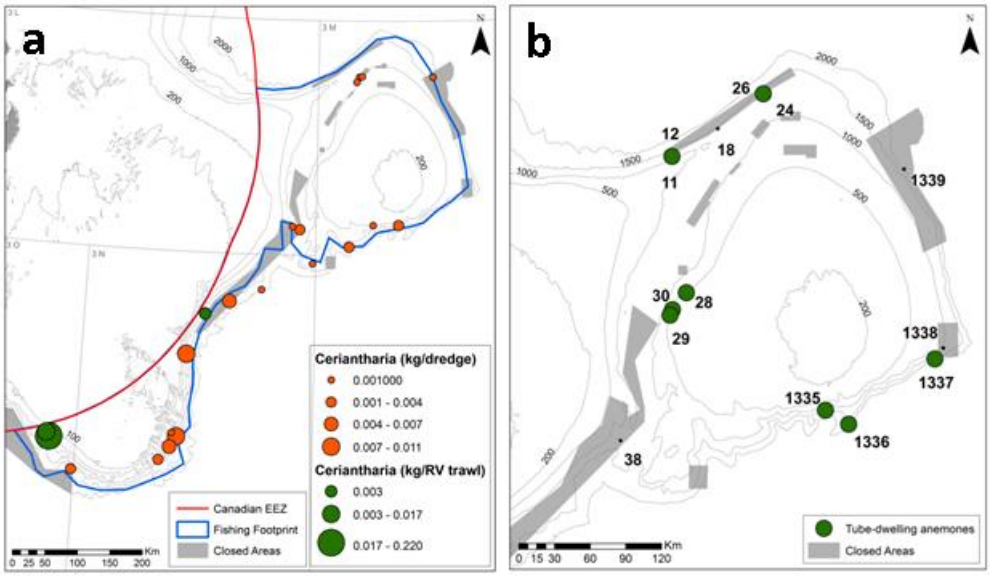

Figure 13 a) Relative abundance of Ceriantharia collected in the NRA during the NEREIDA surveys between 2009-2010 using a rock dredge (orange) and EU-Spain research trawl surveys between 2006-2013 (green), b) Presence of tube-dwelling anemones (Family Cerianthidae) on video and photographic transects collected from the Flemish Cap area in 2009 and 2010.

Significant Concentrations of Erect Bryozoans

Significant concentrations of erect bryozoans in the NRA have not previously been identified using kernel density analyses and associated evaluation of the kernel surface until the November 2013 WGESA meeting. A kernel analysis is presented here for Erect Bryozoans on the Tail of Grand Bank using all available data from the RV trawl surveys. Specifically, data from the Spanish 3NO and 3L surveys (2002-2013) were assessed. These data sources yielded 340 erect bryozoan records. Following previously established methods and assessment criteria, a kernel density surface was created and the area of successive density polygons calculated. The kernel density distribution identified significant concentrations of erect bryozoans on the Tail and Nose of the Grand Bank (Figure 14).

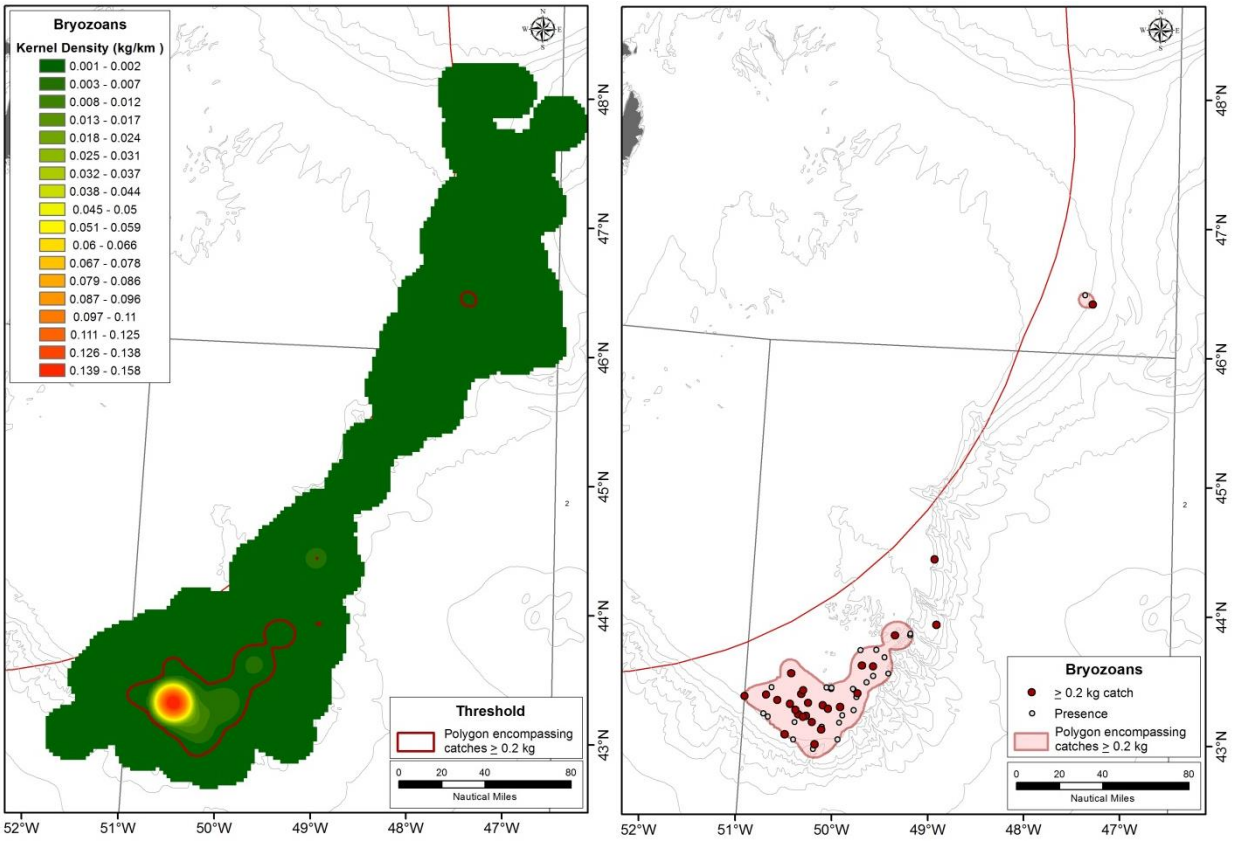

Figure 14 Left panel. Kernel density distribution of erect bryozoans on the tail and nose of the Grand Bank of Newfoundland and Flemish Pass with the 0.2 kg density polygons defining the bryozoans VMEs superimposed in red. The green areas represent low bryozoan densities while the red areas indicate high bryozoan densities. Right panel. The location of catches greater than 0.2 kg (red circle) and smaller bryozoan catches (open circles) within the 0.2 kg density polygons defining the bryozoan VMEs.

Significant Concentrations of Crinoids

Crinoids are delicate organisms that are not well-sampled by trawl nets although they are represented in the catch (Figure 15a). The NEREIDA photographic transects provide *in situ* evidence for dense aggregations of this VME indicator (Figure 15b). The stalked crinoid *Conocrinus lofotensis*, a VME indicator species, was observed in high abundances on the Sackville Spur, but was completely absent from the Flemish Pass area. Video analysis revealed dense fields of the stalked crinoid *Gephyrocrinus grimaldii* on the southern, southeastern, and northeastern slope of the Flemish Cap. This species was completely absent on transects from the Sackville Spur and Flemish Pass area. Unstalked crinoids were not observed in high abundances on any transect analyzed. The data from the RV surveys were only identified to Class (Crinoidea) but do identify crinoids in Flemish Pass and on Grand Bank that were not seen with the benthic imagery.

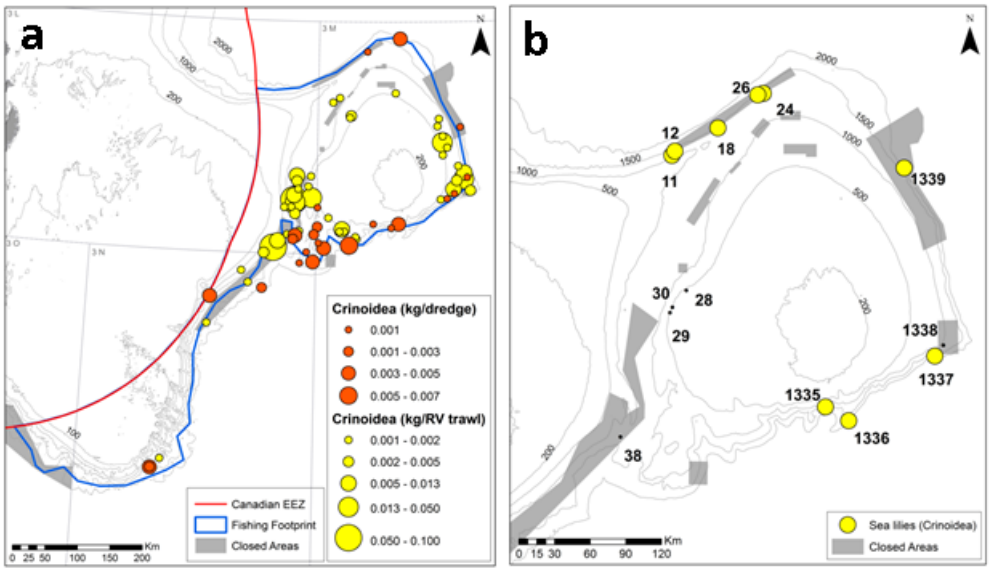

Figure 15. a) Relative abundance of Crinoidea collected in the NRA during the NEREIDA surveys between 2009-2010 using a rock dredge (orange) and EU-Spain research trawl surveys between 2006-2013 (yellow), b) Presence of sea lilies (*Conocrinus lofotensis* and *Gephyrocrinus grimaldii*; Crinoidea) on video and photographic transects collected from the Flemish Cap area in 2009 and 2010.

Significant Concentrations of Large Sea Squirts

Large sea squirts (specifically stalked tunicates) were identified as VME indicators in Murillo *et al.* (2011) and accepted by NAFO as such (NAFO, 2012). Maps of their distribution in the NRA have been prepared previously but no quantitative assessment had been undertaken. There are 87 records of large sea squirts, mainly of *Boltenia ovifera*, a habitat-forming stalked tunicate, a VME indicator species, all of which are located on the Tail of Grand Bank (Figure 16). Beazley *et al.* (2013) did not observe any on their photographic transects on Flemish Cap, and none were collected in the NEREIDA box cores or rock and scallop dredge samples.

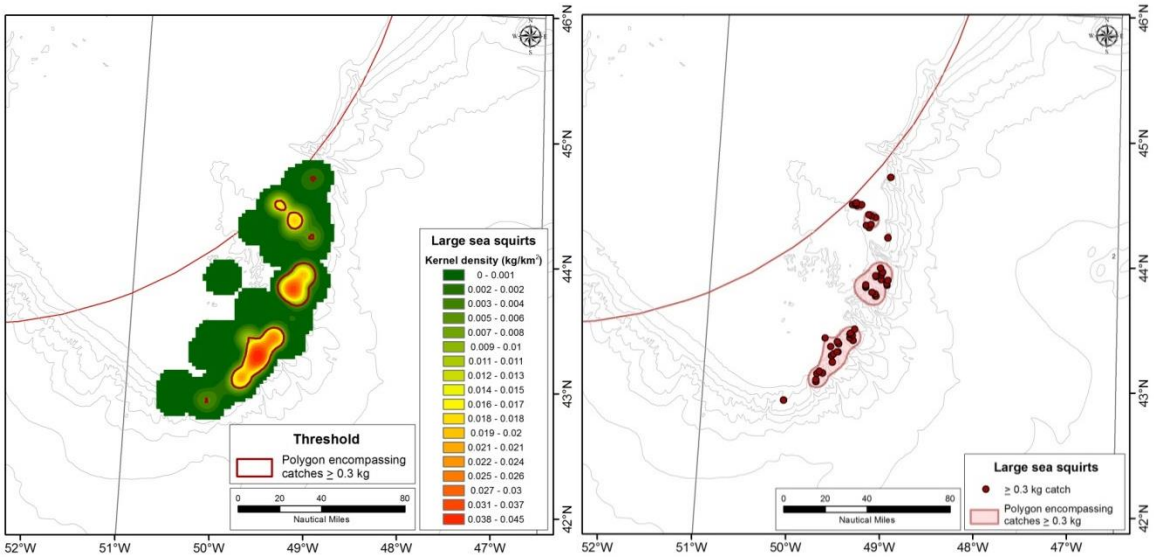

Figure 16. Left panel: Kernel density distribution of large sea squirts (mainly *Boltenia ovifera*) in the NAFO Regulatory area with the 0.3 kg density polygons. The green areas represent low large sea squirt densities while the red areas indicate high densities. Right panel: The location of catches greater than 0.3 kg (red circle) within the 0.3 kg density polygons.

3. Annual scientific surveys to assess fishery resources and ecosystem state

Stock assessments are conducted on a routine basis (between every one to three years) and rely in many cases on research vessel trawl surveys. Unlike commercial hauls, these are usually between 15 and 30 minutes and cover a wide area of the NRA. Comparability of the surveys (time series) is an important consideration.

EU-Spanish Flemish Pass Division 3M Bottom Trawl Survey

A random stratified bottom trawl survey on the Flemish Cap (NAFO Div. 3M) has been carried out by Spain during July since 1988 (Table 7). A survey protocol can be found in Vázquez *et al.* (2013). The area surveyed extends to depths of 800 fathoms (1460 meters). In the most recent survey, 181 fishing stations were planned, of which a total of 174 valid hauls were completed (Figure 17). Survey results including abundance indices of the main commercial species and age distributions for cod, redfish, American plaice, Greenland halibut, roughhead grenadier and shrimp.

Table 7. History of the EU-Spain Flemish Cap Survey, 1988 - 2012.

Year	Vessel	Valid tows	Dates
1988	*Cornide de Saavedra*	115	8/7 – 22/7
1989	*Cryos*	116	12/7 – 1/8
1990	*Ignat Pavlyuchenkov*	113	18/7 – 6/8
1991	*Cornide de Saavedra*	117	24/6 – 11/7
1992	*Cornide de Saavedra*	117	29/6 – 18/7
1993	*Cornide de Saavedra*	101	23/6 – 8/7
1994	*Cornide de Saavedra*	116	6/7 – 23/7
1995	*Cornide de Saavedra*	121	2/7 – 19/7
1996	*Cornide de Saavedra*	117	28/6 – 14/7
1997	*Cornide de Saavedra*	117	16/7 – 1/8
1998	*Cornide de Saavedra*	119	17/7 – 2/8
1999	*Cornide de Saavedra*	117	2/7 – 20/7
2000	*Cornide de Saavedra*	120	10/7 – 28/7
2001	*Cornide de Saavedra*	120	3/7 – 20/7
2002	*Cornide de Saavedra*	120	30/6 – 17/7
2003	*Vizconde de Eza* *Cornide de Saavedra*	177 (114) 50**	2/6 – 2/7 7/6 – 17/6
2004	*Vizconde de Eza* *Cornide de Saavedra*	177 (124) 61**	25/6 – 2/8 23/7 – 2/8
2005	*Vizconde de Eza*	176 (117)	1/7 – 21/8
2006	*Vizconde de Eza*	179 (115)	1/7-26/7
2007	*Vizconde de Eza*	174 (117)	23/6-19/7
2008	*Vizconde de Eza*	179 (111)	23/6-19/7
2009	*Vizconde de Eza*	178 (119)	23/6-20/7
2010	*Vizconde de Eza*	153 (97)	22/6-21/7
2011	*Vizconde de Eza*	128 (79)	29/6-9/8
2012	*Vizconde de Eza*	174(118)	26/6-24/7

( ) valid tows carried out in depths lesser than 400 fathoms
** calibration tows

EU-Spanish Flemish Pass Division 3L and 3NO Bottom Trawl Survey

The Spanish bottom trawl survey in NAFO Regulatory Area Div. 3NO is conducted during June on board the R/V *Vizconde de Eza* (Casas and González-Troncoso, 2013). In the most recent survey, total of 122 valid hauls and 122 hydrographic stations were taken within a depth range of 45-1450 m according to a stratified random design (Figure 17). Furthermore, a stratified sampling by length class and sex was used to sample gonads and otoliths of Atlantic cod, American plaice and Greenland halibut for histological maturity, fecundity and growth studies. The results of this survey, including biomass indices with their errors and length distributions, as well as the calculated biomass based on conversion of length frequencies for Greenland halibut, American plaice, Atlantic cod, yellowtail flounder, redfish, witch flounder, roughhead grenadier, thorny skate and white hake are presented as Scientific Council Research Documents. In addition, age distributions are presented for Greenland halibut and Atlantic cod.

In 2003 it was decided to extend the Spanish 3NO survey toward Division 3L (Flemish Pass) (Roman *et al.,* 2013). The R/V *"Vizconde de Eza"* has carried out these surveys following the same procedures and using the

same bottom trawl gear. Table 8 presents the number of valid tows, the depth strata covered and the dates of the survey series. Figure 17 shows haul positions of Spanish surveys in NAFO Division 3L in 2013.

Table 8. History of the EU-Spain Division 3L Survey, 2003 - 2012.

Year	Vessel	Valid tows	Depth strata covered (m)	Surveyed strata (no.)	Dates
2003	R/V *"Vizconde de Eza"*	39	118-1100	17	June 2 - June 6, June 29
2004	R/V *"Vizconde de Eza"*	50	141-1452	23	August 7 - August 15
2005	-	-	-	-	-
2006	R/V *"Vizconde de Eza"*	100	116-1449	24	July 31 - August 18
2007	R/V *"Vizconde de Eza"*	94	119-1449	24	July 23 - August 11
2008	R/V *"Vizconde de Eza"*	100	105-1455	24	July 24 - August 11
2009	R/V *"Vizconde de Eza"*	98	111-1458	24	July 25 - August 12
2010	R/V *"Vizconde de Eza"*	97	119-1462	24	July 25 - August 14
2011	R/V *"Vizconde de Eza"*	89	115-1419	24	August 10 - August 24
2012	R/V *"Vizconde de Eza"*	98	112-1478	24	July 30 - August 18

Canadian Multi-Species Survey

The Canadian multi-species survey, which extends beyond the EEZ limits, out to the edge of the Grand Bank, has been carried out Fisheries and Oceans Canada (DFO) off the coasts of Newfoundland and Labrador since the 1950s (Figure 17). Originally directed at specific commercial species, more species have been added to the sampling over the years. The result is that DFO's current multi-species survey program provides a continuous baseline for the abundance and distribution of many of the major commercial fish and shellfish, dating back to the early 1970s (Healey *et al.,* 2012). This is critical information, providing nothing less than the very foundation for any efforts to determine trends in population, assess stocks, set catch levels, and monitor the effects of fishing pressures on various stocks. Great care is taken to keep the survey design and methods consistent with those of past years, so as to maintain the integrity of the multi-year database. Changes in methodology have to be tested to ensure that they do not bias the results.

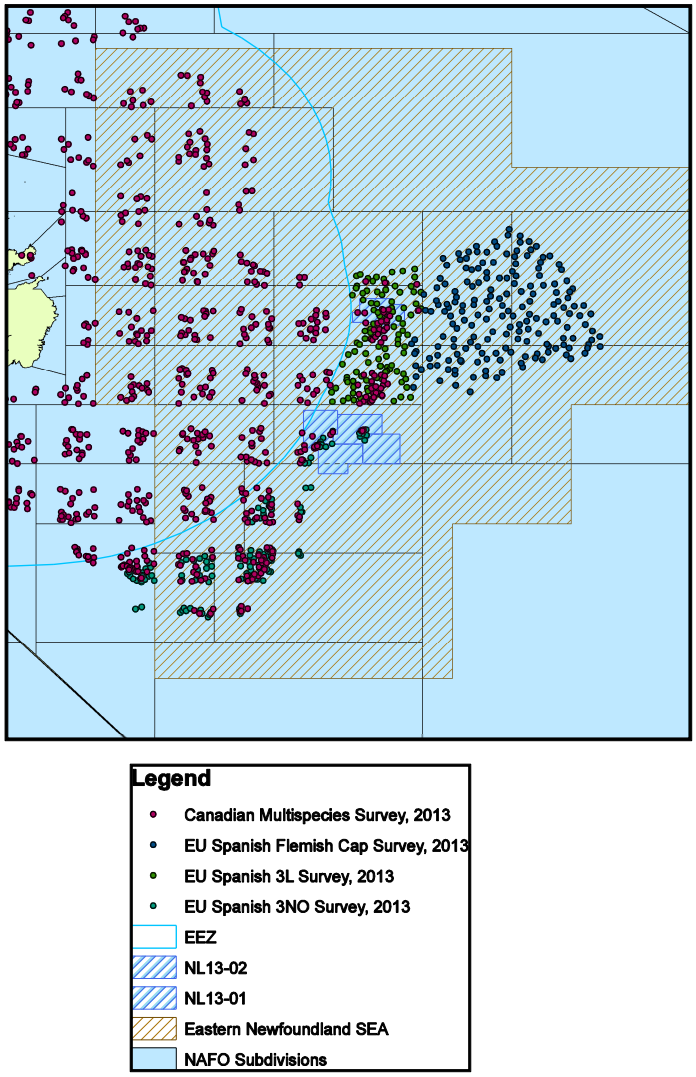

Figure 17. Positions of Spanish and Canadian survey hauls used in NAFO assessments, 2013.

4. Scientific assessment of fish stocks

NAFO scientific Council has developed a wide range of biologic scientific advice through carrying out stock assessments and provides advice on the status of 17 commercially exploited fish and shellfish stocks occurring within its regulatory area. Of these, 16 occur within the area considered in the current SEA. Half of these are presently under moratorium and closed to fishing to allow rebuilding. The most recent assessment and advice for each stock is summarized in .

Table 9.

Table 9. Summary of science advice in NAFO for specific stocks

Species	**Area**	**Status**	**Advice**
American plaice	Div.3M	Stock at low level	No directed fishery to allow rebuilding
	Div. 3LNO	Stock below biomass limit reference point	No directed fishery to allow rebuilding
Capelin	Div. 3NO	Stock at low level	No directed fishery to allow rebuilding
Cod	Div. 3M	Stock increasing, above biomass limit reference point	Catches up to 14521 in 2014
	Div. 3NO	Stock below biomass limit reference point	No directed fishery to allow rebuilding
Greenland halibut	Subarea 2 + Div. 3KLMNO	Stock managed under a harvest control rule	Following the HCR, the TAC for 2014 is 15 441 t
Northern shrimp	Div. 3M	Stock below biomass limit reference point	No directed fishery to allow rebuilding
	Div. 3LNO	Stock at biomass limit reference point	No directed fishery to allow rebuilding
Redfish	Div. 3M	Stock stable at high level	No increase on TAC of 6500 t
	Div. 3LN	Stock has recently recovered	Fishing mortality should be kept around current levels, leading to catch options up to 6287 t for 2014
Squid	Subarea 3+4	Stock in low productivity state	TAC no greater than 34 000 t
Thorny skate	Div. 3LNOPs	Stock has remained low since mid-1990s	Catches in in excess of recent levels (~4 700 t) will increase the risk of the stock failing to rebuild
White hake	Div. 3NO	Stock at low level	Catches of 100 – 300 t
Witch flounder	Div. 2J3KL	Stock below biomass limit reference point	No directed fishery to allow rebuilding
	Div. 3NO	Stock at low level	No directed fishery to allow rebuilding
Yellowtail flounder	Div. 3LNO	Stock increasing, above biomass limit reference point	Catches up to 26 000 t in 2014

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Annex 1. GFS/14-131: NAFO response to the C-NLOPB SEA draft report

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GFS/14-131

16 April 2014

Canada-Newfoundland and Labrador Offshore Petroleum Board
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140 Water Street
St. John's, NL A1C 6H6
Email: information@cnlopb.nl.ca

Dear Madam/Sir,

Subject: NAFO response to the C-NLOPB SEA draft report

Attached is the response of the Northwest Atlantic Fisheries Organization (NAFO) to the invitation for comments to the draft Eastern Newfoundland Strategic Environmental Assessment (SEA) Report recently released by the Canada-Newfoundland and Labrador Offshore Petroleum Board (C-NLOPB). Although the NAFO Secretariat offered to provide information to the SEA process at a stakeholder workshop in September 2013, no requests for dialogue were received. Recognizing the implications of oil and gas exploration (e.g. seismic surveys), oil and gas development (e.g. location and exclusion zones) and the possibility of spills (e.g. immediate effect on fisheries and productivity), NAFO wishes to bring a range of information on fisheries, habitat and research that occur on the high seas outside of the Canadian exclusive economic zone to the attention of C-NLOPB, to inform its SEA.

The attached NAFO response focuses on the following areas:

1. There is **extensive fishing activity in the NAFO Regulatory Area** (NRA – the NRA is that part of the Northwest Atlantic high seas adjacent to Canada's 200-mile Exclusive Economic Zone), missing from the draft SEA Report, which overlaps with current leases and exploration areas. Fishing activity in the NRA targets a range of species (mainly cod, redfish, Greenland halibut, shrimp, skates and other flatfish). The approximate first sale (landed) value is $200M annually across all members. Fishing activity is not distributed uniformly across the NRA and some areas are particularly important for certain stocks. As the objective of the SEA is to develop information for future licencing decisions by the C-NLOPB for this region, NAFO believes that the impacts of possible future oil and gas exploitation on fishing activities in the proposed new licensing areas must be considered in the SEA report.

2. The **proposed oil and gas licensing areas significantly overlap with already-recognized Vulnerable Marine Ecosystems (VME) protection areas in the NRA**. The international obligation to protect vulnerable marine ecosystems (VMEs) is referred to in numerous United Nations General Assembly Resolutions (UNGA Resolution 61/105 of 2006, Resolution 64/72 of 2009 and Resolution 66/68 of 2011). These most vulnerable ecosystems are easily damaged and have a very slow recovery or may never recover, even from occasional disturbances. NAFO has already implemented extensive management actions to protect VMEs in the NRA. These measures take into account the nature of fishing activities (e.g. tow length and orientation of trawl tracks) in order to manage responsible fishing and minimize the risk of significant adverse impacts on VMEs. NAFO has also decided to close these areas for fisheries.

3. The possibility that **oil and gas exploration activities could interfere with ongoing fishery research.** In 2013 a seismic vessel - MV *Sanco Spirit* - undertaking geoscientific surveys in the context of the SEA, heavily disturbed the work of a fisheries research vessel carrying out a biological survey. During its research activities around the Flemish Cap the research vessel was forced to modify its research plan a number of times (a stratified-random sample) as the seismic vessel was a huge source of noise. Fisheries research vessels are specially designed to reduce noise and interference with the marine ecosystem. Operating a research vessel is costly and having to modify plans at the last minute undermines the quality of the research. Fishery surveys also need to be conducted in a consistent manner from year to year to produce comparable results and a perturbation during a particular survey may considerably bias the results, undermining scientific advice and fisheries management.

One area which we need to consider urgently is a mechanism to share information between the operators/licence holders and NAFO. This is particularly important in the short-term for the operation of our research vessel surveys that will occur between June and August. We believe it is important that adequate arrangements are found in order to ensure a mutual exchange of information between NAFO and the organizations behind the seismic surveys taking place in the NRA. Furthermore, it would be important to reflect on mitigation measures. In particular, an appropriate mechanism should be put in place to reduce the risk of loss or damage and to provide compensation for any such loss or damage to NAFO Contracting Parties.

This letter forms an integral part of our submission (Annex 1).

Sincerely yours,

[redacted]

On behalf of

[redacted]

NAFO President and
Chair of the General Council

VV:ll
Encl.: NAFO response to the C-NLOPB SEA draft report (32 pgs.)