Fisheries and Oceans Canada
Science
Pêches et Océans Canada
Sciences

Newfoundland and Labrador and Maritimes Regions

Canadian Science Advisory Secretariat
Science Response 2010/008

REVIEW OF THE SOUTHERN NEWFOUNDLAND STRATEGIC ENVIRONMENTAL ASSESSMENT

Context

DFO Science was called upon by the Oceans, Habitat, and Species at Risk (OHSAR) Branch to review the Canada-Newfoundland and Labrador Offshore Petroleum Board's (CNLOPB's) "Southern Newfoundland Strategic Environmental Assessment" (SNL SEA). Previous to this, a Scoping Document for the SNL SEA was prepared by CNLOPB with the assistance of a working group consisting of members from federal and provincial government agencies, local Regional Economic Development Boards, the fishing industry, and non-governmental organizations to provide an outline of factors to be considered in the SEA, the scope of those factors, and guidelines for the preparation of the SEA report, and provides a framework for which a review can be carried out. The SNL SEA was drafted by LGL Limited and released for public review on August 20, 2009 (http://www.cnlopb.nl.ca/env_strategic.shtml), with a response deadline of September 29, 2009. Given that DFO is not the final advisory body for this request (through the Canadian Environmental Assessment Act (CEAA) process), the short timeline to carry out a review, and since reviews of previous CNLOPB SEA reports in the Region have been provided by DFO Science in the past, it was determined that the Special Science Response Process (SSRP) should be used.

Background

A SEA incorporates a broad-based approach to environmental assessment that examines the environmental effects that may be associated with a plan, program or policy proposal and allows for the incorporation of environmental considerations at the earliest stages of program planning, and therefore considers the larger ecological setting, rather than a project-specific environmental assessment that focuses on site-specific issues with defined boundaries. In this particular case, information from the SEA will assist the CNLOPB in determining whether further exploration rights should be issued in whole or in part within the SNL SEA Area and may identify general restrictive or mitigative measures that should be considered for application to consequent exploration activities.

Although subsequent activities still require the specific approval of the CNLOPB, including a project-specific environmental assessment (EA) of its associated environmental effects, the SEA assists in streamlining and focusing these EAs by providing an overview of the existing environment, discussing in broader terms the potential environmental effects associated with offshore oil and gas activities in the Southern Newfoundland SEA Area, identifying knowledge and data gaps, highlighting issues of concern, and making recommendations for mitigation and planning.

The effects of offshore petroleum projects on the immediate marine environment are of interest to DFO as there are a broad range of Valued Ecosystem Components (VECs) occurring within the study area, including: many species of fish, fish habitat (including benthic habitat); commercial fisheries, marine mammals and sea turtles, species at risk and sensitive areas.

This Science Response includes a review of the proponent's evaluation of the physical and biological marine environment, exploration and production associated environmental effects, and cumulative effects – focusing on associated data gaps and inconsistencies that might occur within the report.

Analysis and Response

General Observations

Given the intent of a SEA to form a basis for subsequent environmental assessment (EA) planning by providing much of the background environmental information that will be used for EA purposes and to focus on the needs for additional research where information gaps are identified, a SEA report must be held to the same standards of documentation and quality as the subsequent EAs. Often, the SEA document is referenced as the basic information for an area during an EA. Therefore, if the information in the original SEA is not correctly addressed and referenced, scientific review of subsequent documents has the potential to become a cumbersome search for the pertinent information and/or the original statement that is being cited.

Many of the biological and ecological components of the draft SNL SEA are severely lacking in this required scientific rigor and documentation. Also in this respect, references are often lacking, are out of date, or improperly cited. For example, some conclusions regarding potential environmental issues and those dismissing potential environmental effects as negligible are unsubstantiated and unreferenced, while other references are cited using "as cited in" other reviews. With respect to the presentation of figures and tables, many of these lack sufficient detail for interpretation.

It was also noted throughout the review that this draft SEA demonstrates some similar omissions in the description of existing knowledge and analysis as those preceding it. Therefore, it is suggested that at least equal responsibility be afforded the CNLOPB to ensure that the same omissions are not repeated in concurrent or subsequent documents.

With respect to the analysis of the information, some sections demonstrate a lack of ecological integration of the system. While individual interactions between possible projects or activities and VECs are discussed, each is viewed independently with little or no attempt at integration. This omission is particularly evident in the discussion (and dismissal) of potential cumulative effects.

In general, there is not a large amount of information from the Maritimes Region contained within this SEA. Information that is provided for this Region does seem to be reasonably accurate and complete. However, further discussion could be provided on the potential impacts of activities (e.g., spills and discharges) conducted within the SEA on areas adjacent to the SEA. Potential implications of oceanographic conditions and dynamics for planning and impacts of human activities are not fully explored.

Notable in the description of the biological environment, the draft SEA often appears to be inappropriately using 2006/07 as benchmarks from which to perform an evaluation of potential impacts (e.g., phytoplankton, zooplankton, commercial fish, and fisheries). Given natural variations in the state of the ocean, assessments of this sort should make use of broader timeframes where possible.

It was also noted throughout the review of the SEA that increased detail and consistency is required in the use of scientific names and place names. For example, 3Pn, 3Ps and 4Vs are Northwest Atlantic Fisheries Organization (NAFO) sub-divisions, not Divisions. Addtionally, it should be recognized that names common to some industries are not going to be common to all (e.g., locations such as Lewis Hill, Whitbourne Canyon and Jukes Canyon and the Stone Fence). It is suggested that a map displaying all place names that are referenced within the document be included in the SEA.

Introduction (1.0)

Scoping (1.2)

The scoping document for the SEA indicates that project-environment interactions for the coastal environment will be identified and discussed. However, boundaries for the study area were chosen based on historical exploration, the 4000 m contour, and administrative boundaries, and neglected to consider that inshore areas could be impacted if the project were to reach the production stage. For example, it is recognized that ship and helicopter traffic could increase significantly in support of production and could have associated inshore effects.

Based on the above observation, it is suggested that the area for the SEA be extended to the southern coast of Newfoundland, including Placentia Bay. The SEA identifies shipping routes to the Newfoundland coast (Placentia Bay specifically) to support potential southern Newfoundland platforms, explorations, and transport. Therefore, it is important to include Placentia Bay in the SEA to allow for early stage planning that could mitigate future cumulative effects.

Physical Environment (2.0)

Climatology (2.1)

Sea surface temperature (SST) at the first occurrence in the text or in tables/figures should be spelled out. Units should also be added to Tables 2.2 to 2.11, and Table 2.17.

The temperature pattern in Figure 2.26 does not “clearly show” the Labrador Current, but at most “suggests” its existence. If it is not the purpose of the SEA to show the two branches of the Labrador Current, the presentation of some model results (Han et al. 2008), Acoustic Doppler Current Profile (ADCP) results (Contact Dave Senciall, DFO) or calculated geostrophic currents from Conductivity, Temperature, Depth (CTD) data would be useful in relaying the appropriate information.

When available from the data, trends in the intensities of wind, waves, air temperature, sea surface temperature, visibility, and precipitation within the past 50 years should be presented within this section of the document. A discussion of storm surges should also be included in this section.

Sea Spray Vessel Icing (2.1.7)

If available, local observational data should be used for calibration of the algorithm for the frequency of potential icing conditions in the SEA area.

Tropical Systems (2.1.8)

In discussing tropical systems, the SEA should indicate where the Canadian Hurricane Centre (CHC) Response Zone is situated. Also for consideration, an explanation for the negative correlation between the summer North Atlantic Oscillation (NAO) index and the storm occurrence on the CHC Response Zone would be useful.

Physical Oceanography (2.2)

Figure 2.16, is supposed to represent the main feature of the surface circulation in the western Atlantic (not just the SEA), but the arrow indicating flow from the Gulf of St. Lawrence does not clearly identify movement in relation to the Scotian Shelf, i.e., it misses the inshore Nova Scotia current. This may not be particularly relevant to impacts within the study area, but it could be relevant to distribution of discharges if they were to occur along the north-western boundary of the SEA area.

Figure 2.17 shows the bathymetry of the SEA Area, but does not cite the source of the bathymetric data. A similar omission in citation occurs in section 7.1 of the Scoping Document where it is stated that the SEA Area extends to the 4000 m contour. It should be indicated whether this information is from a commercially available dataset, from a combination of datasets or from a Canadian Hydrographic Service (CHS) survey. Without providing the source for this bathymetric data, future assessments carried out against the information in the SEA risk the possibility of using another source of bathymetry that might not be in total conformity with that in the SEA. Also in this figure, additional labels for details such as the Laurentian Channel, Hermitage Channel, etc. in the Newfoundland Region, and for the banks in the adjacent Maritimes Region would be helpful.

Currents (2.2.1)

The summary on currents is incomplete with respect to ocean current variability without including the advances made in the past decade. There are studies on ocean currents associated with Gulf Stream rings for the slope area (e.g., Han 2003; Han 2004; Chaudhuri et al. 2009), where the speed can reach 1-2 m/s in Area 3P. In addition, a few of the details provided in this section of the SEA could be debated. For example, the offshore branch of the Labrador Current, particularly the surface flow, frequently does not make it around the tail of the bank – sea surface current statistics for this region from satellite altimetry that are described in various publications (e.g. Han 2004; Han 2006) to address and highlight this interannual variability of the offshore Branch of the Labrador Current within the SEA.

Ice (2.3)

Sea Ice (2.3.2)

Figure 2.28 shows the zonal division line occurs at about 56.1˚ W not 55˚ W as stated in the text. The figure and text need to concur. Also in this section, “Fig. 2.18” in the text should read “2.28”.

Icebergs (2.3.3)

Figure 2.36, illustrating iceberg drift patterns, does not match the text describing the general drift patterns. The error in drift patterns in the figure should be corrected.

Bathymetry (2.4)

Place names and identifying features are presented only within the actual SEA area, although areas outside this area are described throughout the document. Features within the Maritimes Region (e.g., Stone Fence) that are described elsewhere in the report could be identified within the representation here.

Geology (2.5)

A quality description of the geology of the area is provided, but no linkages are made with the implications of this information for the evaluation of potential project impacts (either in this section or in the planning implications).

The location of the Eastern and Western Valleys is not clear. These should be indicated by either map or latitudes and longitudes in this section.

Planning Implications (2.7)

Physical Oceanography (2.7.2)

Conclusions for planning implications based on physical oceanography need to be cautious. Currents over the slope can be much stronger than those over the Bank. The warm core ring with a significantly large current speed (1-2 m/s) may also reach quite deep (>1000 m). Therefore, operating conditions could be significantly different in this slope region when compared with operations occurring over the Grand Bank in terms of possible flow-induced torque. Current meter data should be collected over the deep slope to validate any oceanographic conclusions used for planning.

With respect to temperature characteristics of the area, significant effort and detail were put into describing the temperature profiles of the region. While not explicitly stated, this section seems to imply that this knowledge of physical oceanography is important primarily to assist with understanding of potential impacts of the environment on the operations within the area rather than to assist with understanding of potential impacts of projects on the environment. Therefore, rationale for inclusion of temperature and salinity information and its relationship to environmental impacts considerations could be strengthened.

Other key omissions in this section include the linkages between ocean currents and spill or discharge trajectories, as well as the implications of slides and sediment movement on potential dispersal (and monitoring) of drilling discharges such as drilling muds and cuttings.

Biological Environment (3.0)

3.1 Fish Habitat

Coral reefs are also a fish habitat VEC and should be highlighted as such in the introduction of this section.

Zooplankton and phytoplankton are considered fish habitat throughout the SEA. It is unclear why – reasoning for this should be elaborated upon if for certain planning or other purposes.

Coastal Algal Communities (3.1.2)

With respect to habitat, increased emphasis should be placed on the role of eelgrass and other near shore habitats and communities within the SEA. For example, eelgrass has recently been identified as an Ecologically Significant Species (ESS) (DFO 2009). Since the identification of ESSs is a tool for bringing attention to species or community properties that have particularly high ecological significance in order to facilitate the provision of a greater-than-usual degree of risk aversion in the management of human activities that may affect them, eelgrass should be elaborated on accordingly within the SEA.

Estuarine Algae - Overall, the community structure and composition of pelagic ecosystems in south coast estuaries is not adequately documented and requires elaboration.

Laminarial communities on the south coast of the Island are changing rapidly at the moment due to the spread of the invasive bryozoan *Membarnipora membranacea.* The dynamics are changing from multi year kelp forests to annual recruitment of kelp and other algae. In addition to fish habitat implications that are largely unknown at this point, this ecosystem shift has consequences for oil spill sensitivity and response. This should be considered in the SNL SEA – possibly through the addition and incorporation of a section specifically addressing this (and other) Invasive Species.

Also of note, benthic diatoms are commonly associated with intertidal sands and muds, not deep water communities as presented in the SEA.

Plankton (3.1.3)

This section does not adequately describe planktonic communities and their ecology – where much of the related discussion is an oversimplification that omits relevant details of community composition, succession and dynamics.

Numerous oversights exist in the section on plankton that must be taken into careful consideration for the planning of exploration and production activities, and in the development of mitigation and monitoring strategies, for the SEA to be thorough in its consideration of the biological environment.

Although the SEA study area has been correctly identified as an area with high concentrations of euphausids and calanoid copepods, the report has failed to consider that the area represents a key overwintering area for *Calanus finmarchicus*, one of the dominant copepods in the region and a key element in the trophic transfer from phytoplankton to upper trophic levels. Head and Pepin (2007) demonstrated high concentrations of this copepod in slope waters along the southern coast of Newfoundland, extending into the Laurentian Channel during the autumn. During the period of dormancy (early autumn to late winter) the bulk of the population is found at depths ranging from 200-800 m, which may correspond to areas subject to the potential impacts of drilling mud (at depth). In the spring, this species emerges from dormancy into surface waters, where animals that have overwintered in the SEA area drift a) on the Eastern Scotian Shelf; and b) into the Southern Gulf of St. Lawrence, where they appear to represent major contributors to the regional secondary production cycle during the spring and early summer. Due to the fact that this species is a key link in food web production, there has to be some consideration of the possible impacts of toxicity downstream of the exploration sites to assess the overall consequence of various activities to productivity.

In addition, it appears that the overall state of the ocean for the region was based almost entirely on the statements from two annual reports produced for an adjacent area. This level of information is inadequate since the SEA fails to provide a substantive assessment of the regional variability in the overall state of primary and secondary producers in the area of concern. In order to obtain some indication of the level of seasonal and inter-annual variability in the area, this requires a quantification of the underlying variability in plankton abundance. There are several data streams from which this information could be drawn, with the longest being that obtained from the Continuous Plankton Recorder series. Although the track followed by this system, that is based on collections from ships-of-opportunity, is varied and may not directly transect the SEA study area, there is still considerable information that can be obtained and serve to determine seasonal cycles and inter-annual variations in standing stock of many taxonomic groups in the region. Only through acknowledging the underlying variability would it be possible to assess whether changes that occur during and after exploration activities are within the bounds of the natural variability that has been observed prior to the program. Again, of additional concern in the current draft document is that the SEA appears to be inappropriately using 2006/07 as benchmarks from which to perform an evaluation of potential impacts.

It was also noted that there is no assessment of the biodiversity of the plankton food web in this report. The SEA study area consists of an area of transition between sub-Arctic, estuarine and temperate/boreal environments. Consequently, there is a potential for a high degree of variability in the diversity observed within the region which can result in uncertainty in the evaluation of potential impacts associated with the program. Therefore, there exists a need for a thorough summary of the available information for the region and a description of the variability that has been observed to date, with careful consideration of the nature of the collections from which conclusions are derived.

More generally, since Station 27 is not located in or near the SEA area, if plankton dynamics are to be inferred from this station for the project area, then the report must include a demonstration that processes in the two areas are similar and correlated or related via the same oceanographic forcings.

Finally, it is not clear which groups of zooplankton the comment on diurnal migration is referring.

Benthic invertebrates (3.1.4)

The references for benthic invertebrates are dated in the SEA. While this is often common in addressing this topic in the NL Region, it should also be noted that limited recent information may be available for consideration through unpublished benthic data (of non-commercial species) obtained during DFO RV surveys. With respect to the references that are included in this section, the document presents a reference list only – there is no related synthesis or discussion.

In a previous review for the Laurentian Subbasin SEA, which is part of the same area, it was suggested the document provide inclusion of results from DFO RV surveys, as well as results from the DFO Banquereau clam dredging experiment and comparisons of these with other areas to enhance information on distribution of benthic invertebrates.

With respect to benthic considerations for coastal areas, some of the information cited in the SEA considers the southern and South eastern coastal areas of Newfoundland (e.g., Hardy 1985, LeDrew 1984), but again does not specifically include Placentia Bay. Likely due to the omission of this area for consideration within the overall context of the SEA, there is no mention of benthic (or other) invasive species, such as green crab, within the document. This omission again highlights the requirement for the SEA to more adequately address the coastal areas of southern Newfoundland. A suggested solution to this shortfall, if not able to be adequately addressed within the final draft of the current SEA, is that a separate SEA for Placentia Bay alone be conducted so the resulting information could then be integrated with those projects that depend on Placenta Bay. Although Transport Canada has already carried out an assessment of sorts for this coastal area, its depth is not as great as that required to address the potential for specific ecosystem effects at the same level as the SEA for Southern Newfoundland.

Also, lobster in this section is mentioned without reference to its scientific name, *Homarus americanus*. Since other lobster species are mentioned later on in the document, it would be useful to be specific here.

(Fish Habitat) Planning Implications (3.1.5)

It should be noted for planning purposes that direct physical contact is not the only potential threat to corals. Increased sedimentation and toxicity resulting from drilling discharges are also a potential consideration.

<u>3.2 Fish</u>

The section on fish makes no mention of snow crab, Iceland scallops, sea-scallops or other invertebrate species that occur in the Maritimes Region in close proximity to the SEA area (e.g., on Banquereau Bank). Also, while it is accepted that data gaps do exist with respect to some species of fish occurring within the SEA area, more detailed information could be added in some of these species descriptions as well.

Eels should be addressed specifically in the SEA. Available data for eels was used in the COSEWIC Assessment and Status Report (2006) and shows trends over time.

With respect to cod and redfish descriptions, stock status updates should be provided in the appropriate sections.

Macroinvertebrates (3.2.1.1)

<u>Snow Crab</u>- The statement referring to total catch per unit of effort (CPUE) for snow crab is incorrect. The 2008 DFO SAR, which is cited, states, “CPUE changed little during 2004-2006 before **decreasing** in 2007”. However, the most recent DFO Science Advisory Report (SAR) (DFO 2009a) states, “CPUE has declined since 2002, to its lowest level in 2008”. Citing DFO (2008) is inappropriate here, and the most recent information available should be included in the SEA.

<u>Sea Scallop</u>- The reference to “Newfoundland’s large offshore banks” should be removed from the reference. St. Pierre Bank has the only commercial Sea Scallop beds in the SEA Area.

<u>Iceland Scallops</u>- The SEA states ‘…*current abundance of mature Iceland scallops on St. Pierre Bank is less than in the 1980s and early 1990s*…’, and cites Ollerhead et al. 2004, stating explicitly that the DFO data used to produce these maps did not contain data on spawning condition but rather just abundance. Therefore, the reference to ‘maturity’ should be removed.

The SEA also cites Ollerhead et. al 2004 for time of spawning of Iceland scallop on St. Pierre Bank. However, the statement from the citation was more general in context and not as site specific as used in the text of the SEA. In fact, the Ollerhead statement is “Iceland scallop are known to spawn in the late summer” (citing DFO Stock Status Report C4-07. *Scallops in Quebec inshore waters*.).

Also in this section, citation DFO 2006b should read 2006d.

<u>American lobster</u>- This section requires additional information and clarification regarding the biennial molt-reproductive cycle. The SEA only addresses the fact that the female carries embryos under her tail for 9-12 months, and does not make mention of the fact that she broods the eggs internally for a year beforehand. This omission makes the reference to the two-year cycle confusing.

Also with respect to lobster, Table 3.2 makes explicit reference to mating, but not spawning, in the "timing of Spawning" column. This should be corrected to reference spawning explicitly, and should be consistent with the species biology information in section 3.2.1.1. In the "Depth Distribution of Eggs/Larvae" column, "Larvae have a 6-10 pelagic stage" should read, "Larvae have a 6-10 **week** pelagic stage"

<u>Orange footed Sea Cucumber</u>- The global distribution of this species is provided in the document, but there is no reference to its specific distribution within the SEA area. Additional information on sea cucumber in the Atlantic Region, including Newfoundland waters, can be found in DFO (2009e).

Finfish (3.2.1.2)

<u>Redfish</u>- In the third paragraph, *“….and (3) Laurentian Channel – Unit2 which includes 3Pn3Ps4Vns [June-Dec.])…”* Should read “…which includes 3Ps4Vs4Wfgj and 3Pn4Vn [June-Dec.]…” Also, *“The importance of addressing the issue of redfish stock definition and boundaries… Fisheries Resource Conservation Council.”,* is a quite a dated statement. More recent information to address this issue can be found in DFO SAR 2008/026.

In the fourth paragraph, the time-series for data collection by Ollerhead et al. should read 1998-2002 not 1995-2002.

<u>Yellowtail Flounder</u>- Yellowtail flounder in the NAFO Divisions 3LNO portion of this area are assessed using a production model. The results of this model should be reported in the SEA rather than the results of the surveys themselves. In addition, information on yellowtail spawning has been updated in Ollerhead et al. (2004) and should be the most recent information cited for spawning time and area for this species.

Also with respect to yellowtail, the SEA states, *“Recent commercial catch data have indicated most catches of yellowtail…, and on St. Pierre Bank.”* However, the majority of catch of yellowtail (about 10000 t + since 2000, except for 2006 and 2007) comes from the NAFO 3LNO area (primarily the southern Grand Bank) with typically < 90 tons from 3Ps (i.e., St. Pierre Bank).

<u>White Hake</u>- Minor spelling error in first paragraph: “Cape Halteras” should read “Cape Hatteras.” Also, the statement “White hake are a temperate species at the limit of their temperature range and as a result are spatially restricted to the south western Grand Banks” is confusing and inconsistent with the previous statement that they range from Cape Hatteras to Southern Labrador. Perhaps reference to the SEA area would be helpful here.

Skates- Winter skate and barndoor skate should be described as uncommon or even rare on the Grand Banks. Winter skate on the Grand Banks were considered 'data deficient' by the Committee on the Status of Endangered Wildlife Species in Canada (COSEWIC), and the percentage occurrence is very low. Barndoor skate are currently under review by COSEWIC. With respect to thorny skate, the SEA initially describes their distribution as relatively continuous, but then goes on to state that the stock had become concentrated in a small area on the southern Grand Bank. For smooth skate, it is not clear why two decline rates are provided (1971-2005 and 1976-2005). This information could be updated to at least 2008. Finally, the last paragraph on smooth skate may be confusing to those not familiar with Kulka et al. (2006). Instead of using the combined Designatable Unit (DU), the SEA might consider reporting on the research vessel trends in each region individually.

Pollock- A more recent summary of information on pollock from NAFO Divisions 4VWX5Z is available in DFO (2009c) and Stone et al. (2009).

Greenland Halibut- This section is incomplete in its coverage. There is discussion about the 4RST Greenland Halibut stock (assessed by Quebec region) which **is not** in the SEA area, but no references to the Subarea 2 + Divisions 3KLMNO stock (assessed by NAFO) where Division 3O **is** within the SEA area. Subdivision 3Ps, which comprises a considerable part of the SEA area, remains a separate entity (located in between) than the stocks mentioned above, where their linkages remain largely unknown.

Also, the fishery data for Greenland Halibut describes catch distribution around St. Pierre Bank, Burgeo Bank and the end of the Halibut Channel, but the SEA area encompasses portion of the NAFO management unit area for Greenland halibut in sub-Area 2 and Divisions 3KLMNO as well. This comment is also relevant to the Greenland halibut description in Table 3.2.

Atlantic Halibut- The description of knowledge about Atlantic halibut spawning is perhaps overly confident. The statement, "*it is known that this flatfish species, within its Canadian range, spawns between February and April at depths ≥ 1,000m."* does not convey an appropriate level of uncertainty. While spent and ripening halibut have been captured in February to March in 4W, Neilson et al. (1993) found peak spawning in November and December on the Scotian Shelf and Southern Grand Banks. Sigourney et al. (2006) suggest that a shift to deeper water in fall may be associated with spawning, while the more shallow distributions in spring suggests that halibut are already returning to summer feeding areas. Therefore, spawning depths are not known with certainty. Also, while the Gulf Atlantic Halibut Tagging Program is mentioned, the tagging program in 3NOPs4VWX5Zc is not, which may be more relevant to this topic.

Witch flounder- This section discusses only the 3Ps stock and has no information on the witch flounder stock that resides in Div. 3O. Information on the life history/distribution of the stock in this area (Div. 3O) should be included in the SEA.

Also, the SEA states, *"These relatively non-migratory flatfish are typically found offshore, in moderately deep water (primarily in 45-275 m depth range)…"*, however, witch flounder are found as deep as 1500 m but the highest abundance is between 185 and 400 m (see http://www.dfo-mpo.gc.ca/zone/underwater_sous-marin/atlantic/witch-plie-eng.htm)

Haddock- The SEA states "…*recent surveys have not shown spawning occurring in the SEA Area…*", citing Ollerhead et al. 2004. However, this is incorrect as the maps in Ollerhead et al. showing April and May distributions of spawning haddock from 1998-2002 clearly show spawning occurring within the SEA Area.

Hagfish- Additional information on hagfish, including information from Newfoundland waters, can be found in DFO (2009d).

Bluefin Tuna- More recent information (i.e., since 2001) has been published and is available on bluefin tuna.

Non-Commercial Species (3.2.2)

Capelin- While the SEA correctly states that no commercial fishery for capelin occurs within the SNL SEA boundary, there are portions of 2 stocks of capelin within its boundary that are fished commercially when they migrate into coastal waters to spawn. Specifically, the St. Pierre Bank or 3Ps stock is fished in Placentia Bay and the NAFO SA2+Div. 3KL stock is fished from St. Mary's Bay to White Bay. Therefore, referring to capelin as a non-commercial fish species as a whole could be considered inappropriate. A third stock, the Southeast Shoal or 3NO capelin stock, spawns on the bottom on the Southeast Shoal. All three of these stocks spend a portion of their life cycle within the SNL SEA.

Capelin are often found along the coasts, especially during spawning season, and occur predominantly offshore while immature and maturing. However, capelin do not normally 'roll' on sand, but usually fine to coarse gravels are the preferred substrate. On beaches, capelin usually spawn at 5-8.5 °C but have been observed to spawn at 4-10 °C. On the bottom, spawning temperatures can be as low as 2 °C on the Southeast Shoal. Males and most females do not survive to spawn a second time. Additionally, spawning now goes into the month of August, and eggs that are produced are yellow, not red, as stated in the SEA. Once hatched, larval capelin, especially after they are in the bays and offshore in the fall are distributed deeper, rather than near the surface.

Capelin feeding occurs throughout the summer, fall, and early winter. They stop feeding in winter and resume feeding in the spring as water temperatures warm. Maturing capelin will feed until a few days before they are ready to spawn. Those females that survive spawning may resume feeding afterwards but the males do not.

Recent variations in year class strength for capelin have been linked to environmental factors affecting survival and release of larvae from beach and bottom substrates, early on in their life history. Several publications support this hypothesis.

Sand Lance- For clarity and conciseness, suggested rewording of the section on sand lance is as follows: "Sand lance is a small planktivorous fish usually found on the shallow portions of the Grand Banks in areas where bottom depths are less than 100 m and the substrate is mostly sandy. Sand lance is a pelagic species that forms varying sized dense schools feeding thoughout the water column, but also spend a portion of each day buried in the sandy seabeds. Sand lance are found in the North Atlantic from Greenland to the Gulf of St. Lawrence." It is also important to add that Sand lance spawn *demersally* within this section of the SEA.

Atlantic Salmon- Atlantic Salmon live in freshwater for the first two to five years, not two years as stated in the SEA; and salmon may pass through the SEA area during their migration from Labrador in the spring, as opposed to the fall as stated in the SEA. Additionally, it is more appropriate to refer to Atlantic Salmon parr rather than post-smolts in the discussion on diet in this section.

It is suggested that information on salmon management areas be expanded upon by including that "…twenty-seven scheduled salmon rivers ***and 82 salmon populations*** occur within the two

SFAs with fourteen ***scheduled rivers*** occurring within the SEA area." Also, "There has not been a recent ***individual*** assessment of the stocks…in the SEA area, ***however, stock status is estimated from a series of index rivers***."

It should also be included in this section that i) Atlantic salmon from the endangered Inner Bay of Fundy listed stocks likely migrate through the study area; ii) there is a harvest (likely domestic) of Atlantic salmon by the French on the Islands of St. Pierre et Miquelon, and given that St. Pierre et Miquelon has no salmon populations this would be an inteceptory fishery on south coast stocks of this species; and iii) COSEWIC is presently reviewing the status of Atlantic salmon.

Finally, since the fishery for Atlantic salmon only closed in 1992 there should be some reference to historical commercial catch data in the SEA.

Macroinvertebrate and Fish Spawning (3.2.3)

The SEA does not specifically address the importance of known pre-spawning and spawning aggregation behavior of Atlantic cod in a spatial sense. For example, in Halibut Channel, cod form dense spawning aggregations in late winter and spring, and is consistent from year to year. It is likely that other areas representative of similar behaviors for this species occur as well. Since Atlantic cod are potentially vulnerable while aggregated an effort should be made to identify locations of fish aggregations during critical life history processes such as spawning.

DFO Research Vessel (RV) Surveys (3.2.4)

The SEA describes in detail the catch results of the 2006 and 2007 DFO RV surveys within the study area. However, since this SEA is intended to serve as an assessment for potential activities over the next five years, a two year time series may be insufficient for drawing authoritative conclusions regarding abundance and/or distribution of various species having differing life-spans. This potential for error in basing conclusions on such a narrow timeframe is especially pertinent to the use of 2006/2007 RV collected in the area during those years due to incomplete survey information resulting from vessel problems there during the same timeframe. Given that this incomplete information is not used in DFO stock assessments, it would also be inappropriate for use in a SEA.

Also in this section, the SEA should provide a better description of the data used in 2006 and 2007. DFO carries out a spring survey in 3Ps, and both spring and autumn surveys in the adjacent 3O, but it is not clear whether the SEA uses both spring and autumn data for 3O.

Catch Weight (3.2.4.1)

This section and its table (3.3) provide no merit given that the sampling trawl has different catch efficiency for various species, making comparing catch weights meaningless. An explanation of minimum and maximum mean depth and how it is calculated would also facilitate the understanding of information provided in Table 3.3.

With respect to the statement, *"…They include deepwater redfish, thorny skate….",* "deepwater" should be removed from the description of redfish as they are not routinely separated by species during the RV surveys, except in sets where the Golden redfish (*Sebastes marinus*) are obvious. Since it appears that the authors utilized the DFO database, what is coded in our RV database with a species code of '0794' is really a mixture of *Sebastes mentella* (deepwater redfish) and *S. fasciatus* (Acadian redfish).

(Fish) Planning implications (3.2.5)

With respect to the statement, *"…Directed cod and redfish fisheries in the SEA area are closed for several months each year due to declining stocks…",* DFO Fisheries and Aquaculture Management Branch should be contacted for clarification on why redfish and cod fisheries are closed for several months each year rather than ascribing the reason to declining stocks. In addition, the 3NO cod stock is **permanently** closed to directed fishing, not for '*several months*' as stated in the SEA.

Table 3.2 in this section also requires the addition of more information for Redfish under "Timing of Spawning" - owing to their unique reproductive biology. Redfish are ovo-viviparous (live bearers) with mating/copulation generally occurring in the Oct-Dec months. Female extrusion predominantly occurs from March-July depending on the species. Under "Eggs/Larvae" in this table, a better description on the chronology of the life history stages is available in the literature. Generally larvae are extruded at about 5 mm in spring/summer, and are pelagic and free swimming until they settle on bottom at about 30 mm.

(Fish) Data Gaps (3.2.6)

Uncertainty in the drift paths for ichthyoplankton and macroinvertebrate eggs/larvae in the area is of similar concern to that raised for secondary producers in section 3.1.3. Therefore, the downstream impact of either longer-term low level or short-term high-intensity contamination on regional production of the elements of the lower food web are again highly uncertain based on this report.

With respect to scallops, the reference to "*last full assessment*" is ambiguous in its context. Although this comment is taken directly from the reference cited, the context of the SAR is for Iceland Scallop in the CORE Area on St. Pierre Bank **only**. The authors are correct however, in that Iceland Scallop has not been assessed for the entire St. Pierre Bank for quite some time.

3.3 Fisheries

It is not clear from the descriptions of fisheries whether a fishery for a particular species is targeted or not, i.e., it is not clear whether landings are the result of a directed fishery or bycatch in a fishery. It is also difficult to evaluate the accuracy of landings from the Maritimes Region from the way the information has been presented, and since not all landings are georeferenced, maps may be an under-representation.

The sections provided on fisheries also make no mention of those that may occur immediately adjacent to the SEA area, but that might be impacted by activities conducted within the SEA. For example, fishing on Banquereau Bank is not discussed.

Finally, it could be useful to briefly describe the different type of licenses discussed in the section on 'Fishing Enterprises and Licenses'.

Figure 3.14 requires the addition of units for quantity - numbers or weights.

Commercial Fisheries (3.3.1)

American Eel – Reference is made to eel eggs being part of the icthyoplankton. Eels are a commercial species and as such deserve a specific species write up. COESWIC is also presently reviewing the status of American eels.

Greenland Halibut- It appears that the SEA does not include any statistics for NAFO member states fishing Greenland Halibut within the portion of Division 3O within the NAFO regulatory Area (i.e. Outside 200 mi).

Sea Scallop- Landings values of average harvest of Sea Scallop differs between Table 3.4 and the text on page 146 (i.e, 1867.4 t in the table is not equal to 280 t in the text). Figure 3.65 also does not reflect the value in the text. Finally, the values in Figure 3.65 differ from those found on the Quota Reports provided by DFO, Commercial Statistical Services and DFO 2007/006.

Yellowtail Flounder- Landings values in Figure 3.30 are low for 2006. It should be mentioned in the text why the value is unusually low (i.e., industry restructuring).

American Plaice- Landings values in Figure 3.45 differ from values in the text. It is possible that the figure is describing American plaice harvest in Div. 3O only while the text is describing something else. These discrepancies should be fixed. Otherwise, the SEA should be explicit in its interpretation of the information being used. In addition, consideration of industry restructuring is also pertinent to the use of 2006 bycatch landings values for American Plaice.

Hagfish- Landings values indicated in the SEA (Fig. 3.54 and the text) are inconsistent with those used in the assessment of hagfish that was reported in the DFO SAR in May 2009. Also, the 2006 SAR indicates landings of about 340 tons (over 700 t is suggested from Fig. 3.54), and the 2007 SAR indicates landings of about 300 t (about 980 t is suggested from Fig. 3.54).

Recreational Fisheries (3.3.3)

Brook Trout- The anadramous form of brook trout are not referenced in the text. The recreational fishery for brook trout is at least as valuable as the recreational Atlantic salmon fishery.

Capelin- Recreationally, capelin are not harvested using seines and traps as these are commercial gear types that require a commercial license for a specific fishing area.

(Fisheries) Data Gaps (3.3.6)

It should be noted both at the beginning of commercial fisheries section and when discussing data gaps that catches outside the 200-mile limit by foreign vessels are not included in the descriptions provided in this SEA. This information on reported catch is available at NAFO at the scale of Division/subdivision but not geo-referenced nor by sub-units.

Lobster- The Sydney Basin SEA Study Area, within the SNL SEA, includes all of Lobster Fishing Area (LFA) 12, and a portion of LFA 11. These two areas have experienced significant increases in reported landings in recent years. Unfortunately, severe data gaps exist for the American lobster fishery in these areas. Limited voluntary logbook coverage in both LFA 11 and 12, along with localized detailed at-sea sampling in LFA 11 provide useful information, but we are largely dependent on reported landings as a primary source of information. As the document correctly states, geo-referenced commercial data is not available.

Marine Mammals (3.5)

The data range for the DFO sightings database as of January 2009 is 1864-2009, with many sightings dating from the early 1940's based on whaling station records.

While the DFO database was cited, the caveats associated with these data (listed much later in the descriptive section) must be emphasized when statements such as "*Of the cetacean sightings identified to species, long-finned pilot whales were the most frequently observed cetacean species within the SEA Area (251 sightings of 3249 individuals)*". While this is true for the DFO sightings data for this area as a whole, these pilot whale sightings were made primarily a number of decades ago, prior to the collapse of the squid stocks around Newfoundland. Overall summaries of broad databases such as DFO must be avoided or done cautiously as annual, seasonal, and geographic variations in marine mammal presence could be masked. In this particular case, DFO has evidence that pilot whales are not the most frequently observed cetacean species in nearshore areas in recent years; the 2005 LGL marine mammal monitoring programme, which sighted a high proportion of pilot whales, occurred in offshore waters for the most part.

Similar issues arise from data condensation when the authors discuss distribution patterns for marine mammals. Most distribution "patterns" are mainly a function of effort, rather than a true representation based on systematic surveys. This point must be made in the discussion of these data early in this section of the SEA.

For abundance values, there are recent minimum estimates (which are currently being updated to account for sightings biases) for some cetaceans in Newfoundland based on a large-scale aerial survey conducted by DFO in 2007 – during which extra effort was expended on the province's south coast (see Lawson and Gosselin 2009).

With respect to specific statements on cetaceans, there have been several live strandings of northern bottlenose whales on the south coast of Newfoundland in recent years, as well as occasionally sightings by DFO and others. Thus the statement "*Bottlenose whales were observed exclusively in offshore areas...*" is incorrect. Also, until more information is available, it is not safe to conclude that northern bottlenose whales sighted in the SEA area "...*presumably represent components of the Scotian Shelf population.*" Regarding Blue whales, the statement *"Blue whales were frequently observed in the SEA Area."* is also incorrect as blue whales have been sighted here, but rarely. Finally, it should be included in the SEA that Sei whales have been seen close to shore in the SEA study area – two sei whales were observed in Placentia Bay in July.

Overall, the SEA does address seals very well. This area is an important transit area for harp and hooded seals during the winter and spring. Therefore they are seasonally abundant and not always associated with ice. Harbour seals are common in the area.

However, hooded seals have been assessed as 'Not at Risk' by COSEWIC while harps have never been assessed. This information should be corrected in Table 3.20

Additionally, the comment that grey seals are breeding on St. Pierre and Miquelon is not accurate. There have been a number of surveys that indicate few, if any, pups are born in the area. The total population of grey seals in the NW Atlantic is approximately 300,000 (not unknown – Table 3.16). This is available in a 2008 CSAS Research Document. The number present in the area is estimated from Hammill (2005) which provides estimates of abundance (that have been updated). Still, this cannot be used to estimate the total number of seals likely to be found in the area.

Species at Risk (3.7)

Fishes (3.7.1)

While the general biological details presented in the SEA for the various SARA fish species are relatively accurate, in nearly every case the data is outdated by at least two years and needs to be updated as best possible.

Atlantic Cod- Mention could be made of the intended reassessment of Atlantic cod by COSEWIC.

American Plaice- American plaice have been found at depths up to almost 1400 m (Morgan and Bowering 2006) not up to 713 m as stated in the SEA. Also, in Table 3.20, American plaice (NL population) has a footnote "a" after NL, but the footnote is not included.

Finally, while there is much information available on spawning and life history characteristics of American plaice in Subdivision 3Ps in the SEA, there is no information on plaice in Division 3O. This should be corrected; especially since there is minimal intermingling of adult fish.

Leatherback Turtle- The large-scale aerial survey conducted in the late summer of 2007 (Lawson and Gosselin, 2009) provided data which allowed a minimal estimate of leatherback turtle abundance. For the south coast of Newfoundland survey stratum only, it was estimated that there were at least 700 leatherback turtles present. This estimate will increase when corrections are made for sighting biases. The large number of leatherback turtles in this area, together with the consistent long-term use of this area in the summer and early fall by feeding turtles, and the seasonal abundance of primary turtle prey (jellyfish), is suggestive that the Newfoundland south coast might be considered critical habitat. Consideration of critical habitat will occur the week of September 25, 2009 during a conference call with the federal leatherback turtle working group to update the Leatherback Action Plan to include critical habitat designations.

The text on page 221 does not include the leatherback sightings made during the 2007 aerial survey, and more recent data from other sources, but the overall pattern of most leatherbacks being on the south coast of Newfoundland will remain the same.

Loggerhead Turtle- The status of loggerhead turtle is currently under assessment by COSEWIC, and DFO is expected to conduct a Recovery Potential Assessment for loggerhead in 2010. Information from these assessments should be considered in future EAs in the SEA area.

Potentially Sensitive Areas (3.8)

Integrated Management Areas(3.8.1)

Figures representing Large Ocean Management Area (LOMA) boundaries should be included in the SEA for both NL and Maritimes Regions. In addition, LOMAs are **thousands** of square kilometres in size, not *hundreds* as stated in the SEA.

Ecologically and Biologically Significant Areas (EBSAs) (3.8.2)

It is more appropriate for this section to be titled EBSAs and Marine Protected Areas (MPAs) and include greater detail and discussion on the processes and implications of EBSAs, MPAs and MPA Networks. Also, **six** new MPAs are to be established under the Health of the Oceans (HOTO) initiative, not *nine* as stated in the SEA. Further information on the potential management implications of these initiatives can be obtained from the DFO Oceans Sector.

Of note, Table 3.22 should include reference to being taken/modified from Templeman (2007).

Canadian Parks and Wilderness Society (CPAWS) Special Marine Areas (3.8.4)

In Table 3.24, it should be noted that Penguin Islands is also the site of an American lobster reserve/closed area. Also in this table, more recent information indicates that the Southeast Shoal is no longer considered nursery habitat for American plaice and Atlantic cod as stated in the text (K. Dwyer, pers. comm.). For American plaice there was a large shift in the location of juveniles when the stock declined from being located adjacent to the shoal to being off the shoal (see Walsh et al 2001). The amount of young cod has also been very limited over the last couple of decades. Analyses that were done showed that the spatial and temporal pattern of juvenile cod distribution was quite variable and in only 1 of the 10 years analyzed was more than 50% of the cod found on the Southeast Shoal (Walsh et al 2001). Haddock, when they were more abundant, occupied the area now occupied by yellowtail flounder here (E. Murphy, pers. comm.)

As mentioned previously, the south coast of Newfoundland – particularly in the St. Pierre Bank area – is under consideration as critical habitat for leatherback sea turtles as a feeding area.

Exploration/Production Activities and Associated Environmental Effects (4.0)

Given available literature and environmental effects monitoring studies (which have been covered in the report) on risks associated with drilling muds, produced waters, oil spills and seismic, there would appear to be no special risk associated with oil exploration in the SEA area. Having said this, it is recognized that the purpose of a SEA is to provide a broad overview and there may be some circumscribed risk associated with a specific site – which would be accounted for (as noted in the SEA) in any specific environmental review.

The SEA identifies data gaps for biological and fisheries resources, actually in considerable detail for a SEA. Most of these data gaps are of general interest and some could apply to oil spills (from any source – shipping, fishing, etc., as well as oil development) and produced water, and probably drill cutting under very special circumstances. However, any risk associated with produced water could be considered both volume and site related, and would be covered in specific environmental assessments.

The SEA provides some major industry and agency reports which deal with the risks of water and synthetic drilling fluids. However, others can be found in the open literature (Deblois et al 2005; Mathieu et al 2005), and another major review has recently been carried out in this area by Stantec under the Environmental Studies Research Fund (National Energy Board). These reviews (which cover laboratory and field data) note the limited zone of impact of drill cuttings associated with the use of water and synthetic drilling fluids. However, regarding benthos, there are a few cases in which some degree of benthic disturbance has been noted beyond “average” disturbance zones of a few hundred meters or so (note that impact zones were both more severe and extensive in the past when diesel based drilling fluids were used).

Since both water-based and synthetic drilling fluids (as well as barite and bentonite, which are major constituents of drilling muds) have generally been shown to have little or not direct toxicity in laboratory studies (and are often classified as negligible by some agencies), the recently noted benthic disturbances could simply be indirect and related to surficial fines and associated slight anarerobosis (e.g. from hydrogen sulfide), or for instance altered sediment texture. It is reasonable to note that any slight movement and deposition at fines whether caused by oil exploration activities, trawling, clamming or natural oceanographic phenomena occurring over widespread geographic areas could cause similar changes in sediment meiofauna. However, since the more recent observations at some sites of benthic disturbance have arisen as a somewhat controversial issue, it would be useful in this respect to carry out laboratory or field simulations with (a) neat surficial fines and (b) fines associated with drilling fluids to investigate the hypothesis. The question of the importance of drilling fines versus all the other sources is probably the major data gap which has arisen over the past few years on oil well drilling in relation to benthic disturbance.

Depending on site and volume, produced water can be one of the main risks associated with petroleum development. Research is ongoing in this area and some developers also have very good monitoring programs in place to provide early warning of any potential problems related to sediment and water quality (e.g. primary productivity), fish quality and fish health. However, given the large amount of available literature on this topic this section could have included more detail in the assessment. Also as noted in the SEA, some further attention should be given to potential effects on ichthyoplankton and zooplankton as there exists a major knowledge gap in this area.

Polycyclic aromatic hydrocarbons (PAHs) are a class of compounds of special ecotoxicological importance and are enriched in petroleum, produced waters and oil combustion residues (e.g. gas flaring). A SEA would not be expected to cover the diverse and voluminous literature in this area. However, toxicity has been associated with very low levels of PAH (e.g., Payne et al 2003; Hylland 2006), where the toxic effects can be diverse in covering biochemical, histopathological, immunological, genetic, reproductive and developmental aspects.

The data gap described for seismic is reasonable with the added understanding that it is premature at this time to adopt sound pressure guidelines for fish and shellfish without some knowledge of dose-response relationships for exposure. Also the issue of chronic seismic exposure under conditions of a 2-3 week survey is a major knowledge gap for which no information is available, for any species. Injury zones may not exist to any major extent for fish and shellfish but representative studies are needed if only for assurance. This is supported by recent sublethal effect observations including disturbances on blood parameters, feeding and alteration in gene expression (Payne et al 2007; Andrews et al 2007).

In Table 4.4, it should be noted that produced water (as it might influence water turbidity or jellyfish body composition through uptake) and industrial light sources (as it effects turtle and jellyfish behaviour) might be considered as possible sources of interaction with the leatherback VEC.

Production Phase (4.2)

The SEA states, “All of the existing platforms offload oil to tankers for transport to the oil transshipment terminal in Placentia Bay or to markets on the east coast.” Therefore, ship traffic from the east coast to Placentia Bay should be a concern for the assessment. Given that the coastal area including Placentia Bay is not considered in the SEA, ecological implications related to the spread of invasive species through such transport is overlooked in the report.

Potential Sources of Effects from Routine Activities (4.4)

The release of drilling wastes to the bottom should be addressed in this section, and references for the duration of measurable concentrations of drilling waste on the bottom need to be included.

For the purposes of the discussion on offshore drilling the many wells of White Rose are used as a worst case scenario. It would be more appropriate to use the predictions developed for the individual EAs for exploratory wells on or near the Grand Banks in this case.

Interactions and Potential Effects of Routine Activities (4.5)

The use and effects of antifouling agents (on and offshore) should be discussed in this section.

Effects of Sound (4.5.1)

This section appears to be very comprehensive. Much of the relevant literature has been considered. However, while this section includes discussion on zooplankton and benthic invertebrates it does not specifically mention corals, an important and sometimes fragile component of fish habitat.

This discussion on sound mentions the lack of behavioural responses by humpback whales to industrial blasting activities. But, the study also suggested that the increased local humpback entrapment rate may have been influenced by the long-term effects of exposure to deleterious levels of sound from these blasts.

On page 270, there is no evidence to assume that hearing plays no part in leatherback turtle navigation, so the statement to this effect must be removed.

With respect to invertebrates producing sound, American lobsters also produce sounds. A reference to related research for *Homarus* species on this topic would be useful to include since *Panulirus* species, mentioned in the text, are not found in NL waters.

Effects of Drilling Muds and Cuttings (4.5.2)

Discussion of the implications of sediment movement through slumps and slides on dispersal of drilling discharges may be relevant to add to the potential effects of drilling muds and cuttings.

The disposal of drill cuttings and mud has the potential to cause a Harmful Alteration Disruption or Destruction (HADD), and therefore should be discussed in the section on Fish, Fish Habitat and Fisheries. The potential for taint of commercial fish should be discussed in this section.

Effects on Bottom Disturbance (4.5.3)

With respect to fish habitat, rock placement is not always an acceptable habitat compensation in the Region, and comes across as implied in this section. Other areas requiring discussion in this section include the the justification for creating habitat in a potentially contaminated area (near a drilling rig); the reef effect and the attraction of fish to a potentially contaminated site; and the effects of the fisheries exclusion zone.

Effects of Produced Water (4.5.4)

The risks associated with the discharge of produced water are not solely related to hydrocarbons. The effects of nutrients, heavy metals and radioisotopes also need to be discussed.

Effects of Presence of Structures (4.5.6)

Regarding the artificial-reef-effect and related scientific evidence, it would be necessary to conduct multi-year monitoring to demonstrate potential effects, the most important component of such monitoring being pre-data. That is, a Before-After-Control-Impact Design would be required, where data would be collected (probably for 3 years) before any construction takes place, followed by additional data collection after construction is completed. Furthermore, control sites should accompany this monitoring in areas that will not be affected. This study design is currently being conducted in relation to wharf and breakwater constructions in Newfoundland to assist in the determination of EAs and HADD implications.

To take advantage of science-based input, there should be discussions surrounding planned activities, and monitoring, long before (i.e. 3 years) construction begins. This can greatly improve mitigation measures, and is perhaps a topic pertinent to the SEA process rather than the EA process if the general impacts can be identified early on.

Effects of Marine Vessel Presence (4.5.9)

The SEA states, "There is no interaction between presence of marine vessels and the Fish VEC." This statement may be true only because the report does not consider coastal areas. For example, Placentia Bay currently has a variety of invasive species that can be transported by marine vessels to and from the area. The effects of invasive species on VECs can target various species of fish, fish habitat, and fisheries. The SEA is very limited in addressing each of these potentially important coastal interactions.

Accidental Hydrocarbon Releases (4.6)

Interactions and Potential Effects of Accidental Hydrocarbon Releases (4.6.4)

American Lobster- Survival of lobster larvae is very likely affected by human activities and associated pollution of the marine environment. This is particularly relevant for coastal areas. Larvae are sensitive to PAHs and heavy metal pollution. In addition, some drilling muds can be toxic to lobster larvae (Section 4.5.2). Sublethal effects of the aforementioned pollutants should be considered. Exposure to crude oil, for example, can affect lipid metabolism and molting in larvae. Sublethal concentrations of drilling fluids can affect larval respiration rate, energetics, and growth.

There is little data to investigate the possibility that the prey of leatherbacks might become contaminated. Given that leatherback turtles are known to consume anthropogenic debris, it is possible they might eat hydrocarbon products such as tar mats or tar balls, in addition to oiled jellyfish.

Cumulative Effects (5.0)

Specific effects of a single activity (e.g. drilling wastes) may be additive but the effects of several different components of a single activity or multiple activities may be synergistic. For example, sublethal hydrocarbon toxicity, nutrient loading and fishing pressure may affect fish trophodynamics and foodweb structure.

References are required to substantiate the statement that effects added by exploration and production activities will be negligible and not measurable.

Commercial, Research and Recreational Fisheries and Aquaculture (5.2)

"*Some parts of the SEA Area undergo intensive fishing activity, so much so that the environmental effects of trawling on benthos and fish, the effects of longlines and gillnets on fish populations, seabirds, sea turtles, and marine mammals greatly exceed any potential effects from oil and gas exploration and production*". This statement is not substantiated and is speculation. Some aspects of it may be true but none of it has been substantiated in the document.

Subsea Cables (5.7)

Maps of existing and planned subsea cables should be included in this section.

Conclusions (6.0)

Planning Implications (6.2)

Identified Potentially Sensitive Areas (6.2.1)

Sensitive areas identified in the SEA do not include DFO *Oceans Act* MPAs or MPA Networks specifically. These MPAs should be considered in addition to LOMA's or EBSAs since Canada has both domestic and international commitments to create MPAs and MPA networks in support of ecosystem-based and integrated management. This process will often integrate various federal departmental mandates (i.e., DFO, Environment Canada, and Parks Canada) and should therefore be considered independent of DFO's identification of EBSAs.

Addressing Data Gaps (6.4)

The SEA refers to monitoring that is specific to EAs. Where possible, it should be acknowledged that mitigation measures can be improved by early monitoring that takes place before the EA process. The SEA process may identify and enable early planning initiatives to improve mitigation measures if they can be identified. This is particularly relevant to habitat mitigation. The SEA process might recommend or identify a specific monitoring plan or process that will benefit or improve the scientific basis of future mitigation activities. This is particularly relevant to the "artificial-reef" idea, because this idea can be greatly improved upon by proper study design and collection of sufficient pre-data.

The SEA also includes a combination of updates for existing SEA areas (Sydney Basin and Laurentian sub-basin) and a new area (similar to NAFO Div. 3O). Throughout the review it is not clear as to what is being updated and what is new.

Conclusions

- The current SEA area includes, and is an extension of, the Laurentian sub-basin SEA and the Sydney Basin SEA that have been reviewed by DFO in recent years. Many of the comments provided by DFO Science in relation to those previous SEA reviews have been considered and addressed in this latest assessment, and a number of sections have been greatly enhanced with more recent information (e.g., the seismic section). In addition, the Southern Newfoundland SEA effectively acknowledges the diversity of issues surrounding potential petroleum exploration and production and associated activities that could occur in the Southern Newfoundland offshore area.

- However, the current Southern Newfoundland SEA still contains some similar omissions in the description of existing knowledge and analysis present in reports preceding this. This Science Special Response has focused on these omissions and additional suggestions for improvement are provided.

- A significant shortcoming in the Southern Newfoundland SEA is the failure to address some vital coastal areas, especially Placentia Bay, that have been proven to provide important fish habitat, and that could be at increased risk of impact should the production stage include transhipment and storage of product at nearby shore-based facilities, as per the agreed scope of the SEA.

- With respect to the analysis of the information, some sections demonstrate a lack of ecological integration of the system, and while individual interactions between possible projects or activities and VECs are discussed, each is viewed independently with little or no attempt at integration. This omission is particularly evident in the discussion (and dismissal) of potential cumulative effects.

- Given natural variations in the state of the ocean, assessments of this sort should make use of broader timeframes where possible. Analyzing multi-year data sets in order to obtain some indication of the level of inter-annual variability in the area is often more appropriate than using shorter timeframes (e.g. 2006/2007) as benchmarks for assessing potential impacts, unless there is specific rationale for doing so. Many of the key physical and biological components contained in the SEA do have significant amounts of data available that should be incorporated into describing, or at least considering, trends in the assessment.

- Major impacts have been adequately assessed; however, there are sections of the SEA that lacked sufficient detail to qualify/quantify other risks (e.g., potential impacts to vulnerable species and sensitive areas) that might require additional analysis at the project EA stage.

- The SEA study area consists of an area of transition between sub-Arctic, estuarine and temperate/boreal environments. Consequently, there is a potential for a high degree of variability in the diversity observed within the region which can result in uncertainty in the evaluation of potential impacts associated with the program.

- Recognizing that the remit for the SEA provides a specific area for consideration, some statements in the Science review of the SEA document may include comments pertaining to areas outside of the remit by reference to adjacent areas. However, in some cases, it is difficult not to address species and stocks that are in close proximity to the SEA area as DFO assesses stocks based on other boundaries that are different from the SEA boundaries, allowing for some assessment areas to overlap with the SEA area. In these instances it is the intention of the review to highlight issues pertaining to areas **immediately** adjacent to the SEA boundary.

Contributors

Nadine Templeman (Chair)	DFO Science, NL Region
Tana Worcester	DFO Science, Maritimes Region
Robin Anderson	DFO Science, NL Region
Chuck Bourgois	DFO Science, NL Region
Steve Campana	DFO Science, Maritimes Region
Roanne Collins	DFO Science, NL Region
Karen Dwyer	DFO Science, NL Region
Gouqi Han	DFO Science, NL Region
Brian Healey	DFO Science, NL Region
Jack Lawson	DFO Science, NL Region
Joanne Morgan	DFO Science, NL Region
Corey Morris	DFO Science, NL Region
Fran Mowbray	DFO Science, NL Region
Eugene Murphy	DFO Science, NL Region
Brian Nakashima	DFO Science, NL Region
Jerry Payne	DFO Science, NL Region
Pierre Pepin	DFO Science, NL Region
Brian Petrie	DFO Science, Maritimes Region
Don Power	DFO Science, NL Region
Sherrylynn Rowe	DFO Science, Maritimes Region
Jim Simon	DFO Science, Maritimes Region
Mark Simpson	DFO Science, NL Region
Don Stansbury	DFO Science, NL Region
Garry Stenson	DFO Science, NL Region
John Wheeler	DFO Science, NL Region

Approved by

Dr. Jay Parsons
A/Regional Director, Science
Fisheries and Oceans Canada
St. John's, NL
(709) 772-2027

Tom Sephton
A/Regional Director, Science
Fisheries and Oceans Canada
Dartmouth, NS
(902) 244-6080

Date: September 28, 2009

Sources of information

Andrews, C.D., Payne, J.F., Fancey, L.L., Hanlon, J., Cook, A., and Cristian, J.R. 2007. The "physical toxicity" side of oil and gas: are seismic survey and important risk factor for fish and shellfish (abstract). Aquatic Toxicity Workshop, Halifax, November 2007.

Deblois, E.M., Leeder, C., Penney, K.C., Murdoch, M., Paine, M.D., Power, F., and Williams, U.P. 2005. Terra Nova environmental effects monitoring program: from environmental impact statement onward. In: Offshore Oil and Gas Environmental Effects Monitoring : Approaches and Technologies. Edited by S.L. Armsworthy, P.J. Cranford and K. Lee. Batelle Press, Columbus,Ohio. Pp 475-491.

Chaudhuri, A.H., Gangopadhyay, A., and Bisagni, J.J. 2009. Interannual variability of Gulf Stream warm-core rings in response to the North Atlantic Oscillation. Continental Shelf Research Volume 29, Issue 7, 15 April 2009, Pages 856-869.

CNLOPB. 2009. Southern Newfoundland SEA Scoping Document. http://www.cnlopb.nl.ca/env_strategic.shtml

COSEWIC. 2006. COSEWIC Assessment and Status Report on the American Eel *Anguilla rostrata* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. 81 p.

DFO. 2009a. Assessment of Newfoundland and Labrador Snow Crab. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2009/045.

DFO. 2009b. Does eelgrass (*Zostera marina*) meet the criteria as an ecologically significant species? DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2009/018.

DFO. 2009c. Pollock in Div. 4VWX+5. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2009/025.

DFO. 2009d. Proceedings of a Workshop on Canadian Science and Management Strategies for Atlantic Hagfish. DFO Can. Sci. Advis. Sec. Proceed. Ser. 2009/009.

DFO. 2009e. Proceedings of a Workshop on Canadian Science and Management Strategies for Sea Cucumber (Cucumaria frondosa); 17-18 June 2008. DFO Can. Sci. Advis. Sec. Proceed. Ser. 2009/023.

DFO. 2008. Advice on the stock definition of redfish (*Sebastes fasciatus* and *S. mentella*) in Units 1 and 2. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2008/026.

DFO. 2007. Sea Scallop Status on the St. Pierre Bank. DFO Can. Sci. Advis. Sec. Sci. Resp. 2007/006.

Han G. 2006. Low-frequency variability of sea level and currents off Newfoundland. Advances in Space Research. 38, 2141-2161.

Han G. 2004. TOPEX/Poseidon-Jason comparison and combination off Nova Scotia. Marine Geodesy, 27, 577-595.

Han G. 2003. Three-dimensional seasonal-mean circulation and hydrography on the eastern Scotian Shelf. Journal of Geophysical Research 108(c5): 3136.

Han G., Lu, Z., Wang, Z., Helbig, J., Chen, N., and DeYoung, B. 2008. Seasonal variability of the Labrador Current and shelf circulation off Newfoundland. *J. Geophys. Res*., 113: C10013.

Head, E., and Pepin, P. 2007. Variations in overwintering depth distributions of *Calanus finmarchicus* in the slope waters of the NW Atlantic continental shelf and the Labrador Sea. *J. Northw. Atl. Fish. Sci*., 39: 49–69.

Hylland, K. 2006. Polycyclic aromatic hydrocarbon (PAH) ecotoxicology in marine ecosystems. J. Toxicol. Environ. Hlth. Part A, 69:109-123.

Lawson, J.W., and Gosselin, J.-F. 2009. Distribution and preliminary abundance estimates for cetaceans seen during Canada's marine megafauna survey - a component of the 2007 TNASS, Department of Fisheries and Oceans, Ottawa, ON. DFO Canadian Science Advisory Secretariate Research Document 2009/031. iv + 29 p.

Mathieu, A., Melvin, W., French, B., Dawe, M., Deblois, E.M., Power, F., Williams, U.P. 2005. Health effects indicators in American plaice (*Hippoglossoides platessoides*) from the Terra Nova development site, Grand Banks, NL, Canada. In: Offshore Oil and Gas Environmental Effects Monitoring: Approaches and Technologies. Edited by S.L. Armsworthy, P.J. Cranford and K. Lee. Batelle Press, Columbus, Ohio. Pp 297-317.

Neilson, J.D., Kearney, J.F., Perley, P., and Sampson. H. 1993. Reproductive biology of Atlantic halibut (*Hippoglossus hippoglossus*) in Canadian waters. Can. J. Fish. Aquat. Sci. 50: 551-563.

Payne, J.F., Mathieu, A. and Collier, T.K. 2003. Ecotoxicological studies focusing on marine and freshwater fish. *In:* PAHs: an Ecotoxicological Perspective. *Edited by* P.E.T. Douben, John Wiley and Sons, London. Pp 191-224.

Payne, J.F., Andrews, C.A., Fancey, L.L., Cook, A.L., and Christian, J.R. 2007. Pilot study on the effect of seismic airgun noise on lobster (*Homarus americanus*). Can. Tech. Rep. Fish. Aquat. Sci. 2712: v + 46.

Sigourney, D., Ross, M., Brodziak, J., and Burnett, J.. 2006. Length at age, sexual maturity and distribution of the Atlantic halibut off the northeast USA. Journal of Northwest Atlantic Fisheries Science. V36, art. 7.

Stone, H., C. Nelson, D. Clark, and A. Cook. 2009. 2008 Assessment of Pollock in 4VWX+5. DFO Can. Sci. Advis. Sec. Res. Doc. 2009/001. viii + 79 p.

Walsh, S.J., Simpson, M., Morgan, M.J., Dwyer, K.S., and Stansbury. D. 2001. Distribution of juvenile yellowtail flounder, American plaice and Atlantic cod on the southern Grand Bank: a discussion of nursery areas and marine protected areas. NAFO SCR Doc. 01/78.

This Report is Available from the:

Center for Science Advice (CSA)
Newfoundland and Labrador Region
Fisheries and Oceans Canada
80 East White Hills Rd.
St. John's, NL A1C 5X1

Telephone: (709) 772-3132
Fax: (709) 772-6100
E-Mail: vanessa.sutton-pande@dfo-mpo.gc.ca
Internet address: www.dfo-mpo.gc.ca/csas

ISSN 1919-3750 (Print)
ISSN 1919-3769 (Online)

La version française est disponible à l'adresse ci-dessus.

Correct Citation for this Publication:

DFO. 2012. Review of the Southern Newfoundland Strategic Environmental Assessment. DFO Can. Sci. Advis. Sec. Sci. Resp. 2010/008.