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**MAR 08 2013**

Ms. Elizabeth MacDonald  
Environment, Canada-Nova Scotia Offshore Petroleum Board  
6th Floor, TD Centre  
1791 Barrington Street  
Halifax, NS B3J 3K9

Dear Ms. MacDonald:

**RE: DFO Maritimes Region Comments on Canada-Nova Scotia Offshore Petroleum Board Draft Strategic Environmental Assessment Reports for Misaine and Banquereau (2A) and Eastern Scotian Slope and Laurentian Fan (2B)**

This letter outlines comments of Fisheries and Oceans Canada (DFO), Maritimes Region, regarding the Canada-Nova Scotia Offshore Petroleum Board (CNSOPB – the Board) draft Strategic Environmental Assessment (SEA) reports for Misaine and Banquereau (Area 2A) and Eastern Scotian Slope and Laurentian Fan (Area 2B). In this review, DFO notes that the intent of the two SEA reports is to identify the potential environment-offshore petroleum activity interactions and associated mitigation requirements that may exist and need to be considered in regard to future offshore petroleum exploration and development activities. Further, the SEA reports will be used as a primary basis for scoping and defining the parameters of subsequent project and activity-specific reviews pursuant to the Board’s environmental management and review process.

To date, DFO has contributed to this SEA process by providing comments on the scope for the SEAs and facilitating access to DFO data holdings for improved mapping and more accurate representations of the ecosystem and human use in the area. We note as well that detailed comments were provided on the previous SEA reports completed in 2012 for Sable and Middle Bank (Area 1A) and Sable Slope (Area 1B). Notwithstanding the comments contained in this review, it is recommended that DFO’s comments on the Area 1A and 1B reports also be consulted for their application, as appropriate.

In general, DFO finds the SEA reports to be well-organized and structured in relation to SEA requirements. However, a number of important issues have been identified through DFO’s review of the documents. With reference to the Board’s November 2012 Scoping Document, DFO believes the SEA reports do not fully satisfy the criteria of under the “Scope of Factors to be Considered” (Section 6.3.2), particularly in terms of planning

considerations around enhanced mitigation for special areas and species, and additional data needs, for project-specific environmental assessments.

The key issues and associated gaps identified through the review are described in this letter, as well as in the detailed list of the comments attached to this letter. DFO strongly recommends that these issues be acknowledged and addressed to the greatest degree possible so that the final SEA reports can perform their function as the basis for scoping and defining the parameters for future exploratory and development activities.

DFO feels that the SEA reports require more information and treatment of expected and/or potential environment-activity interactions and associated mitigation requirements. In particular, information on important ecological areas and species associated with these marine areas requires enhancement. DFO notes that the area covered by the SEA reports is among the most ecologically important, complex and sensitive marine regions in Atlantic Canada. Further, DFO is responsible for several federally legislated environmental protection measures in this area that are not sufficiently examined in these documents. These include compliance with the prohibitions under the *Species at Risk Act*, *The Gully Marine Protected Area Regulations* under the *Oceans Act*, and marine mammal and sensitive benthic ecosystem protections under the *Fisheries Act*.

In light of recognized sensitivities in this region, recent precautionary best-practices implemented by industry, and recent gains in scientific knowledge, DFO recommends a more thorough treatment by the SEA reports. Further, it is DFO's view that additional mitigation measures are warranted for activities in this area and that they should be identified well in advance of project-specific assessments. This proactive approach would provide industry and the public with a level of certainty on the future conduct of activities in this area. DFO fully recognizes that it will be challenging to address all of these issues within the current SEA completion timelines. Accordingly, DFO is committed to working with the Board to improve the SEA reports, as well as to develop additional guidance and practical measures to address outstanding departmental concerns.

DFO highlights the following key issues in relation to the SEA reports as requiring additional or improved information, description and/or analysis:

**Application of Statement of Canadian Practice:** Portions of the marine area and species encompassed by the SEA reports for both 2A/B and 1A/B present the type of circumstances envisioned by the Statement of Canadian Practice with respect to the Mitigation of Seismic Sound in the Marine Environment (SOCP) as requiring enhanced treatment and consideration of additional mitigation measures. As such, DFO does not agree with the suggestion in the SEA reports that "no further assessment" will be required for cetaceans and sea turtles if proponents adhere to the SOCP. It is DFO's view that cetaceans and sea turtles should be considered as VECs.

**Wide Azimuth (WAZ) 3D seismic:** The SEA reports require greater discussion of Wide Azimuth (WAZ) 3D seismic surveys, including noise levels/intensity, footprint, duration,

and impacts on marine species and fisheries. The discussion should consider applicability of the SOCP in context of this newer technology, including the relevance of existing mitigation measures and the identification of data gaps.

**Northern bottlenose whale (endangered Scotian Shelf population):** The SEA reports require greater discussion regarding the potential impacts of seismic surveys on beaked whales such as northern bottlenose whales (endangered). Areas 2A and 2B overlap directly with habitat for known year-round concentrations of northern bottlenose whales, including identified critical habitat in Shortland Canyon and Haldimand Canyon. The waters surrounding and between identified critical habitat are also extensively used by this population, particularly slope areas greater than 500 metres in depth. As well, areas 2A and 2B are in close proximity to the identified critical habitat in the Gully MPA (Zone 1).

DFO has strong concerns with the use of conclusions drawn from the 1998 Generic Class Assessment for Seismic concerning these whales. Similar concerns are held with respect to the interpretations, as presented in the SEA reports, of the 2003 seismic effects monitoring coordinated by DFO's Center for Oil and Gas Environmental Research and undertaken in collaboration with industry. We ask that those portions of the documents be revisited before the SEA reports are finalized (see detailed comments for direction). The SEA reports do not adequately describe the requirements to be in compliance with the *Species at Risk Act* (SARA), particularly with respect to the prohibitions that apply to the northern bottlenose whales and their critical habitat. Section 32 of SARA prohibits the harm, harassment, capture, kill or take of individuals, and Section 58 prohibits the destruction of critical habitat. DFO also notes that the presence of prey species (*Gonatus* squid) is an important component of northern bottlenose whale critical habitat that may be affected by exploration activities.

It should be reinforced that seismic activities in areas frequented by beaked whales, such as northern bottlenose whales, will require additional forms of mitigation beyond the SOCP, which is considered a minimum standard. The 30-minute required observation period prior to seismic activity ramp-up is not sufficient to detect beaked whales. Beaked whales typically dive for more than 30 minutes, with a maximum recorded dive time of 70 minutes being reported for northern bottlenose whales. It is recommended that the 30 minute required observation period outlined in the SOCP be extended to 60-70 minutes to provide the adequate time necessary to detect beaked whales that may be present in the seismic program study area.

Further, a combination of Marine Mammal Observation (MMO) and Passive Acoustic Monitoring (PAM) provides the best probability of detecting beaked whales present in the seismic program study area prior to ramp-up, rather than only implementing PAM during periods of low visibility. A combination of MMO and PAM should be used prior to ramp-up, including in good visibility conditions, to maximize the probability of detecting beaked whale and other cetacean species that may be present in the study area.

**Other SARA listed species:** Areas 2A and 2B also coincide with important areas for several other cetacean species listed under SARA; in particular, blue whale (endangered), fin whale (special concern) and Sowerby's beaked whale (special concern). The SEA

reports should include more information on these species, as well as other marine mammals that frequent the area. Appropriate mitigation measures, similar to ones discussed above, should also be described.

The region covered by the SEA reports is also used by leatherback turtle (endangered). Additional information on this species and potential interactions for exploration activities are required.

**The Gully Marine Protected Area (MPA):** The Gully MPA is directly adjacent to Areas 2A and 2B. Section 4 of the Gully MPA Regulations prohibits activities in the vicinity of the MPA that are likely to result in disturbance to any living marine organism within the MPA. The proximity of Areas 2A and 2B to the Gully MPA requires an analysis of potential interactions with the Gully ecosystem and the identification of mitigation measures to demonstrate compliance with the MPA Regulations. The SEA reports require more information on the considerations associated with their close proximity to the Gully MPA in order to more accurately provide the basis for scoping and defining parameters for exploration activities.

**Other ecologically important areas:** By comparison with the regions covered in SEAs 1A/B, the slope to the east of the Gully is far more varied, complex, biodiverse and generally less impacted by human activities. The SEA reports identify several areas recognized for their ecological importance. These include Shortland and Haldimand Canyons which, in addition to being identified as critical habitat for the northern bottlenose whales, contain structure forming cold-water corals. Another important feature is the Stone Fence area which includes the only documented living *Lophelia* reef in the Northwest Atlantic, as well as a range of other cold-water coral species. The SEA reports also include relevant information on ecologically and biologically important areas (EBSAs) and several bank areas (Middle Bank, Misaine Bank and Eastern Shoal) identified by DFO during its preliminary MPA network analysis work. DFO notes that due to the convergence of these distinct ecologically important areas in the SEA areas, parts of this region will likely emerge as priority areas in the future MPA network plan for the Scotian Shelf bioregion. As such, the information on ecologically important areas will require attention and updating over time.

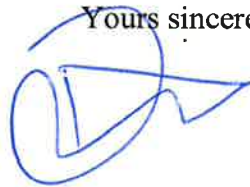
**Commercial and Aboriginal fisheries:** The SEA reports provide a reasonable amount of information and level of detail on commercial and Aboriginal fisheries in Areas 2A and 2B. DFO notes that these areas are important for a number of commercial fisheries including snow crab, surf clam and large pelagics. As such, DFO recommends that the SEA reports provide clear direction on the requirement for ongoing information sharing, consultation and cooperation with fisheries interests to avoid conflict and negative interactions during future exploration activities. In addition, the SEA reports should provide more recent, publicly available information on the specific distribution of important habitats for commercial fish species in the study area.

In closing, DFO would like to thank the Board for the opportunity to review and provide comments on the SEA reports. DFO recognizes the importance of preparing comprehensive and authoritative SEAs to guide project-specific reviews and future

exploration activities. In addition to the recommended improvements to the SEA reports as contained in this letter and associated detailed comments, DFO invites the Board to work collaboratively to define an appropriate set of protection, mitigation and monitoring measures, in addition to those now in place under the SOCP, for the area and special status species covered by the SEA reports, as well as relevant portions of SEA Areas 1A and 1B. This collaborative work is consistent with the intent of our shared Memorandum of Understanding and associated annual workplan activities. DFO believes that this work will both serve to improve clarity around expectations for future exploration activities, as well as to enhance environmental safeguards for this important marine area.

If you have any questions or concerns regarding DFO's review and comments, please do not hesitate to contact Glen Herbert at a time convenient to you by telephone, 902-426-9900, or by email, [glen.herbert@dfo-mpo.gc.ca](mailto:glen.herbert@dfo-mpo.gc.ca).

Yours sincerely,



David Millar  
Regional Director  
Ecosystem Management  
Maritimes Region

Attachment

cc: Paul Gentile  
Tim Hall  
Mark McLean  
Maxine Westhead

**Comments applicable to both reports (Misaine Bank and Banquereau as well as Eastern Slope and Laurentian Fan) are as follows:**

**Executive Summary- Table E.1- Summary of Key Issues and Mitigation- Key issues/potential effects for species of special status-** For listed species, the bar for effects is higher than mortality (includes harm, harassment, capture, take). This text combines effects to individuals and effects to habitat which in SARA are considered in separate prohibitions. Key mitigation for species at risk- Adherence to SOCP is a minimum standard. Mitigation beyond SOCP is required for beaked whales, more detailed comments follow.

**Executive Summary- Paragraph 1-** The term “species of special concern” is defined in the *Species at Risk Act* and has a specific meaning. Can a different term be used to avoid confusion?

**Executive Summary- Paragraph 2-** “beyond sustainable levels” What does sustainable levels mean for a species at risk?

**1.0 Introduction- Paragraph 3-** Notable features should include Haldimand and Shortland canyons. There is the lack of recognition of the potential issues that may arise from oil and gas exploration and development activities in or near Shortland and Haldimand submarine canyons. These two canyons, like the nearby Gully Marine Protected Area (MPA), are ecologically important areas that support a diversity of wildlife including rare corals and whales, and are identified as critical habitat of an Endangered species. Given their importance to species listed under the *Species at Risk Act* (SARA), these canyons deserve more careful consideration within these SEAs and the potential impacts oil and gas activities occurring in and around them should be more thoroughly addressed.

**2.0 Exploration Activities- Table 2.1- Generic Description of Exploration Activities**  
**Geophysical survey activities-** streamers can be up to 10,000 m in length.

**3.0 Key Characteristics of the Environment -** There exists no systematic discussion of acoustic propagation on the Scotian Shelf/Slope anywhere in the SEAs, although isolated facts appear (e.g., 5.2.1.1, 1<sup>st</sup> paragraph “...sound attenuates more rapidly with range in shallower water depths.”). Since anthropogenic sound as an environmental stressor is extensively discussed in the SEAs, discussion of acoustic propagation effects is warranted. Topics which should be treated or at least acknowledged include seasonal variability of acoustic propagation due to the spring-summer growth of the seasonal thermocline and more downward refractive higher loss conditions, and the possibility of excitation of low attenuation, near-surface sound channels in late spring/early summer. In terms of the exploration seismic induced sound levels delivered to the deep, beaked whale foraging habitats within the Gully, Shortland, and Haldimand Canyons, there could be considerable differences between fairly inefficient down-slope acoustic propagation from surveys in the shallow “Phase 2A” Project Area vs. fairly efficient up-slope propagation from deep water regions of the “Phase 2B” Project Area. In the latter case, the delivery of sound to the deeper regions of the Gully would be more efficient if

the survey area is situated such that sound can propagate directly up the deep central canyon axis. The Laurentian Channel also has its distinctive propagation environment. It is expected that such effects will be documented in detail in the acoustic modeling accompanying forthcoming survey-specific EAs, but some acknowledgement of the nature and importance of these effects belongs in the current SEAs. Many of these issues have been documented in Davis et al. (1998) a document which is referenced in these SEAs in other contexts.

Davis, R. A., D. H. Thomson, and C. I. Malme. 1998. Environmental Assessment of Seismic Exploration on the Scotian Shelf. Rep. by LGL Ltd. and C.L. Malme for Mobile Oil Properties Ltd., Shell Canada Ltd., and Imperial Oil Ltd., Calgary for Submission to the Canada/Nova Scotia Offshore Petroleum Board, 5 Aug. 1998: 181 p. + Appendices.

**3.1 Physical Characteristics- Table 3.1-Overview of Physical Characteristics- Sea Bed Characteristics-** A better description of the seabed is needed. A physical description of the Sable Island Bank can be found in:

Li, Micheal Z. and Edward L. King. 2007. Multibeam bathymetric investigations of the morphology of sand ridges and associated bedforms and their relation to storm processes, Sable Island Bank, Scotian Shelf. Marine Geology 243:1-4 pp.200-228.

**3.1 Physical Characteristics-Table 3.1-Overview of Physical Characteristics- “Wind” and “Waves”-** The information provided is the same for both areas. Is this realistic?

**3.2.1.1 Zooplankton and 3.2.1.3 Ichthyoplankton-** Eastern Nova Scotia or Eastern Scotian Shelf?

**3.2.3 Corals and Sponges- Table 3.3- Cold Water Corals- Locations within the Study Area-** The Stone Fence should be recognized as an important coral area.

**3.2.3 Corals and Sponges- Figure 3.2- Coral and Sponge Locations-** Absence of coral and sponge observations in deep water beyond the shelf break reflect an absence of survey effort rather than an absence of organisms.

**3.2.4 Commercial Fisheries and Invertebrates- Table 3.5- Summary of Spawning and Hatching Periods for Principal Commercial Fisheries Species with the Potential to Occur in the Study Area-** What does a white box indicate?

**3.2.5 Marine Mammals and Sea Turtles-** No plots of whale sightings on the Eastern Scotian Shelf and Slope. Such data is available through DFO and maps showing such data could be provided.

**3.2.5.1 Mysticetes and Odontocetes-** It is important to note that while the TNASS surveys provide a large-scale overview of various cetacean species of the Scotian Shelf, the results from this survey are based on about one month of effort in July/August 2007 and thus cannot tell us much about cetacean distribution and abundance in non-summer months or natural variability in the trends observed. Finer scale abundance and distribution patterns for some species of particular interest can be obtained from species-specific research programs, such as

Hal Whitehead's (Dalhousie University) work on Scotian Shelf northern bottlenose whales. Some additional references that would be relevant and useful for this section:

Breeze, H., Fenton, D., Rutherford, R.J. and Silva, M.A. (2002). The Scotian Shelf: An ecological overview for ocean planning. Ca. Tech. Rep. Fish. Aquat. Sci. 2393. - provides a comprehensive review of cetacean species of the Scotian Shelf and likely preferred habitat based on analysis of several available datasets (probably the most comprehensive review of cetacean distribution on the Scotian Shelf to date based on available information).

Whitehead (2013) Trends in cetacean abundance in the Gully submarine canyon, 1988-2011, highlights a 21% per year increase in Sowerby's beaked whales (*Mesoplodon bidens*). Canadian Journal of Zoology. 91: *in press*. - recent paper looking at whale densities in the Gully, Shortland and Haldimand canyons.

Though the focal point of the distribution of northern bottlenose whales is around the Gully and nearby Shortland and Haldimand canyons, there is evidence that the shelf-break areas between these canyons are also important feeding areas (see Moors 2012). This more recent acoustic monitoring study indicates that northern bottlenose whales feed year-round in not just the Gully, but also in Shortland and Haldimand canyons, as well as between the canyons. These whales are thus considered to be year-round residents of the Scotian Slope including canyon and between canyon areas. The likely importance of between-canyon areas should also be considered.

Moors, H.B. (2012) Acoustic monitoring of Scotian Shelf northern bottlenose whales (*Hyperoodon ampullatus*). PhD thesis. Dalhousie University. Available online at: <http://dalspace.library.dal.ca/handle/10222/15238>

There are also a number of northern bottlenose whale sightings reported along the continental slope in areas west of the Gully (see Figure 2 in the northern bottlenose whale Recovery Strategy). Because of the lack of research effort in areas to the west of the Gully, it is hard to gauge the importance of these areas to the whales. The Recovery Strategy recognizes that the distribution of the whales does extend west of the Gully and the need to investigate canyons west of the Gully (such as Logan canyon) as potential critical habitat for the whales. There should be some acknowledgement that the distribution of these whales does extend west of the Gully, along the entirety of the Scotian Slope (and even as far south of Georges Bank – see sightings reported by NMFS shipboard surveys). See the following references for more information on sightings south of the Gully:

DFO (2010) Recovery strategy for the northern bottlenose whale (*Hyperoodon ampullatus*), Scotian Shelf population, in Atlantic Canadian waters. Species at Risk Act Recovery Strategies Series. Fisheries and Oceans Canada. Vi + 61 p. Available online: [http://www.sararegistry.gc.ca/virtual\\_sara/files/plans/rs\\_northern\\_bottlenose\\_whale\\_0510\\_e.pdf](http://www.sararegistry.gc.ca/virtual_sara/files/plans/rs_northern_bottlenose_whale_0510_e.pdf)



NMFS (2007) Sightings of northern bottlenose whale (*Hyperoodon ampullatus*): Western North Atlantic Stock. 3 pp. Available online: <http://www.nefsc.noaa.gov/publications/tm/tm205/pdfs/67NorthBottleW.pdf>

**3.2.5.1 Mysticetes and Odontocetes- Table 3.9- Marine Mammals Known to Occur within the Study Area-** More is known about the distribution of some of these species than what is described in the table. For example, long-finned pilot whales actually occur on the Scotian Shelf throughout the year, not just late spring thru fall. Humpback whales are regularly sighted over most areas of the shelf and not just in the Gully. There have been a number of blue whale sightings in the Gully in late summer. The Recovery Strategy for the blue whale identifies seismic surveys as a high-risk anthropogenic threat. As well, Sowerby's beaked whales are listed as Special Concern by COSEWIC as well as SARA.

Beauchamp, J., Bouchard, H., de Margerie, P., Otis, N., Savaria, J.-Y., 2009. Recovery Strategy for the blue whale (*Balaenoptera musculus*), Northwest Atlantic population, in Canada [FINAL]. *Species at Risk Act Recovery Strategy Series*. Fisheries and Oceans Canada, Ottawa. 62 pp.

**3.2.5.3 Sea Turtles-** Very little is provided on sea turtles. For leatherbacks, important areas have been identified which should be recognized in this document. A map of sea turtle sightings and these important areas could be provided.

DFO. 2011. Using Satellite Tracking Data to Define Important Habitat for Leatherback Turtles in Atlantic Canada. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2012/036.

DFO. 2012. Assessment of Leatherback Turtle (*Dermochelys coriacea*) Fishery and Non-fishery Interactions in Atlantic Canadian Waters. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2012/041.

**3.2.5.3 Sea Turtles- Table 3.11- Sea Turtle Species Known to Occur in the Study Area-** Leatherback turtle is a SARA listed species, Schedule 1, Endangered

**3.2.6 Marine Birds-Table 3.13- Species Groupings for Fifield et al. (2009) Seabird Abundance and Distribution Analysis-** Last column- heading should indicate what the numbers represent with units.

**3.2.7 Special Areas- Table 3.15- Designated and Candidate Protected Area- *Lophelia* Conservation Area-** This is a *Fisheries Act* closure. This should be described under designation and administration. It should also be noted that the larger area around the *Lophelia* Conservation Area, known as the Stone Fence is an important coral area and should be recognized.

**3.2.7 Special Areas- Table 3.16- Additional Special Areas in the Study Area- Whale Critical Habitat-** Critical habitat should be included in Table 3.15 rather than being placed in a table with areas that have no legal standing. These areas are identified in the Recovery Strategy (2010), and a Ministerial Order for the Protection of Critical Habitat is being developed which will bring into force Section 58 of SARA and prohibit the destruction of

critical habitat. Designation or administration of critical habitat should be described referencing the critical habitat provisions from *Species at Risk Act*. “Critical Habitat Statement” is not the proper terminology. Should be changed to: Critical Habitat as described in the Recovery Strategy.

**3.2.7 Special Areas- Table 3.16- Additional Special Areas in the Study Area- Former Area of Interest (AOI) candidates-** Former AOI sites are not afforded any higher significance than EBSAs. Misaine Bank and Eastern Shoal and Middle Bank can be included under the Ecologically and Biologically Significant Areas heading.

The draft SEA reports recognize the efforts DFO has made regarding the identification of ecologically important areas, including the preliminary MPA network analysis used to inform the selection of the St Anns Bank Area of Interest. The MPA network analysis is being updated and revised based on recent advice through the department’s science advisory process. Over the next two years, DFO will be discussing this revised analysis and conducting public consultation as part of its effort to lead the development of an MPA network plan for the Scotian Shelf bioregion. While it is premature to identify or predict the areas that will eventually emerge from this process, the SEA study areas do contain several areas recognized for their ecological importance. For example, it includes Shortland and Haldimand Canyons, which, in addition to being identified as critical habitat for the northern bottlenose whales, contain significant concentrations of structure forming cold-water corals. The SEA areas also encompass the only documented living *Lophelia* reef in the Northwest Atlantic. Due to the convergence of these distinct ecologically important areas in the SEA areas, it is anticipated that parts of this region will emerge as priority areas in the future MPA network plan for the bioregion.

**3.3.1 Commercial Fish and Fisheries- Paragraph 1-** should refer to Table 3.17 at the end of first paragraph as it is not referred to anywhere else. Last sentence of first paragraph – making up the remainder of the catch “value” respectively.

**3.3.1 Commercial Fish and Fisheries-** Should include a description of how the landings and values data was derived.

**3.3.1 Commercial Fish and Fisheries-Table 3.18- Summary of Fishery Licences In Study Area** - suggest title change for columns 4-5 “Species that may have had landings”. Only one Porbeagle licence was active in 2011 not 3.

Surf clam is identified as the most important fishery in section 3.3.1.3 Invertebrate Fisheries, however Table 3.18 indicates to no licences for offshore clams had landings in 2011. Is this correct? There seems to be a contradiction between the text and the table.

**3.3.1 Commercial Fish and Fisheries-Table 3.19- Summary of Fishing Seasons for Principal Commercial Fisheries Species Potentially within Study Area-** Mako shark is added but it is not a directed species. Suggest removing.

**3.3.1 Commercial Fish and Fisheries- Figure 3.6- Groundfish Fisheries-** Figure 3.6 is groundfish but should be large pelagics. Switch figures 3.6 and 3.7.

### **3.3.1 Commercial Fish and Fisheries-Table 3.21- Pelagic Fishery Seasons and Gear Type-**

- 1) define Fishery seasons - full season (year round) versus main fishing season
  - a. Bluefin tuna main fishing season is summer and fall
  - b. Other tunas – main fishing in July –November
  - c. Swordfish – main fishing in
    - i. Harpoon – June to July
    - ii. Longline – July – November
- 2) gear
  - a. – Bluefin tuna – “Gear used is either direct fishing by angling (rod and line), tended line, trap, longline or electric harpoon and indirect fishing by longline.”
  - b. Swordfish - .... Pelagic longline, and electric harpoon
- 3) suggest removing mako shark as it is not a directed fishery

**3.3.1.2 Groundfish Fisheries – Paragraph between Tables 3.22 and 3.23**– is this referring to large pelagics or groundfish? If large pelagics move to just after table 3.20; if groundfish replace large pelagics. (As noted before figure 3.7 should be groundfish and 3.6 should be large pelagics)

### **3.3.1.3 Invertebrate Fisheries- Table 3.25- Invertebrate Fishery Seasons and Gear Type- Snow Crab**

- a. Crab Fishing Areas 22, 23, 24, ~~11 and D~~ are located within the Study Area.
- b. CFA 22 runs from mid-April – end of July.
- c. Remove: The fishing season for CFA 11 and D runs from the beginning of April- June 30.

**3.3.4 Other Ocean Uses- Table 3.26- Other Ocean Uses In and Around the Study Area- Scientific Research-** There are other scientific research projects within the study areas beyond those listed, including cetacean studies conducted by the Whitehead Lab of Dalhousie University every 3-4 years, and ongoing long-term acoustic monitoring studies in the Eastern Scotian Slope region (contact: Hilary Moors-Murphy, DFO).

**4.2.1 Regulatory Context- Table 4.1- Summary of Key Relevant Legislation and Guidelines- Statement of Canadian Practice with respect to the Mitigation of Seismic Sound in the Marine Environment-** “Specifies the minimum requirements for mitigation.”

**4.2.1 Regulatory Context- Table 4.1- Summary of Key Relevant Legislation and Guidelines- Species at Risk Act-** The prohibitions of SARA should be outlined in this section. Proponents should be advised that all activities must be in compliance with SARA.

**4.5 Selection of Valued Environmental Components- Table 4.3- Selection of Valued Environmental Components -Marine Mammals and Sea Turtles-** “No further assessment will be required provided that the proponent adheres to mitigation measures outlined in the Statement of Canadian Practice with Respect to the Mitigation of Seismic Noise in the Marine Environment (SOCP) for marine mammals and sea turtles.” This statement should be removed. DFO contends that cetaceans and turtles be given full treatment in project specific EAs regardless of their conservation status. SOCP provides the minimum requirements for

seismic activities. SOCP needs to be augmented for SARA-listed species, particularly beaked whale species such as northern bottlenose whales and Sowerby's beaked whales. Specifically, the 30 minute required observation period is shorter than the maximum dive time of these species (Scotian Shelf/Slope northern bottlenose whales commonly dive for over thirty minutes, with maximum recorded dive times of 70 minutes being reported: see Hooker and Baird, 1999). Thus, the SOCP observation period should be increased substantially (at least 60-70 minutes) when conducting activities in the presence of beaked whales or near their habitat. It is also known that these poorly-understood, deep-diving species are generally very difficult to spot, even by well-experienced and trained observers, since they spend so little time at the surface. Even in the best of circumstances, using experienced observers and during good weather conditions, the probability of visually detecting beaked whales even when they are present and near the vessel is in the range of 20-50% (Barlow and Gisiner, 2006). This probability decreases significantly with inexperienced observers and as sea state increases and visibility decreases (e.g. rain, fog, and reduced light levels) – under these conditions the probability of sighting a beaked whale is estimated to be low as 1-2% (Barlow and Gisiner, 2006). When beaked whales such as northern bottlenose whales undergo deep dives they often do so to forage and frequently produce distinctive echolocation clicks (Hooker and Baird, 1999; Moors 2012). Thus, a combination of passive acoustic monitoring (PAM) and visual observation likely provide the greatest probability of detecting bottlenose whales present in a seismic study area (Moors, 2012). The above should also be included in section 5.1.2 on Mitigation and Planning Considerations.

Barlow, J. and R. Gisiner. 2006. Mitigating, monitoring and assessing the impacts of anthropogenic sound on beaked whales. *J. Cet. Res. Man.* 7: 239-249.

Hooker, S.K. and R.W. Baird. 1999. Deep diving behaviour of the northern bottlenose whale, *Hyperoodon ampullatus* (Cetacea: Ziphiidae). *Proc. R. Soc. Lon. B.* 266: 671-676.

Moors, H.B.. 2012. Acoustic monitoring of Scotian Shelf northern bottlenose whales (*Hyperoodon ampullatus*). PhD thesis. Dalhousie University. Available online: <http://dalspace.library.dal.ca/handle/10222/15238>.

**4.5 Selection of Valued Environmental Components Table 4.3- Selection of Valued Environmental Components- Fisheries-** Fisheries should be identified as the VEC selected.

**4.6 Potential Exploration Activities- Environment Interactions- Table 4.4 Potential Environmental Interactions of Petroleum Activities and Selected VECs- Seismic surveying-** Should specify that the activity can affect the “special area”, not just the “species.” E.g. can affect the critical habitat, not just the individual northern bottlenose whale.

**5.1.1 Potential Effects and Existing Knowledge-** No mention of important behavioural changes that may occur.

**5.1.1.1 Seismic and seabed surveys- Physiological and Behavioural Effects on Fish Species-** There are maps available that identify important areas for fish, including larvae distribution maps, that should be referenced in this section.

Horsman, T.L. and Shackell, N.L. (2009) Atlas of important habitat for key fish species of the Scotian Shelf, Canada. Can. Tech.Rep. Fish. Aquat. Sci. 2835:viii+82p.

**5.1.1.1 Seismic and seabed surveys- Physiological and Behavioural Effects on Marine Mammals-** The SEAs note that there is a potential for seismic to impact on beaked, deep diving whales such as the northern bottlenose and Sowerby's beaked whales. However, only a few potential impacts are mentioned "there is potential that seismic noise could cause a change in swimming behaviour and avoidance of this habitat, thereby potentially affecting the local population" and potential direct effects on their prey species (squid) – one valid pathway – but not the only possible pathway - affecting foraging efficiency. Additional significant risks include alterations in swimming behavior (including diving and foraging behaviours), which considering the multi-month duration of typical modern seismic surveys, could place these species under stress on a spatially widespread or population basis and in the worst case (unlikely but possible) produce more acute physiological effects from gas exchange problems arising from shallow repetitive dive patterns (Zimmer & Tyack 2007). This section in general needs to be more thorough. Some relevant references not currently included in the SEA are provided in the Scotian Shelf northern bottlenose whale Recovery Strategy:

DFO (2010) Recovery strategy for the northern bottlenose whale (*Hyperoodon ampullatus*), Scotian Shelf population, in Atlantic Canadian waters. Species at Risk Act Recovery Strategies Series. Fisheries and Oceans Canada. Vi + 61 p. Available online: [http://www.sararegistry.gc.ca/virtual\\_sara/files/plans/rs\\_northern\\_bottlenose\\_whale\\_0510\\_e.pdf](http://www.sararegistry.gc.ca/virtual_sara/files/plans/rs_northern_bottlenose_whale_0510_e.pdf)

Zimmer, W. M. X. and P. L. Tyack 2007. Repetitive shallow dives pose decompression risk in deep-diving beaked whales. *Marine Mammal Science* 23(4): 888 – 925.

The potential impacts of masking are also important and should be discussed in more detail given that seismic surveys can occur over long time periods (weeks to months). Changes in behaviour such as area avoidance may be important over long time scales and such changes in behaviour have the potential to cause population-level impacts. The population-level effects of the behavioural changes of individuals that were discussed (e.g., evidence of avoidance of seismic arrays and reduction in vocalization rates noted during Marathon and Encana seismic surveys) or other potential impacts such as masking, when such impacts occur over long time scales (weeks-moths) needs to be considered.

The reason there is such great concern about the potential effects of seismic on beaked whales, including northern bottlenose whales and Sowerby's beaked whales, is that this family of whales appear to be particularly sensitive to underwater sound. There is scientific evidence of beaked whale strandings caused by intense anthropogenic noise (such as military sonar), thus intense sounds in general, including seismic noise, are of concern. Seismic noise produced by oil and gas activities has been identified as a threat to the Scotian Shelf northern bottlenose whale population and is discussed in the Recovery Strategy for the population (DFO 2010).

This section should highlight the concerns around beaked whales and intense noise, especially as the study area encompasses known habitat of an endangered beaked whale population.

While the study results presented in Lee *et al.* (2005) provide some information on species presence and behavior during seismic surveys, data on cetacean presence and behavior was not collected before the seismic vessels were present in the study area or after they left, thus proper comparisons of cetacean behavior before, during and after seismic operations could not be made. This caveat should be explained as this may affect that conclusions that one may draw from the statement about there being no indications that species were significantly affected by the 2003 seismic programs.

“Davis *et al.* (1998) concluded the zone of behavioral effect on the Scotian Shelf for odontocetes may be approximately 1 km in radius”. Caution should be taken when making inferences about a zone of behavioural effects based on a previous assessment rather than scientific literature. As well, there has been some advancement in knowledge about behavioural effects since 1998, thus a review of the current scientific literature, as well as modelling studies would provide a more accurate idea of the range at which seismic sound production may impact marine mammals.

With regards to the 1998 Generic Assessment (Davis et al 1998) and the Board’s own Class Environmental Screening for Seismic Exploration on the Scotian Shelf (CNSOPB 1998), DFO provided a thorough review detailing significant shortcomings when the CNSOPB was planning an update in 2002. At that time, DFO voiced concerns about the reliance on those resources for decision-making in areas frequented by at-risk whales. Beyond the knowledge gains mentioned above, the regulatory environment has changed considerably since then as have exploration and mitigation technologies. DFO thus strongly cautions against the contemporary use of any conclusions drawn in that earlier time—especially those related to toothed whales and the Gully. SEA edits to this effect are advised. Further, the CNSOPB and exploration interests are directed to material provided in these detailed comments for any project specific assessments that might follow.

This section discusses potential effects of seismic activities on squid and suggests that seismic sound production may cause squid to avoid an area. If this were to occur in identified critical habitat of northern bottlenose whale (Shortland and Haldimand Canyons), particularly over a prolonged period, it could be considered destruction of critical habitat under the prohibitions of the *Species at Risk Act* (SARA). As well, disturbance of listed individuals is also prohibited by the SARA.

#### **5.1.1.1 Seismic and seabed surveys- Physiological and Behavioural Effects on Sea**

**Turtles-** There is very little information provided within the documents about the potential impacts of oil and gas activities on sea turtles. Seismic noise production has been identified as a potential threat to Endangered Leatherback Sea Turtles, and concerns around oil and gas activities for the species are discussed in the Recovery Strategy for the population. The Recovery Strategy is an important source of information on the potential impacts of oil and gas activities on the population that should be included/discussed within the SEA.

Atlantic Leatherback Turtle Recovery Team 2006. Recovery Strategy for Leatherback Turtle (*Dermochelys coriacea*) in Atlantic Canada. *Species at Risk Act* Recovery Strategy Series. Fisheries and Oceans Canada, Ottawa, vi + 45 pp.

**5.1.1.2 Exploratory Drilling** – Continuous noise generated by drilling activity could potentially have physiological and behavioral effects on marine mammals. For example, drilling may potentially disturb marine mammals, mask their vocalizations, or cause avoidance of an area. The potential effects of drilling activities on marine mammals are not thoroughly discussed.

A better description of the modelling or fate of drilling wastes (i.e. muds) is needed.

Hannah, C.G., Drozdowski, A., Loder, J. et al. 2006. An assessment of the fate and environmental effects of offshore drilling mud discharges. *Estuarine Coastal and Shelf Science*: 70(4), pp. 577-588.

**5.1.1.2 Exploratory Drilling- Last paragraph-** Where does “the expected extent of spatial avoidance by marine mammals is expected to be 0.5-1 km” come from?

“The effects of drilling noise on marine mammals of special status is considered to be temporary and reversible”- references from primary scientific literature should be used to back up such strong statements. Potential effects are discussed very generally in this paragraph, though potential impacts will vary considerably between species. For example, some listed whale species are highly migratory (such as blue whales) and may be able to search for food elsewhere if forced to avoid feeding in an area where drilling is occurring. Northern bottlenose whales, on the other hand, are year-round residents of a relatively small area, and have a relatively restricted home range. If they are forced to avoid prime foraging habitat (or habitat needed for other important life functions such as mating and rearing young) for an extended period, they may have nowhere else to go to perform these important life functions and thus prolonged avoidance of an area could potentially have significant population-level impacts.

**5.1.1.3 Vessel Traffic-** Increases levels of vessel noise and potential masking is also an important impact of increased vessel traffic on marine mammals. This should be addressed in this section.

**5.1.1.4 Well Abandonment-** The mitigation measures for marine mammals and sea turtles are not adequately explained here. Where does the distance of 1 km distance from the blast location come from? Is there scientific literature that can be referenced to support this buffer zone as a safe distance? How long will a site be monitored prior to blasting to ensure no marine mammals or turtles are in the area, considering that these animals can spend very long times at depth?

**5.1.1.5 Accidental Spills-** Accidental spills, particularly a blowout, have the potential to cause significant and long-term environmental impacts. The potential population-level impacts of such incidents, particularly on listed species, should be discussed. Mitigation of these potential

impacts, particularly what is expected of oil and gas companies in terms of mitigation and response, should also be discussed.

**5.1.2 Mitigation and Planning Considerations- Tables 5.1- Mitigation and Planning Considerations for Species of Special Status- Seismic and Sea bed Surveys** – Measures beyond the SOCP are required for seismic activities with respect to beaked whales as noted above. In addition to the increased observation period described in the comments for section 4.5, suggest the use of a marine mammal observer with experience in identifying beaked whales (as outlined above experience in identifying beaked whales is an important factor for increasing probability of sighting these whales).

Measure # 4 consists of detailed acoustic modeling as input to any project-specific EA's. Acoustic modelling could and should also be used to adequately protect marine mammals while at the same time not unduly compromising industry's field programs to exploit a resource.

**5.1.3 Data Gaps and Uncertainties – Paragraph 1** – Critical knowledge gaps are acknowledged, “Concerns regarding potential effects of seismic on beaked whales (e.g. northern bottlenose whale and Sowerby's beaked whale) remain a data gap. However, the remainder of this subsection should be strengthened to identify important research opportunities. Effects of seismic sound on northern bottlenose whale will not be understood until the relevant experiments are done - and the most relevant experiments will be ones in which northern bottlenose whales are closely monitored while exposed to actual seismic sound. Seismic surveys on the eastern Scotian Shelf would present an unparalleled research opportunity to fill knowledge gaps - provided excessive liberties are not taken with the precautionary principle. Such research would pay dividends for future work both on the Scotian Shelf and elsewhere. SEAs should strongly emphasize this opportunity and encourage industry support and cooperation (promoting research is not the central purpose of SEAs but significant knowledge gaps do remain to be filled).

**5.2 Special Areas- Paragraph 3-** “a higher degree of caution and enhanced mitigation should be exercised in Special Areas that have been recognized through formal designations as areas with specific management measures: the Gully MPA, Sable Island National Park Reserve, Shortland Canyon (along with Haldimand Canyon as northern bottlenose whale Critical Habitat), as well as St Anns Bank and Laurentian Channel AOI's”. All future survey-specific EA's must thoroughly assess their specific environmental sensitivities.

“Shortland Canyon (along with Haldimand Canyon as northern bottlenose whale Critical Habitat)” This is awkwardly written, remove the brackets. High degree of caution should be exercised in areas where there are regulatory consequences.

**5.2 Special Areas- Table 5.2- Special Areas and Ecological Features Potentially Affected by Oil and Gas Activities-** No connecting corridor between the Gully and the two easterly canyons is listed as a potentially affected “Special Area” even though it is known that the northern bottlenose whale populations exchange between these recognized northern bottlenose whale critical habitats.

**Seismic and Seabed Surveys-** The Gully MPA could identify Zone 1 as northern bottlenose whale critical habitat.



**Exploratory drilling-** Shortland and Haldimand canyons should also be included in the list of special areas potentially affected by Exploratory Drilling. The Stone Fence area, in addition to the Lophelia Conservation Area, should also be included because of the abundance of corals.

**Vessel traffic- Shortland and Haldimand Canyons-** Vessel traffic would more directly impact the whales themselves as opposed to their habitat.

**5.2.1.1 Seismic and Seabed Surveys-** “Although seismic surveys will not affect the Special Areas themselves” Not how this would be characterized in terms of critical habitat, Seismic could affect the functions, features and attributes of critical habitat, and thus affect the critical habitat.

“...affecting the biodiversity and integrity of these areas.” Seismic could affect the utility of these areas required by the species in question to fulfill a biological requirement.

**5.2.1.1 Seismic and Seabed Surveys- Effects of Seismic Noise on Areas of Significance for Fish and Invertebrates** There are maps available that identify important areas for fish, including larvae distribution maps, that should be referenced in this section. In addition, there are atlases that identify important spawning areas.

Horsman, T.L. and Shackell, N.L. (2009) Atlas of important habitat for key fish species of the Scotian Shelf, Canada. Can. Tech.Rep. Fish. Aquat. Sci. 2835:viii+82p.

**5.2.1.1 Seismic and Seabed Surveys- Effects of Seismic Noise on Areas of Significance for Marine Mammals and Sea Turtles- Paragraph 1-**The Gully MPA, Shortland and Haldimand canyon are “designated”..., correct SARA term is identified. Endangered blue whale has also been observed in the Gully MPA.

**5.2.1.1 Seismic and Seabed Surveys- Effects of Seismic Noise on Areas of Significance for Marine Mammals and Sea Turtles- Paragraph 2** – “Although monitoring of marine mammals was conducted during seismic programs in the vicinity of the Gully showing no indication of significant effects (Lee et al. 2005).” Studies reported in Lee et al. (2005) may have not shown indications of significant effects merely because they were not designed to detect more subtle behavioural and foraging effects which might, for instance, now can be monitored by electronic tags. Also, some of the Lee et al. studies based on vocalization monitoring were conducted at sufficient ranges from the seismic source that acoustic levels at typical northern bottlenose whale foraging depths would be quite low. One can probably safely say there was little evidence of northern bottlenose whales vacating critical habitat areas on a large scale although there was some evidence that toothed whales in general were affected by the seismic source at ranges up a kilometre or so and appeared more sensitive than mysticetes (baleen whales) to the elevated sound levels at such ranges – or as stated by the immediately preceding paragraph: “odontocetes (e.g., northern Bottlenose whales and Sowerby’s beaked whales) appear to be more sensitive, particularly within 1 km of the array.” The fact is that currently, the studies of Lee et al. (2005) notwithstanding, there is still uncertainty about the behavioural responses and sensitivities of endangered northern bottlenose whales to seismic sound. Significant caution needs to be exercised when undertaking activities in areas where listed species are known to occur and proponents should be

aware that the prohibitions of the *Species at Risk Act*, with respect to individuals and critical habitat apply.

The SEA authors make selective use of the Lee et al (2005) study findings and present some conclusions without the necessary context. For example, while it is accurate to state that no significant alterations to whale behaviour were observed in the 2003 study, the SEAs make no mention that farfield biological monitoring was only conducted in key habitats when the seismic vessel's closest point of approach was 40 to 50 kms. In truth, although robust measurements of sound pressure levels from airgun pulses were collected in 2003, very little was learned about whale behaviour in the presence of active seismic programs (as pointed out by Thomsen et al in 2011). Accordingly, DFO recommends that the SEAs provide more fulsome treatment of the 2003 findings; we also request that for project-specific EAs, the CNSOPB and industry refer to the full length peer-reviewed papers that resulted from the ESRF report.

Cochrane, N. A. 2007. Ocean Bottom Acoustic Observations in the Scotian Shelf Gully During an Exploration Seismic Survey – A Detailed Study. Canadian Technical Report of Fisheries and Aquatic Sciences. 2747: viii + 73 p. Available online: <http://www.dfo-mpo.gc.ca/Library/330618.pdf>

Gosselin, J.F. and J. Lawson. 2004. Distribution and abundance indices of marine mammals in the Gully and two adjacent canyons of the Scotian Shelf before and during nearby hydrocarbon seismic exploration programmes in April and July 2003. Canadian Science Advisory Secretariat Research Document 2004/133: ii + 24 p. Available online: <http://www.dfo-mpo.gc.ca/Library/317117.pdf>

Lee, K., H. Bain, and G. V. Hurley. Editors. 2005. Acoustic Monitoring and Marine Mammal Surveys in The Gully and Outer Scotian Shelf before and during Active Seismic Programs. Environmental Studies Research Funds Report No. 151, 154 p + xx.

McQuinn, I.H. and D. Carrier. 2005, Far-field Measurements of Seismic Airgun Array Pulses in the Nova Scotia Gully Marine Protected Area. Canadian Technical Report of Fisheries and Aquatic Sciences 2615: v + 20 p. Available online: <http://www.dfo-mpo.gc.ca/Library/319590.pdf>

Potter, J.R. M. Thillet, C. Douglas, M.A. Chitre, Z. Doborzynski and P.J. Seekings. 2007. Visual and Passive Acoustic Marine Mammal Observations and High-Frequency Seismic Source Characteristics Recorded During a Seismic Survey. IEEE Journal of Oceanic Engineering, Vol. 32, No. 2, pp. 469-483.

Thomsen, F., S.R. McCully, L.R. Weiss, D.T. Wood, K.J. Warr, J. Barry, R.J. Law. 2011. Cetacean stock assessments in relation to exploration and production industry activity and other human pressures: Review and data needs. Aquatic Mammals 37(1): 1-93.

**5.2.2 Mitigation and Planning Considerations- Paragraph 1-** DFO agrees that avoidance is best mitigation measure. Although the avoidance of special areas is the most effective

mitigation measure, additional buffer zones may also be required as noise can travel far from the location at which it is produced influencing special areas even though the source activity may occur at distal locations. This point is particularly pertinent to beaked whales and their critical habitat areas such as the Gully, Shortland, and Haldimand Canyons.

**5.2.2 Mitigation and Planning Considerations- Paragraph 1-** Need to include Haldimand Canyon as highly sensitive to oil and gas activities.

**5.2.2 Mitigation and Planning Considerations- Paragraph 2-** “Avoidance of these areas is not feasible.” “Desirable” is probably a more accurate term from an industry perspective? What would make avoidance “not feasible”?

**5.2.2 Mitigation and Planning Considerations- Paragraph 5-** We endorse and support the recommendation “to work collaboratively with DFO on mitigation measures regarding special areas”.

**5.2.2 Mitigation and Planning Considerations- Table 5.3- Mitigation and Planning Considerations for Special Areas- Seismic and Seabed Surveys-** Need to go beyond SOCP for seismic and seabed surveys. In addition to the increased observation period described in the comments for section 4.5, suggest that use of a marine mammal observer with experience in identifying beaked whales (as outlined above experience in identifying beaked whales is an important factor for increasing probability of sighting these whales).

**5.2.2 Mitigation and Planning Considerations- Table 5.3- Mitigation and Planning Considerations for Special Areas- Exploratory drilling-** should include Shortland and Haldimand Canyons as areas to avoid.

**5.2.3 Data Gaps and Uncertainties -** Predicting received sound levels in special areas (e.g., SARA Critical Habitat) is a significant data gap that should be addressed by the modeling predictions as called for in Sections 5.1.2 and 5.1.3 pertaining to species of special concern. Until such time that more definitive sound propagation modeling requirements are established for activities in and near sensitive areas, proponents are directed to relevant sections of the Scoping Documents prepared for Exploration Licenses 2409, 2415 and 2416 (available in the Board’s Public Registry Archives). Those scopes contain some basic and preliminary modeling expectations as jointly crafted by DFO and the CNSOPB.

**5.3.1.1 Seismic and Seabed Surveys- Physiological Effects on Fisheries Resources- Paragraph 2 –** “... seismic exploration on snow crabs ..... DFO (2004b) .... chemical and biochemical sampling techniques.” The DFO study looked at effects based on histological and histochemical techniques. The author feels this is different from chemical and biochemical techniques and suggests that the way it is written no other method could/would show damage.

**5.3.1.1 Seismic and Seabed Surveys- Behavioural Effects of Fisheries Resources Affecting Catchability- Paragraph 2 -** ... (mainly cod and Pollock), was reduced by 36% ...”

A number of case studies are cited reporting correlations between the conduct of exploration seismic operations and the subsequent catchability of fish. Such effects should be taken seriously as having potential economic implications for the fishing industry even if the underlying biological effects might be reversible.

**7.2 Cumulative Effects Analysis** – One of the longstanding concerns for the cumulative effects of hydrocarbon exploration in the vicinity of beaked whale habitats along the Scotian Slope has been the impact, if any, of concurrent and consecutive seismic surveys. In regard to acoustically-related cumulative stress or low level behavioural impacts on beaked whales or other species “anchored” to limited geographical areas, the timing of surveys in adjacent Project Areas could be quite important. The potential for wide area ensonification, multipath propagation and difficult-to-predict canyon reverberation remains as much of a concern now as it was in 2003 when Marathon and EnCana ran simultaneous deep water surveys (and clause 13.a.i of the SOCP was being drafted to address multiple arrays). From a strictly economic point of view there may exist a strong motivation to run surveys in closely spaced Project Areas consecutively without significant time breaks since this would entail only a single visitation by one or more survey vessels. Such a procedure might not be the best interests of vulnerable populations. However, whether consecutive surveys have an even greater potential for cumulative effects than simultaneous surveys remains unknown. In light of these acknowledged uncertainties, as well as those suggested by wide azimuth programs—potentially up to five widely spaced airgun arrays firing in sequence—the Board and proponents are requested to anticipate temporal overlaps, program timing, survey logistics and cumulative soundfields to the extent possible in project specific assessments.

**7.2 Cumulative Effects Analysis- Table 7.1-Cumulative Effects Assessment- Species of Special Status- Mitigation Measures-** Need to go beyond SOCP for seismic and seabed surveys. In addition to the increased observation period described in the comments for section 4.5, suggest the use of a marine mammal observer with experience in identifying beaked whales (as outlined above experience in identifying beaked whales is an important factor for increasing probability of sighting these whales). In addition to measures already mentioned.

**8.0 Data Gaps and Recommendations** - is quite vague in stressing research opportunities - for example Table 8.1 Data Gap/Uncertainty “Uncertainty around sublethal effects of seismic sound on marine mammals” - Implications/Recommendations “Research programs have studies underway to address sound source characterization and propagation; physical and physiological effects and hearing; behavioural reactions and biologically significant effects; and mitigation and monitoring”. Important opportunity for collaborative research to fill in knowledge gaps should be emphasized and could be scoped out at the strategic planning level.

**8.0 Data Gaps and Recommendations- Table 8.1- Summary of Data Gaps and Recommendations-Detection of presence and behavioral effects of marine mammals and sea turtles during low visibility and conditions-** Need to go beyond SOCP. In addition to the increased observation period described in the comments for section 4.5, suggest the use of a marine mammal observer with experience in identifying beaked whales (as outlined above experience in identifying beaked whales is an important factor for increasing probability of sighting these whales).

**9.0 Summary and Conclusions- Table 9.1- Summary of Key Mitigation for Exploration Activities in Phase 1A Project Area- Seismic and Seabed Surveys-** Mitigation beyond SOCP is required. In addition to the increased observation period described in the comments for section 4.5, suggest the use of a marine mammal observer with experience in identifying beaked whales (as outlined above experience in identifying beaked whales is an important factor for increasing probability of sighting these whales).

**Comments specific to the Misaine Bank and Banquereau banks (2A)**

**3.3.1 Commercial Fish and Fisheries- P3.44-Table 3.17- 2010 Catch (Landings and Value) for all Species Caught within the Phase 2A Study Area-**Total values for both Landings and value have totals that are slightly off from the addition of the species groups. Although this is probably due to rounding etc. since some totals do add up (table 3.22 and value in 3.24) it might be useful to change totals or identify why there is a slight difference.

**3.3.1 Commercial Fish and Fisheries- P3.45-Table 3.18- Summary of Fishery Licences in General Phase 2A Study Area-** CFA 22 snow crab licence are eligible to fish within the study area however the 23 licences identified to have landings actually fished the Glace Bay hole which is most likely outside of the study area.

**3.3.1.1 Pelagic Fisheries- P3.48-Table 3.20- 2010 Catch (Landings and Value) for Key Pelagic Species Caught within the Phase 2A Study Area-** Total values for both Landings and value have totals that are slightly off from the addition of the species groups. Although this is probably due to rounding etc. since some totals do add up (table 3.22 and value in 3.24) it might be useful to change totals or identify why there is a slight difference.

**3.3.1.3 Invertebrate Fisheries-P3.53- Paragraph 1-** Last sentence: for consistency on rounding, suggest changing shrimp 2(%) to shrimp (3%).

**3.3.1.3 Invertebrate Fisheries- P3.53-Table 3.24- 2010 Catch (Landings and Value) for Key Invertebrate Species Caught within the Phase 2A Study Area** total value for landings out by 20,000kg.

**Comments specific to the Eastern Slope and Laurentian Fan (2B)**

**3.3.1.1 Pelagic Fisheries- P3.44-Table 3.20- 2010 Catch (Landings and Value) for Key Pelagic Species Caught within the Phase 2B Study Area-** total landings off by a reasonable value.

**3.3.1 Commercial Fish and Fisheries- P3.40** Last line on page has three small edits - .... data from NAFO\_4Vn and \_4Vs.