Fisheries and Oceans Canada
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Your file *Votre référence*

Our file *Notre référence*
BAB 3990-5

June 14, 2010

Mr. Darren Hicks
Environmental Analyst
Canada-Newfoundland and Labrador Offshore Petroleum Board
5th Floor TD Place
140 Water Street
St. John's NL A1C 6H6

Dear Mr. Hicks:

Subject: Environmental Assessment of Chevron's Offshore Labrador Seismic Program, 2010-2017.

Fisheries and Oceans Canada (DFO) has reviewed the document entitled '*Environmental Assessment of Chevron's Offshore Labrador Seismic Program, 2010-2017*', dated March 2010 and offer the following comments for your consideration.

General Comments:

This assessment reviews the potential impacts of the proposed multi-year (2010-2017) seismic (2-D, 3-D, and geo-hazard) surveys on Chevron's exploration acreage (Exploration License 1109) in offshore Labrador. Overall, this report provides a comprehensive assessment of the issues at hand; however, as noted below, some sections could benefit from further explanation, referencing, and inclusion of certain topics to enhance the thoroughness of the report.

Biological and Socio-economic Environments
Although this section provides a generally comprehensive overview of the species which may be impacted by seismic activity in the Study Area, there appears to be a general lack of supporting references for this information. Typically, all scientific statements should be properly cited and referenced. It should also be noted that at least two fish species under moratoria (2+3K American Plaice and Witch Flounder) and possibly other sensitive species are found in this area, so even a small event may have a large impact for some of these species. There also seems to be a lack of recent studies on the life history of some species. For example, there are more recent DFO reports for Greenland Halibut than the studies referenced in this report, which should be

considered during this assessment. Please refer to the NAFO Scientific Council Studies for annual studies and updates on Greenland Halibut. Also, if additional information is required on specific species please feel free to contact respective DFO Scientists.

It should be noted that there are no studies which support the following statement: "*Planktonic organisms are so ubiquitous and abundant and many have such rapid generation times that there will be essentially no effect on plankton communities from the seismic program*". And even if this statement was true, this does not necessarily mean that there is no potential for influence on other organisms which depend on these planktonic organisms for food. For example, it is possible that timing of the survey may significantly affect feeding for certain species.

Effects Assessment

This section contains a comprehensive review and interpretation of known risks of sound and seismic on marine organisms. Expertise has been applied to evaluating risks to fish, shellfish and other aquatic organisms in the survey area and conclusions are consistent with what is known to date about the risks of seismic and the present guidelines for evaluating risk. The report also correctly notes in several places that this data is very limited. It is still important to note that the few studies which have been carried out for this type of assessment have considered different species and even fewer have replicate studies for any particular species. It should also be noted that extrapolating results of individual studies to population scale effects may be difficult, especially since it may require a large response for an effect to become obvious in any one study or survey. Population scale effects may therefore not become obvious until some time has passed. Furthermore, to date studies have involved different species, environments, sound levels as well as field and lab conditions, making comparisons difficult.

Considering the broader question regarding the potential risks of seismic, the assessment notes a somewhat dated paper in which a variety of effects were recorded in brown shrimp chronically exposed to a relatively low level of sound. Included were effects on growth and reproduction. This dated paper reinforces the question of acute versus chronic effects, which is a major knowledge gap for aquatic organisms in general. Given that shrimp is a major fishery in the Study Area, and that 2D and 3D surveys may be carried out along the Labrador coast for a number of years (by Chevron as well as others), regulators should address the question on whether chronic exposure of shrimp to low levels of sound poses any risk to these species during surveys of 3 weeks duration or more. Addressing this question would provide a basis for providing an informed opinion on whether a risk might exist or not. Any such studies on shrimp would also be of value for application to other crustaceans.

Overall, this section provides little discussion regarding the impacts on less mobile invertebrates. Mobile organisms may be able to avoid impacts of seismic sound, but those with less mobility may have increased susceptibility to repeated exposures to high levels of sound. Effects on organisms such as invertebrates may have an added effect on the food web as a whole. This may lead to problems such as reduced prey availability for important species such as Atlantic Cod.

It is indicated that "*spatial and temporal avoidance of critical life history times*" would mitigate airgun sound. This statement is very general and it is not clear how this strategy would be

implemented. Would there be monitoring for large aggregations of fish? It is possible that the July to November time period may overlap with the spawning period of some species.

Effects of the Project on the Environment- Marine Mammals and Sea Turtles
A discussion of factors such as visibility, which may impact timing of the survey as well as the effectiveness of mitigation measures, such as the ability of marine mammal observers (MMOs) to detect marine mammals should be included in the assessment.

This section mentions that surveys will not likely affect the prey of sea turtles, including jellyfish. Given the fragile nature of jellyfish, it would be useful to have more information to examine this likelihood more closely. As for other species, the possible interruption of prey availability due to seismic activity should be noted as a potential negative effect.

Mitigations and Follow-up
In Table 5.19 (p. 220) it was noted that delayed start-up will be used for marine mammals and sea turtles within 500 m, but that shutdown will occur only for endangered/threatened species. However, harming or disturbing any marine mammal is prohibited under s. 32 of the *Fisheries Act* and therefore shutdown should be employed for all such species. Also in this regard, it is suggested that multiple MMOs be utilized to ensure sufficient rest during the course of the survey. While it is emphasized that MMOs will be utilized during daylight hours, it is not clear whether these mitigation measures will exist for nighttime survey activity.

Cumulative Effects
Cumulative effects should also include other seismic studies which are expected to occur near the Study Area within the same time frame (2010 to 2017). It is likely that other seismic surveys will be conducted in adjacent areas of the Labrador Shelf during this time period, and it is suggested that this should be carefully considered when timing the present study in order to avoid concurrent surveys, which may lead to greater stress and displacement of organisms.

SARA
For the purposes of this assessment, it is sufficient to simply include species listed under Schedule 1 of *SARA* and omit the COSEWIC designations, since this is the official list (federally) of species at risk.

Please note all species designated under Schedule 2 of SARA have been reassessed and 13 out of 103 species designated under Schedule 3 have been reassessed. Please refer to the links below for more information: http://www.sararegistry.gc.ca/species/schedules_e.cfm?id=2; http://www.sararegistry.gc.ca/species/schedules_e.cfm?id=3.

Potentially Sensitive Areas
The study and project areas are both located in Canada's NL-Labrador Shelves Marine Ecoregion. This is important to note, as two primary uses of this biogeographic classification system are i) assessing and reporting on ecosystem status and trends, and ii) spatial planning for the conservation of ecosystem properties and management of human activities. In addition, these

areas (and information) will be useful towards guiding the selection of future representative marine protected areas.

Specific Comments:

Section 3.0 Physical Environment

Page 12

1st para- Within this section Oceans (2009) is summarized and refers the reader to Sikumiut (2008). While this may be appropriate in some circumstances, it appears that some information, which is important to the timing of the survey and assessing the effectiveness of certain mitigation measures, such as MMOs has been overlooked in this section.

Section 3.3 Climatology

Page 12

1st para- It mentions that "*...maritime climate tends to be fairly humid, resulting in reduced visibilities, low cloud heights, and significant amounts of precipitation*". These factors should be discussed in more detail as they relate to the timing of the proposed surveys and the implementation of various mitigation measures. This would include data on wind, waves and especially visibility.

Section 3.3 Climatology

Page 13

3rd para- The discussion of storm occurrence is informative, but is not likely to have much of an effect on seismic activities as they would not likely occur under these conditions.

Section 3.4 Physical Oceanography

Page 14

Captions for tables and figures in Section 3.4 should include information on the source of the data. This is particularly important for comparisons purposes. This generalization also applies to other tables and figures throughout the report.

Section 3.4.2 Water Properties in the Project Area

Page 20

Figure 3.5- The resolution in this figure is poor, particularly the numbers associated with the contours. It appears the data in this figure is for July only. This should be clarified.

2nd para- It is noted that differences in salinity and temperature may be related to geographic variability, but the statement that this is "*more related*" to geographical rather than seasonal variation is not likely, particularly for surface waters.

Section 3.5 Ice and Icebergs

Page 25

There should be a discussion in this section as to whether more icebergs have been observed recently due to increased effort. Is there any way to know the "error rate" for observing icebergs? It seems likely that monthly sightings would be more relevant to the proposed study.

Pages 26-27
In Figures 3.6 and 3.7, it is unclear what the colours are referring to when the y-axis represents percent coverage. Should the axis be percent observations while the bar colours refer to percent coverage? Simple monthly median values would likely be sufficient to convey the necessary information.

Section 5.7.4.2 Effects of Exposure to Airgun Sound
Page 133
2nd para- Although it states that "*design problems*" may have impacted the results from DFO (2004b), it does not define these problems or how they would impact the findings.

Page 135
1st para- Further explanation should be provided regarding the following: Saetre and Ona (1996) determined the mortality rates for eggs and larvae by employing a "worst-case scenario" computer model. How is this defined? It also appears that few of the variables used here are understood well enough to make this type of model useful.

Page 137
3rd para- It states that, "*...even if masking does occur in some invertebrates, the intermittent nature of airgun sound is expected to result in less masking effect than would occur with continuous sound.*" However, there seems to be little data to support this assertion. While it was mentioned in the assessment that fish may produce sounds in various behavioral contexts such as mating, the potential effect of masking in this context is not discussed within the report. Atlantic Cod have been shown to produce sounds during spawning and therefore this may be a potential impact in this area.

Section 5.7.4.3 Effects of Exposure to marine Vessel Sound
Page 143
4th para- Reference to "*...Subsection 5.7.5.2....*" is incorrect and should be Subsection 5.7.4.2

Also in this section, Snow Crab and Atlantic Cod were chosen as representative species that have been studied in the context of exposure to airgun sound. However, it is not clear how specifying Atlantic Cod guides the assessment of these effects, especially when there is generally little information available about the effect of seismic sound for this species. While it appears there have been a number of studies on Snow Crab, there appeared to be only two studies referenced for cod at different life stages (Wardle et al 2001 - juvenile cod; Thomsen 2002 - cod catch data).

Section 5.7.4.4 Other Project Activities Not Related to Sound
Page 145
Table 5.3 indicates that there is evidence of existing negative impacts in the assessment of effects on fish and fish habitat, yet the basis for this assessment does not appear to have been described in the text.

Accidental Events
Page 146

Many of the references pertaining to the effects of accidental spills on eggs and larvae appear to be rather dated. It is uncertain as to whether or not these studies are reflective of the present level of knowledge.

Section 5.7.7.2 Categories of Noise Effects- (B) Masking Effects of Airgun Sounds
Pages 167-169
The assessment of masking suggests repeatedly that the "*intermittent nature*" of airgun pulses would reduce any masking impact. However, this statement is somewhat speculative. While whales may continue to call during seismic activity, it is not clear whether they can still hear under these conditions. Whale calls may actually be longer than the time between pulses and therefore important information may be lost to them. The data required to truly assess the importance of masking in this context is still rather sparse, making an accurate assessment of effects difficult. Similarly, based on the data available, it appears that little is known about how turtles detect sound. Therefore it is also speculative to assume that sea turtles will be able to receive important sound information between airgun pulses.

Section 5.7.7.2 Categories of Noise Effects- (C)Disturbance by Seismic and Geohazard Vessels
Page 173
2nd para- Regarding the ramp-up procedure, there seems to be some indication that certain species of pinnipeds may move towards an array, and it was also noted in the report that some male whales had approached an array. This questions the assumption that mammals will necessarily move away from airgun sound and avoid injury. Therefore, data indicating that the ramp-up procedure is effective for these species should be included if available or the appropriate uncertainties should be described.

Section 5.10 Residual Effects of the Project
Page 222
Table 5.20 indicates a high level of confidence for the effect of the airgun array. A medium level of confidence seems more warranted based on the limited data available. Other surveys have maintained small airgun pulses during line changes. Will this be done in the present study or will this involve ramp-ups? Is this considered necessary?

Thank you for providing DFO the opportunity to comment on this document. If you have any questions or comments regarding the above, please contact Elizabeth Bennett, Senior Biologist, Marine Section by phone at 772-0853 or by e-mail (elizabeth.bennett@dfo-mpo.gc.ca).

Yours truly,

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