MKI Response to Reviewer Comments (25 March 2020) on the Amendment of Environmental Assessment of Multiklient Invest Newfoundland Seismic Program, 2018-2023
(LGL Ref. FA0203A)

GENERAL COMMENTS

Fisheries and Oceans Canada (DFO)

1. MKI has indicated that the 7-day/30-km temporal/spatial buffer is operationally impractical; however, we note that the same mitigation measure is in place for other current seismic projects.

> ***Response:*** *In recent years, MKI has been the only seismic operator to conduct 3D seismic surveys offshore Newfoundland and Labrador. Other operators, namely GX Technology, have conducted 2D surveys. For 2D seismic surveys, the wider spaced survey lines over a larger geographic area make it more feasible to avoid the DFO-industry post-season snow crab survey.*

2. While MKI has committed to working cooperatively with the FFAW-Unifor and DFO through communication channels, the EA Amendment does not indicate whether the FFAW-Unifor is in agreement, only that, "the representative of the FFAW-Unifor acknowledged MKI's description of the rationale behind the proposed modification to the mitigation measure."

> ***Response:*** *During the meeting held on 4 February 2020, the FFAW did not provide specific feedback. The FFAW's comments on the Amendment has been submitted to the C-NLOPB and are provided below.*

Fish, Food and Allied Workers/Unifor (FFAW/Unifor)

The unknown long-term effects of seismic activities continue to concern fish harvesters. While the research to date has not determined any direct mortality, of fish or shellfish, attributable to seismic activity. There may be behavioural changes, which could affect migration and/or reproductive and spawning activities as well as movement of the exploitable biomass in an area. This, in turn, can impact catch rates in a given fishing season, during a science survey and/or for years to come. For many years, FFAW-Unifor has advocated for local research to be conducted on the impacts of seismic activity on important commercial species including shrimp, crab, turbot and Atlantic cod to address industry concerns and data gaps.

Recently, a first of its kind local study on snow crab catchability before, during and after seismic sound exposure was conducted on the Grand Banks, by Dr. Corey Morris with DFO. The results of this research provided scientific advice in support of a 2 week/30 km temporal/spatial buffer to be incorporated in to environmental assessments.

Field work, by Dr. Morris in 2017 saw a decrease in catch rates following 3D seismic activity, while field work in 2018 saw an increase in catch rates following 3D seismic activity. While the decrease/increase could be passed off as being attributable to natural variability, the report specifically states that the potential for 3D seismic surveying to affect catch rates cannot be ruled out.

The data showed impact within a two-week period and less than 30 km radius from the test site. Therefore, the recommendation for the 2 week/30 km temporal/spatial buffer was made.

It is recognized that the 7-day/30 km temporal/spatial buffer that seismic companies have been using as a mitigation measure for several years is operationally challenging. FFAW-Unifor has also been consistently critical of this mitigation measure as you will recall. In fact, our membership has NOT been in support of any seismic activity being conducted over these stations prior to them being sampled for the year.

With local science on the impacts of seismic sound and snow crab catchability, we strongly urge C-NLOPB to adopt the advice from Dr. Morris's research as a qualified mitigation measure rather than to completely dismiss any spatial or temporal mitigation method.

The importance of both the fishery and the post-season industry collaborative snow crab survey must be recognized across both industries. This post-season crab survey is vital to the fishing industry as it informs decision making with regards to quotas for coming years. Our members rely on this survey to be completed each year, without interruption or potential effects from outside variables, allowing confidence in the index and time series.

The collaborative DFO-industry post-season crab survey has undergone a number of changes in recent years in terms of the location and number of survey stations. It is also being proposed that the survey start mid-August in 2020 to avoid weather challenges often encountered later in the fall. While this is frustrating for planning all around, it continues to be FFAW-Unifor's position that seismic work should NOT be conducted in the vicinity of survey stations until they have been sampled for the year. We have been consistent in this position with all seismic activity and remain steadfast in our stance.

In the past, we have worked cooperatively with MKI on this issue and anticipate the same level of understanding going forward. We must ensure our members' concerns are heard and addressed, and we must also ensure that the importance of both the fishery and the post-season industry snow crab survey are recognized across each of our industries.

> ***Response:*** *MKI acknowledges the importance of scientific studies examining the effects of seismic surveys on important commercial species and their fisheries. MKI/PGS has provided in-kind logistical support of the scientific studies led by Dr. Morris each year since the study began in 2015. The basis of FFAW/Unifor's statement that DFO's is now recommending the 2 week/30 km temporal/spatial buffer due to more recent findings of snow crab studies from 2017-2018 is unclear. Furthermore, MKI has not dismissed* "any spatial or temporal mitigation method" *as suggested in the FFAW/Unifor response. As in previous years, MKI is committed to working cooperatively with the FFAW/Unifor and will establish a temporal and spatial separation plan as stated in the EA Amendment.*
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> *There are several statements (see points 1-3 below) made in FFAW/Unifor's comment that MKI contends are inaccurate.*
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> **1.** "The results of this research provided scientific advice in support of a 2 week/30 km temporal/spatial buffer to be incorporated in to environmental assessments"
> **2.** "The data showed impact within a two-week period and less than 30 km radius from the test site. Therefore, the recommendation for the 2 week/30 km temporal/spatial buffer was made."

3. "…we strongly urge the C-NLOPB to adopt the advice from Dr. Morris's research as a qualified mitigation measure rather than to completely dismiss any spatial or temporal mitigation measure."

The ESRF report published in 2021 (Morris et al. 2021[1]), which summarizes all the local snow crab studies (i.e., fisheries catch rates, crab movements, physiology, and genomic response) led by DFO summarizes the findings in the Executive Summary as follows:

"This research did not measure consistent statistically significant impacts of seismic oil and gas exploration on commercial Snow Crab. Catch rates were inconsistent, higher in one year and lower in another year for experiments that exposed Snow Crab to extended periods (days-weeks) of seismic exposure (3D surveying), and no difference was detected in catch rate for all shortterm (hours-days) exposures (2D surveying) to seismic surveying. The behaviour of Snow Crab exposed to seismic surveying supports the catch rate information; analysis of movement patterns found no significant differences owing to seismic surveying. There was also no evidence of physical damage to internal organs or based on histological examination, which confirmed expectations. Genomic effects of seismic surveying on sound-responsive genes also supported the physiology results, showing inconsistent results from one year to the next and did not show evidence of significant effects. However, environmental variables such as temperature, depth, time of day, and different locations, had measurable effects on catch rates and the movement of snow crab, thus the analysis was sensitive enough to account for sources of natural variability.

The conclusion from this research is that if seismic surveying impacts commercial snow crab, based on factors considered by our experiments, it is within the range of natural variability. Consistency among several independent measurement metrics used in this study, including measure of catch rate, movement, physiology and genomic response, adds considerable weight-of-evidence support to this conclusion."

DFO also states the following in the ESRF report:

- "No effects of 2D seismic surveying were detected during controlled experiments in 3 different years. Statistical difference in catch rate was observed in response to 3D surveying, but the catch rates were decreased in one year and increased in another; not a predictable decrease in catch rate as hypothesized." *(page 36)*
- "Our results did not support the contention that seismic surveying activity negatively affects catch rates in the shorter term (i.e. within days) or longer time frames (weeks). However, significant differences in catch were observed across study areas and years (Figure 7). While the inherent variability of the CPUE data limited the statistical power of this study, our results do suggest that if seismic effects on Snow Crab harvests do exist, they are smaller than natural changes related to spatial and temporal variation." *(pages 36 and 37)*

[1] Morris, C.J., D. Cote, B. Martin, R. Saunders-Lee, M. Rise, J. Hanlon, J. Payne, P.M. Regular, D. Mullowney, J.C. Perez-Casanova, M.G. Persiak, J. Xu, V. Han, D. Kehler, J.R. Hall, S. Lehnert, E. Gonzalez, S. Kumar, I. Bradbury, and N. Paddy. 2021. As assessment of seismic surveys to affect Snow Crab resources. St. John's, NL. Environmental Research Fund Report No. 200. 75 p. + appendices.

In short, the various studies did not find any clear effects of seismic surveying on snow crab catch rates and any effects which were detected the authors stated were within the parameters of natural variability.

In all the studies (ESRF report and journal publications), we found no text stating that DFO recommends or advises that a 14 day/30 km temporal/spatial buffer be implemented as a mitigation measure. DFO does state on page 68 of the ESRF report that "For commercial Snow Crab and its fishery at least, this study indicates that if there are potential effects of seismic, the effects occurred within 30 km of the survey and were not observed 2 weeks after surveying had ended. This information can inform the seismic surveying industry to guide its operations in Newfoundland and Labrador offshore waters in a manner that mitigates potential impacts using the best available information, and helps to ensure appropriate industry interactions with minimal environmental effects." *As confirmed with Dr. Corey Morris (Research Scientist, DFO, pers. comm., 9 September 2021), the 14 days and 30 km referenced in this text are directly attributable to study design limitations. In one year of the study (2017), catch rates of crab in the "Impact" area were significantly lower "During" a period of 3D seismic exposure versus 14 days "After" in a "Control" area 30 km away (Morris et al. 2020[2]). Based on the study design, DFO did not examine catch rates at any point from Day 1 to 13 post-seismic exposure in 2017. Likewise, data on catch rates were not acquired at closer distances than 30 km from the Impact site. [Interestingly, catch rates were higher After exposure to 3D seismic surveying in 2018 and no effects on crab catch rates were detected during exposure to 2D seismic surveying in three years (Morris et al. 2018[3]) – highlighting the lack of consistent findings in catch rates.]*

DFO surmised that a finer-scale study on snow crab movement was warranted because catch rates ultimately depend on crab movement. DFO undertook an acoustic telemetry monitoring study (Cote et al. 2020[4]) to examine the effects of seismic surveying on snow crab movement before, during, and after exposure to 2D seismic surveying. They tagged and tracked the fine scale (2 m accuracy every few minutes) movement behaviour of several hundred crab during experiments over a three-year period. Their analysis of crab movements did not detect changes in response to seismic surveying sound. DFO did, however, measure small changes in movement which were attributable to changes in water temperature and time of day. They noted this was important because it demonstrated that their methodologies were capable of detecting changes in movement if indeed seismic sound had elicited such changes.

MKI contends that management decisions regarding mitigation should be based on robust science including the local studies undertaken by DFO on snow crab. As DFO notes: "The conclusion from this research is that if seismic surveying impacts commercial snow crab, based on factors considered by our experiments, it is within the range of natural variability. Consistency among several independent measurement metrics used in this study, including measure of catch rate, movement, physiology and

[2] Morris, C.J., D. Cote, S.B. Martin, and D. Mullowney. 2020. Effects of 3D seismic surveying on snow crab fishery. **Fish. Res.** 232: 105719. Doi: 10.1016/j.fishres.2020.105719.

[3] Morris, C.J., D. Cote, B. Martin, and D. Kehler. 2018. Effects of 2D seismic on the snow crab fishery. Fish. Res. 197: 67-77.

[4] Cote, C., C.J. Morris, P.M. Regular, and M.G. Persiak. 2020. Effects of 2D seismic on snow crab movement behaviour. **Fish. Res.** 230: 105661. Doi: 10.1016/j.fishres.2020.105661.

genomic response, adds considerable weight-of-evidence support to this conclusion." *The old temporal / spatial restriction of 14 days/30 km was not based on science and new scientific information does not support its continued use. Imposing a restrictive temporal and spatial buffer which is not directly supported by science and which was not recommended by DFO (in their research or in their comments on MKI's EA Amendment), is not prudent. MKI is committed to working cooperatively with the FFAW/Unifor and DFO on this issue. As stated in the EA Amendment, a temporal and spatial separation plan will be prepared each year with established communication channels to avoid snow crab survey stations prior to their sampling, to the best extent possible.*

SPECIFIC COMMENTS

Fisheries and Oceans Canada (DFO)

Section 2.0 Modification to Mitigation Measure (paragraph 3, sentence 2)
The Proponent states: "The rationale for the change is that the buffer is considered operationally impractical based on MKI's recent experience in the Project Area". Based on MKI's experience, what spatial and temporal buffers would be feasible for the post-season snow crab survey?

Section 4.0 Conclusion (sentences 3 and 4)
Although ongoing communication is an important mitigation, the Proponent should clarify that they intend to develop a temporal and spatial separation plan in collaboration with FFAW-Unifor and DFO, as noted in Section 3.0.

Response (to both DFO specific comments): *As a mitigation measure, MKI commits to develop a temporal and spatial separation plan in collaboration with FFAW/Unifor and DFO. Based on MKI's experience in recent years, the temporal and spatial "buffers" have been variable and this flexibility is essential in collected data in support of the Land Tenure system and wider interests of the province. The principles of the plan are consistent with the general avoidance mitigation for active harvesting; the seismic vessel and equipment will stay away from the snow crab sampling activity. Ideally and in practice this has been coordinated dynamically with direct communication between the seismic operation and the harvesters at sea.*