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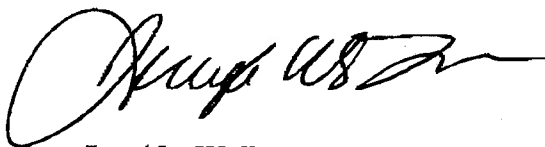
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Date: Feb 26, 2003

Hi Alan

Here is our technical report for the Western Geco 2D Seismic Program. If you need any additional information please do not hesitate to contact me or our term Fisheries Biologist, Les Harris at (867) 777-3429 or email to jen.larsen@grrb.nt.ca or les.harris@grrb.nt.ca.

Thanks a lot,



Jennifer Walker-Larsen
 Forestry/Fisheries Biologist

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Technical Report Submitted to the Mackenzie Valley Environmental Impact Review Board Re: Western Geco 2D River Seismic Program - 2 June 2003

Non-Technical Summary

The Gwich'in Comprehensive Land Claim Agreement established the Gwich'in Renewable Resource Board (a co-management board) as the main instrument of renewable resource management in the Gwich'in Settlement Area. Our staff has conducted a technical review of the following general subjects in the Mackenzie and Liard Rivers 2D Seismic Program environmental assessment document and information requests.

We believe that the Project scheduling will overlap with the spawning runs of Arctic Red River and Mackenzie River inconnu. The Mackenzie River inconnu will probably be most affected because the seismic work overlaps with their migratory route from the Mackenzie River delta to the suspected spawning areas near the Rampart Rapids. We think that possible congregating and spawning areas of Mackenzie River inconnu should be identified using scientific and community knowledge and that the Program should shut down within 1 km of these areas. This will provide a minimal level of protection to the spawning stock.

We also believe that air gun operation may damage Mackenzie River and Liard River fish hearing. The studies undertaken by Western Geco do not show that airgun exposure does not hurt native fish species, particularly fish that are harvested for subsistence purposes. Because of the importance of these fish to local harvesters, we believe that more testing is required to determine the sensitivity of Coregonid fish species to air gun operation before the Program is approved.

Introduction

The Gwich'in Renewable Resource Board (GRRB) would like to present the following technical comments on the Environmental Impact Assessment for the WesternGoco Mackenzie and Liard Rivers 2D Seismic Program (EA022-2552). The mandate of the GRRB is to conserve and manage renewable resources within the Gwich'in Settlement Area in a sustainable manner to meet the needs of the public today and in the future. The GRRB, a co-management board, was established under the guidance of the Gwich'in Comprehensive Land Claim Agreement (GCLCA) to be the main instrument of wildlife, fish and forest management in the Gwich'in Settlement Area. The GRRB collects and uses both scientific and community knowledge to help make management decisions in the settlement area. The powers and responsibilities of the Board are detailed in Chapters 12 and 13 of the GCLCA, Volume 1.

We have conducted a technical review of the following general subjects in the Mackenzie and Liard Rivers 2D Seismic Program environmental assessment document and related information requests:

- Effects on fish
- Effects on invertebrates
- Effects on aquatic vegetation
- Effects on hydrology
- Effects on water quality
- Effects on Traditional Land Use
- Cumulative Effects

The specific comments and concerns expressed by the GRRB, in regards to the environmental assessment are presented under the "specific comments" heading. Where no comments have been offered, no concerns were identified.

The GRRB serves in this assessment as an expert adviser and a directly affected party. The comments included here are offered in our departmental capacity as an expert advisor, except where it is specifically indicated otherwise.

Specific Comments

1. Scheduling of Seismic Operations and Timing of Inconnu Spawning Migration

Reference: ToR line # 4.9, EA Sec. 3.3.4. (p. 32), EA Sec. 8.2 (p. 54) and EA Sec.8.2. Table 8-3 (p. 62)

Developers Conclusion:

Western Geco concluded that 'there will likely be little overlap between the Project and these fish migrations' (EA pg 32) since 'Arctic cisco, broad whitefish, chum salmon, dolly varden, inconnu, lake whitefish and least cisco typically enter the Mackenzie River in the late summer-fall to begin their upstream migrations' (EA pg 54 and EA Table 8-3)

Our Conclusion:

The GRRB agrees that the project scheduling will minimize overlap with spawning migrations of most fish species. However we would like to point out that this is not true for inconnu, an important subsistence species. As scheduled, the Project will overlap significantly with the spawning migrations of Arctic Red River and Mackenzie River inconnu stocks.

Our Rationale/Evidence:

According to the EA Sec 3.3.4 p. 32, the Program is scheduled to move upstream from the Gwich'in/ISR border beginning in late June. The Mackenzie seismic run is expected to take roughly six weeks (EA p. 30).

Inconnu harvests in the GSA peak in early July (DFO Stock Status report D5-04) when pre-spawning adults migrate to spawning areas in the Peel, Arctic Red, and Mackenzie Rivers. At the mouth of the Arctic Red River pre-spawning Arctic River and Mackenzie River inconnu are caught from early July until mid-August (Howland, 1997). The Project will travel nearly the entire migratory route of the Mackenzie inconnu stock which is believed to congregate and spawn close to the Ramparts Rapids near Fort Good Hope. The Arctic Red River stock will likely be less impacted as they will head up the Arctic Red River once they reach its mouth.

Recommendations:

1. Scientific and community knowledge should be reviewed to determine probable spawning and congregating areas of inconnu along the mainstem Mackenzie River. If areas are identified, airguns should be shut down within 1 km of these areas.

2. The effects of airgun operations on fish hearing

Reference: EA Sec 9.2.2.1 (p. 110-112)

Developers Conclusion:

Western Geco concluded that based on the results of their Caged Fish Study and literature review, the predicted impacts of the Project on fish hearing in the Mackenzie and Liard Rivers would be negligible.

Our Conclusion:

The GRRB believes that the impact of airgun operations on fish hearing in the Mackenzie and Liard Rivers cannot be predicted based on the study and literature review completed. There is virtually no scientific information about sensitivity of local fish species coregonid species, to loud noises and recent work by McCauley et al (2003) demonstrates that long term damage to fish hearing can occur from airgun operation. The particularly alarming conclusion from McCauley et al's study is that the damage to fish hearing is not immediately evident after exposure and that the damage can only be detected by scanning electron microscopy.

The GRRB believes that the poor design of the Caged Fish Study compromised the quality and predictive value of the data. Damage or impairment of fish hearing is important as it may leave fish very vulnerable to predators or with a loss of ability to find mates. We feel that no conclusions can be made about the impact of air gun operation on Mackenzie and Liard River fish because of the following study method problems.

- a. *No Coregonid species were used for the test species for the caged fish test*
Reference: ToR line # 4.9, EA Appendix III, Sec. 3.3.4.1. (p. 12)

The following eight fish species were used: burbot (*Lota lota*), flathead chub (*Platygobio gracilis*), longnose sucker (*Catostomus catostomus*), northern pike (*Esox lucius*), pearl dace (*Semotilus margarita*), walleye (*Stizostedion vitreum vitreum*), slimy sculpin (*Cottus cognatus*), and trout perch (*Percopsis omiscomaycus*). Although these fish species have a fundamental role in ecosystem functioning, no subsistence species were used. Coregonid species (broad whitefish, lake whitefish, inconnu, and arctic and least cisco) are the most important subsistence species in the area and negative impacts from airgun operation could significantly impact their populations. The potential impacts to coregonid fish hearing from airgun operation remains unknown.

- b. *Exposed fish were sacrificed too early to detect hearing damage*
Reference: Section 3.3.4.2 of appendix III (p. 17)

Caged fish were sacrificed for histopathological analysis 48 hrs after air gun exposure. According to a recent study by McCauley et al. (2003) that evaluated hearing damage of pink snapper exposed to air-gun stimulation, visible damage to auditory structures was minimal for fish sacrificed 18 hours

after exposure but significantly greater for fish sacrificed 58 days after exposure. These results suggest that damage is unlikely to be detected 48 hours after air gun exposure.

- c. *Histopathological methods used were inadequate to detect hearing damage*
Reference: ToR line # 4.9, EA Appendix III, Sec. 4.1.3.3. (p. 35) and Sec.5. (p. 38)

Western Geco states that histopathological examination of the inner ear, swim bladder and other tissues or structures showed no abnormalities attributable to airgun discharge. Although some internal structures of fish can be viewed in adequate detail through the use of light microscopy, further examination of internal tissues and structures may have revealed different results under examination with a scanning electron microscope (SEM). The use of an SEM would have allowed detailed, visual analysis of the audio organs of fish (i.e. hair cells on the sensory epithelium and saccule). These audio organs were not taken into account, nor were they examined in fine detail, during histopathological analysis of the test fish from the Mackenzie.

- d. *No large bodied fish used in cages placed at 2 m away from the air-gun array during caged fish assessments.*
Reference: ToR line # 4.9, EA Appendix III, Sec. 3.3.4.2. (p. 13, 14), Sec. 6 (p. 41)

Western Geco concluded that fish native to the Mackenzie River within the sound pressure range (2 – 450 m) of actively firing air-guns did not experience immediate mortality and exhibited no physiological damage attributable to air-guns used by WesternGeco. However the GRRB does not believe that the above statements may be correct for all sizes of fish as no large bodied fish were tested in the closest cage with the highest level of sound exposure.

Recommendations:

1. The GRRB recommends further studies be conducted to determine the impact of air gun operation on Coregonid fish species using a range of fish sizes. A longer period of time should lapse before fish are sacrificed for histopathological analysis and histopathological analysis should follow methodology used by McCauley et al (2003).

Summary of Recommendations:

1. Scientific and community knowledge should be reviewed to determine probable spawning and congregating areas of inconnu along the mainstem Mackenzie River. If areas are identified, airguns should be shut down within 1 km of these areas.
2. The GRRB recommends further studies be conducted to determine the impact of air gun operation on Coregonid fish species. Histopathological analysis should follow methodology used by McCaulcy et al (2003).