

Revised Hunt EEM Program

September 19, 2005

INTRODUCTION

This report presents the conceptual design and estimated costs for conducting an EEM program for the proposed Hunt Oil seismic survey in Sydney Bight. The EEMP is to be conducted at the onset of the seismic survey, which is scheduled to begin between November 1 and 15, 2005.

This document is intended for discussion only. It presents a conceptual design only. Specific values are used to provide as much detail as possible, but these values will need to be confirmed by further plan development.

TEST HYPOTHESIS

The EEM program is designed to determine the threshold at which sublethal damage to ear structures of fish, in this case Atlantic cod, occurs. The test location is close to the Bird Islands, an area known as a juvenile nursery area for cod. The test hypothesis is that no damage to ear structures occurs at distances greater than 1000 m from a sound pressure level of approximately 220 dB re 1 m (note that the proposed sound pressure level will be confirmed later).

The EEM provides a direct connection to the predictions of the EA in relation to potential effects on young fish in the Bird Islands area. The EA predicted that the Bird Islands were beyond the range of sublethal effects. The results will also help understand possible impacts of the seismic survey of migration of 4Vn cod, assuming a relationship between significant ear damage and fish migration behaviour.

TEST ORGANISM

Cod will be obtained from a hatchery in Newfoundland to ensure all fish are consistent in genetic and physical quality. Four fish will be sacrificed at the onset of the study to provide a reference comparison for test and control fish. Two reference fish will be used to provide a reference for ear studies, and two will be used for reference for other tissues. All fish are expected to be in their second year and about 10 to 15 cm in length.

Approximately 50 fish will be obtained. Fish will be shipped to North Sydney by ferry before November 1 and held at the Big Bras d'Or wharf in cages until needed for the EEMP.

TEST AND CONTROL SITES

The proposed test and control sites are illustrated in Figure 1. The test location is as close to the Bird Islands as possible. The control site, near Ingonish, is approximately 50 km away from the test site. Both sites are in approximately 80 m of water. Test site vessels will berth at Big Bras d'Or, while the control site vessel will berth at Ingonish Harbour.

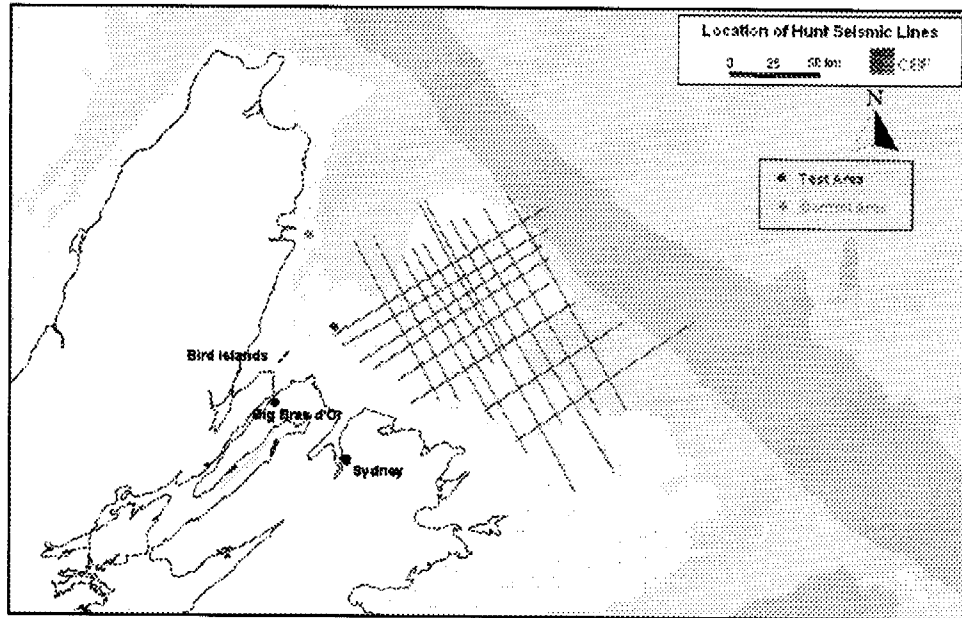


Figure 1: Location of Test and Control Longline Sites for the Hunt EEMP

The test site was selected because of its proximity to the Bird Islands. The control site was selected because it had water depths similar to the test site in relatively close proximity, and the location was well removed from competing sources of noise, such as routine shipping, ferries or gypsum vessels.

TEST EXPOSURE AND CONTROL TREATMENT

Fish will be deployed in wire crab cages with the interior netting removed. These cages can be used for storage at the wharf as well as for test and control deployment. For test and control conditions, no more than five fish will be placed in each 1.2 m length cage to minimize any effects of fish crowding on results. Ten fish will be placed at each test and control site.

Test and control fish will be treated identically. All fish will be placed in tanks for transportation to the test and control sites. Cages will be set the day prior to the pass by the seismic survey vessel. If a soft start is required, a minimum duration is preferred to limit disturbance of fish prior to the passage of the vessel with the airguns at operating at full power.

At the test site, three sets of cages will be set at approximately 500, 1000 and 1500 m in a line perpendicular to the path of the seismic survey vessel. Additional sound propagation modeling will be carried out to determine the most appropriate separation of test sites, with the middle line being at the anticipated threshold of effect.

SAMPLE PREPARATION AND ANALYSIS

One cage of fish will be retrieved approximately five hours after the survey vessel has completed its pass with airguns active. Fish will be sacrificed and ears of three fish removed and prepared for shipment to the University of Maryland for analysis. Removal and preservation of ears will be carried Ray Soper of Oceans Ltd. (Ray was trained by Dr. Popper and did the tissue removal and preparation in tuna for a previous study). Electron Microscopy grade fixatives will be used. The fixed ear tissue will be sent to Dr. Popper at University of Maryland for analysis. The three otolithic end organs in each ear, and both ears of each fish will be examined.

The two remaining fish will be sacrificed and preserved for shipment to the Veterinary College in Charlottetown. Dr. David Groman will prepare slides of liver, gonads, and brain and review them for abnormalities compared to the reference fish.

The second cage of fish will remain in the water for two days. Cages will then be recovered and treated similarly to the fish in the first cage. The fish from the 2nd cage are intended to provide a check for injuries that are delayed in appearance after the original exposure. The hypothesis will be the fish from the two cages should show the same injuries. The number of fish analyzed from the second set of cages will depend on the results provided by first set of samples and by the money remaining in the budget.

Samples will be prepared immediately on arrival back at the Big Bras d'Or wharf, or if weather is inclement, at a local facility nearby. All samples will be placed in appropriate preservative for shipment to either the University of Maryland or the Veterinary College. Approximately 10 samples of fish for ears (20 ears) and 14 samples of whole fish are anticipated from the first set of cages. An additional 8 samples of fish for ears (16 ears) and 12 samples of whole fish would be provided by the 2nd set of cages.

IN SITU SOUND MEASUREMENTS

Sound will be measured in situ at the test and control sites. Hydrophones will be attached to the cages approximately 1 m above the bottom. Sound measurements will be recorded remotely at the cage or a cable will be run to the fishing vessel anchored nearby. Measurements will be made at the test sites 500 m and 1500 m from the survey line, and at the control site. Thus, two or three hydrophones and data acquisition systems will be required.