Evaluation of an Electrical Gradient as a Seal Deterrent
Vancouver Aquarium Study
March 27, 2007
Preliminary Results

On March 26, 2007, staff from the Pacific Salmon Commission and Smith-Root Inc. installed a system to create an electrical voltage gradient in a research pool at the Vancouver Aquarium. The anode and cathode of the system were located directly across from one another approximately 4.9 m on opposite sides at the west end of the research tank. The test seals could not simultaneously touch both electrodes. In addition, a non-electrified area within the pool was created. The electric field occupied approximately one third of the pool. Final calibration of the system was completed on March 27, 2007 and the voltage gradient in the field area was mapped following each trial. Electrical field density readings ranged between 0.10 - 0.32 Volts/cm. Two harbour seals (*Phoca vitulina*) were evaluated during separate trials in this study: Seal 1, a male weighing 92 kg and Seal 2, a male of 89 kg. The purpose of the trials was to determine the minimum voltage field that elicits a change in the behaviour of the harbour seals used in the study. The intensity of the voltage field was manipulated by varying pulse width.

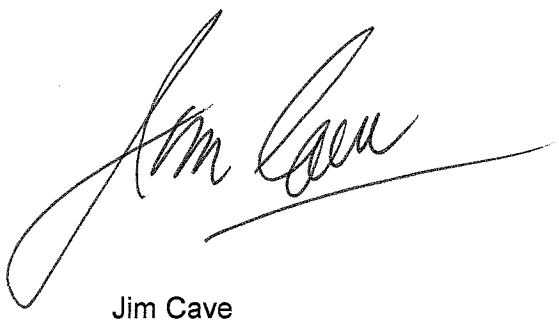
The pulse frequency was fixed during the trials at 2.25 Hz. Pulse width was increased at approximately 5 minute intervals during the trials with steps beginning at 75 micro-seconds, 100 micro-seconds, 200 micro-seconds and 400 micro-seconds. Prior to the commencement of the trials, the test animals were allowed to acclimate to the research pool and the study equipment. During the acclimation, the animals showed no apparent interest in the equipment and their behaviour was judged normal by the Vancouver Aquarium marine mammal trainers and Dr. Martin Haulena, the Vancouver Aquarium veterinarian.

The first study animal, Seal 1, demonstrated no change in behaviour at a pulse width of 75 micro-seconds (5 minute period) or at a pulse width of 100 micro-seconds. The seal swam into all areas of the pool and used haul-outs on both ends of the pool. However, at a pulse width of 200 micro-seconds, he demonstrated a noticeable change in behaviour by swimming in a tight little circle (less than one body length in diameter) near the edge of the electric field and exiting to the non-electrified portion of the pool outside of the voltage gradient. During the 5 minute interval at a pulse width of 200 micro-seconds, the seal approached the electric field 4 times demonstrating active avoidance of the electrical gradient area on each occasion. At this point the electrical gradient was turned off and Seal 1 resuming normal swimming patterns in the area that was previously avoided at the 200 micro-second pulse width setting.

The second study animal, Seal 2, demonstrated no change in behaviour at pulse width settings ranging from of 75-200 micro-seconds (5 minute periods each). However, at a pulse width of 400 micro-seconds, he demonstrated a noticeable change in behaviour by turning around at the edge of the electric field and returning to the area outside the voltage gradient. The seal approached the electric field 18 times demonstrating apparent avoidance of the voltage gradient areas on each occasion. This animal did not demonstrate the same behaviour as the previous animal, which swam in the quick, tight little circle each time it entered the voltage gradient. As in the previous trial, at this point the electrical gradient was turned off and Seal 2 resumed swimming in the area that was avoided at the 400 micro-second pulse width setting. The study was repeated with Seal 2 using a pulse frequency of 1.32 Hz with the same avoidance behaviour noted at 400 micro-second pulse width with resumption of normal

swimming patterns after the gradient was removed. Seal 2 was more active throughout the study than was Seal 1.

A more careful review of the results will be made when the hand-held video footage is made available. However, both seals demonstrated avoidance responses at voltage gradients and pulse width settings much less than typically required for freshwater fish (Dave Smith, Personal communication, Smith-Root Inc). At the conclusion of each of the trials, the study animals demonstrated no negative effects of the experiment as judged by the marine mammal trainers and Dr. Martin Haulena. The animals resumed feeding 3 hours after the experiment and exhibited no abnormal behaviours.



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