A Field Test of the Counting Accuracy of the CWT Tube Detector In the 1998 Area 5 Sockeye Fishery

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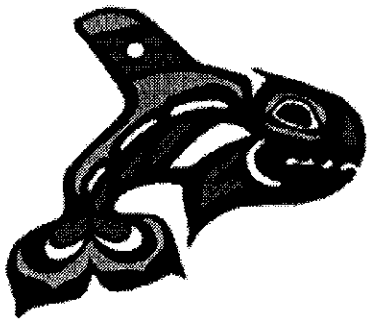

Northwest Indian Fisheries Commission

INTRODUCTION

In 1998, recovery of coded wire tags (CWTs) in coho salmon will occur with the use of electronic detection equipment in Oregon, Washington, and British Columbia. Due to past concerns about the tube detector gate, counter, and sampler errors, WDFW and NWIFC staff decided to conduct tests of the new tube detector and the redesigned gate prior to their use in the 1998 coho fisheries. The goal of the testing was to determine the accuracy of the tube/gate/counter system and whether the equipment count could be used in the upcoming coho CWT sampling process.

The specific objective of this NWIFC field test was to determine the accuracy of the fish counter in a commercial fishery sampling situation. The Area 5 sockeye fishery was selected for the availability of fish in the early part of the season, and a fish size that was similar to coho. Additional testing is planned to determine the accuracy of the system for detecting, sorting, and counting CWTs.

METHODS

The testing was conducted at the Olympic Fish buying pier, at Sekiu Washington, on July 28, 29, and 30, 1998. Sampling was conducted by two NWIFC staff. The sampling area was spacious and proved to be ideal for use of a tube detector. Fish were brailed from fishing boats into an iced tote on the pier. Fish were sampled from tote to tote using the latest model NMT R-9500 series tube detector with sorting gate. A total of 1,006 different fish were passed through the tube detector. The sample size was selected to determine a counting error rate of $\geq 0.5\%$. Since the sockeye were not coded-wire tagged, a hand held CWT injector was used to place single length tags in 43 (4.3%) of the fish. A hand-held wand detector was used to verify the existence of the CWTs and to verify and locate the cause of false detections on the fish. Fish that were determined to be "false positives" (untagged fish which were incorrectly identified as tagged by the tube) were rinsed and passed through the tube a second time.

EQUIPMENT SETUP

Setup of the tube was conducted by passing 30 fish through the tube and adjusting the detector sensitivity, gate signal delay, and gate signal duration. This was needed to calibrate for the magnetic moment of the CWTs, environmental electro-magnetic interference, and the velocity of the fish moving through the tube. We found that for our tube's factory default settings:

- The sensitivity was set too high for our working environment.
- The gate signal delay was too long for the fish velocity.
- The gate signal duration was set too short for the fish to be sorted correctly.

With the machine set up properly, the test was started. The sampler would place a fish in the tube and observe each fish to determine if:

1. The fish was detected properly.
2. The fish was sorted properly.
3. The fish was counted properly.

RESULTS

A total of 1,006 fish were sampled over a three-day period. On July 28, the tube detected and sorted the first 86 fish correctly. However, after a 15 minute pause fish 87 was a false positive that was not sorted to the tagged fish side of the gate. It was counted on the untagged side, which ultimately was correct. It was determined that the gate signal duration was set too quick for the slow velocity of that particular fish. This was due to a dry tube. We adjusted the signal duration so the gate would stay open longer and moistened the tube with ice. The tube worked flawlessly the rest of the day with a total of 157 untagged fish processed, 7 tagged fish detected out of 7 tagged fish processed, and 3 false positives.

On July 29, we did not adjust the settings from the previous day. After passing approximately 200 fish the sampler knocked off the plastic plate that protects the setting dials. At fish 317 the sampler hit the dials with a fish and the machinery became too sensitive. The tube was recalibrated and sampling continued. A daily total of 726 untagged fish were processed, 36 tagged fish were detected out of 36 tagged fish processed, and 3 false positives were obtained, with no counter errors.

On July 30, 1998 we did not adjust the settings. A daily total of 80 untagged and 2 false positive fish were sampled with no counting errors.

A total of 8 false positive fish were encountered. These fish were immediately wanded and the magnetic cause of the false detection was located on all but one fish. In several instances rust particles, presumably from the fishing boat, were located and visually identified. All fish were rinsed and sent back through the tube undetected. The tube counter was adjusted to subtract the false positives.

ANALYSIS

After proper equipment calibration, sampling of 1,006 sockeye resulted in the following:

- A total of 955 different, untagged fish were processed and both detected and counted correctly by the tube.
- There were 8 false positives in the 963 untagged fish processed (0.83% false detection rate: 95% confidence interval 0.26% to 1.40%).
- All 43 fish with a CWT were detected, counted and sorted correctly.

There were 963 untagged fish (the 955 untagged fish plus the 8 false positives which were correctly detected and counted after rinsing) sampled with no error in counting. If the tube has a

true underlying error in counting untagged fish of 0.5% or more, there is less than a 1% chance that 963 fish could be processed without a counting error. Therefore, we conclude that the tube, when properly calibrated, has an error rate for counting untagged fish of less than 0.5%.

SUMMARY AND RECOMMENDATIONS

The tube detector, when properly set up, performed well in our test. All fish were accurately counted.

Care must be taken to calibrate the equipment to the idiosyncrasies of each site. This includes:

- Adjust the magnetic sensitivity for the sampling site. Background "noise" of magnetic fields is a common problem in many sampling situations. Electric motors, mechanical equipment, steel and iron pipes, beams, boats, winches, vibrations, and size of fish, can effect the tube's CWT detection sensitivity.
- Setting the gate signal duration to match the velocity of the fish is also critical. If the fish travels slower than the period of time the CWT gate is open, the fish will be diverted and counted to the non-CWT side, even though the machine detects a CWT. Periodic testing with a CWT fish should be part of the sampler's normal procedure. Maintaining a standard fish passage velocity is also important for the machine's ability to detect a CWT. Any long pause in sampling should be followed with moistening of the tube to insure consistent slide rates.
- A thorough description of the tube and its adjustments is located in the product manual and on a short video supplied by the manufacturer. We recommend that this information be thoroughly reviewed by the sampler prior to using the equipment.

When checking positive detections with the wand detector, flakes of rust were identified as the primary cause of false positives in this test. If many fish are contaminated with magnetic particles, it may be a good use of sampler time and effort to wand positive fish, with subsequent rinsing and re-testing of potential false positive fish.