STUDY PERFORMANCE REPORT

State: Michigan

Project No.: F-53-R-15

Study No.: 464

Title: Coded-wire tag and oxytetracycline marking of salmonines in the Great Lakes and tributary streams and data base management for tagged fish returns and weir and survey data

Period Covered: April 1, 1998 to September 30, 1999

Study Objective: To coded-wire tag and adipose fin clip, or mark with oxytetracycline experimental lots of fish at state fish hatcheries. To design, develop, and manage databases for research studies which utilize coded-wire tags (CWT) or oxytetracycline (OTC), harvest weir data, and survey data from Charlevoix Fisheries Station research studies. To convert all past Charlevoix Fisheries Station main frame and personal computer data files into a common personal computer-based format.

Summary: Approximately 932,000 fish in 1998 and 649,000 fish in 1999 were marked with an adipose fin clip and coded-wire tag (CWT). Tag retention for individual lots of fish ranged from 72-100%, and was highest for steelhead (average 92.7-97.6%), followed by Atlantic salmon (90.9%), and chinook salmon (84.8-91.1%). Marked and unmarked Atlantic salmon, brown trout, chinook salmon, coho salmon, lake trout, and steelhead trout were sampled at harvest weirs, from survey vessels and electrofishing surveys, during creel surveys, by roving head hunters, and at fishing tournaments. Chinook salmon (N=2,555 fish) and lake trout (N=2,905) accounted for the majority of fish returned for CWT processing in 1997. In 1998, a significant number of steelhead trout (32.8% of total fish) were also returned. In both years, sport-caught fish made up the majority of returns.

We have almost completed efforts to standardize data codes and databases within the office. The conversion of historic information is also nearly complete for assessment, creel, and coded-wire tag databases.

Job 1. Title: Mark fish and conduct quality control.

Findings: Approximately 932,000 fish were marked with an adipose fin clip and coded-wire tag (CWT) in 1998. Of these, approximately 54,000 were Atlantic salmon, 486,000 were chinook salmon, 225,000 were Michigan-strain steelhead, and 167,000 were Skamania-strain steelhead (Table 1). Tag retention for individual lots of fish ranged from 72-100%, and was highest for steelhead (average 92.7-97.5%), followed by Atlantic salmon (90.9%), and chinook salmon (84.8%; Table 1).

In 1999, approximately 649,000 fish were marked with CWTs (270,000 chinook salmon and 379,000 steelhead; Table 2). Overall tag retention was similar to that in 1998 (95.6% in 1999 versus 93.1% in 1998); tag retention was again slightly higher for steelhead (97.0-97.6%) than for chinook salmon (91.1%; Table 2).
Job 2. Title: **Sample marked and unmarked fish.**

**Findings:** Marked and unmarked Atlantic salmon, brown trout, chinook salmon, coho salmon, lake trout, and steelhead trout were sampled at harvest weirs, from survey vessels and electrofishing surveys, during creel surveys, by roving head hunters, and at fishing tournaments (Table 3). These collections resulted in proportional samples of marked and unmarked fish. Additional, non-proportional samples of marked fish were obtained from fishers who observed an adipose fin clipped fish and voluntarily returned the head to a designated drop off site.

Chinook salmon (N=2,555 fish) and lake trout (N=2,905) accounted for the majority of fish returned for CWT processing in 1997 (Table 3). In 1998, a significant number of steelhead (32.8% of total fish) were also returned. In both years, sport-caught fish made up the majority of returns (79.1% in 1997 and 94.2% in 1998). Most of these (>30% in each year) came from volunteer angler returns (Table 3).

Job 3. Title: **Read CWT and OTC marked fish.**

**Findings:** All adipose-clipped fish collected during the 1997 and 1998 field seasons (see Job 2) were examined for presence of a CWT; tags were removed, read, and recorded in a database. Data were provided to other researchers and managers (both within and outside the MDNR) as requested. A significant portion of work in this job involves data sharing and exchange with other state and federal agencies.

Vertebrae were collected from all chinook salmon sampled during vessel surveys on Lake Michigan and from electrofishing surveys in the Muskegon and Big Manistee Rivers. Vertebrae were cleaned and examined under ultraviolet light for the presence of a fluorescent mark. Data were provided to other researchers and managers as requested, for use in their studies to estimate the extent of natural reproduction.

Job 4. Title: **Prepare annual report.**

**Findings:** This Performance Report was completed as scheduled.

Job 5. Title: **Develop data base structures and do data entry.**

**Findings:** In the past, databases were created using a variety of software and data codes. In general, it was difficult to link and work with multiple databases even when they were related. We initiated this job to create database structures utilizing common software and common file structures with one or more common fields. In addition to work in Charlevoix on fisheries station databases (assessment, creel, coded-wire tag), we have worked with the MDNR Fish Health Laboratory, State Fish Production Section, and Information Management Section to ensure compatibility of their databases with ours.

We have almost completed efforts to standardize data codes and databases within the office. There are now standard site code listings for the creel, assessment, and CWT databases; which we derived from the standard creel program numeric codes. We have compiled a database
indicating the county, district, site name or description, and numeric code for each site. Jerry Rakoczy, Creel Coordinator, keeps this database and updates it as needed. Standardized fin clip code lists are complete, and we’ve adopted a standard alphabetic code. We’ve integrated the standard three-letter species code names used by the creel and Information Management Section of fisheries division. We have worked with these programs to expand existing lists to accommodate the needs of our assessment and CWT collection programs. Fish quality/health, fin-clip and tag retention data records are now entered into files that integrate with assessment and CWT data at the Charlevoix Great Lakes Station. Similar formatting allows us to share information and saves time by eliminating repetitive data entry within the state.

We have developed a standard entry format for the coded-wire tag database that greatly simplifies the entry process and eliminates errors. Visual basic programming is complete, allowing for automatic searches of the extensive angler and CWT codes databases.

We are entering information on stocking locations and capture locations in formats that are compatible with GIS (graphic information systems) mapping programs. By recording locations in decimal degree formats and standardizing entries depending on the amount of information available, we allow for simplified spatial and movement analyses using information obtained from within the coded-wire tag database.

Job 6. Title: Convert historic data sets.

Findings:

Assessment/Vessel survey data:
Survey data collected by the S.V. Steelhead exist since 1968. All survey and fishery monitoring data collected prior to the late 1980’s were stored on a mainframe computer at the University of Michigan and have been downloaded as ASCII files. We have converted survey data from 1978 to the present into (Microsoft) ACCESS-based data files. In ACCESS we have developed new database structures, and have adopted coding rules that make the survey vessel data files more compatible with other Charlevoix Fisheries Station databases as well as statewide databases. Work has slowed due to staff shortages. The 1968 to 1978 data still need to be converted.

Creel Survey Biological Data:
We have converted creel biological data into ACCESS based files.

Coded-Wire Tag Data:
The coded-wire tag database includes records from 1986 to the present. Since August 1998, we have entered all data in the new ACCESS database format. We have transferred data prior to 1998 into ACCESS files. We are still working on fully integrating the old data format into the new database structures and are cleaning up entry errors. Because data requests and modeling efforts are currently focusing on lake trout, we have completed most of the conversion process for this species. We are in the process of addressing formatting and entry errors in the historic data set for other species in the database. There are two databases other than the CWT fish database, associated with the CWT program. The first is a code file that lists the CWT numbers, and associated early life history, marking, and planting information for each group of fish marked. We have fully converted the CWT codes database into the new file format. The second is an angler database in which we store information on anglers reporting to the program (i.e. name and address). Proper handling of this database eliminates mailing errors and duplication of effort in entering data. The angler database is also fully converted into the new file format.
Job 7. Title: Develop standard queries and tables.

Findings: Much of the success of the CWT program is dependent on cooperating fishers. Paul Gelderblom, retired fisheries technician, developed Visual Basic-based software to automate the process of mailing letters to cooperating fishers. Because of Paul’s efforts, the cooperating fisher database is easier to search and edit than ever before, eliminating many errors and duplication of effort. Letters provided by this program to the angler include information about the CWT program, biological data (age, length, weight, species, and strain) on the individual fish caught, and tell where and when the fish were planted. On the back of the letter we now recognize companies and organizations that have provided donations and or financial support for our lure reward program. As an incentive, we send a fishing lure to the cooperating fisher who has captured a chinook, coho, steelhead, or Atlantic salmon with a coded-wire tag in its snout. As incentive for anglers to participate in our program, we annually summarize angler coded-wire tag return information and provide it to groups holding raffles or reward drawings. We also provide summaries to research biologists for inclusion in annual reports for specific related projects.

Prepared by: Richard G. Schorfhaar, Jory Jonas, David Clapp, and John Clevenger, Jr.
Date: September 30, 1999
Table 1.—Number of fish marked with coded-wire tags and stocked in 1998 by species and stocking location. Number tagged is not corrected for tag retention or fin clip rates.

<table>
<thead>
<tr>
<th>Species (Strain)</th>
<th>Study ID</th>
<th>CWT #</th>
<th>Age</th>
<th>Plant Site</th>
<th># Tagged</th>
<th>Tag Retention (%)</th>
<th>Plant Date</th>
<th>Net Pen (Y/N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atlantic salmon</td>
<td>LSSU</td>
<td>59-16-57</td>
<td>YR</td>
<td>St. Marys River</td>
<td>17,251</td>
<td>72.1</td>
<td>05-00-98</td>
<td>No</td>
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<td>(Landlocked)</td>
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<td>YR</td>
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<td>05-00-98</td>
<td>No</td>
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<td>485,634</td>
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</table>

Average: 90.9 for Atlantic salmon, 84.8 for Chinook salmon.
<table>
<thead>
<tr>
<th>Species</th>
<th>Study ID</th>
<th>CWT #</th>
<th>Age</th>
<th>Plant Site</th>
<th># Tagged</th>
<th>Tag Retention (%)</th>
<th>Plant Date</th>
<th>Net Pen (Y/N)</th>
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<tbody>
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<td>Avg.</td>
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<td>Species (Strain)</td>
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<td>CWT #</td>
<td>Age</td>
<td>Plant Site</td>
<td># Tagged</td>
<td>Tag Retention (%)</td>
<td>Plant Date</td>
<td>Net Pen (Y/N)</td>
</tr>
<tr>
<td>-----------------</td>
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<td>----------</td>
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<tr>
<td>Steelhead (Skamania)</td>
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| All species     |        |          |     |                  | 931,965  | Avg.              |            |               |


Table 2.—Number of fish marked with coded-wire tags and stocked in 1999 by species and stocking location. Number tagged is not corrected for tag retention or fin clip rates.

<table>
<thead>
<tr>
<th>Species (Strain)</th>
<th>Study ID</th>
<th>CWT #</th>
<th>Age</th>
<th>Plant Site</th>
<th># Tagged</th>
<th>Tag Retention (%)</th>
<th>Plant Date</th>
<th>Net Pen (Y/N)</th>
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<td>91.0</td>
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<td>Age</td>
<td>Plant Site</td>
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<td>Retention (%)</td>
<td>Plant Date</td>
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Table 3.—Number of fish collected from various sources and examined for the presence of coded wire tags, 1997-98. Tags were removed and read at the Charlevoix Fisheries Station. Percentage of total fish from each source and species is shown in parentheses.

<table>
<thead>
<tr>
<th>Source</th>
<th>Gear type</th>
<th>Atlantic salmon</th>
<th>Brown trout</th>
<th>Chinook salmon</th>
<th>Coho salmon</th>
<th>Lake trout</th>
<th>Rainbow trout</th>
<th>Other</th>
<th>All species (% of total)</th>
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<td>0</td>
<td>462 (7.4)</td>
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<td>3</td>
<td>0</td>
<td>2</td>
<td>53</td>
<td>0</td>
<td>58 (0.9)</td>
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<tr>
<td>Sport-Caught</td>
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<td>88</td>
<td>3</td>
<td>232</td>
<td>15</td>
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<td>346 (5.5)</td>
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<tr>
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<td>758 (12.1)</td>
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<td>906</td>
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<td>30</td>
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<td>22</td>
<td>0</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>7 (0.1)</td>
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Table 3.—(continued).

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<th>Coho salmon</th>
<th>Lake trout</th>
<th>Rainbow trout</th>
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<th>All species (% of total)</th>
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