

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.

Species (Strain)	Study ID	CWT #	Age	Plant Site	# Tagged	Tag Retention (%)	Plant Date	Net Pen (Y/N)
Atlantic salmon (Landlocked)	LSSU	59-16-57	YR	St. Marys River	17,251	72.1	05-00-98	No
	LSSU	59-17-34	YR	St. Marys River	6,092	97.4	05-00-98	No
	LSSU	59-17-35	YR	St. Marys River	8,987	92.5	05-00-98	No
	LSSU	59-17-36	YR	St. Marys River	11,376	92.5	05-00-98	No
	LSSU	59-18-11	YR	St. Marys River	10,453	100.0	10-04-98	No
					Total	54,159	Avg. 90.9	
Chinook salmon	482	59-17-51	SF	Swan River	101,287	89.7	05-20-98	No
	482	59-17-52	SF	Port Austin	101,175	87.1	05-18-98	No
	482	59-17-53	SF	Harbor Beach	101,293	83.5	05-00-98	Yes
	482	59-17-54	SF	Harbor Beach	104,835	83.5	05-18-98	No
	482	59-17-56	SF	Tawas City	14,921	83.8	05-26-98	No
	482	59-17-57	SF	Tawas City	15,972	83.8	05-26-98	No
	482	59-17-58	SF	Tawas City	14,914	83.8	05-26-98	No
	482	59-17-59	SF	Tawas City	15,006	83.8	05-26-98	No
	482	59-17-60	SF	Tawas City	16,231	83.8	05-26-98	No
					Total	485,634	Avg. 84.8	

Table 1.-(continued).

Species (Strain)	Study ID	CWT #	Age	Plant Site	# Tagged	Tag Retention (%)	Plant Date	Net Pen (Y/N)
Steelhead (Michigan, Winter)	487	59-16-58	YR	Manistee River	16,727	98.0	04-24-98	No
	487	59-16-60	YR	Manistee River	15,044	98.0	04-28-98	No
	487	59-16-63	YR	Manistee River	15,110	98.0	05-01-98	No
	487	59-17-38	YR	St. Joseph River	11,697		05-15-98	Yes
	487	59-17-39	YR	St. Joseph River	9,982	100.0	04-15-98	No
	487	59-17-40	YR	St. Joseph River	10,173	96.1	04-15-98	No
	487	59-17-41	YR	St. Joseph River	10,107	98.0	04-17-98	No
	487	59-17-42	YR	St. Joseph River	10,591	100.0	04-16-98	No
	487	59-17-43	YR	St. Joseph River	9,726	100.0	04-16-98	No
	487	59-17-44	YR	Manistique River	8,134	98.0	05-04-98	No
	487	59-17-45	YR	Muskegon Lake	10,180	98.0	04-20-98	No
	487	59-17-46	YR	Muskegon River	9,832	97.0	04-23-98	No
	487	59-17-47	YR	Muskegon River	10,386	97.0	04-23-98	No
	487	59-17-61	YR	AuSable River	16,176	96.8	05-15-98	No
	487	59-17-62	YR	AuSable River	15,987	98.7	05-15-98	No
	487	59-17-63	YR	AuSable River	6,147	98.7	05-15-98	No
	487	59-18-01	YR	Muskegon River	9,474	94.0	04-21-98	No
	487	59-18-02	YR	Muskegon River	10,706	94.0	04-21-98	No
	487	59-18-03	YR	AuSable River	8,851	96.8	05-15-98	No
	487	59-18-04	YR	Sturgeon River	5,222	95.0	05-05-98	No
487	59-18-07	YR	Sturgeon River	5,128	98.0	05-06-98	No	
Total					225,380	Avg.		
						97.5		

Table 1.-(continued).

Species (Strain)	Study #	CWT #	Age	Plant Site	# Tagged	Tag Retention (%)	Plant Date	Net Pen (Y/N)	
Steelhead (Skamania)	487	59-17-01	YR	Manistee River	17,071	98.0	04-28-98	No	
	487	59-17-02	YR	Manistee River	17,105	100.0	05-01-98	No	
	487	59-17-37	YR	St. Joseph River	11,615		05-15-98	Yes	
	487	59-18-05	YR	Sturgeon River	3,682	99.0	05-06-98	No	
	487	59-18-06	YR	Sturgeon River	5,103	98.0	05-06-98	No	
	487	62-31-08	YR	St. Joseph River	10,608	82.0	04-20-98	No	
	487	62-31-09	YR	St. Joseph River	10,556	91.0	04-21-98	No	
	487	62-31-10	YR	St. Joseph River	10,667	90.0	04-22-98	No	
	487	62-31-11	YR	St. Joseph River	32,013	94.0	04-15-98	No	
	487	62-31-12	YR	St. Joseph River	32,237	91.0	05-13-98	No	
	487	62-31-13	YR	St. Joseph River	16,135	84.0	04-13-98	No	
					Total	166,792	Avg.	92.7	
	All species				Total	931,965	Avg.	93.1	

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.

Species (Strain)	Study ID	CWT #	Age	Plant Site	# Tagged	Tag Retention (%)	Plant Date	Net Pen (Y/N)
Chinook salmon	482	59-17-49	SF	Swan River	102,277	92.6	05-12-99	No
	482	59-17-55	SF	Port Austin	101,361	89.9	05-24-99	No
	482	59-18-29	SF	Tawas City	10,699	91.0	05-26-99	No
	482	59-18-30	SF	Tawas City	11,295	91.0	05-26-99	No
	482	59-18-31	SF	Tawas City	11,549	91.0	05-26-99	No
	482	59-18-32	SF	Tawas City	11,081	91.0	05-26-99	No
	482	59-18-33	SF	Tawas City	11,414	91.0	05-26-99	No
	482	59-18-34	SF	Tawas City	10,604	91.0	05-26-99	No
					Total	270,280	Avg.	91.1
Steelhead (Michigan, Winter)	487	59-17-03	YR	St. Joseph River	15,030	96.0	04-14-99	No
	487	59-17-04	YR	St. Joseph River	10,049	95.2	04-15-99	No
	487	59-18-08	YR	St. Joseph River	10,577	100.0	05-00-99	Yes
	487	59-18-09	YR	St. Joseph River	9,987	93.2	04-16-99	No
	487	59-18-12	YR	Sturgeon River	5,145	98.4	05-01-99	No
	487	59-18-13	YR	Sturgeon River	5,216	94.1	05-01-99	No
	487	59-18-16	YR	AuSable River	25,050	98.0	05-06-99	No
	487	59-18-17	YR	AuSable River	25,426	95.5	05-07-99	No
	487	59-18-18	YR	St. Joseph River	20,054	99.2	04-17-99	No
	487	59-18-19	YR	Muskegon River	20,022	96.4	04-21-99	No
487	59-18-20	YR	Muskegon River	20,058	97.0	04-26-99	No	

Table 2.-(continued).

Species (Strain)	Study ID	CWT #	Age	Plant Site	# Tagged	Tag Retention (%)	Plant Date	Net Pen (Y/N)
Steelhead (Michigan, Winter)	487	59-18-21	YR	Manistee River	15,080	100.0	04-27-99	No
	487	59-18-22	YR	Manistee River	15,544	96.3	04-28-99	No
	487	59-18-23	YR	Manistee River	15,033	97.9	04-30-99	No
	487	59-18-27	YR	Manistique River	8,008	94.1	05-04-99	No
	487	59-18-28	YR	Muskegon Lake	10,095	100.0	04-20-99	No
				Total	230,374	Avg.		97.0
Steelhead (Skamania)	487	59-17-48	YR	St. Joseph River	10,265		05-00-99	Yes
	487	59-18-24	YR	Manistee River	12,555	98.1	04-29-99	No
	487	59-18-25	YR	Manistee River	12,961	96.6	04-30-99	No
	487	62-01-08	YR	St. Joseph River	15,989	94.8	04-13-99	No
	487	62-30-03	YR	St. Joseph River	11,054	98.8	04-20-19	No
	487	62-30-06	YR	St. Joseph River	10,823	97.8	04-21-99	No
	487	62-30-07	YR	St. Joseph River	11,108	95.8	04-19-99	No
	487	62-30-32	YR	St. Joseph River	32,009	99.5	04-12-99	No
	487	62-30-33	YR	St. Joseph River	31,726	99.0	05-12-99	No
				Total	148,490	Avg.		97.6
All species				Total	649,144	Avg.		95.6

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.

Source	Gear type	1997							All species (% of total)
		Atlantic salmon	Brown trout	Chinook salmon	Coho salmon	Lake trout	Rainbow trout	Other	
Assessment / Index Samples	Gill net	1	0	11	0	449	1	0	462 (7.4)
	Electrofishing	0	0	3	0	2	53	0	58 (0.9)
Sport-Caught	Charter boat	4	2	88	3	232	15	2	346 (5.5)
	Creel clerk	5	3	206	2	411	113	0	740 (11.8)
	Headhunter	8	2	365	9	741	97	3	1,225 (19.6)
	Tournaments	7	0	221	0	493	36	1	758 (12.1)
	Volunteer	181	14	906	11	555	215	4	1,886 (30.1)
Tribal Samples	Gill net	0	0	30	0	22	0	0	52 (0.8)
	Other	7	0	0	0	0	0	0	7 (0.1)
Weir Samples		0	0	725	0	0	0	0	725 (11.6)
	All Sources (% of total)	213 (3.4)	21 (0.3)	2,555 (40.8)	25 (0.4)	2,905 (46.4)	530 (8.5)	10 (0.2)	6,259 (100.0)

Table 3.--(continued).

Source	Gear type	Atlantic salmon	Brown trout	Chinook salmon	Coho salmon	Lake trout	Rainbow trout	Other	All species (% of total)
<u>1998</u>									
Assessment / Index Samples	Gill net	37	0	0	0	0	1	0	38 (0.6)
	Electrofishing	0	3	0	1	0	70	0	74 (1.2)
	Other	0	0	1	0	11	1	0	13 (0.2)
Sport-Caught	Charter boat	1	0	105	2	79	52	0	239 (3.9)
	Creel clerk	3	2	278	26	775	479	0	1,563 (25.3)
	Headhunter	6	1	267	7	623	432	0	1,336 (21.6)
	Tournaments	0	0	8	1	477	128	0	614 (9.9)
	Volunteer	104	8	621	13	522	793	6	2,067 (33.4)
	Other	0	1	0	0	2	3	0	6 (0.1)
Tribal Samples	Gill net	0	0	0	0	3	0	0	3 (0.0)
	Other	14	0	0	0	0	0	0	14 (0.2)
Weir Samples	Fish ladders	0	0	0	0	0	48	0	48 (0.8)
	Weirs	0	0	151	0	0	19	0	170 (2.7)
All Sources (% of total)		165 (2.7)	15 (0.2)	1,431 (23.1)	50 (0.8)	2,492 (40.3)	2,026 (32.8)	6 (0.1)	6,185 (100.0)