

STUDY PERFORMANCE REPORT

State: Michigan

Project No.: F-80-R-6

Study No.: 230482

Title: Investigations into causes of, and solutions for, variable survival of Chinook salmon stocked into Lake Huron

Period Covered: October 1, 2004 to September 30, 2005

Summary: From 1993-2000, study fish were marked, reared, and stocked at Oscoda, Swan River, Harbor Beach, Tawas, and Port Austin as planned. Two roving “head hunters” were employed in all study years on Lake Huron to collect snouts with coded-wire tags from angler-caught Chinook salmon. Coded-wire tags from Chinook salmon were processed and the data entered. Tag recovery rates from the sportfishery suggested survival of groups of Chinook salmon from acclimation raceways at Oscoda was more than twice that of conventionally-planted fish. Weir collections and fall electrofishing were used to assess growth and condition and proportions of study groups returning to stocking sites as mature fish. In the Au Sable River, test (acclimated) fish were observed more than 5 times as frequently as the control (conventionally stocked) groups in the spawning runs, suggesting acclimation raceways there enhanced both survival and homing. Similarly, raceway acclimated Chinook salmon at Harrisville Harbor appear to be performing much better than conventionally stocked Chinook from other ports. Return rates from a netpen at Harbor Beach were not consistently different from conventional stockings, possibly because of exposure of the pen to unusually warm temperatures in a power plant thermal discharge. The 1997 and 1998 year classes appeared to be weak across all experimental stocking sites. All jobs but Job 4 are completed. For Job 4, the last of the year-2000-stocked cohorts were measured in the fishery and at the weirs as age-4 fish in 2004. The draft manuscript of the final report was nearly completed and will be submitted for publication by December 2005.

Findings: Only job 4 was scheduled for 2004-2005 (as updated in the 2004-2005 amendment), and progress is reported below.

Job 4. Title: Read coded-wire tags and tetracycline marks, enter and analyze data, and prepare annual reports and publications.—Tag extraction and data entry for all coded-wire tag returns received though 2004 were completed at the Charlevoix Fisheries Research Station. Some coded-wire tags caught in prior years were returned by anglers this year and the tags were read and the database updated accordingly.

Data summaries and analyses were done in preparation for the final report. We are reporting in Table 2 return rates for Port Sanilac, Lexington, Au Gres, and Harrisville, which were not part of this study, because the results of these test plants might not otherwise be evaluated. To date, it appears that return rates for Swan River, our “benchmark” for comparison with other sites, have been declining over the study period. In fact, return rates were lower at nearly all sites after 1996; rates for all Lake Huron sites averaged 220 per 100,000 stocked from 1990-1996, but only 87 from 1997-2002. An exception during the later period was that return rates to date from the acclimation raceways at Harrisville averaged 371 for the 2000 and 2001 cohorts. The acclimation raceways at Harrisville and Oscoda produced instances of exceptionally high return rates while net pens at Harbor Beach appear not to have produced enhanced return rates.

The last returns of the 2000 year class were measured in the fishery and at the weirs as age-4 fish in 2004. All coded-wire tags have been extracted except for a few late voluntary returns. The

draft manuscript of the final report was nearly completed and will be submitted for publication by December 2005. The annual performance report was prepared. Data from this study and from Study 703 (Chinook reproduction in Lake Huron) are being used by the Lake Huron Technical Committee in the maintenance of the Lake Huron bioenergetics model and by Lake Huron agencies in evaluating stocking methods and rates.

Table 1a.—Coded-wire tag returns per 100,000 stocked by study site and objective—Au Sable River acclimation raceways (acclimation) vs. direct plant in the Au Sable River, Michigan.

Year class	Ages	Direct river	Acclimation
1993	0.0	0.00	0.00
	0.1	30.72	63.35
	0.2	63.50	125.62
	0.3	54.28	93.41
	0.4	6.14	16.10
	0.5	2.05	0.00
Total		156.70	298.48
1994	0.0	0.00	1.08
	0.1	24.52	73.44
	0.2	30.36	98.28
	0.3	56.04	157.68
	0.4	1.17	6.48
	0.5	0.00	0.00
Total		112.09	336.95

Table 1b.—Coded-wire tag returns per 100,000 stocked by study site and objective—Au Sable River, acclimated Chinook salmon release site comparison in the Lake Huron Basin.

Year class	Ages	River release	Beach release
1995	0.0	0.00	0.00
	0.1	52.03	80.40
	0.2	87.50	115.87
	0.3	98.14	140.71
	0.4	15.37	30.74
	0.5	0.00	1.18
Total		253.03	368.91
1996	0.0	0.00	0.00
	0.1	42.03	42.04
	0.2	81.85	96.09
	0.3	79.64	66.06
	0.4	8.85	9.61
	0.5	0.00	0.00
Total		212.38	213.80
1997	0.0	0.00	0.00
	0.1	9.20	2.50
	0.2	25.30	9.99
	0.3	21.85	19.97
	0.4	0.00	0.00
	0.5	0.00	0.00
Total		56.36	32.46

Table 1c.—Coded-wire tag returns per 100,000 stocked by study site and objective—Harbor Beach net pen vs. direct plant in southern Lake Huron.

Year class	Ages	Netpen	Direct plant
1995	0.0	1.11	0.00
	0.1	32.17	33.43
	0.2	106.50	94.01
	0.3	75.44	111.77
	0.4	18.86	44.92
	0.5	0.00	1.04
Total		234.08	285.17
1996	0.0	0.00	0.00
	0.1	38.35	19.39
	0.2	104.41	86.70
	0.3	145.96	83.27
	0.4	23.44	9.13
	0.5	0.00	0.00
Total		312.16	198.49
1997	0.0	0.00	0.00
	0.1	7.55	8.16
	0.2	32.37	28.55
	0.3	21.58	26.51
	0.4	0.00	2.04
	0.5	0.00	0.00
Total		61.50	65.25
1998	0.0	0.00	0.00
	0.1	19.07	7.34
	0.2	22.88	9.79
	0.3	17.80	12.23
	0.4	0.00	0.00
	0.5	0.00	0.00
Total		59.74	29.36

Table 1d.—Coded-wire tag returns per 100,000 stocked by study site and objective—stocking site evaluations in Lake Huron.

Plant year	Ages	Swan River	Tawas River	Port Austin	Port Sanilac	Lexington	Au Gres	Harrisville acclimated
1998	0.0	0.00	0.00	0.00	—	—	—	—
	0.1	29.05	6.76	3.56	—	—	—	—
	0.2	40.67	10.14	10.67	—	—	—	—
	0.3	18.59	1.69	15.41	—	—	—	—
	0.4	1.16	0.00	0.00	—	—	—	—
	0.5	0.00	0.00	0.00	—	—	—	—
Total		89.48	18.60	29.64	—	—	—	—
1999	0.0	0.00	0.00	0.00	—	—	—	—
	0.1	25.54	9.90	37.32	—	—	—	—
	0.2	47.89	19.79	41.72	—	—	—	—
	0.3	43.63	26.39	50.50	—	—	—	—
	0.4	6.39	0.00	0.00	—	—	—	—
	0.5	0.00	0.00	0.00	—	—	—	—
Total		123.44	56.08	129.54	—	—	—	—
2000	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.1	9.14	9.14	10.71	10.50	19.24	20.35	30.97
	0.2	25.14	25.58	27.37	33.00	35.51	20.35	48.32
	0.3	52.57	14.62	28.56	0.00	7.40	22.38	205.66
	0.4	2.29	—	—	—	—	—	6.19
	0.5	—	—	—	—	—	—	—
Total		89.13	49.33	66.65	43.50	62.15	63.07	291.15
2001	0.0	0.00	—	—	0.00	0.00	0.00	0.00
	0.1	14.17	—	—	16.04	10.38	24.17	38.27
	0.2	55.49	—	—	21.92	16.32	34.23	158.17
	0.3	138.13	—	—	18.99	11.87	32.22	253.83
	0.4	—	—	—	—	—	—	—
	0.5	—	—	—	—	—	—	—
Total		207.78	—	—	56.98	38.57	90.62	450.27
2002	0.0	0.00	—	—	0.00	0.00	0.00	0.00
	0.1	7.32	—	—	2.57	1.28	5.41	7.67
	0.2	24.04	—	—	15.44	3.85	12.63	36.14
	0.3	—	—	—	—	—	—	—
	0.4	—	—	—	—	—	—	—
	0.5	—	—	—	—	—	—	—
Total		31.36	—	—	18.02	5.13	18.05	43.81