

## **2005 New York Cooperative Trout and Salmon Pen-Rearing Projects**

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In 1998, concerns over post-stocking survival and imprinting of steelhead and chinook salmon to stocking sites led to the formation of several cooperative sportsmen's groups interested in pen rearing (Bishop and Pearsall 1999). Concerns from the eastern basin of Lake Ontario centered on the predation of stocked steelhead by cormorants. Western basin concerns included the apparent lack of imprinting and subsequent impaired homing of chinook salmon and steelhead to the stocking streams.

After the successful completion of pen-rearing projects at Oswego Harbor and Oak Orchard Creek in 1998, a number of other sportsmen's groups expressed interest in pen-rearing. New sites were added in 1999, including the Lower Niagara River, Sandy Creek, Genesee River and Sodus Bay. No additional sites were added until 2003, when a new pen project for Skamania steelhead was initiated at Little Salmon River. In 2005, a chinook pen-rearing project was initiated at Olcott Harbor on Eighteenmile Creek. All sites have been active each year since inception, except for Sandy Creek which was inactive in 2004 and 2005.

Evaluations of the pen-rearing studies conducted at Oak Orchard Creek and the Lower Niagara River are reported in Bishop et al. (2006). This report summarizes 2005 pen-rearing activities and results

### **Methods**

All sites, except the Lower Niagara River, used similar pen materials, design and netting as described for the 1998 Oak Orchard Creek Project in Bishop and Pearsall (1999). Standard operating procedures for stocking, maintaining, feeding, and releasing penned salmon were developed by NYSDEC (Wilkinson 1999). Differences are noted under each specific site description. Table 1 provides characteristics of each of the pen-rearing sites.

Observed mortalities for all projects were based on the number of dead fish collected from the pens during captivity and from the bottom of the pens after release. Both sources of mortality were noted by cooperators, except where listed otherwise. Mortality does not include fish lost to cannibalism or from predators that may have gained access to pens.

#### *Little Salmon River*

Five thousand Skamania steelhead were placed into a pen at Salmon Country Marina on 15 April. The steelhead were administered a double fin clip (adipose and left pectoral fin); the standard clip for all New York stocked Lake Ontario Skamania steelhead.

Penned steelhead were fed five times daily, and pens were cleaned four times during the rearing period. Water temperature was measured once each day. On 12 May, after 27 days of rearing, the pen was towed to the mouth of the Little Salmon River, where the steelhead were released.

*Oswego Harbor*

Twenty thousand steelhead were placed by the Oswego Net Pen Group into three pens at Oswego Marina on the Oswego River on 29 April. Forty thousand chinook were also placed into two pens on the same date.

Penned steelhead and Chinook were generally fed five times daily, although on some days, the fish were fed as infrequently as twice per day. Water temperature was recorded at most feedings. Pen netting was not cleaned during the pen period.

Both steelhead and salmon were released on 23 May by releasing them at the pen site. Both species were released prior to the desired date, however, both species had reached target weight. Both species were also released without towing to the Lake, as had been done in previous years. Both unplanned changes were due to unanticipated, significant chinook mortalities.

*Sodus Bay*

On 28 April, 52,600 Chinook were placed into two pens near First Creek at Sodus Bay. Chinook were piped to the pens directly from the hatchery truck. Feeding was performed five times per day, and pens were cleaned weekly during the rearing period. Water temperature was monitored with a recording device starting on 6 May. On 19 May, after 21 days of rearing, the pens were towed into the open lake. The fish were released in approximately 25 feet of water lakeward, and east of, Sodus Bay Channel. Pens were inverted to release the fish.

*Genesee River*

The Genesee Charter Association, in conjunction with Irondequoit Bay Fish and Game Club and Greater Rochester Sportfishery Association, used six pens located at Shumway Marina in the Genesee River for raising steelhead and Chinook. Ten thousand steelhead were placed into two pens on 27 April. Chinook (85,250) were placed in four pens on 27 April. The pens were gravity-loaded by piping the steelhead and salmon from the hatchery truck. Feeding was performed five times per day, and pens were cleaned once weekly. Water temperature was monitored with a recorder starting on 4 May. Steelhead and Chinook were released on 18 May and 20 May, respectively, by inverting the pens on site. Chinook were released two days after the

steelhead to reduce potential predation by steelhead upon recently-stocked chinook.

*Oak Orchard Creek*

On 25 April, 14,000 steelhead were delivered to Lake Breeze Marina and placed into three pens. On the same date, 85,250 Chinook were placed into four pens at the same location. A PVC extension pipe was used to transfer steelhead and Chinook into pens located farthest from the shore. Trout and salmon were fed four times daily, and pens were cleaned every three days. Water temperature was monitored with a recording device starting on 4 May. Steelhead were released after 21 days by towing the pens to the river mouth at Point Breeze. Salmon were held in pens from 25 April to 18 May, a total of 23 days. Salmon were also towed to the lake and released at the river mouth.

*Eighteenmile Creek*

Pen-rearing at Eighteenmile Creek was initiated in 2005. The project was sponsored by Lake Ontario Trout and Salmon Association (LOTSAs), Town of Newfane, Niagara County Legislature, Niagara County Sportfishing Development Board and Slippery Sinker Bait and Tackle Shop. Two pens, both previously used at the Lower Niagara River pen site, were used to rear Chinook. The pens were located in Olcott Harbor at the Town of Newfane Marina, approximately 1/4 mile from the lake. The pens were tethered to pile-supported docks and oriented with the long axis of the pens perpendicular to the direction of water flow. The shoreward ends of both pens rested on the bottom of the harbor, and the waterward ends generally rose slightly above the bottom, depending upon harbor water depth. A discernable pulsing of water flow, in alternating directions, existed at the site.

Fifty thousand Chinook salmon were placed into two pens on 26 April. Fish were piped directly from the hatchery truck to the pens. Fish were fed five times each day. Water temperature was continuously monitored with a digital thermometer and temperature was recorded at feeding times. Pens were brushed every three days. Fish were monitored for growth once, approximately two weeks after stocking into pens, and a second time on the release date. On 16 May, 20 days after placing Chinook in the pens, the fish were released at the pen site. The fish were released by cutting netting ties and attaching small weights to the netting, thus allowing netting to slip downward. Most salmon left the nets

soon after the netting was opened.

#### *Lower Niagara River*

The Niagara River Anglers Association (NRAA) pen site was located in a boat slip at Constitution Park in the Village of Youngstown. The project site is located approximately one mile upstream from the mouth of the Lower Niagara River. Two lots of steelhead were stocked, one pen-reared and one direct stocked. Chinook salmon were also stocked and reared in pens at this site.

An estimated 9,858 Washington strain steelhead were loaded into the downstream (north) pen on 4 May. Of these, an estimated 7,861 were adipose-clipped and coded-wire tagged (CWT; snout tagged, tag batch #60-01-25) at the hatchery; however, a subsequent examination of the fin-clipped steelhead indicated only about 41% of the clipped fish had CWTs. These data suggest that only 3,301 pen-reared steelhead had CWTs. Mean length of steelhead placed in pens was 5.2 in and weight was 26 fish per lb. The fish were hydraulically transferred to the pen directly from the hatchery truck via piping.

On 3 May, approximately 9,801 steelhead were stocked directly into the Lower Niagara River at Lewiston. A portion of these steelhead were adipose fin-clipped and coded-wire tagged (tag batch number 23-16-19). Mean length of direct-stocked steelhead was 5.4 in and weight was 22.8 fish per lb. Of these, an estimated 6,745 were adipose-clipped and received CWTs at the hatchery; however, a subsequent examination of the fin-clipped steelhead indicated only about 38% of the clipped fish had CWTs. These data suggest that only 3,109 direct-stocked steelhead were adipose clipped and had CWTs.

Seventy-five thousand Chinook salmon were piped directly into the upstream (south) pen on 4 May.

Feeding of steelhead and Chinook was typically performed five times daily during daylight hours. Temperature was monitored continuously with a digital meter, and readings were recorded at each feeding. Pen netting was brushed infrequently during the pen-rearing period. Flotsam was removed from the pens and boat slip on an as-needed basis.

Dissolved oxygen (DO) was measured on 19 May using a YSI Model 55 meter. DO was measured at three locations in each pen during mid-day. Measurements were also made at two locations in the river approximately 4 ft. waterward of the pens, just upstream and downstream of the pens. Four measurements were taken at each sampling location: subsurface, 2 ft., 4 ft. and 6 ft. depths.

Steelhead and Chinook were released on 2 June. The fish were released by lowering the netting on the open side of the boat slip at the rearing site.

### **Results and Discussion**

Five sites pen-reared a total of 58,858 steelhead (Washington and Skamania strains), comprising 9.1% of NYSDEC's Lake Ontario rainbow trout/steelhead stocking allotment in 2005. Observed mortalities at the five steelhead rearing sites ranged from 0.14 to 0.97% (Table 1). Overall, steelhead mortality in 2005 was low in comparison with previous years. Six pen-rearing sites raised a total of 388,100 Chinook salmon, representing 21% of NYSDEC's 2005 Chinook salmon stocking allotment. At the six sites where Chinook were penned, mortality estimates ranged from 0.08 to 1.8%.

Water temperatures during the pen-rearing period generally benefitted from cool weather during late April and early May. The water temperature criterion (65°F) established for pen projects, however, was exceeded at Sodus Bay and Oak Orchard Creek.

#### *Little Salmon River*

In the third year of pen-rearing at Little Salmon River, Skamania steelhead grew from 16.8 to 10.4 fish per lb after 27 days in the pen (Table 1). Due to their relatively large size at delivery to the pen, the Skamania yearlings may not have received the full benefit of imprinting to the project site.

#### *Oswego Harbor*

Steelhead released on 23 May weighed 12.6 fish per lb. Chinook grew from 185 fish per lb to 79 fish per lb after 24 days.

#### *Sodus Bay*

Chinook grew from 185 fish per lb to 90.4 fish per lb after 21 days. The mean total length of released Chinook was 3.3 in.

*Genesee River*

Steelhead were released on 18 May and weighed 13 fish per lb. Chinook released from pens on 20 May weighed 88 fish per lb, versus a delivery weight of 185 fish per lb.

*Oak Orchard Creek*

Steelhead were held in pens from 25 April to 16 May, a total of 21 days. Steelhead weighed 17.1 fish per lb and were 5.65 in total length when released. Chinook were held for 23 days and released, weighing 98.1 fish per lb. Total length was 3.29 in.

*Eighteenmile Creek*

Chinook were released on 16 May, after 20 days in the pens. Initial weight of Chinook when placed into pens was 190 fish per lb. Chinook grew very rapidly, increasing their weight almost 2.7 times during the 20 day period. Mean weight of Chinook taken from one pen was 68.7 fish per lb and was 72.8 fish per lb from the second.

*Lower Niagara River*

Steelhead were penned for 29 days and released on 2 June. At release, mean weights of two fish samples were 9.5 and 12 fish per lb, with corresponding mean lengths of 6.38 and 5.91 in. Water temperature in the pen complex was approximately 57°F on the release date.

Chinook were penned for 29 days and released on 2 June. Mean weights at release of two Chinook samples were 80 and 83 fish per lb. On the release date, Chinook were observed struggling at the surface and a number of apparently fresh, dead Chinook were observed on the bottom of the pen. Addition of food to the pen resulted in essentially no feeding response, suggesting significant stress. The fish were released soon thereafter. The cause of mortality was not determined, however, we suspect it resulted from water quality. Interestingly, the steelhead in the adjacent pen showed no outward signs of stress.

DO values measured on 19 May pen ranged from 8.4 to 9.3 ppm. in the Chinook pen, and from 8.9 to 9.6 ppm in the steelhead pen. DO values in the Niagara River at two locations approximately four feet from the pen complex ranged from 12.3 to 12.5 ppm., substantially higher than in the pens.

**Conclusions**

Steelhead target weights (12-15 fish per lb) were reached at four of the five pen sites. Chinook target weights (90 fish per lb) were achieved at five of the six pen sites. It is likely that a large percentage of the penned fish imprinted to water at their respective pen sites, since a large majority of fish reached target weights.

The eighth year of pen-rearing steelhead and chinook salmon along the New York shoreline of Lake Ontario was successful due to relatively low fish mortality at most sites, a relatively high percentage of fish being imprinted, and the goodwill generated through partnership in the projects.

**Acknowledgments**

We wish to express our sincere appreciation to the many individuals, businesses, and organizations that made these projects possible. Their dedicated efforts demonstrated a deep commitment to the resource and provided a new management technique that would not have been available without their help.

**References**

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TABLE 1. CHARACTERISTICS OF 2005 LAKE ONTARIO TROUT AND SALMON PEN-REARING PROJECTS

Site	Species (Strain)	Number Stocked	Number of pens	Date Stocked	Size at Stocking (# /Lb)	Date Released (Days Held)	Size at Release (# / Lb)	Temp. Range (°F)	Mortality (# Fish)	Mortality (%)
Little Salmon	steelhead (Skamania)	5,000	1	15 April	16.8	12 May (27)	10.4	48-64	15	0.3
Oswego	steelhead	20,000	3	29 April	22.8	23 May (24 )	12.6	49-60	27	0.14
Oswego	Chinook	40,000	2	29 April	185	23 May (24 )	79	49-60	705	1.8
Sodus	Chinook	52,600	2	28 April	185	19 May (21)	90.4	54-67a	59	0.11
Genesee	steelhead	10,000	2	27 April	21.5	18 May (21)	13	49-64b	24	0.24
Genesee	Chinook	85,250	4	27 April	185	20 May (23)	88	49-64b	107	0.13
Oak Orchard	steelhead	14,000	3	25 April	21.5	16 May (21)	17.1	51-67b	136	0.97
Oak Orchard	Chinook	85,250	4	25 April	190	18 May (23)	98.1	51-67b	388	0.46
Eighteen-mile	Chinook	50,000	2	26 April	190	16 May (20)	71	50-62	40	0.08
Niagara	steelhead	9,858	1	4 May	26	2 June (29)	10.8	45-58	14	0.14
Niagara	Chinook	75,000	1	4 May	152	2 June (29)	82	45-58	202	0.27

Notes:

- a Temperature was monitored with a recorder starting 6 May
- b Temperature was monitored with a recorder starting 4 May