

2008 Salmon River Wild Young-of-Year Chinook Salmon Seining Program

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Seasonal base flows mandated by the Federal Energy Regulatory Commission hydroelectric licensing agreement (FERC 1996) have resulted in a dramatic increase in natural reproduction of Chinook salmon in the Salmon River since 1997. A cooperative index seining program was initiated in the spring of 1999 by the U.S. Geological Survey (USGS) and the New York State Department of Environmental Conservation (NYSDEC). The purpose of the survey is to assess spatial and temporal aspects of relative abundance, size structure, and distribution of wild young-of-year (YOY) Chinook salmon in the river. The initial work in 1999 served as a pilot study to establish sampling techniques and sites. The 2000 survey was hampered by high flows which prevented sampling during peak emergence. The surveys conducted from 2001 through 2008 were relatively seamless and provide consistent data for useful comparisons.

Methods

Seine hauls were conducted weekly at four sites (Altmar, Pineville, CO. RT. 2A, and Douglaston, Figure 1) from 6 May through 26 June. The bag seine was 20 feet wide by 6 feet deep with 1/8 inch bar mesh. Hauls were made by stretching the seine perpendicular to the current and sweeping downstream toward one bank to a suitable landing area. A sample consisted of one seine haul per site. Obstacles on the river bottom and differences in the lengths of the hauls prevented the use of catches per unit of effort as precise density estimates but the range of numbers captured between sites and dates do provide a relative estimate of abundance. All species captured were counted and sub-samples of up to 30 Chinook were measured (total length) for each haul.

The relative numbers of fish produced, measured by the mean catch per haul for the three consecutive weeks with the highest catches for each year, are compared with mean flows during the previous first three weeks in October using a logarithmic regression (Microsoft Excel 2000). Salmon River flow records are available from the Brookfield Power Company on the internet at: <http://www.h2oline.com/365123.asp>

Results

The 2008 year class appears to be very weak with a mean peak catch of only 49 YOY Chinook per haul during the last week of May and the first two weeks of June. Catches throughout the survey were well below average and the peak occurred later and was more prolonged than normal (Figure 2). The late peak was likely due to cool temperatures experienced in May. The highest number of YOY Chinook caught at a single site in 2008 was 151 at Pineville on 27 May compared with previous years' highest catches at a site ranging from 279-1523 fish in 1999 and 2004 respectively.

Another factor that may have played a role in the low numbers of fish produced in 2008 was that, in addition to the fall of 2007 being dry, it was also abnormally warm. The high temperatures experienced during the maturation of the salmon are believed to have caused lower than normal eye-up of the Chinook eggs taken at Salmon River Hatchery so egg survival in the river was likely to have been relatively low as well.

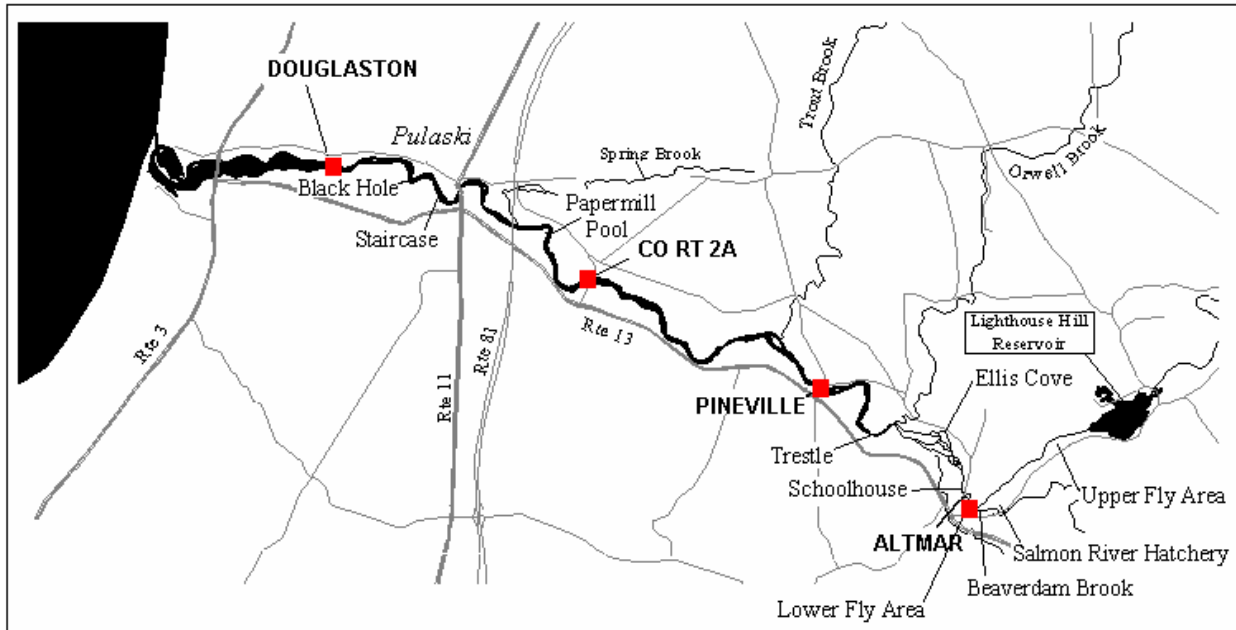


Figure 1. Sampling sites for the USGS/NYSDEC Salmon River seining program.

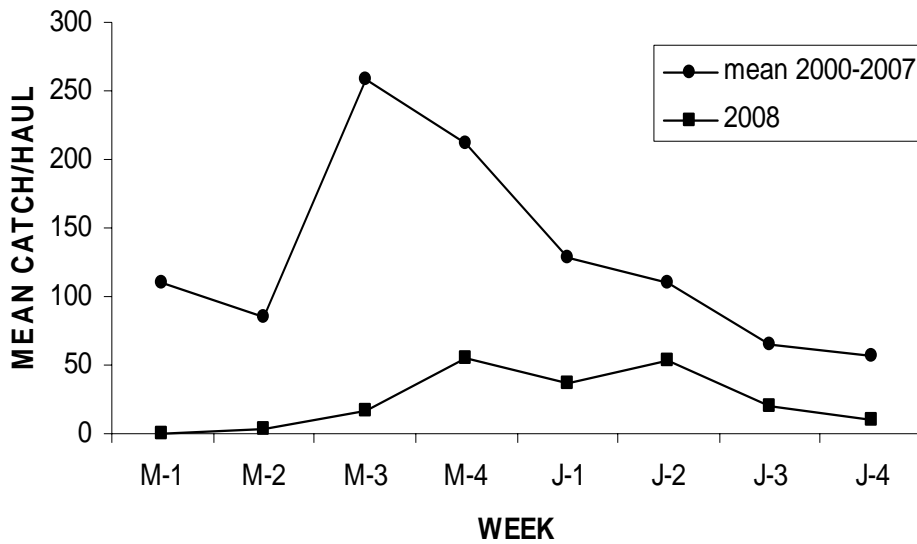


Figure 2. Mean numbers of YOY Chinook salmon captured per seine haul by week in the USGS/NYSDEC Salmon River seining program for 2000-2007 and 2008 (M=May, J=June).

Numbers of YOY Chinook caught by site and length frequency distributions of the catches by site provide us with insights about abundance, size and distribution of the fish throughout the survey. Based upon numbers of fish caught at each site, most of the successful spawning appears to have occurred between Pineville and Altmar (Figure 3).

Note the relative lack of fish caught at Altmar, particularly early in the survey. Surveys from previous years reveal that much higher proportions of overall catches occurred at Altmar in many of the years. A significant portion of the potential spawning habitat lies above Altmar adjacent to the Salmon River Hatchery (Everitt 2006). This area is also closed to fishing so fish can spawn without harassment from anglers. Drought conditions and warm temperatures during the fall of 2007 severely limited fish access to this section of the river due to angler exploitation in the lower river and what was probably higher than normal catch and release mortality. The little blip

in numbers at Altmar that occurred in June may be attributable to some late season spawning that occurred above Altmar. This probably resulted from higher flows that commenced the last week of October when rains finally came and the base flow was increased allowing fish to get to that section of the river.

The site specific length frequency distributions revealed that fish became fully recruited to the seine in the 1.75 to 1.99 inch length interval (Figure 4). Note that fish smaller than 2 inches were relatively more abundant in the upper river catches and that larger fish accounted for larger proportions of the catches in the lower river. This occurred because most of the spawning occurred in the upper river and because the fish were growing as they worked their way downstream. Declining percentages of fish in the larger length intervals were likely the result of fish out-migrating to Lake Ontario or otherwise removed from the system (i.e., predation).

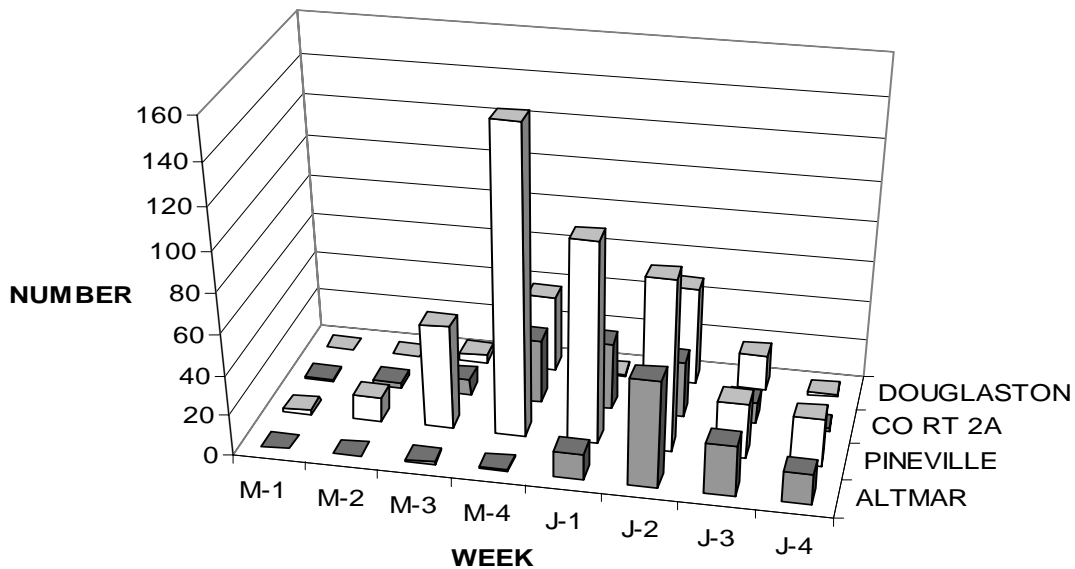


Figure 3. Numbers of YOY Chinook caught by week and site from the USGS/NYSDEC seining program 2008.

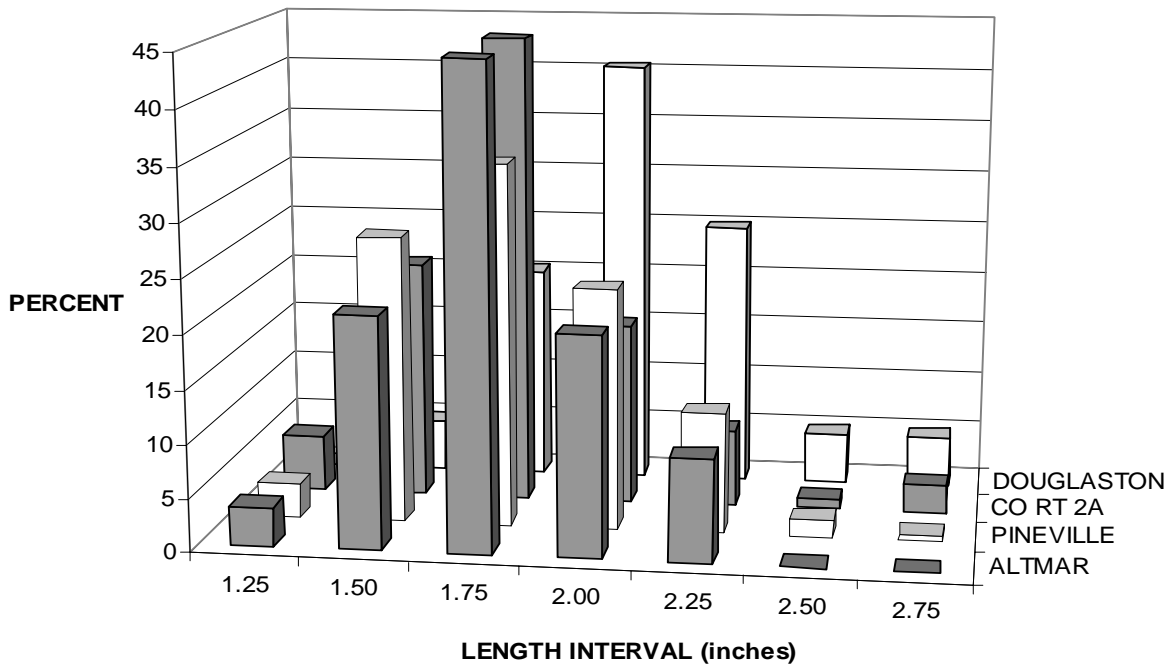


Figure 4. Site specific length frequency distributions of YOY Chinook salmon from the 2008 USGS/NYSDEC Salmon River seining program.

We have previously documented a strong relationship between October flows and numbers of YOY Chinook produced in the river the following spring. The larger catches of YOY Chinook generally occurred in springs that followed Octobers with higher flows. Record low flows in the fall of 2007 provided us with a new “low” for flows and we refined our period of measured flows from the entire month of October to the first 3 weeks in October. As expected, we caught relatively few fish in the spring of 2008. The October flows now explain 86 percent of the variability in relative peak catches of YOY Chinook the following spring since we have the appropriate data starting in 2001 (Figure 5).

The 2002 and 2005 year classes were the two largest outliers in the relationship. Relatively low numbers were produced in 2002 and high numbers were produced in 2005. October flows were at or near the prescribed base flow of 335

cubic feet per second (cfs) in both years. Examining the flow records from the Septembers of the relevant years revealed that flow was as at or near the prescribed base flow for the entire month in 2001, and in 2004 there was an approximate 2,000 cfs flow event from the 8th through the 11th and flows remained above 750 cfs through the 22nd. It is possible that these high flows in September 2004 aided the fish in dispersing throughout the river and provided additional protection from anglers during that time period. This suggests that while the river is capable of producing relatively high numbers of YOY Chinook at prescribed base flows, angling activity can suppress production in years with relatively low flows the previous fall.

It is interesting to note that removing the 2005 year class from the regression analysis results in an R^2 of 0.96. Either way, there is little doubt that fall flows play a major role in numbers of

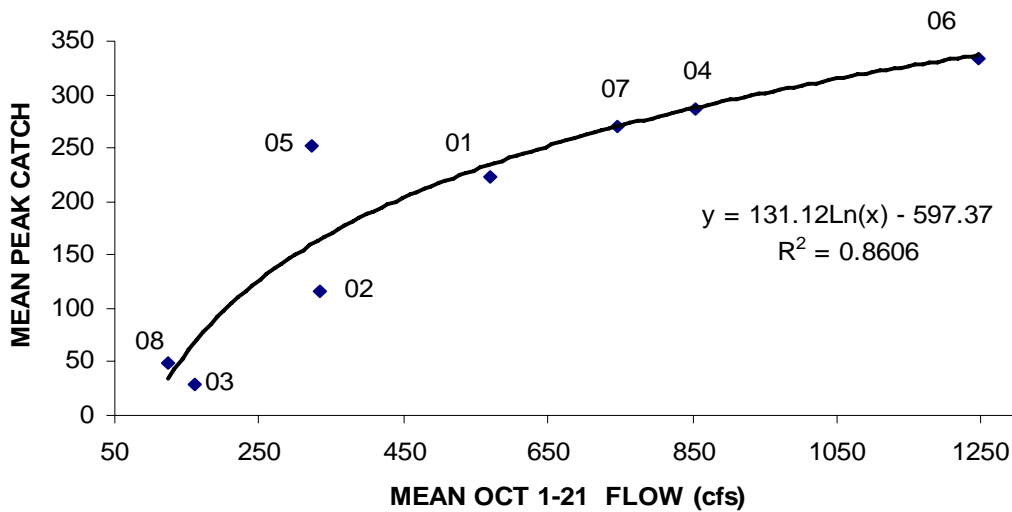


Figure 5. Mean peak catches of YOY Chinook salmon (year classes 2001-2008) and mean flows from the prior first three weeks in October from the USGS/NYSDEC Salmon River seining program.

YOY Chinook produced in subsequent springs.

The question of how naturally reproduced Chinook survive relative to hatchery Chinook and what contribution the wild fish make to the overall lake adult population remains unanswered. Various investigators have used a number of techniques to separate wild from hatchery fish and they have produced conflicting results. Fortunately, NYSDEC has acquired a fish marking trailer from Northwest Marine Technology and all of the hatchery Chinook stocked in the Lake Ontario system from both New York and Ontario were marked with an adipose fin clip in 2008. This marking study will provide us with a variety of information including

the relative contribution of wild Chinook to the Lake Ontario and Salmon River systems.

References

- Everitt, D.W. 2006. Natural reproduction and spawning site characteristics of Chinook salmon (*Oncorhynchus tshawytscha*) in the Salmon River, NY. MS thesis, State University of New, College of Environmental Science and Forestry, Syracuse, New York.
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