

Upper Fraser/Thompson River Coho Salmon

Background

Upper Fraser/Thompson coho (Oncorhynchus kisutch) originate in the four sub-regions indicated on the adjoining map. As a group they are descended from coho of the upper Columbia River and are genetically distinct from coho in the lower Fraser. Recent (1996-98) spawning escapements in the North and South Thompson drainages are less than 30 % of the average escapements during 1988-95. The main reason for the decline is reduced marine survivals and fishery exploitations exceeding those that the stocks can withstand. Freshwater habitat alterations have also contributed.

In response to conservation concerns for Thompson coho, in 1998 severe restrictions were placed on B.C. salmon fisheries. No directed fisheries on coho were permitted, and there was mandatory non-retention and non-possession of coho in all areas, with the exception of some terminal hatchery locations. The overall exploitation rate was lowered to about 7 % (2 % in Canada). However, while there was a slight improvement in 1998 over 1997, for most unenhanced streams returns in 1998 were less than in 1995, their brood year. Coho spawners were not seen in 27 % of streams where they had been seen 3 generations earlier. The status of South and North Thompson coho remains poor. Their productivity has declined in the last 10 years to the point where many populations are not replacing themselves, even with major reductions in fishing impacts.

The Fishery

Coded wire tags from Thompson and other Upper Fraser River coho have been recovered in fisheries from Alaska to Oregon. Most were gathered during troll and sport fisheries off the West Coast of Vancouver Island and in the Strait of Georgia. Upper Fraser/Thompson coho fish have also been caught incidentally in net fisheries for other species in Johnstone Strait, Juan de Fuca Strait, Strait of Georgia, the San Juan Islands, and in the Fraser River. Their recent catch distribution has been dominated by dramatic swings between fisheries inside and outside of the Strait of Georgia. Prior to 1991, large numbers of coho remained inside Georgia Strait each year and supported major sport and troll fisheries. In 1991, 1995, 1996, 1997, and 1998, the majority of coho appeared to leave Georgia Strait. Marine fishery exploitations (catch as a proportion of catch plus escapement) averaged approximately 65 % during 1987-97 (Irvine et al. 1999a).

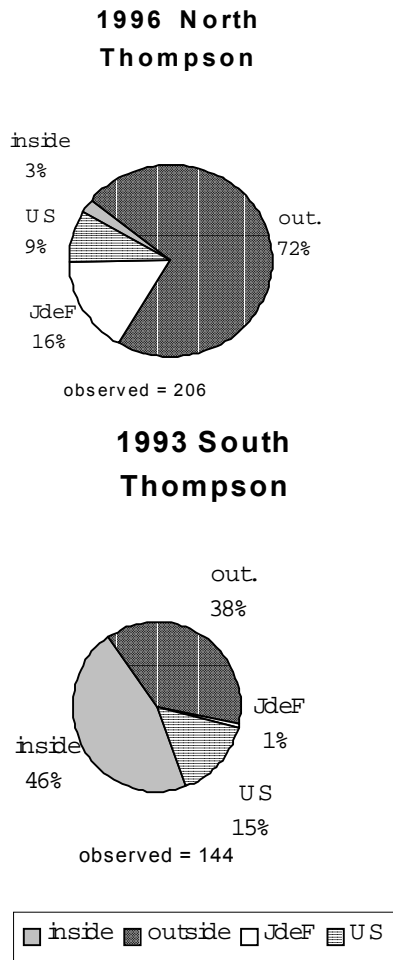


Figure 1: Estimated marine catch distributions of coded-wire tagged Thompson coho during 1996 (an outside distribution year) and 1993 (an inside distribution year). Fisheries included were inside and outside of Georgia Strait, in Juan de Fuca, and Washington State (US) with total observed recoveries of CWTs from the same fisheries.

Sport fisheries for coho salmon in the Upper Fraser River and tributaries have been limited and often focused on enhanced stocks. Upper Fraser/Thompson coho are also angled in the lower Fraser River, but it is thought that harvests are minor (Irvine et al. 1999a).

From the mid-1970s to present there has been limited effort in the Fraser watershed by First Nations directed at coho salmon. The preferred species based on catch and effort are sockeye and chinook. Most harvests of coho in recent years occurred at enumeration fences on enhanced stocks.

Canadian salmon saw unprecedented restrictions during 1997 and especially 1998. In 1998, no directed fisheries on wild stocks of coho were permitted, and there was mandatory non-retention and non-possession of incidentally caught coho in all areas (with the exception of some terminal hatchery locations). The coast of B.C. was divided into a series of red and yellow zones. In the south, red zones consisted of those areas and times where Thompson coho stocks were expected to be prevalent. Yellow zones were areas where Thompson coho were not expected to be prevalent. Prevalence was determined by the historical frequency of capture of coho of known Thompson origin determined from an analysis of coded-wire tag data.

During 1998, only a small number of restricted experimental and test fisheries were allowed in red zones and these were closely monitored. In yellow zones, the only salmon fisheries permitted were directed on salmon species other than coho. To reduce the bycatch and mortality of coho in yellow zones, a selective fishing strategy was implemented for all commercial gear types. Logbooks were mandatory and an onboard observer program was instituted in southern B.C. Recreational fisheries were monitored more intensively than in previous years.

In 1998, tissue samples were collected from coho in many fisheries to estimate the proportion of Thompson-origin fish. Stock compositions were estimated from DNA analysis and the historical distribution of coded wire tags. The numbers of Thompson coho estimated to have been killed in southern B.C., northern B.C., and U.S. fisheries were 205, 105, and 953 respectively (Irvine et al. 1999b). Almost all of the U.S. mortalities occurred in Washington State.

Resource Status

Many of our inferences about the status of Thompson River and other Upper Fraser coho stocks rely upon spawner escapement data. In producing the accompanying figures, the coho salmon escapement database for Thompson basin

stocks was filtered to remove the confounding effects of inconsistent monitoring and enhancement. Spawning escapements to unenhanced streams in the North and South Thompson were at moderate levels from 1975 through the early 1980s. For the next 5 or 6 years, returns were higher, but subsequently declined until 1996. Escapements to each aggregate increased annually from 1996 to 1998; however, for many streams, the 1998 escapements were less than those in 1995, the brood year. Although time series of escapement data for Lower Thompson and Upper Fraser/non-Thompson rivers are of shorter duration and lower quality than those for the North and South Thompson, the status of these stock aggregates appears better than the North and South Thompson.

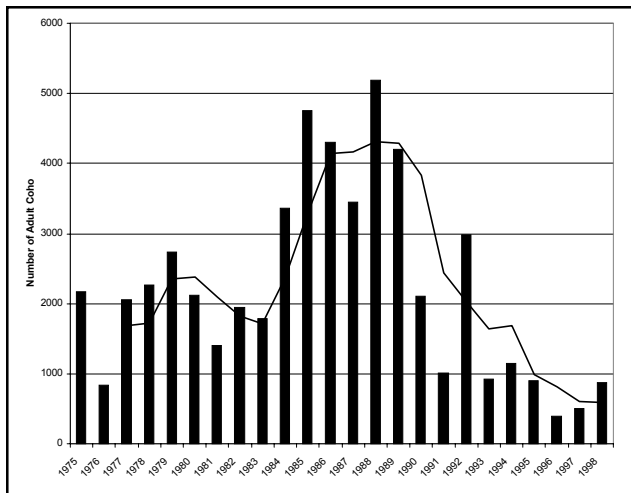
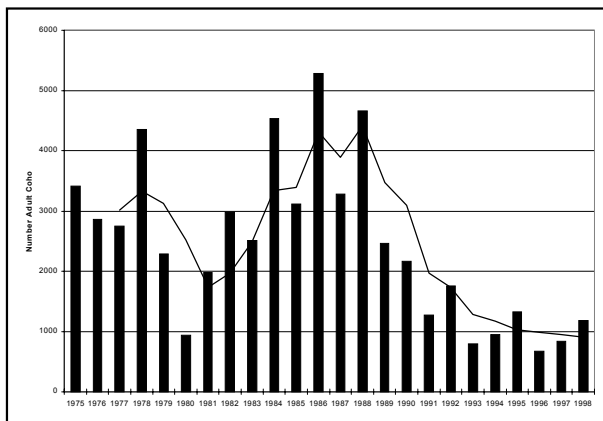


Figure 2 (above) and Figure 3 (below): Aggregate coho escapement to 16 South Thompson (above) and 10 North Thompson streams (below) (1975-1998). Trendlines are 3-year moving averages.



To see if there have been changes in the numbers of progeny produced per parental spawner, one can examine a plot of r (calculated as $\ln(\text{Recruits}/\text{Spawner})$). Positive numbers indicate a potential for population growth while negative numbers indicate a risk of declining populations. The productivity of the stock groups appears to fluctuate fairly coherently over time, and there has been considerable year-to-year variation. South Thompson streams have fluctuated around zero for the last 5 years. There was a slight overall increase in r in 1998 (1995 brood) over 1997 (1994 brood) for South Thompson stocks, but r is currently about 0 for both aggregates.

While there was a small increase in the total numbers of coho returning in 1998 compared with 1997, spawning in the North and South Thompson drainages continues to be concentrated in relatively few streams. Bradford (1998) noted that 32 % of streams that had fish observed in them in 1988 had reached “none-observed” status in 1997 (i.e. 3 generations later); this fraction was largely unchanged (27 %) for the 1998 spawning relative to the 1989 distribution.

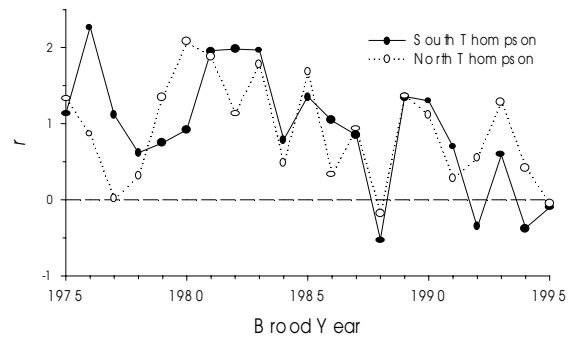


Figure 4: Time series of the intrinsic rate of growth, r , for North and South Thompson coho salmon. When $r < 0$, populations are unable to sustain themselves even in the absence of fishing. r is calculated as $(\text{Returns } t+3 / \text{Escapement } t) / (1-h)$; where $\text{Returns } t+3 = \text{Escapement } t+3$; h is the exploitation rate.

There is a great deal of uncertainty about the precision of these proportions, as reporting methods for the data have varied considerably.

Nevertheless, even with increased effort to find fish in 1998, and in the near absence of fishing in B.C., some streams were apparently devoid of spawners.

Outlook

The extreme management measures undertaken in B.C. during 1998 to conserve coho appear to have stemmed the decline for some populations. Numbers of coho in the upper Fraser/Thompson may be larger than previously thought, but we are concerned that those streams with very few fish in them continue to be at risk of local extinctions.

The short-term forecast for Thompson coho is for continued poor returns (Holtby et al. 1999), in part because marine survival rates are expected to remain low. The 1996 and 1997 spawning populations were small, and there was concern that the reproductive potential of these broods may be lowered because of male-biased sex ratios and reductions in fecundity (Bradford 1998, Irvine et al. 1999a). Low parent spawner abundance, and poor prospects for the return/spawner rate mean that no significant improvements to the overall abundance of Thompson River coho are anticipated for the next 2 years. To conserve these populations, levels of fishing mortality should continue to be minimized.

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