Suitability of tagged Coleman Hatchery late-fall Chinook as surrogates for juvenile spring run emigrants

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Spring-run yearlings begin emigrating in the fall when precipitation events occur (DFG 1998). It is unknown whether some yearlings leave the tributaries prior to precipitation events, and it is unknown how quickly they emigrate to the delta. There are several reasons for the uncertainty about timing of yearling emigration: (1) there is a small number of yearlings emigrating, so they may not be detected in the monitoring programs; (2) they are relatively large, strong swimmers, so they may avoid the monitoring gear; and (3) other juvenile Chinook in the mainstem Sacramento River can be in the same size range used to define yearling spring-run Chinook, confounding data interpretation.

Coleman Hatchery late-fall juveniles are used as surrogates to estimate yearling spring-run emigration timing and take at the delta export facilities. Since 1995, the USFWS has released approximately 17% of the Coleman Hatchery late-fall production in three separate groups, one in November, one in December, and one in January as part of the 1995 Spring Run Protection Plan.

These fish are adipose fin clipped and coded wire tagged prior to release. In addition to these releases approximately 83% of the production is released in the upper Sacramento River as one large group in early January. The Coleman Hatchery late-fall Chinook are considered appropriate surrogates because they are reared to a size similar as spring-run yearlings and released in the upper Sacramento River.

To address the question on the suitability of Coleman Hatchery late-fall Chinook as surrogates, this analysis is on three issues. These issues are 1) the timing of each release to recoveries of juvenile spring run in the Mill and Deer Creek rotary screw traps, 2) comparing the timing of Coleman late-fall Chinook with recoveries of older juvenile length Chinook in the monitoring at Knights Landing, Sacramento River, and Chipps Island, and 3) comparing loss of Coleman late-fall Chinook with the loss of older juvenile Chinook at the Delta Fish Facilities.

Rotary screw traps have been operated on Mill and Deer creeks since 1996. Due to problems with gear selectivity and effectiveness at extreme low and high flows, recoveries are only meant to represent presence and absence, with no inference to abundance. Juvenile spring run Chinook recovered in both Mill and Deer creeks fall in the winter and late-fall run length criteria even though the traps are located upstream of non-natal reared winter run influence, and surveys have not detected sustainable late-fall populations in either creek (DFG, pers comm.). For this analysis these juveniles are classified as older juvenile Chinook. The older juvenile Chinook are defined as all Chinook above the minimum winter run length line. This same older juvenile classification is also used in the downstream monitoring and at the Delta Fish Facilities.

Since 1996 the number of juvenile spring run recovered in the Mill Creek trap has ranged from 0 to 1135 and from 0 to 723 in the Deer Creek trap (Table 1). Because of the operational limitations of the traps it is difficult to draw any conclusions about the timing of the surrogate releases; especially in years where very few juveniles are detected leaving the tributaries.

The surrogate releases are timed, as closely as possible, with precipitation induced flow events. In most years, from 1999 through 2003, the November releases occur during a period of increased recoveries of juvenile spring run in the tributaries (Figures 2-6). A similar pattern is seen with the December releases, however in several years the traps were not operating during the entire month (Figures 2-6). Juvenile spring run are still being recovered in the tributaries during January, when the final release is made. However in most years the traps were not operating due to high flows making it inconclusive whether the January surrogates are timed properly (Figures 2-6).

The November surrogates have the longest period from release to first recovery in the upstream monitoring at Knights Landing and the Sacramento trawl. On average, the surrogates were recovered over a 22-day period in the upstream monitoring and a 44-day period in the downstream monitoring at Chipps Island and at the Delta Fish Facilities (Figures 1-6). These surrogates have the lowest average survival (0.22) to Chipps Island based on data from 1995-2004.

The November surrogates were recovered during the first pulse in catch of the older juvenile Chinook in the monitoring in years where there were precipitation induced flow events in the fall months (Figures 1-2 and 5-6). This first pulse generally occurs in mid to late December. In 2000 and 2001 the precipitation induced flow events were smaller in the fall and very few surrogates were recovered (Figures 3-4). The surrogates were also recovered during a time when very few older juvenile Chinook were being recovered in the monitoring (Figures 3-4).

The December surrogates were recovered over a 21-day period in the upstream monitoring and a 35-day period in the downstream monitoring (Figures 1-6). The average survival (0.41) to Chipps Island was higher than the November surrogates.

The December surrogates were also recovered during the first pulse in catch of the older juvenile Chinook in the years with wetter fall months (Figures 1-2 and 5-6). Like the November surrogates, very few surrogates were recovered in 2000 and 2001, the years with drier fall months (Figures 3-4). These surrogates were recovered during a time when very few older juvenile Chinook were recovered in the monitoring (Figures 3-4).

On average, the January surrogates were recovered over a 15-day period upstream and a 25-day period downstream (Figures 1-6). This recovery timing was similar for the Production release which is also made in January. The January surrogates have the highest average survival (0.49) to Chipps Island of the three surrogate groups. The Chinook from the Production release have a slightly lower average survival (0.45) to Chipps Island based on data from 1995 through 2003.

In years with wetter fall months there are typically two pulses in older juvenile Chinook recoveries, one in mid-December/early January and a second pulse in late February/March. The January surrogates were released after the first pulse in older juvenile Chinook recoveries. Most of these surrogates were recovered by late January when the older juvenile recoveries are low (Figures 1-2 and 5-6). In years, like 2000 and 2001, with drier fall months there was only one pulse of older juvenile Chinook recoveries in mid-February/March. In these years the surrogates took longer to emigrate through the system and were recovered during this pulse in older juvenile Chinook recoveries (Figures 3-4). This pattern was also seen in the recoveries of Chinook from the Production release.

Under the interim spring run Biological Opinions for 1999-2004 the incidental take level at the Delta Fish Facilities has been set at 1% of the total release for each group. Based on data from water years 1995 through 2004 the loss of November surrogates has averaged 0.2%, ranging from 0 to 0.5% (Table 2). In years with wetter fall months the surrogate loss increased in December during an increase in older juvenile Chinook loss at the Delta Fish Facilities, except in 1999 and 2004 (Figures 7-8 and 11-13). In 1999 exports were reduced from mid-November to early January. During this period the loss of both the surrogates and the older juvenile Chinook was very low. In water year 2004 the November and December surrogates were released as one group in late November. The loss of surrogates increased in mid-December, in a pattern similar to the other wet years, however the loss of older juvenile Chinook remained low. In years with drier fall months the loss of surrogates was low (Figures 9-10). In 2000 the loss occurred during periods of older juvenile Chinook loss while in 2001 the loss of surrogates occurred when older juvenile loss was very low (Figures 9-10).

The loss of December surrogates has averaged 0.5%, ranging from 0 to 1.3% (Table 2). The loss of these surrogates occurred in a pattern similar to the November surrogates in all years.

The loss of January surrogates has averaged 0.6%, ranging from 0 to 1.4% (Table 3). In years with wetter fall months the January surrogates were released after the first pulse in older juvenile Chinook loss. Most of the surrogate loss occurred in late January when older juvenile loss was low, except in 2004 (Figures 7 and 11-13). In 2004, the release was made at the very end of January and the surrogate loss occurred during a period of older juvenile loss in mid-February (Figure 13). In years with drier fall months there was only one pulse

of older juvenile Chinook loss in late February/March. In these years the surrogate loss occurred over a longer period and overlapped with this pulse in older juvenile Chinook loss (Figures 9-10).

The loss of Chinook from the Production release has averaged 1.0%, ranging from 0 to 3.3% (Table 3). The loss from this release occurred in a pattern similar to the January surrogates in all years, except 2004. In 2004 the Production release was made in early January and most of the loss occurred during a period when older juvenile loss was low.

Based on the current data, it is inconclusive whether the Coleman Hatchery late-fall Chinook are suitable surrogates. Due to the operational limitations of the rotary screws traps on Mill and Deer Creeks it is not clear whether the timing of the surrogate releases is appropriate. The timing of the November and December surrogates does match with older juvenile Chinook recoveries in the downstream monitoring in years with wetter fall months. While the timing of the January surrogates and the Production release did not match in wetter years but did in years with drier fall months. However, new genetic markers have been developed and are being used at the Delta Fish Facilities to identify individual spring run. Once available, this data will provide a better understanding on the timing of juvenile spring run and will provide more information on whether the surrogates are suitable indicators of juvenile spring run Chinook.