
MEMORANDUM

TO: HARVESTERS ASSOCIATION
FROM: BILL GAZEY
SUBJECT: COMMENTS ON CULTUS LAKE SOCKEYE
DATE: MAY 4, 2004
CC:

The harvesters association hired me five months ago as an independent biologist to participate on the Cultus Recovery Team and to provide the harvesters assistance in understanding the sometimes complex population dynamics involved. All of the issues and comments listed below have been discussed and raised with members of the Harvesters Association. Some issues are not in the purview of Recovery Team (points 1 and 7) so have not been extensively discussed with other Recovery Team members. The purpose of this memorandum is to record the key issues that come up repeatedly with respect to Cultus Lake sockeye.

1. It is not my purview, as a member of the Recovery Team, to question the rationale for listing Cultus Lake sockeye under the Species at Risk Act. And, the Cultus population certainly meets all criteria with respect to declining trends and the currently small population size. However, I do question treating the stock as a species in reproductive isolation. The following arguments for reproductive isolation have been used by COSEWIC:
 - a. Genetic analysis of 14 microsatellite loci and one MHC loci. Overall the analysis demonstrates that Cultus is distinct or different in comparison to other stocks (as one should expect for a stock). The data also show some exchange of spawners with Weaver Creek, Pitt River and Berkinhead River. This does not seem to be indicative of reproductive isolation. I should hasten to add that I am not a geneticist. If you want to pursue these data more thoroughly I would strongly suggest consulting with a geneticist.
 - b. Transplant attempts into Cultus have failed. Sockeye salmon are notoriously difficult to transplant. Successful introductions into Upper Adams River and Fennell Creek required persistent attempts with many millions of fry. Given the relatively small and infrequent introductions into Cultus, the lack of success is not surprising.
 - c. Cultus exhibit unique adaptations for their local environment (migration delay, long adult residence in the lake, extended breeding period, fry school and move offshore to avoid predators). Examples of these behaviors can be found in many sockeye stocks. These responses seem to be population level

adaptations (i.e., response of any sockeye stock in similar conditions) and not a species adaptation.

2. DFO has attributed the cause in decline of the Cultus stock (through PSARC and COSEWIC reports) to (a) high fishing mortalities from mid-1960's to mid-1990's, (b) poor marine survival in the 1990's, and (c) high pre-spawning mortality (PSM) from early migration 1999-2001. That high fishing mortality caused a substantial decline in the stock can not be disputed; however, the historical stock-recruitment data would result in an equilibrium level of 4,000 to 7,000 spawners under the high exploitation rates previously experienced. Obviously, some additional factors have caused the stock to decline to endangered levels. The scientific evidence for poor marine survival and PSM of the Cultus stock as the culprits is not clear. Cultus smolts were not enumerated for the 1977 to 1998 broods so there is no direct marine survival estimates. The poor survival statements are based entirely on Chilko smolt survival; however, in the 23 years (previous to 1977) where synoptic data were collected there is no correlation between Chilko and Cultus in the survival estimates. In other words, there is not an empirical basis for attributing poor marine survival as causing the decline. The high PSM attributed to the 1999-2001 broods is based entirely on low smolt-to-spawner ratios and the difficulty in finding spawners in the lake. An alternative explanation may be that lake spawners were not easy to find because of displacement into deeper water by milfoil encroachment on the traditional spawning grounds and the low smolt-to-spawner ratios are caused by poor egg to smolt (i.e., freshwater) survival. Detailed observations were taken of successful spawning in 2002 and 2003 by the Coast Guard using remotely operated underwater vehicles. They noted extensive deep water spawning and an observed PSM about half that of other late run stocks determined by the tagging studies in 2002 and 2003. A reasonable hypothesis is that Cultus sockeye experience lower mortalities from early migration because they can quickly migrate through the high river temperatures (particularly in Sweltzer Creek) and hold in the cooler water in Cultus Lake until they are ready to spawn in the fall. In summary, I think poor freshwater survival may be a primary cause for the endangered status of Cultus Lake sockeye.
3. DFO characterizes freshwater survival of sockeye as not a problem for Cultus (PSARC and COSEWIC reports). The Recovery Strategy (Draft) is somewhat more cautious. The only indicator for freshwater survival is the smolt-to-spawner ratio. Its history is as follows:
 - The ratio was near average or above up to the 1976 brood.
 - No data are available for the 1977 to 1987 broods.
 - For the 1988 brood, the ratio was low.
 - For the 1989 and 1990 broods, the ratio was above average; however, a pikeminnow removal program was in place.
 - No data are available for the 1991 to 1998 broods.
 - The brood year ratio was exceptionally low in 1999 and 2000 (the basis for 93% PSM estimate) and low in 2001.

The smolt out-migration for the 2002 brood is in progress. It is the first year since the 1988 brood that PSM is known from independent observations and thus the true extent of freshwater survival can be assessed. As of 28-Apr-04 about 30,000 have been counted (about 100,000 smolts are needed to call the ratio "average"). We are now about half way through the migration period.

4. For the purposes of analysis, marine run timing has been assumed to be the same as the late run group. Fin clip data from the 1930's indicate that the marine run timing was up to two weeks later than other late run stocks. Others speculate that the marine run timing may extend over a longer period because entry into the lake is over an extended period. Alternative marine run timings will likely result in less catch allocated to the Cultus stock than the existing procedures. This will result in lower exploitation and productivity estimates. The impact will be that the fishery is not as large a lever as currently perceived. Reduced fishing will not result in the desired response in the stock. (Alternatively, fishing will have to be reduced more dramatically to get the desired response). It is difficult to see a definitive resolution to the magnitude of this uncertainty because the run is small relative to other co-migrating sockeye. Sensitivity analysis (trials with alternative marine timings) may provide some insight. This analysis will take a lot of work and will require a lot of input from PSC staff. It is unlikely to see any products until Spring of 2005.
5. The current (draft) recovery objectives call for a four-year arithmetic mean of 1000 successful spawners with no fewer than 500 on any one cycle. Growth in successful spawners for each generation (across four years) must be obtained by achieving growth in three out of four years. A recovery goal (in numbers of successful spawners) has not been specified. The setting of a recovery goal has been highly contentious for the Recovery Team because some (me included) define recovery in the context of removing Cultus from the SARA list and others as a long term societal goal (e.g., maximum sustained yield at about 32,000 or historical average pre Weaver channel at about 20,000). I will continue to press for a recovery goal based on criteria that will achieve delisting because it would be good to know when the pain might stop; however, the current recovery objectives are satisfactory in my opinion. Regardless of the recovery objectives, delisting can only occur by petitioning COSEWIC for a reassessment.
6. Based on out-migration smolt counts in 2002 and 2003 the returning run size in 2004 and 2005 will be very low (less than 500). Therefore, fishing will be kept to a minimum (essentially no commercial openings on late run stocks) for those years. Some fishing may be allowed (25%, say) for 2006 and 2007. The first possible chance for delisting would be 2008 (2010 more likely) assuming a good response in the population from recovery efforts.
7. In my opinion the best action plan (The Recovery Team only recommends approaches and can not specify an action plan) for the recovery of Cultus will be by enhancing freshwater survival through removal of milfoil and northern pikeminnow

(see points 2 and 3 above). Even if it turns out that freshwater survival is not as big a problem as I fear, the survival boost would shorten the recovery time and allow for a higher long term exploitation of late run stocks. For the program to work in future, it will be necessary to "go big or go home". I'm not convinced that DFO are willing to make the necessary commitment to make the program work, as was demonstrated during the 1930's. DFO seems to want to portray the results of previous predator removals as equivocal, providing good justification for a "do nothing" approach. My concern is that Northern pikeminnow control, while a recommended approach in the Recovery Plan, will not be carried out very enthusiastically in the Action Plan.

8. As recommended in the PSARC report a risk assessment framework (ecological, economic and social) is still urgently required to evaluate fishing plans.