

PRCC Hatchery Subcommittee Meeting

Thursday, February 18, 2016

Wenatchee, Washington

Meeting Summary

PRCC HSC Members

Craig Busack, NOAA (alt)(via phone)

Bill Gale, USFWS

Peter Graf, GPUD (alt)

Keely Murdoch, Yakama Nation

Deanne Pavlik-Kunkel, GPUD (alt)

Todd Pearsons, GPUD

Mike Tonseth, WDFW

Kirk Truscott, CCT

Justin Yeager, NOAA

Other Participants

Catherine Willard, CPUD (via phone)

Elizabeth McManus, Facilitator

Andy Chinn, Facilitator

Decisions

- A. HSC members approved the January 2016 conference call as amended.
- B. HSC members approved the SOA on Feasibility of Dryden Facility Modifications as amended.

Actions

1. GPUD will circulate the projections for 2016 fall Chinook return for Hanford Reach.
2. GPUD will draft text on flexibility around the need for real-time otolith reading for Hanford Reach fall Chinook for the draft broodstock collection protocols.
3. HSC/HC members will provide comments on the draft 2016 broodstock collection protocols to WDFW by 2/29.
4. Ross Strategic will finalize the Dryden SOA with the appropriate dates and send the final document to GPUD for posting to the HSC external website.
5. Ross Strategic will circulate instructions for HSC members to access the HSC SharePoint site.
6. WDFW will draft and circulate a set of criteria for facility operators to use in the event that a fish release at NCAF outside of the established time frame becomes necessary.
7. Ross Strategic will forward the memo on White River decision making to the PRCC.

I. Update and Meeting Summary Review

- A. January Meeting Call Summary** – HSC members approved the January meeting summary as amended.
- B. HCP-HC Update** – Please refer to the 2/17 HCP-HC meeting summary for joint HCP-HC and PRCC-HSC discussions (Appendix A of this document).

II. Recent and Upcoming Events

- A. Upper Columbia Science Conference** – There were several relevant presentations during the UCSRB- sponsored science conference, including an overview of PUD involvement in

the upper Columbia basin. Links to the presentations will be available on the UCSRB website.

- B. **March AFS Meeting in Chelan** – Reminder for the Washington-British Columbia Chapter [AFS meeting in Chelan, March 28-31](#).

III. **Permit Updates**

- A. **NOAA** – NOAA is making progress on Methow Spring Chinook consultations and is working to complete discussion of gene flow sliding scales as the final technical issue prior to program permitting. The draft HGMP for Chewuch production will be issued for 30 day public comment around 3/1. If the PNI issue is resolved, all other processes are on schedule for a final permit in May.
- B. **USFWS** – Coho program consultation and Wells re-licensing consultation will likely cover GPUD's planned acclimation activities for the spring Chinook program. USFWS is on track for Section 7 coverage completion in the next 4 – 6 weeks, matching NOAA's schedule so that the two permit packages can move forward concurrently.

IV. **Broodstock Collection (Joint HSC-HC discussion)**

- A. **Draft 2016 Protocols** – There are relatively few changes between the 2015 and 2016 protocols with respect to the number of fish and where they will be collected. WDFW is waiting for a few final forecasts in order to complete the spring Chinook and adult management sections of the protocols. WDFW has flagged the sections of the draft 2016 protocols for specific review and/or for HSC/HC members to provide information.
 - The draft 2016 protocols reduce the number of additional broodstock collected to lower the number of surplus fish and provide a plan to deal with overages.
 - GPUD noted that Paul Hoffarth (WDFW) projects annual fall Chinook returns to the Hanford Reach, including PHOS. 2016 projections indicate that the PNI objective for fall Chinook could likely be met without the need for real-time otolith reading. GPUD suggested that language could be added to the broodstock collection protocols (both in 2016 and in future protocols) to forego real-time otolith reading if certain conditions are met.
- B. **Next Steps**
 - GPUD will circulate projected fall Chinook return for Hanford Reach.
 - GPUD will draft text on flexibility around the need for real-time otolith reading for Hanford Reach fall Chinook for the draft broodstock collection protocols.
 - HSC/HC members will provide comments on the draft 2016 broodstock collection protocols to WDFW by 2/29.

V. **Dryden Facility**

- A. **Draft SOA on Feasibility of Facility Modifications** – GPUD and WDFW revised the draft SOA on Dryden feasibility prior to the February HSC meeting. HSC members discussed the revisions and suggested additional minor changes.
- B. **Voting** – HSC members voted to approve the Dryden feasibility SOA as amended.

C. Next Steps

- Ross Strategic will finalize the Dryden SOA with the appropriate dates and send the final document to GPUD for posting to the HSC external website.

VI. HSC Document Sharing

A. HSC SharePoint Site – The HSC SharePoint site contains the same files as the (now shuttered) HSC Boxnet site. HSC members will need to complete the administrative process for gaining access to the SharePoint site. After all HSC members have completed the process to access the site, meeting materials and other documents will be accessed through the site rather than attached to e-mails, in order to reduce the number of administrative records generated through the course of HSC activity.

B. Next Steps

- Ross Strategic will circulate instructions for HSC members to access the HSC SharePoint site.

VII. Nason Acclimation Facility

A. Intake Issues – Nason operators are experiencing problems supplying water to the facility through the in-river intake and have used groundwater and added dissolved oxygen to supplement the water supply. The intake, which is designed to be self-cleaning, is becoming obstructed by debris. This could be due to turbidity from recent rain-on-snow events or sediment/debris loading from recent upstream habitat work. If intake outages persist, conditions at the facility may become stressful from a fish health perspective and fish culturists may request leeway for early fish release.

- The Nason operating permit only allows for early release under extenuating circumstances and if early release were to occur, WDFW is required to notify NOAA. Prolonged exposure to high turbidity conditions increases risk of bacterial gill disease, and pumping in groundwater and adding dissolved oxygen may not be sufficient to mitigate the risk of anoxia.
- GPUD noted that it would be useful for all facilities to have a set of criteria under which fish could be released outside of established time frames.
- GPUD engineers and contractors are working on proposed design changes for the Nason intake and plan on in-river work during the July-August time frame.

B. Next Steps

- WDFW will draft and circulate a set of criteria for facility operators to use in the event that a fish release outside of the established time frame becomes necessary.

VIII. Wrap Up and Next Steps

A. Next Meeting: Thursday, March 17, 2016

B. Potential March Meeting Agenda Items

- Draft broodstock collection protocols
- Nason facility

Meeting Materials

The following documents were provided to HSC members in advance of this meeting:

- February meeting agenda
- Draft SOA on Dryden feasibility

Appendix A: Joint Item Discussion Summary from February 2016 HCP Hatchery Committee Meeting

II. Joint HCP-HC/PRCC HSC

A. Imprinting and Homing Presentation and Discussion (Tom Kahler/Andrew Dittman)

Andrew Dittman shared a presentation titled, “Effects of Hatchery Rearing and Release Practices on Olfactory Imprinting and Homing” (Attachment B). (Note: Sarah Montgomery distributed the presentation to the Hatchery Committees on February 18, 2016.)

Dittman said he works at the Northwest Fisheries Science Center, and this talk in no way represents official NOAA policy; rather, he only presents the biology of imprinting and homing. A summary of the presentation and questions and comments are included in the following sections.

Background (Slides 1 and 2)

Dittman said salmon learn odors associated with natal streams during development and use olfactory cues when returning upstream.

Experimental Evidence (Slides 3-4)

In a study by Scholz et al. (1976)¹, fish groups that were exposed to different odor cues and released in different rivers returned primarily to their release rivers. Hasler and Scholz (1983)² found that imprinting is associated with thyroid hormone surges that occur during smolting.

Sequential Imprinting Hypothesis (Slide 5)

Dittman said fish learn a series of olfactory waypoints as they experience inputs from tributaries during downstream migration. These waypoints are hormonal responses, which may be triggered by novel water input, and when fish migrate back upstream, it is thought the olfactory waypoints guide them to their natal sites.

Straying (Slides 6 to 12)

Dittman said straying is natural and may occur for a variety of reasons, such as age, memory loss, signal change over time, or exhaustion. Fish may make tradeoffs between homing and spawning site selection. Hatchery-origin salmon do not necessarily stray more than natural-origin salmon; however, factors such as transport and release strategies; the location, timing, and duration of

¹ Scholz, A.T., R.M. Horrall, J.C. Cooper, and A.D. Hasler, 1976. Imprinting to chemical cues: the basis for home stream selection in salmon. *Science* 192:1247-1249.

² Hasler, A.D. and A.T. Scholz, 1983. Olfactory imprinting and homing in salmon: investigations into the mechanism of the imprinting process. *Zoophysiology* Volume 14.

acclimation; inappropriate release habitat; and the hatchery environment itself may increase straying.

Dittman said Lister et al. (1981)³ studied the effect of transport distance on homing fidelity to release sites and found that stray rates are low when fish are released at the location at which they were reared or at distances greater than 47 kilometers.

Craig Busack asked what the operational definition of straying is for Dittman's presentation. Dittman said he considers a fish not returning to its acclimation tributary a stray. Dittman said some studies found that the time of release was more, or equally, important as the location of release.

Yakima River Spring Chinook Salmon Imprinting and Homing (Slides 15 to 19)

Dittman shared results from the Yakima River spring Chinook salmon Supplementation Program. He said the sequential imprinting hypothesis explains why fish returned with high fidelity to the Easton Acclimation Site; fish traveling upstream receive familiar input from the hatchery, arrive near the hatchery, then continue receiving familiar input from their acclimation site and, therefore, travel upstream toward their acclimation site. In contrast, fish released from the Jack Creek site reach an olfactory fork in the river during upstream migration, where the Teanaway River flows into the Yakima River, and the hatchery (on the Yakima River) provides more attractive olfactory cues due to early imprinting than their acclimation sites, ultimately resulting in high stray rates.

Strategies to Decrease Straying (Slides 30 to 46)

Tilson et al. (1994)⁴ found that thyroid hormone levels in fish surge during two life stages, 1) as embryos at the time of hatching and emergence, and 2) as smolts. Salmon imprint to natal sites during these two life stages.

Dittman said strategies such as incubating in natural or distinct waters (olfactory enrichment), embryonic imprinting, artificial imprinting cues, out-of-basin rearing, transport to target sites, and monitoring of physiological development and release timing may help to decrease straying. Larval imprinting proposes collecting water from targeted sites and exposing fish during sensitive developmental windows to their target tributary waters. Dittman said storing and freezing water should be considered if the target reaches of tributaries are difficult to access regularly. Dittman

³ Lister, D.B., D.G. Hickey, and I. Wallace, 1981. Review of the effects of enhancement strategies on the homing, straying, and survival of Pacific salmonids. Prepared for the Canada Department of Fisheries and Oceans, Vancouver, B.C.

⁴ Tilson, M. B., A.T. Scholz, R.J. White, and J.L. Hendrickson, 1995. Artificial imprinting and smoltification in juvenile kokanee salmon: implications for operating Lake Roosevelt kokanee salmon hatcheries. 1994 Annual Report. U.S. Department of Energy, Bonneville Power Administration. Project No. 88-63. Contract No. DE-8179-88BP91819.

said artificial cues such as morpholine and phenyl ethyl alcohol may help decrease straying, but they are hazardous chemicals and, therefore, permitting may be difficult. He said he is currently studying the potential for natural substances like watercress and algae extract to act as artificial cues.

Tom Kahler asked if the addition of artificial cues to increase hatchery-origin homing would affect the ability of wild fish to home. Dittman responded that he thinks it would not make a difference for wild fish because they are already imprinting on so many odors, and one more odor would likely not change homing behavior.

Potential Solutions and Experiments in the Methow Basin (Slides 47 to 52)

Regarding incubating in natural waters, Greg Mackey asked if natural waters could be treated for disease without changing their imprinting signature. Dittman said he studied the response of the olfactory system in fish to different odors of collected and stored water from the White River using an electro-olfactogram. Fish had no significant change in response from natural waters to frozen or refrigerated water. Ultraviolet (UV)-treated water elicited a change in olfactory response, but fish exposed to the UV-treated water did not have a behavioral change in homing. Fish exhibited a significant olfactory change in response to freeze-dried and reconstituted water; however, Dittman said commercial freeze-drying units still hold potential for future studies. Peter Graf said there might be tradeoffs between release date and homing and asked if there are data available regarding release date, survival, and homing. Dittman said he believes that the earlier a fish is released into its natal watershed, the better it will imprint and home. However, if the fish does not survive, it also will not return to its natal watershed. He said maximizing survival is likely more important to managers than maximizing imprinting and homing. Graf asked if fish should still be acclimated to natal water if they are exposed to it during embryonic development. Dittman said it probably would not be a problem to acclimate the fish, but it might be easier to truck release the fish instead. However, he said acclimation and its merits are worth considering. Mackey asked if fish are unified in thyroid hormone escalation levels when they are nearing release date in the hatchery. He said it might be possible to find an optimal date for stocking fish if the hormone levels in fish peaked at the same time. Dittman said some species are more conducive to a single release date than others, and with wider ranges in size, there would likely be wider ranges in hormone levels. He said the profile of hormone levels across the population might be similar; however, it is largely dependent on their rearing environment (hatchery effects).

Kahler asked if environmental conditions in the Teanaway River were accounted for and corrected in the Yakima River study. Dittman said the numbers of fish spawning in Jack Creek are correlated with flow, and the passive integrated transponder (PIT)-tag results show that some fish migrated into the Teanaway River and back out later in the season. In this study, bigger fish were more likely to stray out of the Teanaway River, and 2015 was a particularly bad year for habitat conditions (and straying) in the Teanaway River.

Tracy Hillman asked why fish that home all the way to the Easton Acclimation Site (responding to smoltification olfactory cues) do not then, in a sequential manner, search for rearing olfactory cues and travel back downstream to the hatchery. Dittman said once the fish have reached the Easton Acclimation Site, they cannot detect any cues coming from the hatchery because it is downstream. Keely Murdoch compared fish homing to the Easton Acclimation Site to White River spring Chinook salmon that reliably swim past their natal hatchery. She said it appears they home to the highest familiar upstream input. Dittman suggested that Methow spring Chinook salmon may home better if they were reared in a hatchery much farther away from their natal sites, and then acclimated and released, in order to prevent familiar olfactory inputs from the hatchery confusing them as they migrate upstream. Murdoch said Wells Fish Hatchery (FH) and Eastbank Hatchery are both downstream of natal acclimation sites and perhaps far enough away to increase natal homing.

B. Methow Spring Chinook Salmon Gene Flow Sliding Scale (Charlene Hurst)

Charlene Hurst shared a spreadsheet titled, "Methow spring Chinook Gene Flow Analysis" (Attachment C), which Sarah Montgomery distributed to the Hatchery Committees on February 19, 2016. Hurst reviewed the updated spreadsheet. She said the cutoff at which wild fish should not be collected as broodstock is set at 100 fish. She said partial proportion of hatchery-origin spawners (pHOS) is calculated differently by NMFS and the PUDs, and inputting the natural run, or an estimate of it in the spreadsheet, results in an output of both pHOS values. She said NMFS would like to see an overall proportionate natural influence (PNI) value of 0.5 or higher. She said Winthrop NFH broodstock currently has an assumed 75 percent contribution of Methow FH returns in the model, and if the contribution of Methow FH to Winthrop NFH broodstock increased, the overall 3-population PNI would also increase. She said the three-population gene flow model can also be used as a two-population model if the Winthrop program is input as zero. Craig Busack said the Hatchery Committees need to agree on management standards for their program based on the three-population gene flow model. He said NMFS is proposing a sliding scale for PNI and pHOS for the PUD program and a percentage for PNI and pHOS for the Winthrop program. Bill Gale said adult management is a joint operation between the programs, and the permits need to fit together to meet that requirement. Todd Pearsons asked why a sliding scale is not proposed for the Winthrop program. He said it does not make sense to have the same percentage of hatchery-origin fish on the spawning grounds regardless of their abundance, especially for a program that is not expected to contribute to natural populations. Tom Kahler asked how the tool and sliding scales translate to management. He said aggressive adult management would be necessary to maximize removal of hatchery returns (particularly those from WNFH) in all but the worst return scenarios.

Busack said the tool would inform when adult management should be less or more aggressive.

Gale said, using this tool, Winthrop National Fish Hatchery (NFH) would always need to aggressively remove adults in order to meet its PNI and pHOS goals, which requires both Methow FH and Winthrop NFH to be operating their respective weirs and traps. He said the weirs and traps would have to be operated to full capacity in order to manage Winthrop NFH goals and still allow Methow program fish to reach spawning grounds. Keely Murdoch said if these fish had higher homing fidelity, fewer would return to the hatchery overall. Tom Kahler said that if that were the case, it would be even more difficult to achieve the desired pHOS targets. Gale said the extraction rates at Winthrop NFH and Methow FH would be very high compared to historical rates, and it might be difficult to meet targets. Mike Tonseth said hatchery returns will be fewer for the next 10-year period (due to decreased program size), which means there will be fewer adults overall, but aggressive extraction would still be needed. Pearsons said the sliding scale makes sense for the PUD HCP programs because when there are fewer natural-origin spawners, hatchery-origin fish provide a demographic boost, and when there are more natural-origin spawners, the proportion of hatchery-origin fish should decrease. Tonseth said there are not enough data to determine how effective adult management can be at variable spawning escapements.

Kirk Truscott said low flow in the Methow River and thus relatively high discharge from Methow FH may have made the hatchery more attractive to returning fish, making adult management more successful in 2015 compared to an average year. Truscott asked what the ramifications would be of not meeting the gene flow targets defined in the spreadsheet. Busack said he will put flexibility in the permit language, and recognizes that the standards are high and may not be achievable in the 10-year period. Gale said changes in the program so far have made a big difference in the number of hatchery fish removed using adult management, and hopefully the natural population will respond. Referring to the gene-flow analysis spreadsheet, Truscott said “wild run” and “wild escapement” are not the same metric and asked if pre-spawn loss is accounted for. Greg Mackey said the 100-fish limit for natural-origin broodstock collection should be, “100 fish after pre-spawn mortality,” because not all of the fish will convert to the Methow River. Tonseth suggested footnoting the spreadsheet to better define “wild run.” Mackey said the Hatchery Committees could vote on the sliding scale, which only applies to the PUD programs. Gale said he will need more time to review the gene flow standards before agreeing to the standards for either the PUD or the Winthrop programs. Kahler said approval of the standards affects Douglas PUD’s contract with WDFW, and contract negotiations need to be completed in June 2016. Hurst said she will revise the gene flow sliding-scale spreadsheet and send it to the Hatchery Committees. Busack said he and Hurst will send an email to the Hatchery Committees describing the gene flow standards that NMFS proposes for Methow spring Chinook salmon, which will be a decision item during the Hatchery Committees conference call in early March 2016.