

**2001 Northwest Fish Culture Conference**  
**Agenda**

***TUESDAY, DECEMBER 4, 2001***

- 8:00 Registration Desk Opens
- 1:00 Welcome – Trent Stickell, George Nandor (Conference Co-Chairs, ODFW)
- 1:10 Keynote Address – Lindsay Ball (Director, ODFW)
- 1:20 Ed Bowles (Fish Division Director, ODFW)
- 1:40 Jay Nicholas (Oregon Watershed Enhancement Board)

**I. Investigative Fish Culture Techniques – Session Chair: Matt Frank**

- 2:00 Early Sexual Maturation in 1+ Age Male Spring Chinook Salmon: Examination of the Roles of Size and Fatness. – Karl Shearer, Penny Swanson, Briony Campbell, Brian Beckman, Paul Parkins, Brad Gadberry, Jon Dickey, and Walt Dickhoff (NMFS).

The incidence of early sexual maturation (before the first females have reached sexual maturity) of male chinook salmon appears to be higher in hatchery-reared males than in their wild counterparts. This reduces the effectiveness of both enhancement and conservation hatcheries. I will present the results of four experiments, conducted from 1993 to 2001, that examine the relationships among growth rate (size), fatness and the incidence of male sexual maturation at 1+ years of age. In brief, our results indicate that the decision to mature sexually is made in the late fall or early winter prior to spring maturation. Growth rate, or size, appears to be the most important factor determining whether a fish will begin to mature. Our results suggest that, in fish larger than 8 g, the larger the fish is by the previous late fall or early winter, the greater the chance that it will sexually mature by the following spring. An apparent exception is that low body fatness tends to reduce the incidence of maturation in small fish. Our results indicate that it may be necessary to alter current rearing practices to reduce the incidence of early male sexual maturation in spring chinook salmon.

- 2:20 Heating and Chilling Water to Meet Program Goals. – Loren Dingwall (WDFW).

This paper describes the equipment and use of heated and chilled water on fish eggs to advance or retard egg development. Three systems are used, chilled raw, heated raw, and heated re-circulated. Methods presented are simple and cost-effective.

- 2:40 Break

- 3:00 Drawing

- 3:10 Partial Spawning of Adult Winter Steelhead. – Bob Hudspeth (ODFW).

The purpose of this project was to find any significant changes in the viability of eggs if portions of the eggs were removed from individual females over varying periods. One practical use for this technology would be to partially spawn wild fish and then return them to the stream where they could spawn naturally while keeping some of their offspring to be reared in the hatchery. This could give us the potential to use the genetic input from a population of wild fish and still allow them to spawn in the wild. It could also allow us to utilize a larger number of wild fish without creating egg surpluses in wild broodstock programs. After initial removal of approximately 1,000 eggs from each female, the fish were held in numbered holding tubes. These fish were then spawned again at intervals ranging from 2 to 13 days. At eye up, all eggs were counted. This study was conducted with returning hatchery stock winter steelhead and was concluded at eye up of the eggs. Eggs were incubated in standard vertical incubators using 5 GPM. Loss percentages were not consistent one way or the other, probably due to the variables common in fish culture. Average losses for initial egg takes were 5.5%, while the other groups averaged a slightly higher loss of 7.3%. The results show that, in most cases, after removing the initial portion of eggs from a female, the remaining eggs continued to be viable up to and including 13 days.

- 3:30 The Effect of Automated Sub-Surface Feeders on the Behavior and Predator Vulnerability of Fall Chinook Salmon. – Desmond Maynard, James Hackett, Michael Wastel, Anita LaRae, Gail McDowell, Thomas Flagg, and Conrad Mahnken (NMFS).

The study compares how automated-subsurface and hand-surface feeding techniques effect the growth, in-culture survival, behavior, and predator vulnerability of fall chinook salmon. Three 6,000 liter fiberglass raceways were fitted with a feeder system that automatically delivered food below the water surface. The three control raceways were fed by hand scattering pellets across the surface. Each raceway was stocked with 4,800 fall chinook salmon with the fish in both treatments being reared and handled in a

similar manner except for feeding method. Within a month, fish in the hand fed raceways became conditioned to swim over to the person feeding them and would swarm at the surface competing for food. Fish in the automated subsurface feeder raceways would never swim over to people working near the surface of their raceway. Underwater video taping indicated no significant difference in the vertical distribution of fish in the two treatments. Fish removed from both treatments that were individually observed in 2001 tanks also displayed identical depth preferences. Fish from the two treatments were equally vulnerable to merganser predation as quantified in test arenas. Fish from both automated and hand fed treatments exhibited a fright response to inanimate objects and bird models displayed beside the rearing raceway. Fish from the automated feed delivery group also exhibited strong fright responses to the image of a human standing beside the raceway, while the hand fed group approached the image; suggesting specific image conditioning. In-culture mortality in the automated subsurface feeder raceways was nearly double that in the conventional hand fed raceways (7.2 vs 4.4%). We conclude that while broadcast hand feeding at the surface conditions fall chinook salmon to approach the image of humans, it may not increase susceptibility to predation.

### 3:50 Salmon Culture Methods in the Russian Far East. – Marianna Meshkova, Vladimir Samarskiy, and Tatiana Shmigirilova.

The Russian Far East relies extensively on salmon for food and commerce. There is a long history of using salmon culture to augment and enhance natural populations of pink, chum, coho, chinook, sockeye, and cherry salmon. There are also recent efforts to use fish culture methods to attempt restoration of reduced or extirpated salmon runs. This presentation will briefly describe and illustrate fish culture methods in use now at facilities in the Sakhalin, Amur, and Kamchatka areas of the Russian Far East and summarize some current issues.

### 4:10 Logistics of Collecting and Holding Angler Caught Alsea Basin Winter Steelhead Brood Stock. - Tim Schamber (ODFW).

A new hatchery reared winter steelhead program was created in the Alsea Basin. Alsea hatchery was utilized for the spawning, incubation, and rearing of progeny taken from wild steelhead. The criteria for random collection and spawning dictated a need to be able to capture, transport, hold, and monitor individually all fish collected. To accomplish this project a group of anglers were organized to collect adults by angling. The logistics of holding fish during angling operations, transportation, and pre-spawn holding and monitoring was accomplished using a 6"x36" PVC tube. The tubes have one fixed barred end and one removable barred end to allow water flow through the tube. The tubes allowed anglers to transport fish along side drift boats. Tubes could be tied off at anyone of eight designated fish pickup points for hatchery pickup or fish could be transported by anglers using aerated fish boxes. Upon arrival at the hatchery, each tube was assigned a number and placed on a holding rack that had been erected in a raceway pond. Fish were successfully held in tubes until post spawn released. This method of holding allowed the program to successfully collect, monitor, treat, spawn, and maintain a record of all actions taken from collection through release of each individual fish.

### 4:30 NATURES Semi-natural Raceway Habitat: The Forks Creek Experience. – Desmond Maynard, Gail McDowell, Thomas Flagg, Conrad Mahnken, and Robert Iwamoto, (NMFS), Brodie Smith, and Barbara Cairns (Long Live the Kings), and Chuck Johnson (WDFW).

Natural Rearing Enhancement (NATURES) studies conducted from 1992-1994 have shown that the in-stream survival of chinook salmon reared in raceways with semi-natural habitat composed of gravel substrates, in-stream structure, and overhead cover may be 25 to 50% higher than that of salmon reared in conventional raceways. A new experiment was initiated at the Washington Department of Fish and Wildlife Forks Creek Hatchery to determine if semi-natural raceway habitat also increases smolt to adult survival. Since 1997, fall chinook salmon have been reared from swim-up fry to zero-age smolt in 9.75 m long raceways. Each year, half of the raceways have been fitted with semi-natural habitat composed of gravel paver substrate, conifer in-stream structure, and camouflage net overhead cover, while the other half are maintained as conventional controls. The raceways fitted with semi-natural raceway habitat can be cleaned with conventional vacuum technology and require only a minor increase in maintenance effort. The in-stream survival of smolts reared in semi-natural raceway habitat averaged 3.8, 10.0, 24.0, and 1.0% higher than their conventional counterparts in 1997, 1998, 1999, and 2000 respectively. The relative in-stream survival advantage for semi-naturally reared fish was greatest (10.0 and 24.0%) in years when baseline (control) survival was less than 61% (60.6 in 1998, 59.3 in 1999). In years, when baseline survival increased above 73% (73.3 in 1997, 80.2 in 2000) the relative survival difference was reduced (3.8 and 1.0%). Theoretically, survival advantages of NATURES may be highest when survival difficulties (e.g., predation) are most severe. The recovery of coded wire tagged salmon released to the sea will be followed over the next five years to determine if semi-natural raceway habitat rearing produces similar increases in smolt to adult survival.

### 4:50 Drawing

6:00 – 7:30 Social – Hosted by Bio-Oregon, EWOS, Moore-Clark, Rangens, and Sterling Silver Cup – Vendor Display Room – You must have your tickets with you to receive complimentary drinks!

Note: Please thank all the feed company representatives for supporting our conference!

**WEDNESDAY, DECEMBER 5, 2001**

**II Fish Propagation and Conservation–Program Updates–Session Chair: Scott Lusted**

8:10 Drawing

8:20 Successful Natural Production of Hatchery Spring Chinook Salmon: A Lesson from Lookingglass Creek in Eastern Oregon. – Michael McLean and Peter Lofy (Confederated Tribes of the Umatilla Indian Reservation), and Richard Carmichael (ODFW).

Hatchery-produced adult Rapid River stock (RR) spring chinook salmon that returned to Lookingglass Hatchery were used to evaluate the restoration of natural production in Lookingglass Creek. We compared life history characteristics and production indices of the adult RR and their naturally-produced progeny with those of the extinct Lookingglass Creek natural population (LCE), and other naturally-produced fish from Grande Ronde River (GRR) or other Columbia and Snake River basin tributaries (CSR). We released from 50 to 133 adult RR above Lookingglass Hatchery in 1992, 1993, 1994, 1996, and 1997. We estimated that in some years 9 to 198 additional fish passed the weir without capture. There was no significant difference in mean adults-per-redd among the RR, LCE, or CSR. The mean juveniles-per-redd for the RR (1993 to 1997) cohorts was higher than the mean for LCE (1965 to 1969) and GRR (1993 to 1997) cohorts. Monthly median fork lengths of juvenile salmon from the RR cohorts were similar or greater than the range for the LCE cohorts. Downstream movement of juveniles for the RR cohorts peaked 1 to 2 months later in the fall than the LCE cohorts. Juveniles from both the RR and LCE moved downstream predominantly as sub-yearlings. RR fish that were PIT-tagged exhibited arrival timing at, and survival indices to, Lower Granite Dam within the range observed for GRR fish. Progeny-per-parent ratios for RR fish were similar to those estimated for GRR.

8:40 Status of the Grand Ronde Basin Spring Chinook Salmon Captive Broodstock Program. – Timothy Hoffnagle, Richard Carmichael, William Noll, and Patrick Keniry (ODFW).

Extremely low returns of adult spring chinook salmon (*Oncorhynchus tshawytscha*) compelled the initiation of a captive broodstock gene conservation program for the Grande Ronde Basin. The program began in 1995 with collection of wild parr from each of Catherine Creek, Lostine River and upper Grande Ronde River with the objective of restoring population numbers to 150 returning adults while maintaining genetic diversity and integrity of each stock and nearby wild stocks. Up to 500 wild parr are collected from each stream and cohort and reared to smoltification at Lookingglass Fish Hatchery. From smoltification to adulthood they are reared in freshwater at Bonneville Fish Hatchery or in saltwater at Manchester Marine Laboratory. Performance indices, such as growth, survival, fecundity and fertility rates, sex ratios, age of maturity and causes of mortality, were measured, recorded and evaluated for each stock, cohort and treatment and F1 generation fish were monitored for survival, growth, migration and return indices. Indices were compared among stocks, cohorts and treatments and with expected rates from the literature that were used to develop this program. The Captive Broodstock Program has met or exceeded most, but not all, expected rates. Unresolved problems remain, including: inability to collect parr each year in Grande Ronde River; BKD-caused mortality and culling; low growth rate; synchronizing maturation timing with wild fish; low fecundity, egg-to-smolt survival, smolt production and migration survival of; and disposition of excess F1 fish in years of overproduction. This program will provide information that will be useful to other, similar efforts.

9:00 Reconditioning of Wild Steelhead Kelts. – Joe Blodgett and David Fast (Yakama Nation Fisheries).

Results of three years of reconditioning steelhead kelts in freshwater tanks will be discussed. Condition of the spawned out adults at time of capture is strongly related to survival and redevelopment of gametes. Another important factor in reconditioning kelts is successfully transitioning to commercial feed. Different diets were tested to determine relative time to first feeding, and percentage of fish that eventually feed. Reconditioned adults are released in mainstem Yakima River and allowed to return to natal streams and spawn naturally. Reconditioned adults are radio tagged at release to determine when and where spawning occurs.

9:20 Saltwater vs. Freshwater Rearing in the Grande Ronde River Basin Spring Chinook Salmon (*Oncorhynchus tshawytscha*) Captive Broodstock Program. – Matthew Snook, Timothy Hoffnagle, Richard Carmichael and William Noll (ODFW).

A captive broodstock gene conservation program was developed in 1995 for Grande Ronde Basin spring chinook salmon (*Oncorhynchus tshawytscha*) due to extremely low adult returns. Up to 500 wild parr were collected in each of Catherine Creek, upper Grande Ronde River and Lostine River. These fish are reared to smoltification at Lookingglass Fish Hatchery and from smolt to adult in either freshwater (Bonneville Fish Hatchery) or saltwater (National Marine Fisheries Service, Manchester Marine Laboratory) after smoltification. At maturity the saltwater-reared fish are transported to Bonneville Fish Hatchery for spawning. We compared survival, growth and spawning characteristics between fish reared in either freshwater or saltwater and spawned in 1998-2001. A greater percentage of fish reared in freshwater survived to spawn and freshwater produced larger fish of both sexes at each age. Four-, five- and six-year old freshwater females were longer, heavier and/or with higher condition factor (K). Three-year old freshwater males had greater length, weight and K and four and five-year-old males had higher K. Mean age of spawners was lower (2.9 years vs. 3.0 years) in freshwater males, but not different for females. Mean fecundity was higher but number of eggs / kg was lower in freshwater females. Mean number of eggs / kg decreased with age of freshwater females but increased with age for saltwater

females. Mean fertility, hatching success and time of spawning within the spawning season were similar between the two treatments. These results will be used to improve rearing methods in this and other captive broodstock programs.

9:40 **Precocial Maturation and Migration in Yearling Hatchery Chinook Salmon, Umatilla River, Oregon. – Christian E. Zimmerman (Alaska Biological Science Center) and Wes Stonecypher (ODFW).**

Hatchery-produced fall and spring chinook salmon, (*Oncorhynchus tshawytscha*), return to the Umatilla River, Oregon as mini-jack, precocial yearling males. In some years mini-jacks comprise up to one half the Umatilla River return. Our goal was to determine if mini-jacks migrated to saltwater, or stayed in the Columbia River prior to returning. In 1999-2000 we collected otoliths from adult male fall chinook salmon, fall and spring chinook salmon mini-jacks and from a reference group of fall chinook salmon juveniles held in the Columbia River 14 days. All mini-jacks and adults were of hatchery origin confirmed by coded wire tag recovery and had been released after one month of acclimation in the Umatilla River. We tested Sr/Ca ratios across the otoliths with microchemistry to determine whether they spent time in saltwater. Analysis of water chemistry data confirmed that mini-jacks migrated at least 350 km to the estuary or further into saltwater prior to returning. They all had gonadotropic indices over 5% similar to adults and jacks. Factors that may contribute to mini-jack development include size and date at release, acclimation (one month versus over-winter), and heritability within certain stocks at different hatcheries. Management implications include fewer returning adults, overestimated of escapement since mini-jacks are included in some determinations, potential fishery and interference with other chinook salmon stocks.

10:00 **Break**

10:20 **Drawing**

10:30 **Spring Chinook Salmon on the Warm Springs Indian Reservation of Oregon. – Bob Spateholts (Confederated Tribes of the Warm Springs Reservation of Oregon) and Doug Olsen (USFWS).**

Spring chinook salmon (*Oncorhynchus tshawytscha*) have been a vital component of the culture, nutrition and economy of the Indian tribes of the Columbia Basin for thousands of years. A variety of human and natural impacts have eliminated or reduced naturally spawning stocks. In the 10,000 square mile Deschutes River drainage, the only remaining wild populations of spring chinook exist in the Warm Springs River and Shitike Creek, both of which are entirely within the boundaries of the Warm Springs Indian Reservation of Oregon. Life history parameters, including spawning escapement, redd production, juvenile out-migration, harvest, and adult returns have been monitored through cooperative efforts for more than 25 brood years. The population has fluctuated dramatically over the study period. During droughts of the late 1960's, late 1970's and early 1990's the population declined. Strong year classes have been associated with good water years. The population has been very resilient, and the 1996 and 1997 brood years have produced record numbers of returning adults. Furthermore, operation of Warm Springs National Fish Hatchery is an integral component of production of spring chinook salmon on the Warm Springs Indian Reservation. Hatchery fish provide a harvestable surplus for tribal and sport fisheries and also provide a source of live adults and carcasses for use as out-plants and for nutrient enrichment in streams underseeded by natural production.

10:50 **Hatcheries, Harvest and Wild Fish: An Integrated Program at Warm Springs National Fish Hatchery, Oregon. – Doug Olsen (USFWS) and Bob Spateholts (Confederated Tribes of the Warm Springs Reservation of Oregon).**

Warm Springs National Fish Hatchery is operated by the U.S. Fish and Wildlife Service and is located on the Warm Springs River within the Warm Springs Indian Reservation of Oregon. The Warm Springs River is a major tributary of the Deschutes River in north central Oregon, which enters the Columbia River 205 miles from the Pacific Ocean. The purpose of the hatchery program is to cooperatively manage the hatchery with the Confederated Tribes of the Warm Springs Reservation of Oregon to provide harvest opportunities and protect wild fish populations. The management objectives established for the hatchery are: 1) produce fish for harvest, 2) maintain wild fish traits in the hatchery and stream environment, 3) minimize impact on wild fish to very low, acceptable levels, and 4) develop and implement a hatchery operations plan to achieve our harvest and conservation goals for Warm Springs River fish populations. The management of Warm Springs National Fish Hatchery demonstrates a sustainable program which integrates hatcheries, harvest and wild fish production.

11:10 **Cle Elum Supplementation and Research Facility First Adult Returns. – David Fast, Jason Rau, and Charles Strom (Yakama Nation Fisheries).**

An overview of the research program of the Yakima/Klickitat Fisheries Program will be presented. The purpose of this program is to determine the efficacy of using supplementation to increase natural production of Spring Chinook salmon in the basin. The program is testing production levels of juveniles reared under two strategies; the Optimum Conventional Treatment or OCT (hatchery practices that are most successful in producing fish) and the Semi-Natural Treatment of SNT (rearing that includes overhead and instream cover, underwater feeders, and painted raceway walls. The research includes studies in four main areas; genetics, post-release survival (as smolts and returning adults), reproductive ecology, and ecological interactions. The program is in its fifth year of brood stock collection, with one year of adult returns completed.

11:40 Fish Culture Hall of Fame Induction Ceremony.

12:00 Lunch

1:00 Drawing

### **III Fish Health – Session Chair: Rich Holt**

1:20 Case Studies from the National Wild Fish Health Survey. – Susan Gutenberger and Kenneth Lujan (USFWS).

Fish have been sampled from sites in Washington, Oregon, Idaho and beyond to help understand the health profile of wild, naturalized, and native fish. Through 1997 to 2001, over 4000 fish and 20 species have been examined by the Lower Columbia River Fish Health Center for the National Wild Fish Health Survey. Generally, the fish have been healthy and rarely has overt disease been noted. However, the pathogen causing bacterial kidney disease, *Renibacterium salmoninarum* is commonly found in the salmonids and other bacterial pathogens including *Aeromonas salmonicida* (furunculosis) and *Flavobacterium psychrophilum* (cold water disease) have also been noted in species as diverse as Pacific lamprey and steelhead. Two isolations of infectious hematopoietic necrosis virus in chum salmon and steelhead have also been made. Several case histories from the Lower Columbia River Fish Health Center will be presented.

1:40 Botulism at Winthrop National Fish Hatchery. – Ray Brunson and Chris Pasley (USFWS).

During the summer of 2001, coho that were being reared at Winthrop NFH started dying in a fashion typical of an infectious agent. Normal diagnostic procedures commonly used produced no likely causes. The authors explore the case history of this episode, present mortality curves, diagnostic photos and ultimate diagnosis. This case illustrates and documents potential hazards and situations that fish culturists may encounter in the current pursuit of “natural rearing methods”, and suggests options to avoid such situations in the future.

2:00 A Preliminary Report on: The Adaptation of Wound Repair Trial Techniques at Round Butte Hatchery, to Evaluate the Ability of Dietary Enhancement, to Improve the Stress Response of Spring Chinook and Steelhead. – Steve Boggio (Moore-Clark), Jack Palmer, Jim Struck, Jeremy Puckett, and Paul Brown (ODFW)

Production enhancement hatchery managers are often faced with needing to evaluate and adapt new fish feed technology to improve their production programs, which are often constrained by environmental and stock specific variables that can be unique to that hatchery. New fish feed products on the market, designed to impart improved health and better ability to respond to stress, have made conventional hatchery trial methods of marginal use in evaluating and understanding these product benefits, due to the variability associated with acute stress and how it effects program performance. This study examined using previously reported wound repair methodology to more specifically and equivocally evaluate whether current immuno-stimulant technology made available by the PROACTIVE feed produced by Moore-Clark, and recommended feeding programs, are useful for producing fish better able to survive and tolerate acute stress. The goal was to find a better tool for enhancement hatcheries to use for evaluating the effectiveness, and learning to adapt PROACTIVE feed, or other dietary enhancements to improve stress response, in this production enhancement environment. Unique aspects of the method included: 1. Combining experimental groups in hatchery tanks to provide homogeneous access to feed, and exposure to stress. 2. Individually weighing and measuring fish to allow assessment of individual treatment populations. 3. Adopting yes/no parameters for assessing wound healing and the occurrence of inflammation (Picture 1). 4. A 3 x 4 factorial design to provide a range of stress and feeding options that allow evaluation of both benefit and potential implementation strategy, in a format to allow technical staff to better collaborate on interpretation of results. Improved rate of wound closure and occurrence of wound inflammation were documented ( $P < .05$ ) in several dietary treatments. Suggestions for further refinement of this method are discussed.

2:20 Spawning Techniques to Reduce the Levels of Bacterial Kidney Disease in North Santiam River Spring Chinook. – Terry Jones and Tony Amandi (ODFW).

North Santiam spring chinook salmon (*Oncorhynchus tshawytscha*) carry Bacterial Kidney Disease (BKD), which is vertically transmitted from adult to offspring. In 1991, OSU Microbiologists, in cooperation with the ODFW Pathologists and Marion Forks Fish Hatchery began a study to determine the levels of BKD in chinook salmon. This involved taking kidney samples from both adults and smolts and testing them by ELISA to determine if the kidneys contained either low, medium, high positives or negative levels. Before 1992 there had been limited action taken in controlling this disease. In 1992 -1995 adult fish were tested but their offspring were not destroyed. In the 1994-1997 action was taken to prevent the smolts from dying by feeding 2 treatments of medicated feed for 21 days. This treatment seemed to have a positive effect on the smolts but adults continued to return with positive BKD results. In 1996 several new spawning techniques were implemented to begin rearing BKD negative smolts. During spawning, eggs were collected and kept in separate numbered mesh bags, disinfected and placed in BKD free water until the water hardening process was completed. Eggs were then placed in incubators with numbers corresponding to the female that was ELISA tested. Once the lab identified BKD positive females, the eggs from that female were destroyed. In 1996 there were not enough BKD negative eggs and eggs containing low levels of BKD were used to meet production goals.

2:40 Culling of Eggs from BKD Positive Spring Chinook Females Can Lead to Reductions of the Disease in Smolts and the Use of Medicated Feed. – Tony Amandi and Leslie Lindsay (ODFW).

A culling program to remove eggs from BKD positive parents began in 1993 with Willamette River stock spring chinook salmon, and was expanded over the next four years to encompass all the Willamette River system stocks. The culling was initiated as an attempt to decrease the BKD outbreaks during rearing and reduce the level of BKD in out-migrating smolts. Outbreaks of BKD in culled negative fish have occurred only at McKenzie Hatchery where *R. salmoninarum* is highly prevalent in the water supply. The numbers of infected smolts prior to release has been reduced dramatically at all the facilities since the culling program started and just as important, the number of fish with moderate or high levels of BKD have decreased to few or none in all the stocks. In conjunction with the elimination of eggs from BKD positive fish, a reduction in the amount of erythromycin (approximately 1,351 pounds per year) being fed prophylactically at four of the five facilities has resulted in substantial cost savings (approximately \$46,200 per year).

3:00 Break

3:20 Drawing

3:30 In Hatchery Survival, First-Time Dam Detections and Incidence of Bacterial Kidney Disease in Oregon Captive Brood Spring Chinook Progeny Reared at Lookingglass Hatchery Under Varying Levels of BKD Segregation: Is There Value in BKD Segregation/Culling? – Sam Onjukka, Glenda Claire, Brett Farman and Bob Lund (ODFW).

Part of the Lookingglass Hatchery program located in Northeast Oregon is to rear Lostine River, Catherine Creek and Upper Grande Ronde River progeny from the Oregon spring chinook captive broodstock program. Brood year 1999 progeny from these three captive brood stocks were ponded and reared based on the *Renibacterium salmoninarum* (Rs) antigen levels of the female parents. Generally there was a positive relationship to maternal BKD levels (BKD segregation) with respect to all four parameters measured during fish health monitoring. Real potential risk exists from BKD loss associated with rearing progeny from captive populations with elevated maternal BKD levels. There were PIT-tag dam detection differences between the higher risk BKD segregation raceways and other raceways indicating poorer out-migration survival. The significant levels of Rs antigen detected in grab-sampled fish at pre-liberation indicates the real potential for continued loss during out-migration and beyond, impacts to other out-migrant stocks, amplification of Rs in stocks? Answer to question in title: YES! The message and value of BKD segregation rearing and/or culling (PREVENTION CONTROL) needs to continue to be stressed to fisheries program decision makers.

3:50 Chemical Contaminants in Fish Food and Juvenile Chinook Salmon. – Gina Ylitalo, Leslie Kubin, Mary Arkoosh, Margaret Krahn, and Tracy Collier. (NMFS).

Populations of wild Pacific salmon are declining, and it is accepted that various natural and anthropogenic factors have contributed to the decline of these salmon populations. Exposure to toxic contaminants may indirectly affect populations of salmon, for example, by increasing susceptibility to opportunistic pathogens at lower exposure levels than are necessary to observe direct toxicity, especially fish that migrate through contaminated estuaries and waterways. We have an ongoing program that measures contaminant levels and associated biological effects in juvenile Pacific salmon. As part of this effort, tissues of juvenile chinook salmon (*Oncorhynchus tshawytscha*) from various estuaries in Washington and Oregon were analyzed for polychlorinated biphenyls (PCBs), DDTs and aromatic hydrocarbons. As expected, whole bodies and stomach contents of chinook salmon from urban estuaries contained higher levels of bioaccumulative PCBs and DDTs than did the tissues of fish from non-urban estuaries. Surprisingly, however, juvenile chinook salmon from some hatcheries in Washington and Oregon contained levels of PCBs and DDTs that were comparable to those measured in juveniles from urban estuaries. As a result of these findings, we analyzed several samples of fish food to determine if hatchery food was a potential source of contaminants in hatchery fish. Hatchery food contained a wide range of contaminant concentrations and juvenile chinook salmon from the hatcheries are bioaccumulating chemical contaminants from certain fish foods as well as from other sources in estuaries.

4:10 Efficacy of AQUI-S<sup>TM</sup> as an Anesthetic on Various Life-Stages of Rainbow Trout (*Oncorhynchus mykiss*). – Jim Bowker, Dan Carty, Molly Poehling, Dave Erdahl and Bonnie Johnson (USFWS).

The use of anesthetics is an important tool with broad application to fisheries management programs. Most often, anesthetics are used to reduce stress associated with the handling or transportation of fish. Anesthetics are widely used both in the culture of captive populations, and in field situations that involve the management of wildstock fish populations. Although a number of compounds have been used in the past, currently, the only approved anesthetic for use on fish is tricaine methanesulfonate (i.e., FINQUEL and Tricaine-S). While FINQUEL and Tricaine-S have been found to be effective anesthetics for use in aquaculture, both products require a 21 day withdrawal period after treatment before harvestable fish can be released. This requirement greatly restricts approved use in many cultured populations and wildstock populations. AQUI-S is a new anesthetic that is approved for use in New Zealand and several other countries as a zero-withdrawal time product. Efforts are currently underway in the United States to gain U.S. Food and Drug Administration approval for the use of AQUI-S as an anesthetic with no withdrawal period. The active ingredient in AQUI-S is approved for human consumption in the U.S. when used as a food flavoring (21-CFR 172.515). A recent study conducted at the Bozeman National INAD Office evaluated various life-stages of rainbow trout treated with AQUI-S at concentrations

ranging from 5 - 80 mg/L to induce handleable and anesthetized fish. Preliminary results indicate that if approved by FDA, AQUI-S may be a useful tool for aquaculturists and field biologist.

4:30 History of Liberations in the State of Oregon. – Dennis Dahrens (ODFW, Retired).

Fish transportation has come a long ways since the day of the horse and buggy. Nearly 100 years of development has brought fish transportation to a new level. Life support systems that are more dependable has taken a lot of the stress off of drivers; better and easier to get to liberation sites has added to less stress on fish as well as drivers; diesel powered trucks, comfortable seats, brakes that actually work, and sweet music radios have definitely been an improvement. One would wonder what some of the earlier liberation wagon or truck drivers would think about today's liberation units.

5:00 Drawing

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6:00 Executive Committee Meeting – Room 1555

Please have representatives from each sponsoring agency attend!

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**THURSDAY, DECEMBER 6, 2001**

**IV. Fish Propagation and Beyond – Session Chair: Jack Hurst**

8:20 Drawing

8:40 A Historical Perspective of the Columbia River Indian Fishery. – Steve Olhausen (USFWS).

The Columbia River Indian Fishery has been going on for about 10 thousand years. Although the fishery was spread out over the entire basin, where salmon had access, the central and most important area was Wyam or Celilo Falls. It was the pivotal trading area for the various tribes inhabiting the Columbia basin, and salmon the most important commodity. Celilo was formed 13 to 16 thousand years ago by a series of eroding glacial floods. Legend has it that the salmon were blocked by a great dam of rocks built by five sisters and that the spirit Coyote tricked the sisters and broke down the dam so salmon would come to feed the people of the river. The rocks from the broken dam made the falls that was Celilo. The fishery consisted of dipnetting, spears and weirs in ancient times. Since the flooding of Celilo behind the Dalles Dam, dipnets and set gillnets are now currently used. Since the Belloni decisions of the 1960's and 70's the fishery is now a regulated and monitored activity giving the four treaty tribes 50% of the harvestable surplus of fish destined for their usual and accustomed fishing areas. With the decline of salmon and steelhead in the Columbia Basin and subsequent ESA concerns, the reliance of hatchery fish has made it possible for the tribes to continue with their tradition of fishing and has provided for subsistence and economic opportunities. With our help, the heritage, customs, traditions of the Indian people and the salmon will prevail for the old and the young.

9:00 Oregon Volunteer-Based Salmon and Trout Enhancement Program (STEP): Propagation Activity Overview and Examples. – Tom Stahl and Tom Rumriech (ODFW).

The Salmon and Trout Enhancement Program (STEP) is a volunteer-based program within the Oregon Department of Fish and Wildlife (ODFW) that seeks to enhance salmon, trout, and other fish resources of the state, and the fisheries dependent on these species. STEP activities are varied, as are the individuals or groups participating in STEP. Activities can be grouped into four main categories: monitoring (fish and habitat surveys), habitat restoration (riparian and in-stream), education (classes and materials), and propagation. Propagation activities which STEP volunteers undertake include broodstock collection and holding, spawning, egg incubation, rearing, acclimation, and release. Most of the facilities which STEP groups utilize are built and run by the volunteers with ODFW assistance and oversight. The purpose of these programs is to rehabilitate or supplement populations of naturally produced salmon and trout and augment fisheries with hatchery fish. STEP propagation programs will release approximately four million salmon or trout in the next year. One of the most successful propagation programs is conducted in Coos County. A history of this varied program will be presented in order to give an idea of STEP propagation program's origins, scope, and management.

9:20 Fish Propagation and Beyond: A Harvest Perspective. – Steve King (ODFW).

Hatchery production of salmon and steelhead is the mainstay for Oregon's fisheries. In recent years, nearly all of Oregon's spring chinook, coho, and steelhead sport fisheries have been restricted to fin-clipped hatchery fish with wild fish released unharmed. Fall chinook fisheries still occur on healthy coastal and Columbia upriver bright wild fall chinook. The Columbia River commercial gill-net fishery will use the tangle net in 2002 for live capture of spring chinook and only hatchery fish can be retained. The ocean commercial troll fishery off the Columbia River mouth is restricted to adipose fin-marked coho only. Other summer and fall commercial salmon fisheries (ocean and Columbia) are focused on hatchery fish with wild fish impact limits driving their harvest levels. It is paramount that fish culturists and fishery managers work together to produce the best hatchery product possible to ensure Oregon's fisheries. Fishery managers are responsible for implementing fisheries to harvest hatchery returns at the highest level

possible (within wild fish and other constraints) to reduce surpluses at hatcheries. Managers should also periodically review mitigation agreements for lost wild fish production to ensure society is receiving full compensation.

**9:40 New Life for Old Ponds. – Paul Kluvers (ODFW).**

ODFW has numerous older hatcheries that are in various stages of deterioration. With shrinking budgetary resources and shifting missions, more is being asked of these aging facilities. To meet the changing needs of the agency and the facilities, the existing ponds must be repaired and modified. This paper and presentation will outline methods ODFW Engineering has employed to meet the changing Agency needs and work within the operational constraints of the facility. Topics that will be discussed include: causes of concrete and structural degradation, methods of concrete repair/restoration and their success, use of epoxies, crack and joint repairs, and pond coating systems. Methods of contractor selection will also be discussed.

**10:00 Break**

**10:20 Drawing**

**V. Public Outreach – Session Chair: Deb Eddy**

**10:30 Rising from the Ashes: 2000 vs. 2001 Free Fishing Day Event at Leaburg Hatchery. – Tim Wright (ODFW).**

Free Fishing Weekend is a statewide event that occurs in early June. The intent is to allow individuals who may not be familiar with fishing an opportunity to try it out with out having to purchase a license or tags. Many hatcheries host events that include educational displays and a chance to catch fish in a setting with a high degree of success. In 2000, Leaburg Hatchery hosted the first Free Fishing Day event at the hatcheries display pond. Even with 6 months planning, numerous problems occurred that resulted in a less than perfect event. After tremendous brainstorming and work from a diverse group of individuals and companies the 2001 event went off virtually with out a hitch. This presentation will detail the problems that occurred during 2000 and how they were solved resulting in a vastly improved 2001 event.

**10:50 ODFW's Information & Education Division. – Anne Pressentin (ODFW).**

**11:10 Use of Volunteers for Backpack Stocking. – Greg Grenbemer (ODFW).**

Located in the beautiful Cascade Mountains, Marion Forks Fish Hatchery has resurrected the once dubious task of getting fingerling rainbow, cutthroat and brook trout into many of the high lakes of the Mt. Jefferson Wilderness. With the rising cost of helicopter use for the stocking program, Marion Forks took on the treacherous task of hiking these fragile creatures into the pristine mountain lakes. The hatchery has taken on the job of stocking 15 to 25 lakes each spring with nothing more than a backpack and a bag of cheese-its. The equipment needed is an overnight size backpack that will hold a four galloon square bucket, plastic bag, water, ice and a hard working loyal Marion Forks employee. The bucket will hold up to 300 young trout, depending on size, for about 3 hours without aeration. When we plan longer hikes the use of a battery powered pocket aerator will give you some extra time.

**11:30 Elk River Fish Hatchery: An Operations Overview. – Robin Crisler (ODFW).**

Elk River Fish Hatchery has been in operation since 1968 producing fall chinook salmon, winter steelhead and rainbow trout. Chinook salmon reared at Elk River contribute to economically important sport and commercial fisheries from southeast Alaska to northern California. A full factorial matrix spawning method is perhaps unique among Oregon's coastal hatcheries, and uses all of the trapped adults to perpetuate genetic diversity and historic age-at-return composition. The Elk River fall chinook salmon is one of the indicator stocks evaluated for ocean exploitation under the Pacific Salmon Treaty.

**12:00 Final Door Prize**

**Alternate Speakers and Presentations:**

**\*\* Fish Health: A perspective on changes and advancements for the new century. – Dr. Pete Taylor (USFWS).**

This talk presents a broad overview of fish health over the past 50 years. Discussion on standardization, new methodologies and new areas of research opportunities are presented.

**\*\* Triploid Trout. – Bob Eselman (???)**



## **Poster Session**

### **Advances In Salmonid Restoration Using Moist Incubation, Otolith Marking, and Eyed Egg Out-planting. – Tod Jones (Clatsop Economic Development Council).**

Poster will show methods of incubation utilizing minimal water without prophylactic treatment, stress marking otoliths for evaluation, and out-planting stress-marked eyed eggs with the Salmon Egg Planting Device and Method.

### **Mobile PIT-tag Detection of Juvenile Salmonids in the Columbia River Estuary. – Richard Ledgerwood, Brad Ryan, and Edmund Nunnallee (NMFS).**

We developed mobile detection equipment to interrogate migrating juvenile salmonids (*Oncorhynchus* spp.) implanted with passive integrated transponder (PIT) tags. Mobile detection equipment was deployed using a pair-trawl in the freshwater portion of the Columbia River estuary near Jones Beach, river kilometer (Rkm) 75. Since 1995, nearly 30,000 PIT-tagged juvenile salmon have been detected using the pair trawl. In addition, we adapted this equipment for use on land to interrogate PIT-tags deposited by piscivorous water birds on Rice Island (Rkm 35) and East Sand Island (Rkm 8). Since 1998, over 155,000 PIT tags have been detected on bird colonies using the land-based equipment. In 2001, we also developed and tested a prototype saltwater detection system using a small trawl, and we anticipate sampling for PIT-tagged salmonids in the lower estuary using this equipment in 2002. Interrogations recorded using the trawls have been used to compare diel behavior, migration speeds, and survival among species and groups of PIT-tagged fish. Interrogations recorded on bird colonies have been used to evaluate relative vulnerability to predation among salmonid species, between hatchery and wild fish, and between transported and in-river migrating fish. Until these mobile interrogation systems were developed, PIT-tag interrogation was limited to stationary detectors at hydroelectric facilities, and no detection capability was available downstream from Bonneville Dam. These new detection methods provide an opportunity for researchers to utilize PIT-tag technology in the lower watershed and to better monitor predation on juvenile salmonids.

### **National Fish Hatchery Assessment in the Columbia River Basin. – Doug Olsen (USFWS).**

*How many U.S. Fish and Wildlife Service National Fish Hatcheries are there?*

Nationwide there are 66 National Fish Hatcheries, 7 Fish Culture Technology Centers, and 9 Fish Health Centers, totaling 82 facilities in 39 states. In the Columbia River basin, there are 12 National Fish Hatcheries, 1 Technology Center and 2 Fish Health Centers, totaling 15 facilities in 3 states (Idaho, Oregon and Washington) with support from 3 fishery resource management offices and one regional office.

*Why are we producing fish at National Fish Hatcheries in the Columbia River?*

National Fish Hatcheries are authorized by laws and agreements to mitigate for salmon and steelhead losses at Federal dams. These National Fish Hatcheries conserve fishery resources, meet tribal trust responsibilities, and provide sport and commercial fishing opportunities. Specific laws and agreements include Tribal Treaties of 1855, U.S. v Oregon (1969), U.S. v. Washington (1974), Mitchell Act (1938), Columbia Basin Project Act (Grand Coulee Mitigation 1940), John Day Mitigation Act, Lower Snake River Compensation Plan / Dworshak Mitigation Act, and Federal Statute 184 (1966).

*What is the Columbia River Fisheries Resource Office - Hatchery Assessment Team doing?*

Our office conducts production planning, marking, monitoring, and post-stocking evaluations. For example, in 2001, over 15 million fish were marked at our National Fish Hatcheries in the Columbia River. Marking can include fin clips, coded-wire tags, PIT tags, and branding. To keep track of hatchery programs, our office maintains the Columbia River Information System and participates on Streamnet and U.S. v Oregon Production Advisory Committees. We also develop Hatchery and Genetic Management Plans and Section 7 Biological Assessments for Endangered Species Act compliance. We develop collaborative projects to investigate diet, release, and rearing density to improve hatchery performance, as well as develop in-stream studies using traps, radio telemetry, and snorkeling to investigate behavior, wild and hatchery interactions and habitat use. Our vision for hatchery assessment is: 1) use National Fish Hatcheries to conserve populations, 2) produce fish for sport, commercial and tribal fisheries, 3) use National Fish Hatcheries to complement fish and wildlife production in their natural habitat, 4) develop partnerships for watershed-based projects in streams where we operate our National Fish Hatcheries, 5) work with engineers, landscape architects, biologists and fish culturists to design and operate hatcheries which simulate natural features, 6) advance education, research and management of our National Fish Hatcheries, and 7) build relationships and establish trust.

### **Assessment of florfenicol and oxytetracycline treatments to control an epizootic of coldwater disease. – Mary Peters Swihart, Steve Turner, Doug Dysart, and Susan Gutenberger (USFWS).**

The efficacy and safety of florfenicol was compared to that of oxytetracycline to control a naturally-occurring epizootic of bacterial coldwater disease in juvenile coho salmon (*Oncorhynchus kisutch*) at Eagle Creek National Fish Hatchery. The onset of the epizootic was related to the age of the fish and time of first feeding. Therefore, raceways were assigned to the two treatment groups and the control group based on their pre-treatment mortality and time of first feeding. The treatment groups received either 15 mg florfenicol/kg fish/day top-coated onto non-nutritive fish pellets for 10 days or 7 g oxytetracycline/100 lbs. fish/day for 14 days as treated feed. Efficacy of each drug and the safety of florfenicol were determined by comparing daily mortality counts during drug administration and 14-days post-treatment. Sensitivity to each antibiotic was assessed through bacterial cultures of kidney and brain tissues. Residues of florfenicol in whole fish were also analyzed. The florfenicol treatment was more effective in controlling the epizootic than oxytetracycline. Cumulative mortalities in the florfenicol group were also lower than the control group indicating that the florfenicol did not contribute to mortality and therefore was safe to use in this population of fish. Cultures of *Flavobacterium psychrophilum* (the causative agent of coldwater disease) were sensitive to both antibiotics before and after treatment. Residues of florfenicol were detected on the last day of treatment, but none found at days 6 and 14 post-treatment. These results suggest that florfenicol can be an effective treatment to control a naturally-occurring coldwater disease epizootic.

## The Survival of Unfed Hatchery Coho Fry Used to Supplement a Population. – Laura Jackson and Dave Loomis (ODFW).

For years ODFW volunteers have raised unfed fry for release in under seeded streams to help rebuild salmon populations. However, there has been little scientific evaluation of the effectiveness of these releases. Thus, the purpose of this study is to measure the survival of unfed, hatchery coho fry used to help supplement under seeded habitat. Brush Creek and Big Tom Folley Creek in the Umpqua watershed were selected as the treatment and control streams. These streams are similar in size, land use and had at least 3 years of pre-treatment coho smolt out-migration data. Coho were thermally marked at Rock Creek Hatchery by warming and chilling incubation water. This causes a recognizable pattern in the growth rings of the fish's otolith (ear drum bone). Voucher specimens were collected and sent to the Washington Department of Fish and Wildlife Otolith Laboratory as a template for the mark pattern. In 1999, 2000, and 2001 approximately 200,000 otolith-marked fry were released annually in Brush Creek. Survival was estimated by collecting every 12th coho smolt the following year and determining its mark status. Preliminary analysis of the 2000 and 2001 smolt data indicates that approximately 0.7 to 1.3% of the unfed fry survived to the smolt stage. They composed 52 and 57% of the smolt out-migration in 2000 and 2001. There was no significant difference between the lengths of marked and unmarked smolts or out-migration time. Smolts will be collected in 2002 to conclude the study. Then additional analysis will be conducted to look at survival estimates and if the unfed fry contributed to the coho smolt population in Brush Creek.

## Smolt Tissue Selenium Loss as a Measure of Accumulated Stress. – John E. Halver (UW), S.R. Felton, and R. Zbanyszek