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DOUBLETREE RIVERSIDE HOTEL
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Preface.

The Idaho Department of Fish and Game hosts of the 56th Annual Northwest Fish Culture Conference are pleased to welcome you to Boise, Idaho. This informal conference brings fish culturists, scientists and interested individuals from private, state, provincial, tribal and federal finfish hatchery facilities in the Pacific Northwest and elsewhere in North America to exchange information and ideas about all aspects of fish culture. These conferences are hosted on a rotating basis by the various fish resource agencies in the Pacific Northwest. The subject matter generally focuses on topics directly applicable to fish culture, but will include topics in fisheries management, research and other disciplines that are directly related to the science of fish culture. This conference is also used to renew old friendships, begin new ones, and develop personal contacts between those of common interest. All persons interested in fish husbandry are invited to attend and to actively participate.

The conference organizing committee would like to thank all speakers, poster authors and session leaders. Your contributions have made for a great conference program. Thanks to all authors who were able to meet our demanding deadlines for abstract and manuscript submission. Your cooperation and efforts have resulted in a quality publication. We also wish to thank all the trade show exhibitors and the generous prize donors for supporting the conference. We hope you enjoy both your stay in Boise and the 56th Annual Northwest Fish Culture Conference!

These Proceedings contain abstracts and manuscripts presented at the conference. They are unedited, contain progress reports of uncompleted programs, and, as such, should not be considered a formal peer-reviewed publication. Mention in these Proceedings does not indicate approval, recommendation, or endorsement of any proprietary product or material

Presentation Abstracts

MYXOBOLUS CEREBRALIS DISTRIBUTION IN THE UPPER SALMON RIVER, IDAHO: THE RIVER WATER SUPPLY OF SAWTOOTH HATCHERY

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Abstract
Two facilities, Pahsimeroi Hatchery and Sawtooth Hatchery, operated by the Idaho Department of Fish and Game remain positive for *Myxobolus cerebralis.* Both facilities rely on river water supplies to complete rearing of ESA-listed Chinook salmon to the smolt stage prior to release. We have previously reported the seasonal pattern of infectivity to rainbow trout sentinels exposed to these waters. Progress in reducing the exposure of cultured Chinook has been provided at Pahsimeroi Hatchery by Idaho Power Company through facility improvements and expansion of the well water supply. Restoration of the ground water supply volume for Sawtooth Hatchery has begun by LSRCP as the most cost effective method of expanding early rearing capabilities for Sawtooth Hatchery to avoid exposure to the parasite and other pathogens as well. We felt that determining the extent of *M. cerebralis* infectivity within the Salmon River water supply of Sawtooth Hatchery would assist these efforts.

The portion of the Salmon River upstream of Sawtooth Hatchery includes the terminus of the entire drainage, the longest free-flowing river system in the continental United States. The upland area within the Sawtooth Valley is within federal ownership while the river bottoms are privately held. Glaciation was extensive in the Sawtooth Range resulting in extensive gravel deposits and spring water that emerges at the valley floor.

Three trials with sentinel rainbow trout were performed in 2004 and 2005 to determine the distribution of *M. cerebralis* infectivity in the Salmon River upstream of Sawtooth Hatchery. The first trial was conducted during May at a time our previous projects demonstrated a high probability of infection. Exposure sites were selected to reveal the overall pattern of *M. cerebralis* infectivity throughout the drainage. Results of the first trial illustrated that infection was not present in Alturas Lake Creek, Camp Creek, Frenchman Creek, or Smiley Creek which join to form the Salmon River. There were, however, two areas in the Salmon River where infections seemed to originate: downstream of the confluence of Camp, Frenchman, and Smiley creeks and also in the main stem Salmon River in the vicinity of Obsidian, ID. In general, the prevalence of infection was high in the areas where sentinels became infected; the intensity as measured by spore counts was low compared to sentinel trials conducted in the Pahsimeroi River and Lemhi River.

The second sentinel trial was designed to examine locations on Pole Creek, Beaver Creek, and the upper Salmon River to further define the source of *M. cerebralis.* Both Pole Creek at its confluence and the Salmon River (a small creek at this area) are sites where the infection originates.

The third sentinel trial demonstrated that the previously-identified sources could be replicated during the spring as well as the fall months. The same pattern of increasing prevalence was obtained from the sites on Pole Creek.

Therefore, the source of the parasite in the river supply of Sawtooth Hatchery is about 18 river miles upstream in the Salmon River. Management implications of this study indicate that this infection was independent of sockeye salmon recovery efforts in Alturas and Pettit lakes. The origin of the infection in the Salmon River may have resulted from the stocking of infected fish from a private hatchery or the IDFG Hayspur Hatchery when it was positive. Our laboratory has routinely detected *M. cerebralis* at Sawtooth Hatchery since 1987.

Integrated Management of BKD Using ELISA-based Culling

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Abstract

The Idaho Department of Fish and Game (IDFG) Chinook salmon program has a history of managing *Renibacterium salmoninarum,* the causative agent of bacterial kidney disease (BKD), dating back to 1969 at Rapid River Hatchery and 1980 for McCall Hatchery. The chronological events described in annual and brood year reports from these facilities document the progression of events that led IDFG into developing an integrated BKD management program for hatchery reared Chinook salmon. The cornerstone of this management strategy was use of the enzyme linked immuno-sorbent assay (ELISA) based culling of eggs from females with high optical density values for *Renibacterium.* The success of this program has been documented by mortality records, routine inspection, and diagnostic sampling during the 18 month period of hatchery rearing.

Early attempts to control this disease were limited to injection of erythromycin for returning adult salmon and erythromycin medicated feed treatments after clinical signs had been observed. Fertilized eggs were water hardened in 1 mg/l erythromycin. Prophylactic feeding of erythromycin medicated feed began in 1977 in the juvenile salmon at Rapid River Hatchery. The treatments became a standard operating procedure for rearing Chinook salmon at Idaho Department of Fish and Game facilities in 1984.

An integrated program of treating hatchery reared salmon for BKD at each life stage was implemented in 1993. This program consists of the following: (1) 20 mg/kg intra-peritoneal injection of erythromycin to returning adult salmon; (2) iodophor disinfection of fertilized eggs in 100 mg/l iodine for 30 minutes during water hardening; (3) testing of kidney tissue from all spawned females by ELISA. To limit risk of vertical transmission and subsequent horizontal transmission, the eggs from brood females with ELISA optical densities of 0.25 or greater were usually culled. In years with low adult numbers, a high BKD segregation group consisting of progeny of females with ELISA optical densities of 0.25 to 0.6 has been reared in isolation. This has been considered the high BKD segregation group since 1998; and (4) usually each brood year

receives two prophylactic regimens of erythromycin feed. The high BKD segregation group received an additional erythromycin medicated feed application.

Pre-spawning mortality of Chinook salmon adults due to BKD averaged 37.3% before the implementation of the strategy described above. Average pre-spawning mortality has decreased to an average of 5% per year, since the implementation of this integrated strategy. The IDFG Chinook salmon hatchery program has not experienced an epizootic due to BKD since 1993. Although clinical signs of BKD have been noticed after stressful events, minor outbreaks have been controlled with medicated feed. Cumulative mortality from ponding to release, from all causes, has decreased from an average of 4.2% to 0.6% per year at Rapid River, and an average of 6.8% to 1.7% per year at McCall, since implementation of this strategy. This strategy has been instrumental in reducing the risk of vertical and horizontal transmission of BKD in the hatchery and subsequently to wild/natural stocks after release. We recommend implementation of this BKD management strategy if the salmon hatchery program is considered risk intolerant.

Environmental Risk Assessment for Application of Erythromycin to Control Bacterial Kidney Disease in Salmon

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Abstract
Erythromycin is effective as a therapeutant to control bacterial kidney disease in salmonids. FDA requires an environmental risk assessment to assess the proposed therapy. Use patterns for seven years in Idaho, Washington and Oregon were examined using records of use. FDA's worst case scenario was developed assuming all the day's treatment was applied directly into the water and released over a24 h. Using this scenario, the average discharge from all hatcheries in Washington and Oregon was less than 10 µg/L. Average discharges in Idaho were variable. In a few cases the worst case scenario produced effluents that might be considered toxic to some algae.

Intermittent feeding for controlling steelhead growth at Hagerman NFH

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Abstract
As part of the Lower Snake River Compensation Plan, Hagerman National Fish Hatchery releases steelhead at 180 -250 mm according to NOAA- Fisheries guidelines designed to reduce competition and predation on native salmon. Steelhead are reared at 59 F that requires reduced feeding to meet target size. Experimental groups were fed for 15 days and then fasted 15 days during brood years 1996-99 to determine if intermittent feeding would reduce growth effectively. Intermittently-fed steelhead performed as well as

continuously-fed steelhead based on returns and fish health parameters. Hagerman NFH has adopted a modified intermittent feeding approach that reduces steelhead growth.

Heat Induced Triploid Trout Production

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Abstract

Introductions of fertile nonnative hatchery trout have led to interspecific and intraspecific hybridization of native salmonid stocks throughout North America. Hayspur Fish Hatchery is Idaho's primary producer of sterile triploid trout eggs. Triploid induction has been monitored at hayspur Fish Hatchery since 2001. An overview of heat induced triploid egg production will be presented.

Routine Use of Sterile Fish in Salmonid Sport Fisheries; Are We There Yet?

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Abstract

Since 1997, Idaho Department of Fish and Game hatchery and research personnel have worked cooperatively to develop a sterile trout program with the primary goals of protecting the genetic integrity of native stocks, while continuing to supply surplus hatchery trout for harvest-oriented anglers. In this presentation, we seek to share our experiences and results so that other agencies may make informed decision as to whether sterile trout programs could be beneficial to conservation and management efforts in their states. Additionally, we present results of a phone survey conducted during 2005 that assessed the current status of sterile fish programs throughout the United States. A total of ten states indicated that they had ongoing programs for sterilizing hatchery salmonids. The majority of these programs, eight, were located in the western United States, while only two occurred east of the Mississippi River. We suspect that the distribution and abundance of species either listed under the Endangered Species Act or petitioned to be listed greatly influenced the presence of these programs. Regardless of native species

status, we believe that expansion of sterile trout programs can improve conservation and management programs in other states.

Production of triploid lake trout *(Salvelinus namaycush)* at Grace Fish Hatchery

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Abstract

In 2001, a cooperative agreement between Idaho Department of Fish and Game (IDFG) and Utah Department of Wildlife Resources (UTDWR) was reached requiring IDFG to stock 50,000 triploid lake trout *(Salvelinus namaycush)* every three years into Bear Lake. Joe Kozfkay (IDFG) and Eric Wagner (UTDWR) conducted experiments to develop techniques for producing triploid lake trout. Personnel from IDFG's Grace Fish Hatchery (GFH) assisted researchers by rearing experimental groups and enumerating survival of fish in different treatments. Over three years, research and hatchery personnel set out to answer a number of questions aimed at improving survival of triploid lake trout. The first questions asked were which hatchery broodstock to use and which method of inducing triploidy would show the best survival of fish to stocking. Second, research and hatchery personnel looked into how to increase survival from eyed-egg to hatch by comparing incubation in chilled water versus ambient water and by comparing incubation of eggs in upwelling incubators versus tray type incubators. Third, hatchery personnel compared fish survival and growth of triploid lake trout reared at GFH in 2003 to diploid lake trout reared the previous year at GFH. Fourth, hatchery personnel examined if the use of AquaMats® and soft moist feed increased growth of triploid lake trout during final rearing in outdoor raceways. As the program moved from the experimental phase to the hatchery production phase, an overview of spawning, rearing, and stocking of triploid lake trout at the GFH will be presented. The development, rearing, and stocking of triploid lake trout shows a successful example of how research and hatcheries worked together to solve a fisheries management problem.

Development of conservation aquaculture strategies for restoration of burbot (*Lota lota maculosa*) in Idaho's Kootenai River

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Abstract
Burbot (*Lota lota maculosa*) are native to the Kootenai River; Northern Idaho. Within the Kootenai River, populations have severely declined and are near extirpation. Development of aquaculture technology is one primary component of a collaborative conservation recovery plan designed to re-establish this population. During preliminary trials (year one), 100% of wild adult burbot (20) spawned in captivity, fertilization rates were near 90%, hatch survival was approximately 50%, and survival of juveniles transitioned to artificial diet was <1%. Specific objectives currently under investigation include: 1) control of spawn timing, 2) improving incubation methods and 3) developing early life feeding strategies.

The History of Developing a Genetically Pure Yellowstone Cutthroat Brood Stock within the Wyoming Game & Fish Dept.

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Abstract
With the potential listing of the Yellowstone cutthroat trout as threatened on the Endangered Species list and at a time when preserving genetically pure native fisheries is at an all time high, the Wyoming Game & Fish Dept. has taken positive strides in developing a genetically pure captive Yellowstone brood stock. This presentation will look at the early attempts to develop a stock from the Paintrock Creek and Mcbride Lake to the more recent advances at Le Hardy's Rapid, Clark's Fork Hatchery, and the new brood facility at the Ten Sleep Fish Hatchery. The Wyoming Game & Fish Dept. is committed to developing a genetically pure captive Yellowstone cutthroat brood stock for sport fisheries maintenance and restoration efforts in their native range.

Role of Hatcheries in the Conservation of Pacific Salmon

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Abstract
NOAA Fisheries believes that Recovery Plans for Endangered Species Act listed salmon and steelhead should clarify how hatchery programs can benefit recovery, how hatchery programs can limit recovery, and how to decide whether to use artificial propagation to support recovery. NOAA Fisheries also believes that detailed descriptions of individual hatchery programs including their contributions to different fisheries and their affects on salmon and steelhead viability should be readily accessible and updated routinely.

Assessments of individual hatchery programs and hatchery guidance developed by NOAA Fisheries have been provided to state and locally sponsored recovery planning efforts in Washington, Oregon and Idaho. This information, Salmonid Hatchery Inventory and Effects Evaluation Report, June 2004 (www.), summarizes the potential for artificial propagation to be used as a tool to support fish recovery and provides available information and affects analysis for more than 400 individual hatchery programs up and down the West Coast.

Hatchery programs can work in two ways. They can preserve tribal and non-tribal fishing opportunity until habitat productivity and capacity is restored and they can help preserve salmon and steelhead populations or jump-start their recovery in the natural environment. Human caused impacts to freshwater habitat mean river systems can produce fewer fish. More than 80 percent of the Lewis River system for example– previously one of the largest and most important producers of salmon and steelhead in the lower Columbia – has been taken out of salmon and steelhead production because major spawning and rearing areas are no longer accessible to the fish. When this happens and the productive potential of a river system is reduced or eliminated, artificial propagation has been called on to at least preserve fishing opportunities. In the lower Columbia, including both Washington and Oregon, 23 of the 25 chinook salmon hatchery programs, 22 of the 28 coho salmon hatchery programs and 23 of the 28 steelhead hatchery programs produce fish for harvest because of impacts to freshwater habitat.

Artificial propagation can also be used to support salmon and steelhead population recovery. Hatchery actions benefit recovery when they contribute to conserving natural self-sustaining populations. Hatchery programs can help preserve a population until the factors limiting recovery are addressed, and they can seed habitat that is accessible and properly functioning with adult spawners. Adult hatchery fish that are surplus to what is needed to spawn naturally (i.e., support population recovery), and what is needed for hatchery broodstock, can be harvested or put to other good uses.

There are two phases to artificial propagation when it is used in salmon and steelhead recovery, getting recovery started and making adjustments in hatchery involvement as population viability improves. Getting recovery started involves first making sure that existing hatchery programs are not a threat to recovery and second, determining whether new hatchery programs would serve or support recovery. Threats posed by hatchery programs that must be avoided or controlled include hatchery fish harvest that results in excessive mortality of natural fish either from retention or from catch-and release fishing,

"mining" or removing too many adult fish from a natural population for hatchery broodstock, hatchery facilities that obstruct fish passage to important spawning and rearing areas, hatchery water intakes that kill or injure fish, planted hatchery fish preying on younger natural fish, planted hatchery fish competing with younger natural fish for food and habitat and disruptive selection caused by hatchery-origin fish spawning in the wild.

Determining whether to use artificial propagation to support recovery should be made at the population scale and should depend on the potential for artificial propagation to alleviate the risk factor or risk factors limiting population viability. For example, adult returns produced from naturally spawning hatchery fish can help alleviate the risk factor low abundance. On the other hand, when low productivity is a risk factor, artificial propagation may serve little purpose in getting recovery started since there is little it can do to improve population growth rate except in cases where the natural population's small size is, in itself, a predominant factor limiting population growth.

Hatchery programs used to support survival and recovery should adjust as population recovery advances or progresses and the purpose of the program is served. Artificial propagation involves both benefits and risks. The quality of hatchery management practices, the intensity of a program (e.g., captive broodstock involving most or all of a population versus supplementing only part of a population) and the duration or reliance on artificial propagation determines whether benefits outweigh risks. Salmon and steelhead populations dependent on artificial propagation are not recovered.

A Comparison of Spawning Characteristics of Natural and Hatchery-reared Female Imnaha River Chinook Salmon Spawned in Captivity, 1984-2005.

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Abstract

The natural population of Imnaha River Chinook salmon *Oncorhynchus tshawytscha* has been supplemented since 1984. We examined broodstock spawning data for differences in spawning characteristics between natural and hatchery females and changes over time from 1984-2005. Natural females spawned earlier, were older at spawning and returned at an older average age than hatchery females. Natural females were also larger and produced larger eggs than hatchery females. Fecundity or BKD prevalence did not differ between hatchery and natural females. However, natural females are spawning later into the season each year. Supplementation appears to have shifted the spawn timing of natural females.

Reproductive success of hatchery- and natural-origin Chinook salmon (*Oncorhynchus tshawytscha*) in the Pahsimeroi River, ID

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Abstract
In 1991, the Pahsimeroi River Hatchery initiated a Chinook salmon supplementation broodstock strategy as part of the Idaho Supplementation Studies evaluation research. Protocols included incorporating natural-origin adults into the hatchery broodstock and allowing hatchery-origin adults to spawn naturally. After ten years of supplementation, the genetic contribution of hatchery- and natural-origin adults to smolt offspring was determined using parental exclusion analyses. Contribution of hatchery and natural adults to smolt offspring was not significantly different for males or females. Additionally, based on the proportions of parental cross-types that gave rise to smolts, it appears the two groups mated in a random fashion.

Performance of Hatchery and Wild Stocks of Juvenile Chinook Salmon Produced in a Conservation Hatchery

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Abstract
Hatchery (HH), wild (WW), and hybrid (HW) crosses were made to evaluate domestication effects in Chinook salmon reared at Warm Springs NFH. Although juvenile performance [e.g. growth, survival] was generally similar among the three crosses, migration timing differences were apparent. Smolt sampling showed the HH cross was 2-3 times more abundant than expected and indicated that greater numbers of the WW cross migrated during a volitional fall release with the HW cross intermediate. Maternal effects were not suggested and differences among wild or hatchery stocks may have been affected by current release strategies.

EVALUATION OF CONSERVATION HATCHERY REARING AND RELEASE STRATEGIES FOR STEELHEAD RECOVERY IN THE HAMMA HAMMA RIVER

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Abstract

Conservation hatcheries for anadromous salmonids have the dual role of supplementing depleted populations, while at the same time minimizing genetic and ecological risks to the extant wild population(s). Conservation hatchery practices designed to aid in population recovery continue to evolve, and there remain numerous uncertainties regarding the demographic and genetic effects of supplementation programs on the status of the wild population targeted for recovery. The present study evaluated the effects of two rearing and release strategies in a supplementation program for steelhead (*Oncorhynchus mykiss*) in the Hood Canal (WA) watershed. The cultured steelhead were reared and released at two different life history stages: age-2 smolts (~ 1,000 to 3,500 per year) and age-4 adults (81 females, 116 males in 2002, 2 females, 2 males in 2003, 35 females, 41males in 2004, and 10 females, 14 males in 2005). Prior to supplementation (1995 through 2001), an annual average of 11 (± 5.7 s.d.) steelhead redds were observed in the Hamma Hamma River. During supplementation, the adjusted redd abundance in the Hamma Hamma River has averaged 100 (± 36) between 2002 and 2005. Increases in redd abundance have not occurred in non-supplemented (control) streams in the Hood Canal watershed. Thus, the supplementation program appears to have markedly increased the number of spawners in the Hamma Hamma River. Most observed spawners in the Hamma Hamma River were released as pre-spawning adult fish and laboratory experiments were conducted to evaluate their reproductive success. Detailed reproductive behavior and DNA pedigree analyses conducted in an experimental spawning channel indicated that captive-reared females deposited an average of 97% of their estimated fecundity, and egg-to-fry survival averaged approximately 25%. All 24 captive-reared females and all but 1 of 24 captive-reared males produced viable fry. Two-year exposure to elevated water current velocities during rearing (~ 1 body length per second) improved the ability of captive-reared males to dominate access to nesting females, but did not result in significant increases in adult-to-fry reproductive success. We conclude that the supplementation program is meeting its initial goal of substantially increasing natural production in the Hamma Hamma River, and that released captive-reared adults have contributed substantially to increased number of redds. The population's productivity and genetic structure will continue to be monitored and will provide greater resolution of the long-term effects of the supplementation program.

Evaluating the Feasibility of Reestablishing a Coho Salmon Population in the Yakima River, Washington. (This is a follow-up to a talk presented at the 2002 NWFCC in Bellingham.)

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Abstract

Historical returns of coho salmon to the Yakima River Basin were estimated to range from 45,000 to 100,000 fish annually but declined to zero by the 1980s after decades of overexploitation of fishery, water, and habitat resources. In 1996 the Yakama Nation and cooperators initiated a project to determine the feasibility of reestablishing a naturally spawning coho population. The Yakima coho project explored whether successful adaptation and recolonization were feasible when multi-generational, hatchery-reared coho were reintroduced to native habitats. After 10-20 years of outplanting, we compared known natural- and hatchery-origin returns for four years. We found that natural-origin coho returned significantly larger than hatchery-origin coho. Mean egg mass of natural-origin females was greater than that of hatchery-origin females, though the difference was not statistically significant. Mean date of fish passage was 2 to 9 days later for natural-origin adults when compared to their hatchery-origin counterparts. Indices of smolt-to-adult survival for natural-origin coho were 3.5 to 16.9 times survival indices of hatchery-origin coho and 0.5 to 6.9 times survival indices of wild/natural spring Chinook. We compared smolt-to-adult survival indices between coho and spring Chinook since both are stream-type (yearling migrant) salmon. For seven juvenile migration years from 1997-2003, we estimated mean smolt-to-adult survival for returns from all hatchery-influenced coho production to be 3.7%, approximately 76% of the estimated mean survival for wild/natural spring Chinook (4.9%) over the same period. Releases from local brood source parents had significantly higher smolt-to-smolt survival than releases from out-of-basin brood source parents. We conclude that hatchery-origin coho, with a legacy of as many as 10 to 30 generations of hatchery-influence, showed evidence of local adaptation and increasing fitness after as few as 3 to 5 generations of outplanting in the wild.

Utilizing parental analyses to evaluate natural smolt production from the Snake River Sockeye Salmon (*Oncorhynchus nerka*) captive broodstock program.

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Abstract
Progeny from the Snake River sockeye salmon (Oncorhynchus nerka) captive broodstock program are reintroduced at different life stages using a variety of release options. In this study, we conducted parental analyses to associate unmarked smolts produced from prespawn anadromous adult releases, full-term hatchery adult releases, and eyed-egg reintroductions. Results from this study indicated no differences between the relative individual contribution of anadromous and full-term hatchery fish in two out of three evaluations. Green-egg to smolt survival comparisons were also not significantly different. However, significant differences in fry-to-smolt survival between anadromous adults that spawn volitionally and eyed-egg reintroductions were observed.

Bacterial Kidney Disease Prevalence in Natural vs. Hatchery-Reared Adult Chinook Salmon Spawned in Captivity and in Nature

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Abstract
The possibility that hatchery salmon releases, particularly those that may be infected with bacterial kidney disease (BKD), may increase BKD prevalence in natural populations is a concern. We examined BKD prevalence and intensity in natural vs. hatchery-reared Chinook salmon in the Grande Ronde and Imnaha basins. We also compared supplemented vs. unsupplemented populations, salmon spawned at Lookingglass Fish Hatchery vs. those sampled as carcasses on spawning ground surveys and examined trends in BKD over time in each stream. We found few differences and that supplementation has not affected BKD prevalence or intensity in these streams.

Accounting for Hatchery-origin Steelhead Returns to the Snake River Basin, 1995-2002

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Abstract
Concern for the potential negative impacts from interaction of artificially propagated steelhead stocks with natural, indigenous steelhead stocks is one reason that the Snake

River Basin steelhead Evolutionarily Significant Unit (ESU) was listed as threatened, under the Endangered Species Act (ESA). Similar concerns about ecological or genetic interactions between hatchery-origin and natural-origin steelhead have been expressed in a number of scientific reviews of the affects of artificial propagation, and in the status reviews leading to the listing of the ESU. NMFS found that the impacts of ecological and genetic interactions between hatchery-origin and natural-origin steelhead, and the uncertainty regarding the distribution of the hatchery-origin fish, were risks sufficient to conclude that operation of steelhead hatcheries could jeopardize the survival and recovery of the ESU. Although adjustments were made in management programs after the listing of the native fish to reduce the potential risks, the large number of hatchery-origin steelhead that migrate into the Snake River and potentially interact with listed natural-origin steelhead remains a concern.

To evaluate the extent of potential interaction between natural and hatchery-origin steelhead stocks, NMFS requested that the USFWS, Lower Snake River Compensation Plan office, and their cooperators in the Snake River Basin steelhead hatchery programs provide an accounting for hatchery-origin steelhead at upstream hatcheries, weirs and traps, in harvest, and in natural spawning areas.

Managers accounted for an average of 95.9% of the adult steelhead returns in harvest, hatchery rack returns, natural mortality, and returns to direct-stream releases. Homing fidelity within the Snake River subbasins is high. Numbers of hatchery strays detected at weirs and in spawning surveys in areas managed for natural production generally total less than 1% of the spawning escapement. Genetic surveys have not detected hatchery influence in natural populations. While excessive straying into areas identified as important to natural spawning has not been found, there are still large numbers of unaccounted hatchery-origin steelhead. Straying into some out-of-basin areas does occur, and some release strategies may tend to increase straying.

Fish and Wildlife Service Columbia Basin Hatchery Reviews

Douglas DeHart* and Don Campton, USFWS – Pacific Region, 911 NE 11th Avenue, Portland, Or 97232. Phone: (503) 231-2386. Fax: (503) 231-2062. E-mail: douglas_dehart@fws.gov

Abstract
U.S. Fish and Wildlife Service (FWS) was a participant in the Western Washington Hatchery Reform Project. The review and recommendations process for western Washington has now moved into the implementation phase. FWS intends to apply the scientific principles and review procedures developed during that project to a review of FWS owned or operated hatchery facilities within the Columbia Basin. A review team has been formed, principles and procedures finalized, and a pilot review initiated. The recently formed hatchery review team intends to complete reviews and recommendations for all FWS facilities by early 2008.

Evaluation of Two 8,000 L/min Partial-Reuse Systems Used for Atlantic Salmon Smolt Production at the White River National Fish Hatchery

B.J. Vinci[1], M. Sharrer[1], M. Gearheart[1], D.A. Creaser[2], K. Gillette[3], **S.T. Summerfelt*[1]**
Phone: 304-876-2815. Fax: 304-870-2208. Email:s.summerfelt@freshwaterinstitute.org

[1] The Conservation Fund Freshwater Institute, 1098 Turner Road, Shepherdstown, WV 25443

[2] US Fish and Wildlife Service, Northeast Region Engineering, 300 Westgate Center Drive, Hadley, MA, 01035

[3] S Fish and Wildlife Service, White River National Fish Hatchery, RR2 Box 140, Bethel, VT 05032

Abstract

Eight of the existing 9.1 m (30 ft) diameter circular culture tanks at the White River National Fish Hatchery in Bethel, Vermont, were retrofit and plumbed into two 8,000 L/min partial water reuse systems to help meet the regions need for Atlantic salmon smolt production. Each system was stocked with ## Atlantic salmon and operated at 87-89% water reuse on a flow basis. Salmon growth, survival, and water quality data were collected to determine system performance at near full fish loading, i.e., 24 kg/m^3 maximum density, 1.5% body weight per day feeding, and 86.5 kg/d feed per system. Results will be discussed.

The Safety of AQUI-S® (an experimental fish anesthetic) to Rainbow Trout

Jim Bowker, **Dan Carty***, Molly Bowman, Bonnie Johnson, Tom Bell, and Dave Erdahl U.S. Fish and Wildlife Service, Aquatic Animal Drug Approval Partnership Program, 4050 Bridger Canyon Road, Bozeman, MT 59715. Phone: (406) 994-9912. Fax: (406) 582-0242. E-mail: dan_carty@fws.gov

Abstract

Public agencies and private industry are working to obtain FDA approval of AQUI-S® (active ingredient, isoeugenol) for use to "sedate all freshwater salmonids for management and handling purposes (no withdrawal period required)." To that end, we recently conducted a target animal safety study with AQUI-S® on rainbow trout *Oncorhynchus mykiss*. Replicate groups of rainbow trout were exposed to 0, 20, 40, or 80 mg/L AQUI-S® for various exposure durations. Data collected included survival, behavior, fish health, and histology. Results support the approval of 20 - 40 mg/L AQUI-S® for use to "sedate all salmonids for management and handling purposes."

Carbon Dioxide Avoidance Response by Rainbow Trout Provides Stimulus for Self-Fish Transfer between Tanks

S.T. Summerfelt*, J.W. Clingerman, J. Bebak-Williams, The Conservation Fund Freshwater Institute, 1098 Turner Road, Shepherdstown, WV 25443. Phone: 304-876-2815. Fax: 304-870-2208. Email: s.summerfelt@freshwaterinstitute.org

Abstract
The Freshwater Institute is developing fish transfer systems to reduce fish stress and labor. We hypothesized that rainbow trout could sense and seek to avoid areas containing higher concentrations of dissolved carbon dioxide (CO_2) and that this behavioral response could be used to induce fish to swim from the growout tank to a harvest tank or to the inlet of a fish pump. The hypothesis was proven correct during controlled, replicated experiments that showed rainbow trout voluntarily swam out of a 70-110 mg/L dissolved CO_2 environment through a pipe that carried water containing ≤ 10 mg/L of CO_2.

The Confederated Tribes of the Colville Reservation,

Chief Joseph Hatchery Program

Joe Peone, Confederated Colville Tribes, Steve Smith, Stephan H. Smith Fisheries Consulting, **Dan Warren***, D.J. Warren & Associates Inc., John McGlenn, Tetra Tech / KCM Inc. D.J. Warren & Associates Inc., P.O. Box 1511, Philomath, OR 97330. Phone: (541) 929-4639 or (541) 602-5950. Fax: NA. Email: warrenasc@comcast.net

Abstract
The Confederated Tribes of the Colville Reservation (CCT)
Chief Joseph Hatchery Program (CJHP)
CCT is currently engaged in a planning process with Bonneville Power Administration and the Northwest Power and Conservation Council (NPCC) to develop a program to release Summer/ Fall and Spring Chinook in the Okanogan Subbasin. The program goal is to support conservation (recover, maintain the health of stocks) & harvest (tribal and recreational) of Upper Columbia summer/fall and spring Chinook in the Okanogan and Columbia Rivers.

The presentation will include;

- An overview of the planned program
- Current status
- A review of deliverables required by NPCC

A discussion of work and activities (planning, research, engineering / design, environmental compliance)

A Tale of Two Weirs

Mike McLean*, Confederated Tribes of the Umatilla Indian Reservation. Phone: 541-663-1794. Fax: 541-663-8058. Email: mmclean@uci.net

Abstract

The Confederated Tribes of the Umatilla Indian Reservation (CTUIR) have been operating remote adult broodstock collection weirs on the upper Grande Ronde River and Catherine Creek since 1997. This presentation will take you on a virtual tour of weir development over the last 9 years. Weir design in the early years of the project was not very efficient at capturing adult spring chinook salmon. The trapping efficiencies from 1997 to 1999 at Grande Ronde ranged from 15 to 33% while those at Catherine Creek were similar from 2 to 30%. Modifications on weir design and application were made yearly to improve the trapping efficiency. As our experience level grew, so did the trapping efficiencies. We observed better efficiencies at Grande Ronde from 2000 to 2002 ranging from 61 to 88% and at Catherine Creek from 16 to 62%. Trapping efficiencies over the last 3 years have ranged from 79 to 100% at the Grande Ronde and from 95 to 100% at Catherine Creek. Factors that can affect trapping efficiency include, peak flows, weir design, fish guidance, beaver dams, loose substrate, and the inability to identify fish recovered on the spawning grounds as having already been trapped. We will continue to make improvements to the weirs because you never know what Mother Nature will throw at you.

The SI-5. Yes It Works!

Gene McPherson*, McCall Fish Hatchery, Idaho Department of Fish and Game, McCall, Idaho 83638. Phone: (208) 634-2690. Fax: (208) 634-3492. E-mail: gmcpherson@idfg.idaho.gov

Abstract

Brief summary and power point presentation demonstrating the needs and use of the SI-5 fish stunning device. Increased safety and improved public perceptions of fish dispatch

methods will be explained. Also, the stunning device provides a more humane method of dispatching fish at spawning.

Evaluation of Calcein Immersion and Medicated Feed to Mark Snake River Cutthroat trout *Oncorhynchus clarki* and Shovelnose Sturgeon *Scaphirynchus platorynchus*

Tom Bell, Greg Kindschi, Jim Bowker, and **Molly Bowman***. U. S. Fish and Wildlife Service, Aquatic Animal Drug Approval Partnership Program, 4050 Bridger Canyon Road, Bozeman, MT 59715. Phone: (406) 994-9916. Fax: (406) 582-0242. Email: molly_bowman@fws.gov

Abstract

Marking fish is a widely used procedure to support a variety of fish management efforts. One such marking technique is the use of the fluorescent dye calcein. Calcein binds with calcium phosphate in bony fish tissue and the fluorescent marks can be detected non-lethally when viewed at proper wavelengths. Preliminary studies have demonstrated detectable marks via immersion or medicated feed application of calcein. Preliminary results from a study conducted by the USFWS to evaluate detectable marks on fish immersed in or fed calcein have shown that administration of medicated feed may be a viable option to mass mark fish.

Mechanical Filtration in Fish Culture

Terry McCarthy*, Water Management Technologies, Baton Rouge, LA 70809. Phone: (225) 755-0026. Fax: (225) 755-0995. E-mail: terry@w-m-t.com

Abstract

Mechanical filtration in fish culture is gaining popularity. Intake, recycle and effluent polishing are all applications where mechanical filtration applies. The author describes each application and offers recommendation sizing, care and maintenance.

Application of Microbead Filters

Dr. Michael Timmons, **John L. Holder***, James M. Ebeling, Cornel University, JLH Consulting, Freshwater Institute. Phone: (250) 897-1334. Fax: (250) 897-1350. E-mail jlhconsulting@shaw.ca

Abstract

The microbead filter is distinctly different than the more commonly used floating bead filters that are used today. Microbead filters use a polystyrene bead (microbead) that is 1 to 3 mm in diameter with a bulk density of 16 kg/m^3 and a specific surface area of 3936 m^2/m^3 (for the 1 mm beads). Biological filters that use microbeads for their nitrifying substrate can be thought of as a trickling biofilter in terms of mechanics of operation and design. For design purposes, microbead filters can be assumed to nitrify approximately 1.2 kg of TAN per cubic meter of media per day for warm water systems with influent ammonia-nitrogen levels from 2 to 3 mg/l. For cool water applications, rates should be assumed to be 50% of warm water rates. These rates are similar to those used for fluidized sand beds. Designs and results in several applications are presented.

Evaluation of Thermal Requirements for June Sucker Propagation

Greg H. Kindschi[1]*, Matt Toner[1], William C. Frazer[1], Doug Routledge[2], Maureen Wilson[3] and Yvette Converse[1],

[1]U.S. Fish and Wildlife Service, Bozeman Fish Technology Center, 4050 Bridger Canyon Road, Bozeman, MT 59715. Phone: 406-994-9908. Fax: 406-586-5942. Email: greg_kindschi@fws.gov

2Utah Division of Wildlife Resources, Fisheries Experimental Station, 1465 W 200 North, Logan, UT 84321. Phone: 435-752-1066. Fax: 435-752-6977. Email: dougroutledge@utah.gov

3Utah Reclamation Mitigation and Conservation Commission, 102 West 500 South, #315, Salt Lake City, UT 84101. Phone: 801-524-3146. Fax: 801-524-3148. Email: mwilson@uc.usbr.gov

Abstract

A laboratory study was conductedto monitor June sucker *Chasmistes liorus* performance when reared at an average of approximately 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, and 30^o C for 16 weeks. The June sucker is an endangered fish native to Utah Lake, UT. Determining an optimal rearing water temperature is crucial to met the June Sucker Recovery Implementation Program supplementation goal of 350,000 eight-inch fish annually. In this study weight gain, condition factor, mortality, and feed efficiency were affected by water temperature with 22 – 24o C being the optimal for June sucker performance. Continued nutritional research is needed to address deformities which did increase during this 16 week study.

Deka-Sulphurous Kokanee Brood Program

Mark Green and **Grant Gale*,** Freshwater Fisheries Society of BC, Clearwater Trout Hatchery

RR#2, Box 5172, Clearwater, BC V0E 1N0 Phone: 250-674-2580. Fax: 250-674-3572. Email: Grant.Gale@gofishbc.com

Abstract
The FFSBC provides the kokanee fry requested by the BC government fisheries biologists for stocking into BC lakes for recreation and conservation purposes. The kokanee run into Meadow Creek, a tributary which flows into the north end Kootenay Lake, has typically been the source of the eggs required to meet these requests. However, in 2000, the kokanee population in Kootenay Lake underwent a dramatic decline in its numbers and the stock needed was unavalaible. Surveys of lakes previously stocked with this strain of kokanee showed that Deka and Sulphurous Lakes in the Cariboo region provided the best opportunity to produce sufficient brood stock. A 2 year program was successful in producing 750,000 and 1.0 million green eggs in successive years.

Growth Characteristics and Serum Chemistry Profiles of Four Rainbow Trout *(Oncorhynchus mykiss)* Cross Types Reared in Recirculating and Flow-through Culture Systems.

Brian Brazil* and Jeff Silverstein, USDA-ARS National Center for Cool and Cold Water Aquaculture, 11861 Leetown Road, Kearneysville, WV 25430. Phone: 304-724-8340. Fax: 304-725-0351. Email: bbrazil@ncccwa.ars.usda.gov

Abstract
At the National Center for Cool and Cold Water Aquaculture, a rainbow trout (RBT) breeding program for growth was initiated with populations domesticated in single pass or serial reuse culture systems. However, new facilities may require water reuse and recirculation technologies to meet to reduce the volume of freshwater required. Thus, we determined whether genotype by environment interactions (G X E) would require separate breeding programs for flow-through and water reuse environments. During a 4-month growth trial, three strains of RBT were cultured in flow-through or water reuse-culture systems. The results suggest there were no significant strain by environment interactions. In fact, at the end of the study fish reared in the recirculated water were 7% larger (averaging 418g). Additionally, fish serum chemistry profiles where nearly identical between environments.

Spring Chinook Size at Release Evaluation

Guy Campbell*, Jacob Wolfe, Mark Johnson, Larry Durham and Larona Laville, Washington Department of Fish and Wildlife, 600 Capital Way North, Olympia, WA 98501. Phone: (360) 985-7424. Fax: (360) 985-7500. E-mail: cowlitzsal@wdfw.wa.gov

Abstract
A size of release study has been conducted on spring Chinook for the past six years at the Cowlitz Salmon Hatchery. The primary focus of this evaluation is to determine the difference in adult return rates of spring Chinook salmon that have been release at the separate target sizes (5 fpp, 8 fpp and 16 fpp). The result of this study provides important information to better manage the hatchery component of the spring Chinook population in the Cowlitz River system in Washington State.

Seasonal population dynamics of New Zealand mudsnails (*Potamopyrgus antipodarum*) in Silver Creek Drainage, Blaine County, Idaho and Riley Creek Drainage, Gooding County, Idaho

Chris A. James* and Christine M. Moffitt, Idaho Cooperative Fish and Wildlife Research Unit, University of Idaho, Moscow ID 83844-1136. Phone: (208) 885-7139. Fax: (208) 885-9080. Email: jame0667@uidaho.edu

Abstract
New Zealand mudsnails have been identified in nearly every western state. These invasive snails are widely abundant in the middle Snake River drainage of Idaho where spring water sources with constant temperatures support highly productive streams and an extensive aquaculture industry including Riley Creek, Gooding County, Idaho site of Hagerman National Fish Hatchery. New Zealand mudsnails are present but not abundant, especially near Hayspur State Fish Hatchery, in the Silver Creek drainage, Blaine County, Idaho, a highly productive spring fed stream, with variable temperature regimes. We are assessing how hatchery thermal influence may affect these stream's temperature regimes and the distribution and abundance of New Zealand mudsnails in them.

Survival and Passage of New Zealand Mudsnails in the Gastrointestinal Tract of Rainbow Trout

R. Louise Bruce* and Christine M. Moffitt, Idaho Cooperative Fish and Wildlife Research Unit, University of Idaho, Moscow ID 83844-1136. Phone: (208) 885-7139. Fax: (208) 885-9080. Email: bruc9238@uidaho.edu

Abstract
Since introduction into the United States in 1987, the New Zealand mudsnail has become established in several fish hatcheries. The snail has been reported to survive passage through the gastrointestinal tract of trout. To examine the survival in rainbow trout, we force-fed snails to fish and sampled at different times to determine the number of alive and dead snails in the stomach, anterior intestine, and posterior intestine. We found live snails in all gut regions and 11.80% were alive in fecal material. Studies will continue to evaluate the effects of snail size, quantity, and fish feeding regime on snail transit time and survival.

Environmental and Social Costs of Production of Beef and Fish for Human

Consumption

Lubia Cajas Cano* and Christine M. Moffitt, Idaho Cooperative Fish and Wildlife Research Unit, University of Idaho, Moscow ID 83844-1136. Phone: (208) 885-7139. Fax: (208) 885-9080. Email: caja0241@uidaho.edu

Abstract
Comparisons of animal protein are often made regarding calories, contaminants, and fat content. We identify and compare factors associated with beef cattle and rainbow trout production within Idaho to consider the social and environmental issues components of each. Our study shows that waste disposal, use of energy, water, and land per unit production may be lower for trout species.

A Solution for Whirling Disease

Genny Fraser[1]* and Gary Vander Laan[2]

[1] Engineering Technologist, PRAqua Technologies Ltd., 1635 Harold Rd, Nanaimo, British Coumbia, V9X 1T4. Phone: 250-714-0141. Fax: 250-714-0171. Email: genny@praqua.com

[2] Industrial Sales – in charge of Aquaculture, Trojan Technologies Ltd.
Phone: 519-457-3400. Fax: 519-457-3030. Email: gvanderlaan@trojanuv.com

Abstract
Whirling disease is causing hatcheries to shut down and destroying entire fish stocks and inventories in many State Hatcheries. The threat of whirling disease is a worry for all hatchery managers as well as governing agencies in affected areas and prevention is key to sustainable, successful stocking. Recent studies conducted by the State of Utah discovered an effective method of eliminating the threat of whirling disease entering a hatchery by treating the influent water. Using ultraviolet disinfection and a low head, microscreen filter the whirling disease parasite (Triactinomyxon) can be inactivated and the threat of whirling disease entering a hatchery by way of influent water eliminated.

POSTER ABSTRACTS

Housing A Snake River Cutthroat Trout Broodstock

Steve Diekema, Wyoming Game & Fish Department, Auburn Fish Hatchery, P.O. Box 130, Auburn, WY 83111. Phone: 208-225-3457. Fax: 208-225-3094. Email: Steve.Diekema@wgf.state.wy.us

Abstract
The Wyoming Game and Fish Department's Auburn Fish Hatchery is responsible for the production and rearing of the area's native trout, the Snake River cutthroat trout (Oncorhynchus clarki ssp.). At the hatchery, a captive broodstock is being managed to provide a genetically pure Snake River cutthroat trout to produce eggs, fingerlings, and catchable trout for the region. In 2001, a new broodstock rearing facility was built to hold the broodstock and provide eggs for this purpose. The facility now holds a disease free, genetically diverse population of 2200 fish with an annual production capability of over three million green eggs.

Aerial Fish Stocking Program For the Wyoming Game And Fish Department

Brad Hughes, Wyoming Game and Fish Department, Speas Fish Rearing Station 8200 Speas Rd. Casper, Wyoming 82604. Phone: (307) 473-2073. Fax: (307) 237-9040. Email: Brad.Hughes@wgf.state.wy.us

Abstract
The Wyoming Game and Fish Department's, Fish Culture Section stocks fish in backcountry lakes and streams utilizing a Jet Belle Ranger helicopter that transports a sling load of custom built distribution tanks. Aerial stocking by helicopter has proven itself to be a highly effective and efficient method of stocking fish into the backcountry of Wyoming, compared to traditional horse packing and backpacking methods. Helicopter stocking provides the Department opportunities to stock many bodies of water in a short period of time with little to no impact on the surrounding environment.

Enclosing an Open Water Source

Joe Gillis, Wyoming Game and Fish Department, P.O. Box 36, Boulder, Wyoming 82923. Phone: (307) 537-5439. Fax: (307) 537-5639. E-mail: jgilli@wyoming.com

Abstract
This Poster will demonstrate how to enclose an open water source and the cost involved. Enclosing a water source will aid in the prevention and spread of fish pathogens.

Safe and Humane Killing of Adult Salmon Broodfish Returning to Bonneville Fish Hatchery

Loren C. Jensen, Bonneville Fish Hatchery, Oregon Department of Fish and Wildlife, 70543 NE Herman Loop, Cascade Locks, OR 97014. Phone: (541) 374-8393. Fax: (541) 374-8090. E-mail: bvhatchery@saw.net

Abstract
Killing of broodfish in hatcheries is a necessary component of the spawning process. Using traditional methods fish are lightly sedated and generally killed by clubbing the fish on the head. The two main concerns of this method are issues of safety / operator injury and public perception. While manual clubbing is normally effective as a rapid killing method, there is a generally held perception that it is not humane and can often appear that way.

A new compact device developed by Seafood Innovations in Australia uses a pneumatically powered, percussive blow to instantly stun fish when they enter the machine and contact the trigger mechanism. The fish are then released and flow through the machine.

The device is known as the SI-5 fish stunner and has been adapted for broodfish from a similar machine used in the commercial harvesting of farmed salmon in Canada, Australia and Scotland.

Nisqually River Floating Fish Weir and Trap: Concept, Feasibility, Operation and Request for Opinions

Jay S. Kidder, P. E. Civil Engineer and Fisheries Biologist with Chinook Engineering and Bill St Jean, Chief Enhancement Biologist, Nisqually Indian Tribe. Phone: (360) 672-5528. Fax: (360) 678-8737. E-mail: jay@chinook-engineering.com

Pneumatic safety rails on Fish Distribution Tankers

Bob Becker, Oregon Department of Fish and Wildlife, NE Region Fish Transportation Coordinator, 107 20th, LaGrande OR, 97850. Phone: (541) 963-2138. Fax: NA. E-mail: robert.r.becker@state.or.us

Abstract
NA

FINAL AGENDA

DAY 1: Tuesday, December 6, 2005

8:00 **Registration**

1:00 **Welcome/Announcements**

1:10 Keynote Speaker: Steven M. Huffaker, Idaho Fish and Game, Director

Session #1: Fish Health/Nutrition, *Session Chair: Keith Johnson, IDFG*

1:30 Keith A. Johnson, Idaho Department of Fish and Game, *Myxobolus cerebralis Distribution in the Upper Salmon River, Idaho: The River Water Supply of Sawtooth Fish Hatchery*

1:50 Doug Munson, Idaho Department of Fish and Game, *Integrated Management of BKD Using ELISA-based Culling*

2:10 Christine M. Moffitt, Idaho Cooperative Fish and Wildlife Unit, Univ. of Idaho, *Environmental Risk Assessment for Application of Erythromycin to Control Bacterial Kidney Disease in Salmon*

2:30 Nathan Wiese, U.S. Fish and Wildlife Service, Hagerman National Fish Hatchery, *Intermittent feeding for controlling steelhead growth at Hagerman NFH*

2:50 – 3:20 Afternoon Break / Raffle Drawing (3:10)

Session #2: Conservation Fish Culture / Recovery Programs, *Session Chair: Doug Burton, IDFG*

3:20 Brad Dredge, Idaho Department of Fish and Game, Hayspur Fish Hatchery, *Heat Induced Triploid Trout Production*

3:40 Joe Kozfkay, Idaho Department of Fish and Game, Resident Fisheries Research Section, *Routine Use of Sterile Fish in Salmonid Sport Fisheries; Are We There Yet?*

4:00 Jeff Seggerman, Idaho Department of Fish and Game, Grace Fish Hatchery, *Production of Triploid Lake Trout (Salvelinus namaycush) at Grace Hatchery*

4:20 Nathan Jensen, Department of Fish and Wildlife Resources and the Aquaculture Research Institute, University of Idaho, *Development of conservation aquaculture strategies for restoration of burbot (Lota lota maculosa) in Idaho's Kootenai River*

4:40 Bret Barngrover, Wyoming Game and Fish Department, *The History of Developing a Genetically Pure Yellowstone Cutthroat Brood Stock within the Wyoming Game and Fish Department*

5:00 Announcements / Raffle Drawing / Adjourn

5:30 – 7:30 Poster session, poster authors present

6:30 – 7:30 Hospitality Hour

DAY 2: Wednesday, December 7, 2005

8:15 – 8:30 **Announcements / Raffle Drawing (8:20)**

Session #2: Continued. Conservation Fish Culture / Recovery Programs, *Session Chair: Jeff Heindel, IDFG*

8:30 Rob Jones, NOAA Fisheries, Hatcheries and Inland Fisheries Branch, Northwest Region, *The Hatchery Tool in Modern Salmon Management*

8:50 Debra Eddy, Oregon Department of Fish and Wildlife, *A Comparison of Spawning Characteristics of Natural and Hatchery-reared Female Imnaha River Chinook Salmon Spawned in Captivity, 1984 - 2004*

9:10 Brian Leth, Idaho Department of Fish and Game, *Reproductive Success of Hatchery-and Natural- Origin Chinook Salmon (Oncorhynchus tshawytscha) in the Pahsimeroi River, ID*

9:30 Michael Hayes, Western Fisheries Research Center, *Performance of hatchery and wild stocks of juvenile Chinook salmon produced in a conservation hatchery*

9:50 Berry Berejikian, NOAA Fisheries, *Evaluation of Conservation Hatchery Rearing and Release Strategies for Steelhead Recovery in the Hamma Hamma River*

10:10 – 10:40 Morning Break / Raffle Draw (10:30)

Session #2 Continued. *Session Chair: Joe Chapman, IDFG*

10:40 Bill Bosch, Yakama Nation Fisheries, *Evaluating the Feasibility of Reestablishing a Coho Salmon Population in the Yakima River, Washington*

11:00 Catherine Willard, Idaho Department of Fish and Game, *Utilizing parental analyses to evaluate natural smolt production from the Snake River Sockeye Salmon (Oncorhynchus nerka) captive broodstock program*

11:20 Tim Hoffnagle, Oregon Department of Fish and Wildlife, *Bacterial Kidney Disease Prevalence in Natural vs. Hatchery-Reared Adult Chinook Salmon Spawned in Captivity and in Nature*

11:40 Herb Pollard, NOAA Fisheries, *Accounting for Hatchery-origin Steelhead Returns to the Snake River Basin, 1995-2002*

12:00 – 1:10 Lunch / Raffle Draw (1:00)

Session #3: Hatchery Operations / New Technology, *Session Chair: Jerry McGehee, IDFG*

1:10 Doug DeHart, U.S. Fish and Wildlife Service, *Fish and Wildlife Service Columbia Basin Hatchery Reviews*

1:30 S.T. Summerfelt, The Conservation Fund Freshwater Group, *Evaluation of Two 8,000 L/min Partial-Reuse Systems Used for Atlantic Salmon Smolt Production at the White River National Fish Hatchery*

1:50 Dan Carty, Aquatic Animal Drug Approval Partnership Program, USFWS, *The Safety of AQUI-S^{R} (an experimental fish anesthetic) to Rainbow Trout*

2:10 S.T. Summerfelt, The Conservation Fund Freshwater Group, *Carbon Dioxide Avoidance Response by Rainbow Trout Provides Stimulus for Self-Fish Transfer between Tanks*

2:30 Dan Warren, D.J. Warren & Associates Inc., *The Confederated Tribes of the Colville Reservation, Chief Joseph Hatchery Program*

2:50 – 3:20 Afternoon Break / Raffle Drawing (3:10)

Session #4: Fish Culture Equipment / Innovations, *Session Chair: Roger Elmore, IDFG*

3:20 Mike McLean, Confederated Tribes of the Umatilla Indian Reservation, *A Tale of Two Weirs*

3:40 Gene McPherson, Idaho Department of Fish and Game, McCall Fish Hatchery, *The SI-5, Yes It Works!*

4:00 Molly Bowman, U. S. Fish and Wildlife Service, Aquatic Animal Drug Approval Partnership Program, *Evaluation of Calcein Immersion and Medicated Feed to Mark Snake River Cutthroat trout Oncorhynchus clarki and Shovelnose Sturgeon Scaphirynchus platorynchus*

4:20 Terry McCarthy, Water Management Technologies, *Mechanical Filtration in Fish Culture*

4:40 John Holder, Cornel University, JLH Consulting, Freshwater Institute *Application of Microbead Filters*

5:00 **Announcements/Adjourn**

5:30 – 6:30 **Ex – Com Meeting, Suite 124**

Day 3: Thursday, December 8, 2005

8:15 – 8:30 Announcements

Session #5: Fish Hatchery and Culture Information / Education, *Session Chair: Steve Wingert, IDFG*

8:30 Greg Kindschi, Bozeman Fish Technology Center, USFWS, *Evaluation of Thermal Requirements for June Sucker Propagation*

8:50 Grant Gale, Freshwater Fisheries Society of BC, Clearwater Trout Hatchery, *Deka-Sulphurous Kokanee Brood Program*

9:10 Brian Brazil, USDA-ARS National Center for Cool and Cold Water Aquaculture, *Growth Characteristics and Serum Chemistry Profiles of Four Rainbow Trout (Oncorhynchus mykiss) Cross Types Reared in Recirculating and Flow-through Culture Systems*

9:30 Guy Campbell, Washington Department of Fish and Wildlife, *Spring Chinook Size at Release Information*

9:50 – 10:20 **Morning Break / Raffle Drawing (10:10)**

Session #6: Miscellaneous Topics Related to Fish Culture, *Session Chair: Doug Young, IDFG*

10:20 Fish Culture Hall of Fame Inductions

10:40 Chris James, Idaho Cooperative Fish and Wildlife Unit, Univ. of Idaho, *Seasonal population dynamics of New Zealand mudsnails (Potamopyrgus antipodarum) in Silver Creek Drainage, Blaine County, Idaho and Riley Creek Drainage, Gooding County, Idaho*

11:00 Louise Bruce, Idaho Cooperative Fish and Wildlife Unit, Univ. of Idaho, *Survival and Passage of New Zealand Mudsnails in the Gastrointestinal Tract of Rainbow Trout*

11:20 Lubia Cajas, Idaho Cooperative Fish and Wildlife Unit, Univ. of Idaho, *Environmental and Social Costs of Production of Beef and Fish for Human Consumption.*

11:40 Genny Fraser, PRAqua Technologies. *A Solution for Whirling Disease Prevention*

12:00 **Closing Remarks / Announcement for next year's conference / Adjourn**

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Bio-Oregon, Inc Walter Kost 1935 NW Warrenton Drive Warrenton, Oregon 97146 Phone: (503)861-2256 Fax: (503)861-3701 Email: biooreg@pacifier.com	Christensen Net Works Britt Holmes 5510A Nielsen Avenue Ferndale, Washington 98248 Phone: (360)384-1446 Fax: (360)312-8996 E-mail: sales@cnwnetting.com
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Raincountry Refrigeration, Inc. Mark Vondrachek 1610 6th Street Bellingham, Washington 98225 Phone: (360)671-9165 Fax: (360)676-8674 Email: raincountryrefrigeration@comcast.net	PRAqua Supplies Genny Fraser 1631 Harold Road Nanaimo, British Columbia V9X 1T4 Phone: (250)754-4844 Fax: (250)754-9848 Email: genny@praqua.com

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MariSource Bruce Erickson 7213 45th St. Ct E Fife, WA 98424 Phone: (253)922-2700 Fax: (253)922-0226	Common Sensing, Inc. Brian G. D'Aoust P.O. Box 130 Clark Fork, ID 83811 Phone: (208)266-1541 Fax: (208)266-1428
Raincountry Refrigeration, Inc. Mark Vondrachek 1610 6th Street Bellingham, Washington 98225 Phone: (360)671-9165 Fax: (360)676-8674 Email: raincountryrefrigeration@comcast.net	Rangen, Inc. Leon Klimes 115 13th A P.O. Box 706 Buhl, Idaho 83316 Phone: (208)543-6421 Fax: (208)543-4698 Email: aquaculture@rangen.com
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Water Management Technology Terry McCarthy 6951 Exchequer Drive Baton Rouge, Louisiana 70809 Phone: (255)755-0026 Fax: Email: terry@w-m-t.com	Western Chemical Inc. Ron Secor 1269 Lattimore Road Ferndale, Washington 98248 Phone: (360)384-5898 Fax: Email: wci@premier1.net
Seafood Innovations Pil Bruce & Lorraine Goodrick 72 Campbell Road Sheldon Q. 4157 Australia Phone: 617 32060777 Fax: 617 32064603 Email: bruce@seafoodinnovations.com.au	Aqua Azul Corporation Joseph Murro P.O. Box 337 Armona, CA 93202 Phone: (559)589-1430 Fax: (559)589-1185

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NORTHWEST FISH CULTURE CONFERENCE HISTORICAL RECORD

YEAR	LOCATION	HOST AGENCY	CHAIRMAN
1950	Portland, OR	U.S. Fish and Wildlife Service	Ted Perry
1951	Wenatchee, WA	U.S. Fish and Wildlife Service	Roger Burrows
1952	Seattle, WA	Washington Department of Fisheries	Bud Ellis
1953	Portland, OR	Fish Commission of Oregon	Fred Cleaver
1954	Seattle, WA	U.S. Fish and Wildlife Service	Bob Rucker
1955	Portland, OR	Oregon Game Commission	John Rayner
1956	Seattle, WA	Washington Department of Game	Cliff Millenbach
1957	Portland, OR	U.S. Fish and Wildlife Service	Harlan Johnson
1958	Seattle, WA	Washington Department of Fisheries	Bud Ellis
1959	Portland, OR	Fish Commission of Oregon	Ernie Jeffries
1960	Olympia, WA	Washington Department of Game	John Johansen
1961	Portland, OR	Oregon Game Commission	Chris Jensen
1962	Longview, WA	U.S. Fish and Wildlife Service	Roger Burrows
1963	Olympia, WA	Washington Department of Fisheries	Bud Ellis
1964	Corvallis, OR	Oregon State University	John Fryer
1965	Portland, OR	U.S. Fish and Wildlife Service	John Halver
1966	Portland, OR	Fish Commission of Oregon	Wally Hublou
1967	Seattle, WA	University of Washington	Loren Donaldson
1968	Boise, ID	Idaho Department of Fish and Game	Paul Cuplin
1969	Olympia, WA	Washington Department of Game	John Johansen
1970	Portland, OR	Oregon Game Commission	Chris Jensen
1971	Portland, OR	U.S. Fish and Wildlife Service	Marv Smith
1972	Seattle, WA	Washington Department of Fisheries	Dick Noble
1973	Wemme, OR	Oregon Fish Commission	Ernie Jeffries
1974	Seattle, WA	University of Washington	Ernie Salo
1975	Otter Crest, OR	Oregon State University	Jack Donaldson
1976	Twin Falls, ID	University of Idaho	Bill Klontz
1977	Olympia, WA	Washington Department of Game	Jim Morrow
1978	Vancouver, WA	U.S. Fish and Wildlife Service	Dave Leith

YEAR	LOCATION	HOST AGENCY	CHAIRMAN
1979	Portland, OR	Oregon Department of Fish and Wildlife	Ernie Jeffries
1980	Courtenay, B.C.	Fisheries & Oceans, Canada	Keith Sandercock
1981	Olympia, WA	Washington Department of Fisheries	Will Ashcraft
1982	Gleneden Beach, OR	National Marine Fisheries Service	Einar Wold
1983	Moscow, ID	University of Idaho & Idaho Department of Fish and Game	Bill Klontz & Evan Parrish
1984	Kennewick, WA	Washington Department of Game	Jim Gearheard
1985	Tacoma, WA	U.S. Fish and Wildlife Service	Ed Forner
1986	Eugene, OR	Oregon Department of Fish and Wildlife	Chris Christensen
1987	Tacoma, WA	Washington Department of Fisheries	Will Ashcraft
1988	Richmond, B.C.	B.C. Ministry of Environment	Don Peterson & Peter Brown
1989	Gleneden Beach, OR	National Marine Fisheries Service	RZ Smith
1990	Boise, ID	Idaho Department of Fish and Game	Bill Hutchinson
1991	Redding, CA	California Department of Fish and Game	Ken Hashagen
1992	Wenatchee, WA	Washington Department of Wildlife & Alaska Department of Fish and Game	John Kerwin & Irv Brock
1993	Spokane, WA	U.S. Fish and Wildlife Service	Ed Forner
1994	Sunriver, OR	Oregon Department of Fish and Wildlife	Rich Berry
1995	Fife, WA	Washington Department of Fish and Wildlife	Larry Peck
1996	Victoria, B.C.	B.C. Ministry of Environment, Lands and Parks & Department of Fisheries and Oceans Canada	Don Peterson & Greg Bonnell
1997	Gleneden Beach, OR	National Marine Fisheries Service	RZ Smith
1998	Boise, ID	Idaho Department of Fish and Game	Tom Rogers
1999	Seattle, WA	U.S. Fish and Wildlife Service	Ray Brunson
2000	Sacramento, CA	California Department of Fish and Game	Judy Urrutia
2001	Portland, OR	Oregon Department of Fish and Wildlife	Trent Stickell & George Nandor
2002	Bellingham, WA	Washington Department of Fish and Wildlife	John Kerwin
2003	Portland, OR	NOAA Fisheries- NW Region & NW Fisheries Science Center	RZ Smith & Tom Flagg

YEAR	LOCATION	HOST AGENCY	CHAIRMAN
2004	Victoria, B.C.	Freshwater Fisheries Society of BC & Department of Fisheries and Oceans Canada	Ray Billings & Roberta Cook
2005	Boise, ID	Idaho Department of Fish and Game	Tom Frew Tom Rogers Lynette Moran