University of Washington
School of Aquatic & Fishery Sciences
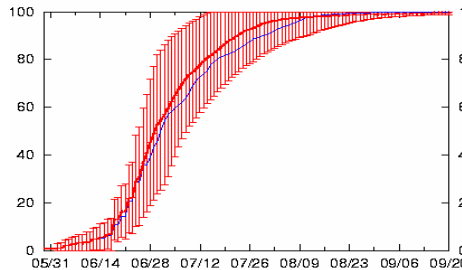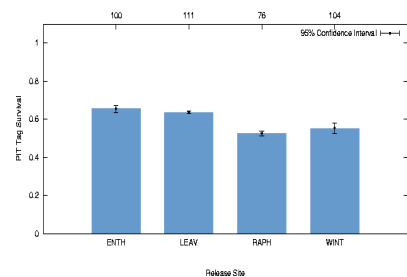## Columbia Basin Research

Columbia Basin Research (CBR) is a scientific research group at the University of Washington, School of Aquatic & Fishery Sciences. We investigate salmon biology and survival in the Columbia and Snake river basins. We provide user-friendly data analysis and modeling tools, and maintain DART, an interactive secondary database, for the fisheries community and the general public.
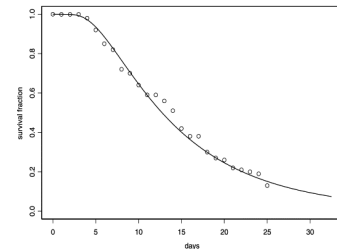
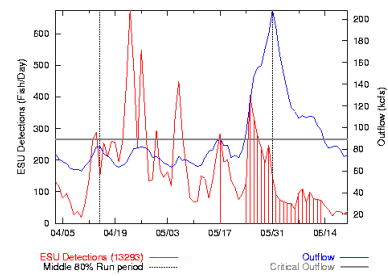## Inside . . .

Highlights of 2003 Run-Timing Predictions

2003 Survival Trends

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River Conditions

2003 Survival Trends for Hatchery Spring Chinook

The year 2003 will go down as another good outmigration year for spring chinook and other stocks. Releases had higher rates of survival, continuing upward trends of survivals for stocks released from Entiat, Leavenworth, Winthrop, and Rapid River hatcheries as shown on the chart and table at the right for spring chinook.

The 2003 spring outmigration PIT-tag results are now posted. In addition, the website includes the travel time and survival estimates for 22 different stocks from 11 hatcheries and traps since 1992.

For more information:
http://www.cbr.washington.edu/pitSurv/
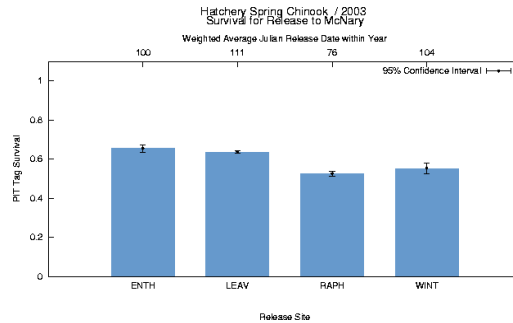
Hatchery Spring Chinook / 2003 Survival for Release to McNary			
Release Site	**Survival**	**Number PIT Tag Groups**	**Release Dates**
Entiat NFH	0.6547	1	10-apr-2003
Leavenworth NFH	0.6371	1	21-apr-2003
Rapid River Hatchery	0.5254	1	17-mar-2003
Winthrop NFH	0.5525	1	14-apr-2003

Introducing PitPro

PitPro is user-friendly utility for generating SURPH data files from PIT-tag data.

The SURPH program is a valuable tool for estimating survival and detection probabilities of fish migrating in the Snake and Columbia rivers. Using special input data files, **SURPH** computes reach-to-reach statistics for any release group passing a system of detection sites. However, PIT-tag

data, as available from PTAGIS, comes in a form that is not ready for use as SURPH input. For the PTAGIS data to be usable by SURPH, it must be preprocessed.

PitPro provides a user-friendly graphical interface that allows a user to easily convert PIT-tag data into SURPH data. The program will check for errors and remove any fish that have an erroneous detection history. A tool, called the Results Manager, is available to analyze and verify results. With the Results Manager, the user can look at a travel time summary or examine the PIT-tag detection history for an entire tag group or an individual fish.

For more information:
http://www.cbr.washington.edu/paramEst/SURPH/Utilities/PtagisUtilities.html

2003 Run-Timing Predictions

Flow augmentation has been a central mitigation strategy for improving downstream migration conditions for juvenile salmonids in the Columbia River Basin for many years. Its effectiveness depends on accurate knowledge of the stock's outmigration timing. Program RealTime, a statistical software program, uses historical data to predict the percentage of the outmigration that will reach an index site, and it forecasts the elapsed time until some future percentage is observed at that site. Since 1994, Program RealTime has provided to the fisheries community forecasts on a number of ESA-listed stocks, in real time, on the worldwide web.

Program RealTime currently monitors the outmigration timing of 35 PIT-tagged stocks of wild and hatchery ESU chinook salmon, sockeye salmon, and steelhead. The program also monitors run-timing using passage indices for run-at-large stocks at 5 hydroprojects. Average daily predictive error

was within 3% of the actual passage percentiles in 2003 for run-at-large stocks.

In this example, Program RealTime predictions and the end-of-season observed passage percentages are compared for subyearling chinook salmon smolts outmigrating to McNary Dam in 2003.
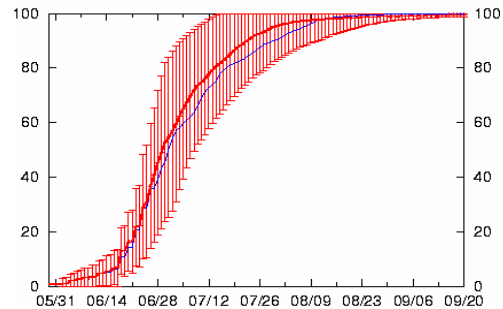
RealTime predictions (red) vs. end-of-season observations (blue)

For more information and results:
http://www.cbr.washington.edu/crisprt/

The Vitality Model: What does not kill us makes us weaker
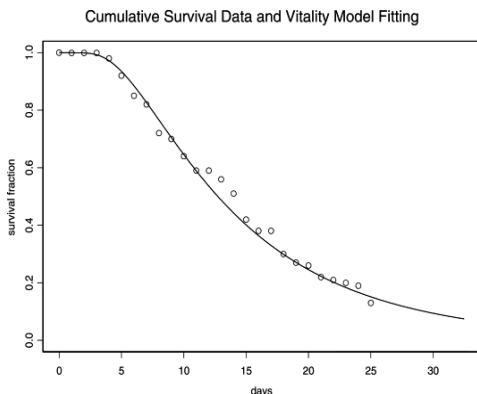
Cumulative survival data and vitality model fit for 3.4 g mean weight rainbow trout subjected to 125% gas supersaturation (data from White et al. 1991).

The vitality-based survival model is a parametric model for relating stressors and environmental properties to organism survivorship. Vitality is an abstract property which changes in response to organism experience; including exposure to disease, toxin or other stressor, level of stress,

feeding success, frequency of predator attack, mating, and habitat choice. Mortality occurs when an organism's vitality reaches zero. Mortality can also occur independent of vitality through accidental-based mortality; catastrophic events occurring equally within a population and independent of the different past histories of the individuals. The modeled survival distribution is then the product of the probability of survival according to the organism's vitality and the probability of avoiding accidental mortality.
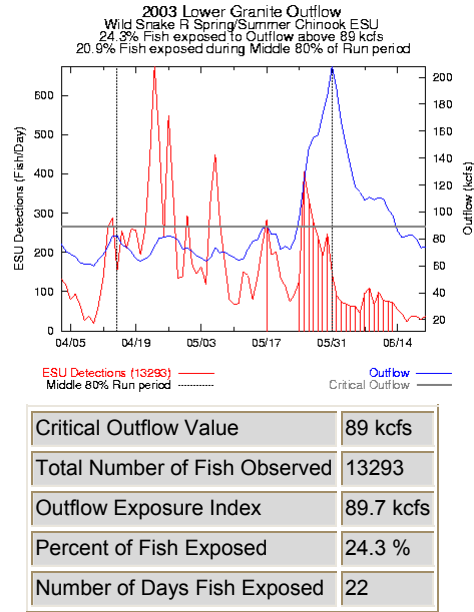
The vitality model is useful, for example, in comparing delayed mortality of migrating juvenile salmon due to stresses incurred in the various dam passage routes.

For papers describing the model and parameter fitting code:
http://www.cbr.washington.edu/vitality/

2003 Fish Exposure to River Conditions at Hydroelectric Projects

We developed the Columbia Basin Performance Measures data analysis tool to calculate fish exposure to river conditions. The online tool generates graphs and summary tables of fish exposure to river conditions—Dissolved Gas Percent, Outflow, Spill, Spill Percent, Temperature, and Turbidity—at the major hydroelectric projects on the Columbia and Snake Rivers. The results are based on observed data retrieved from the Columbia River Data Access in Real Time (DART) database. Exposure is based on the total number of fish passing a selected project under user-specified hydrological conditions. Summary tables include statistics for the total run period and the middle 80% of the run period.

This example shows the exposure of the Snake River Wild Spring/Summer Chinook ESU population during the 2003 outmigration to conditions above the 2000 Biological Opinion's target for spring flow at Lower Granite Dam.

2003 Lower Granite Outflow
Wild Snake R Spring/Summer Chinook ESU
24.3% Fish exposed to Outflow above 89 kcfs
20.9% Fish exposed during Middle 80% of Run period

Critical Outflow Value	89 kcfs
Total Number of Fish Observed	13293
Outflow Exposure Index	89.7 kcfs
Percent of Fish Exposed	24.3 %
Number of Days Fish Exposed	22

For more information and results: http://www.cbr.washington.edu/perform/

What's Next in 2004

Watch our web site for new developments and products in 2004. The following are several highlights for the beginning of 2004.

Adult Escapement — Adult escapement is being summarized for the following salmonid species:
- Spring/Summer Chinook: Upper Columbia River (1958-2001), Snake River (1957-2001), and Redd Count Index Areas
- Fall Chinook: Snake River (1975-2001)
- Sockeye: Snake River (1977-1995)
- Steelhead: Upper Columbia River (1976-2001), Middle Columbia River (1974-2001), and Snake River (1949-2001)

Columbia Basin ESU populations — We are expanding our juvenile and adult

Columbia Basin ESU data services to include:
- Upper Columbia River Spring Chinook
- Upper Columbia River Fall Chinook
- Middle Columbia River Steelhead
- Lower Columbia River Chinook
- Lower Columbia River Steelhead

2004 Run-timing and Water Quality Predictions — The 2004 run-timing forecasts for juvenile and adult salmonid populations and water quality forecasts will start at the beginning of April.

To keep up-to-date with our latest work, please visit: http://www.cbr.washington.edu/whatsnew.html