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RL 101

CONSERVING the KENAI KING

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to try to manage precisely within a set range of fish.

In 2012 and 2013, ADFG had to find ways to get enough kings in the Kenai River unharmed without exceeding the top end of the sustainable escapement goal range for sockeyes, which is 1.2 million.

The late-run king salmon sustainable escapement goal, or SEG, is 15,000 to 30,000 fish.

According to ADFG's final estimate, 15,395 late run kings escaped in 2013. That number is based on what were counted by the sonar, and subtracting the in-river harvest and additional fish to account for catch and release mortality.

It's also a number for much debate, and managing multiple goals at one time in one river when sockeye are abundant and kings are not is only one part of the challenge.

In recent years, the goals themselves have become the focus of dispute for fishermen, biologists and stakeholder advocates concerned about catches and the health of the river.

The arguments stem, in part, from disagreements about counting methods.

ADFG has used different tools over the past decade to estimate how many fish are swimming into the river, and how many of those are not caught by sport anglers, and instead allowed to spawn.

Different tools have different "currencies," or ways to count the fish also known as "enumeration." ADFG must update escapement goals periodically to reflect new enumeration methods, the most recent returns and new knowledge about what number of spawners result in the best returns.

In March 2013, the Board of Fisheries voted to approve the new late-run Kenai king salmon goal produced by ADFG. The board vote was a formality, as under the law the board must accept sustainable escapement goals without operation.

The board does have the ability to choose optimum escapement goals, or OEG, which can be higher than the SEG for allocative purposes.

In 2011, the board raised the late-run sockeye salmon optimal escapement goal to enhance the in-river sport fishery. The change raised the upper end of the goal from 800,000 to 1.4 million, allocating 200,000 for the in-river sport fishery. That was proposed by the Kenai River Sportfishing Association, or KRSA.

The sustainable escapement goal for that run is 700,000 to 1.2 million salmon, also set in 2011.

The goals for Kenai River kings are based on a run reconstruction that McKinley and other ADFG scientists modeled using 30 years worth of data from both sonars, and other enumeration methods and relative abundance metrics such as mark-recapture, netting projects and catch per unit effort.

The late-run reconstruction, "is trying to take that all of that into account," McKinley said.

The reconstruction produced official estimates of total run, in-river run, escapement and recruitment for late-run kings, he said.

Based on that, the department determined the ideal escapement, that would produce the best runs in the future, using the counts from the new DIDSON sonar. DIDSON stands for dual-frequency identification sonar, and it distinguishes more accurately between kings and sockeyes.

The lack of distinguishing between species was the main drawback to the previous "split-beam" counters used for in-season management up until 2011.

The new late-run Kenai River goal of 15,000 to 30,000 is lower numerically than the previous goal of 17,800 to 35,500 used with the less precise split-beam counter. But that doesn't mean that the department thinks fewer fish need to spawn, McKinley said, it just means the fish are measured in a different currency.

Questions linger

Fishermen, however, have questions about the methodology — from concerns about how the enumeration methods are incorporated into the goals, to issues with the Bayesian statistical method that underlies the models.

Bayesian statistical methods use the language of probability to quantify uncertainty in the model parameters, including the data that drives the model.

According to ADFG's late-run escapement goal report, the use of Bayesian methods incorporates a more realistic assessment of uncertainty than classical statistical methods, and allows the effects of measurement error and missing data to be incorporated into the analysis.

A peer review of the escapement goal reports released Dec. 16 on the ADFG website was largely favorable. ADFG asked three fisheries professionals to review the reports.

University of Washington fisheries professor Ray Hilborn, University of Rhode Island professor Jeremy Collie and National Marine Fisheries Service research biologist Robert Kope each reviewed, and commented, on the reports.

Each reviewer's comments were published anonymously by ADFG.

One wrote: "The analyses are very thorough, and carefully explore and characterize the uncertainty in both the data and the resulting estimates of parameters and reference points. The use of a state-space model in a Bayesian framework allows for incorporation of nearly all available data as well as evaluation of the uncertainty in those data. In my view, this a far superior approach to conventional spawner-recruit analyses where all these data are condensed into time series of spawner and recruit abundance, and most of the uncertainty is ignored."

The others largely agreed with that assessment, although they offered certain critiques of other components.

Prior to the peer review release, fishermen voiced their concerns about ADFG's escapement goals. That might be one of the only points that the Upper Cook Inlet sport and commercial fishermen agree on right now, although they've taken opposing positions on the goals in the past.

Photo/File/AP

Dipnetters work a bank near the mouth of the Kenai River alongside a commerical fishing boat looking to net sockeye salmon. Salmon swim a daunting course past setnets, drifters, dipnetters and anglers in order to reach their natal spawning grounds in the lakes and tributaries of the Kenai River.

Photo/File/AP

Given the questions surrounding counting methods, and the ways in which those have changed, both organizations and fishermen have asked if it's fair to develop a model and goal based upon them.

One of the reviewers said the methodology accounted for that properly, although he noted that he didn't "know enough about the individual data sources to critically review all of the assumptions."

The United Cook Inlet Drift Association, or UCIDA, has questioned other aspects of the methodology. After ADFG did its run reconstruction and determined the range of returns that would produce the most fish in the future, a "safety factor" was added.

According to the late-run escapement goal report, produced this past January, a range of 13,000 to 28,000 kings would be expected to provide yields of at least 90 percent of maximum sustained yield even at the minimum end of the range. That was adjusted upward by 2,000 fish at each end of the goal in part because of reduced productivity in recent years, according to the report, which means that the historical productivity may not be as reliable at precisely predicting future performance.

Jeff Fox, a former ADFG Kenai Peninsula area management biologist who now works as a consultant for UCIDA, said the upward adjustment for the "safety factor" can also be seen as an allocation for in-river users.

More fish in the river makes it easier to catch one, added UCIDA Executive Director Roland Maw. According to Fox, UCIDA wouldn't have questioned adding fish at the lower bound of the goal. But at the upper end of the goal, extra spawning fish could equate to smaller returns in the future.

When the escapement changes from 12,000 to 13,000 fish, the return increases by about 1,800 fish, Fox said. But at the upper end of the goal you start losing fish in subsequent years when you add more spawners, he said.

That's goes back to the density dependent issues, which appear in the numbers generated by the run reconstruction.

Smaller escapements in the late 1990s produced large returns in the early to mid-2000s. Then, exceptionally high escapements in 2003, 2004 and 2005 far greater than the top end of the goal of 35,500 produced the smallest number of recruits into the fishery seen in the reconstruction, according to the escapement goal report.

In 2004, 63,770 kings escaped out of a total run of 99,690, according to the run reconstruction. Those spawners contributed just 21,280 fish to future runs, according to the model.

According to the report: "The relative role of density-dependent and density-