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ALASKA BOARD OF FISHERIES  
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**Subject: Report (RIR.5J.2016.09) to the Alaska Board of Fisheries:  
*Progress Report on Genetic and Coded Wire Tag Mixed-Stock Analysis of  
Chinook Salmon Harvested in Cook Inlet Marine Sport Fishery, 2014–2016***

Dear Board Members,

My name is Henry Bissell. I am not an Alaska resident, but for over 20 years I have made annual trips to Alaska to fish and enjoy the outdoors. Of all the Alaska destinations I have visited, I have to say that Homer is my favorite. For this reason I want to comment on the Lower Cook Inlet Chinook Salmon Marine Sport Fishery and some issues I find troubling.

Most recently, I have been following the current mixed-stock analysis of the Chinook salmon marine sport fishery (identified above). I can tell you, it has not been a simple task. There have been several different versions of Operational Plans, ranging from 39 pages to 117 pages.<sup>1</sup> Keeping up with the ongoing changes to the study has been a challenge.

While I am not currently using my Bachelors Degree in Chemistry, I do know that the best scientific practices include proper planning, effective sampling design, and consistent practices throughout the period of study. In light of ADF&G's Operational Planning policies and procedures<sup>2</sup>, particularly *Appendix E1: Requirement for Operational Plan Amendment*, I believed an amendment would become available.

This belief was reinforced by the Department's published policy for scientific reports<sup>3</sup>, which states: "*Major revisions (to publications) require an Addendum, which will be published as a separate document.*"

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<sup>1</sup> **Operational Plan:** (2015, 39 pp.) ROP.SF.2A.2014.19

Failor, B. J. 2013. Cook Inlet Chinook salmon marine recreational harvest assessment. Alaska Department of Fish and Game, Regional Operational Plan ROP.SF.2A.2014.19, Anchorage.

**Operational Plan:** (2015, 110 pp.) ROP.SF.2A.2015.17

Failor, B. J. 2016. Operational Plan: Cook Inlet Chinook salmon marine sport harvest assessment, 2015. Alaska Department of Fish and Game, Regional Operational Plan ROP.SF.2A.2015.17, Anchorage.

**Operational Plan:** (2016, 117 pp.) ROP.SF.2A.2016.01

Failor, B. J. 2016. Operational Plan: Cook Inlet Chinook salmon marine sport harvest assessment, 2016. Alaska Department of Fish and Game, Regional Operational Plan ROP.SF.2A.2016.01, Anchorage.

<sup>2</sup> Regnart, J. and C. O. Swanton. 2012. *Operational Planning—Policies and Procedures for ADF&G Fisheries Research and Data Collection Projects*. Alaska Department of Fish and Game, Special Publication No. 12-13, Anchorage.

<sup>3</sup> MacClellan, J., S. R. Royse, and A. M. Carroll. 2012. *Policy and Procedures for ADF&G Scientific and Technical Fisheries Reports*, third edition. Alaska Department of Fish and Game, Special Publication No. 12-14, Anchorage.

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However, Department staff informed me that Operational Plans are considered separate plans, and not amended versions, even if they contain changes to the methods or objectives of the same scientific study. For this and other reasons, I am increasingly concerned with some of the scientific practices and findings that relate to this fishery.

### **MATURITY DETERMINATIONS**

Maturity determinations have been an integral part of a number of Chinook salmon saltwater sport fishery assessments in this region. It is not an easy matter to discuss in this forum, but I will try.

Multiple assessments by Department biologists, including Begich, McKinley, and even possibly this current study<sup>4</sup>, have enlisted some variation of a method developed for Southeast Alaska salmon stocks by Kissner.

*“Kissner (1974) found that he could successfully estimate the proportions of Alaskan and non-Alaskan Chinook in a harvest sample by examining the freshwater growth zone of spring Chinook scales. Unfortunately, Kissner's technique was unable to discriminate between Chinook stocks from southeast Alaskan waters.”<sup>5</sup>*

*“Salmon in populations with more difficult migration routes produce fewer and smaller eggs for a given body size and have a higher ratio of egg number to egg size than fish with easier migrations. A comparison among 16 populations, with matching migration and rearing environments but different incubation environments (i.e., separate spawning streams), confirmed this prediction; smaller females produced larger eggs for their size in warmer creeks.”<sup>6</sup>*

Regarding “SALMON IN THE OCEAN: *It has been shown that determination of the degree of maturity is accomplished primarily by comparing the distribution of egg sizes of a group of fish with the similar distribution of fish known to be mature. It has been pointed out that the size of the eggs changes during the season; that there are differences in the size of eggs of fish of different ages, due to the difference in the size of the fish; and also there are racial differences in the size of the eggs.*

*In preparing eggs for this measurement it is necessary to free them very carefully from the ovarian membranes, so as not to break the delicate egg membrane and yet to clear them of all shreds of tissue which might tend to affect the measurement. The smaller eggs—those less than 1 mm. in diameter—were measured by means of a microscope fitted with an eyepiece micrometer, carefully calibrated against a stage micrometer. In using this method it was necessary, of course, to measure the 10 eggs separately, and then the average of these measurements was found.*

*It is obvious that these factors will make it impossible to draw a sharp line of distinction, which will hold good throughout the season, between the size of the eggs of mature and immature fish, and that the determination of the relative maturity of the fish taken in the*

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<sup>4</sup> “Relative maturity (immature and prespawning) will be determined for as many Chinook salmon as possible. Additionally, when time and anglers permit, in-skein egg diameter of females and cross-section diameter of milt sacs will be measured to the nearest mm.” ROP.SF.2A.2016.01.

<sup>5</sup> L.M. Neimark, 1985, *Harvest Estimates of Selected Fisheries Throughout Southeast Alaska*, Sport Fish Investigations of Alaska, F-9-16

<sup>6</sup> Braun, Douglas C., David A. Patterson, and John D. Reynolds. “Maternal and environmental influences on egg size and juvenile life history traits in Pacific salmon.” *Ecology and evolution* 3.6 (2013): 1727-1740.

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*ocean must depend upon a comparison of the distribution of egg sizes in the various age groups with the distribution of egg sizes of unquestionably mature fish taken in the river at about the same time of the year.*

*This method is applicable only to the females and no method has yet been devised for accurately determining the relative maturity of the males.*

*Another disturbing factor, which undoubtedly makes the accurate determination of the relative maturity from the size of the eggs more difficult, is the fact that the various collections contain a mixture of races, which, as has already been mentioned, have not been segregated, and it is known that there is considerable variation among different races in the size of the fully mature eggs.*"<sup>7</sup>

*"Substantial egg size and female length variation was observed in Chinook salmon populations..." "Regional variation in egg size was also observed..."*<sup>8</sup>

The maturation methods applied in previous assessments of this fishery appear to be crudely designed, merely making coarse measurements of eggs and dividing up what sizes equal what, without disclosure of the rigorous sampling practices and measurements known to be essential to making reliable maturation determinations. Without such scientific rigor, carelessly designed maturation schedules can be little more than subjective determinations without verification or measurement of accuracy. Prior assessments show signs of this lack of scientific rigor, and I am concerned about the future of the current assessment and any maturity analysis it might attempt.

Thank you for this opportunity. If you have any questions, I will try to answer them.

Sincerely,

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Henry Bissell

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<sup>7</sup> Rich, W. H. 1925. *Growth and degree of maturity of Chinook salmon in the ocean*. Bull. Bur. Fish. Vol. 41: 15-90.

<sup>8</sup> Beacham, T. D., and C. B. Murray. "Fecundity and egg size variation in North American Pacific salmon (*Oncorhynchus*)." *Journal of Fish Biology* 42.4 (1993): 485-508.