

March 13, 2023

Alaska Board of Fisheries

P.O. Box 115526

Juneau, Alaska 99811-5524

Attn: Executive Director / Art Nelson

Chairperson / Carlson-Van Dort / Members of the Board of Fisheries

Subject: Upper Cook Inlet Commercial Fishing Announcement No. 1 / Emergency Order Number 2S-1-23

Board Members,

Please review this Example of the complexities of enumerating “large” kings using the ARIS array system. This report (FDS No. 22-13) was published in August of 2022. It is the most current analysis of the counting system used in the Kasilof and Kenai Rivers. While the report is specific to the Kasilof counter, the last six pages of the report illustrate the complexities and arbitrary nature of real time identifications of kings on a real-time basis.

While useful for establishing indices, and run timing, there is an “arbitrary” component of the process. Other test netting for age class composition and to establish an “all king return” to a given system has considerable issues with accuracy or within a given “confidence” interval.

This report and others explain the cautions within the data generated.

I am offering this information to the board as it was part of my testimony and to highlight that pre-season projections or even in-season predictions cannot be accurate to such fine detail as in single or hundreds of kings. They are relative numbers and without having a “true” population number of ALL kings returning to a given system the proportions of “large” kings maybe skewed.

It is my understanding that the Department knew that there was potential for errors in their assessments and added approximately 1,500 Kenai River Late-Run Kings to the calculated all king return in establishing the lower bounds of the SEG.

It should be noted that 1,500 “large” kings in “all” all king terms in-river means 2,100 (60% large – 40% less than 34 inches). When the BOF members in 2020

approved an OEG of 15,000, they were actually looking at an in-river return of over all of 4,200 kings.

That is 4,200 hundred over a large king goal of 12,000 which was advocated by some within the Department when they were recommending the escapement goal. To be consistent, at 12,000 large kings that would mean and all king in-river return would be approximately 16,000 kings.

Thank you,

Paul A. Shadura II

[REDACTED]

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Fishery Data Series No. 22-13

**Late-Run Kasilof River Chinook Salmon Sonar
Assessment, 2019–2020**

by

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and

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August 2022

Alaska Department of Fish and Game

Divisions of Sport Fish and Commercial Fisheries



**APPENDIX A: INSTRUCTIONS AND SETTINGS USED FOR
MANUAL FISH LENGTH MEASUREMENTS FROM ARIS
IMAGES USING ARISFISH SOFTWARE VERSION 2.6**

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Appendix A1.—Instructions and settings for manual length measurements from ARIS images using ARISFish version 2.6.

Set Global Settings after a NEW installation of ARISFish:

- 1. Open ARISFish global settings and ensure you have the following settings to measure fish:**
- 2. Enable smoothing is off.**
- 3. Display Measured Lengths is on.**
- 4. Auto select fish for measurement on mark entry is on.**
- 5. Prompt for Editor ID is on.**

Set processing parameters for a new set of files for a new day or stratum:

- 1. Select <Files> <Open Recently Viewed>**

- 2. Navigate to the appropriate directory and open a file (or simply double click on the file of interest)**

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At this point, the ARISFish display should look similar to the image below:

- 3. Select the <Background Subtraction> icon and wait about 30 seconds background to subtract.**
- 4. Then select <Show EG> to display the Echogram.**
- 5. You will be prompted to enter your Editor ID. Press OK.**

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Your display should now look like the one below

- 6. Select <More> from the Fish Counting window to get the extended window where you can**

- a. enter your Editor ID initials
- b. set the Upstream Fish direction
- c. ensure that Loop length is set to at least 8 seconds
- d. then select Less to unexpand Fish Counting window (you'll be able to access other controls like BS easier if you do this).

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7. Select <Background Subtraction> icon on Filters Menu (Toggle)—this will now turn background subtraction off on the video image. Failing to turn background subtraction off prior to measuring fish image length may result in an underestimate of actual fish length.

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8. Set Signal Intensity sliders to optimize video image for measuring fish.

9. Your overall display should look similar to the following:

10. Now you are ready to start measuring (or marking) individual fish.

11. Once finished measure/marking all fish in the file, turn <Background Subtraction> on prior to advancing to the next file.

-continued 1 Now that we use ARIS instead of DIDSON, we mostly no longer use the background selection option while measuring fish image length. The

ARIS background selection algorithm is more aggressive than the DIDSON selection and unless one is very careful in selecting a frame, it is

easy to underestimate fish length. Toggling between background selection mode and the raw image can sometimes be helpful in determining

the end of the tail or snout. If we do use background selection, we generally take background selection off before finalizing the measurement.

A well selected frame will give the same length measurement with or without background selection.

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12. Select <Alt><right arrow> to advance to the next file.

to <left click> along the midline of the fish to create a “segmented measurement.” The segments should follow the midline of the body of the fish, ending with the snout.

c. Toggling between BS mode and the raw image can sometimes be helpful in determining the actual end of the tail or snout.

8. Select <f> key to add measurement to the .txt file (fish it!)—you will see measurement in red (<Left Click> on echogram inside mark, if you want to delete measurement and start over).

9. Select <v> key to unzoom movie window (not necessary if you have another fish nearby you want to measure).

10. Next fish...repeat steps 1–8, or

11. Occasionally press <E> to save your work on each sequence when complete (or before you divert to another task).

12. <Left Click> on Master Echogram to advance to new echogram section, or

13. <Alt><Right Arrow> to advance to next file.

To mark (count) fish in SMC ARISFish software version 2.6:

1. <Left Click> on the fish trace in the echogram if upstream.

2. <Ctrl> <Left Click> on the fish trace in the echogram if downstream.

Hot keys used in measuring and counting fish in SMC ARISFish software:

<e> to “save” all echogram measurements to file

<f> to “fish it” (to accept the measurement and display it on the echogram)

<u> to “undo” the last segment

<d> to “delete” all segments

<space bar> to pause in movie mode

<right arrow> forward direction when you play movie or advances frame one at a time if the movie is paused

<left arrow> opposite of above

<Left Click Drag> to show movie over the selected time

<Right Click Drag> zooms the selected area in the image when an echogram fish is selected

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Instructions for including or excluding fish to be counted or measured:

To optimize the aim of sonar beams relative to the bottom of the river, the insonified zone is often divided into individual range strata that are sampled separately. To avoid overcounting fish as they cross stratum boundaries, we apply the “centerline rule” where a fish is not counted unless it crosses the centerline of the sonar beam. Appendix A2 demonstrates the potential for overcounting without applying this criterion. Additional examples are given in Appendix A3. Note that although the centerline examples illustrated in Appendices A2 and A3 make it appear that all strata are sampled simultaneously within an hour, this is not the case. Each stratum for a given bank was sampled at different times within the hour.

Summary of fish measurement rules:

1. For a fish to be considered valid for measurement, it must cross the centerline.
 - a. If a fish enters or exits the beam on the near- or far-range boundary (beginning or end range), the snout of the fish must cross the centerline before it can be considered a valid fish to measure.
 - b. If the snout of the fish enters the near- or far-range boundary right on the centerline, the fish should be considered valid for measurement.
2. Exclude fish that hold throughout the length of the sample.
3. Exclude fish that are holding at either the beginning or the end of the sample.
 - a. Fish that are actively migrating (not holding) as the sample begins or ends should be considered valid targets for measurement as long as they cross the centerline.
4. Exclude fish that enter the beam from upstream, then exit the beam upstream (do not measure even if they cross the centerline).
5. Exclude fish that enter the beam from downstream and then exit the beam downstream (do not measure even if they cross the centerline).
6. Exclude fish that enter the beam from either upstream or downstream and then disappear from the image (unless there is evidence to suggest direction of travel).
7. Use the video image to identify actively migrating fish when several holding fish are present. If you have several fish holding throughout the sample, use the video mode or run your cursor

13. Once the new file opens, turn <Background Subtraction> off before beginning to measure fish (all other parameter settings and display configuration settings should be preserved from the previous file).

14. When you switch banks, you will need to reset the direction of travel parameter in step 5.

15. Now you are ready to start measuring/markings fish in the new file.

Instructions for manual fish length measurements using SMC ARISFish software version 2.6:

1. Ensure <Background Subtraction> is toggled off as described in step 6 above.
2. <Left Click> on the Echogram fish to be measured (Puts red marker on fish and automatically activates the movie showing the fish bounded by range arcs.
3. Press <space bar> to start or stop the video playback.
4. Use <right arrow> and <left arrow> to step through movie one frame at a time to find a frame that displays the entire fish length well.
 - a. Measurements should be taken from frames where contrast between the fish image and background are high and where the fish displays its full length.
 - b. In general, the best images are obtained when the fish is sinusoidal in shape (rather than straight and/or perfectly perpendicular to the sonar beam.
 - c. Watching the behavior of the head and especially the tail over several frames, and taking several measurement, is often helpful in distinguishing the best frame.
5. <Right Click Drag> on movie image to zoom in for measurement.
6. <Left Click Drag> if necessary to center movie window prior to measuring.

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7. Measure fish image:

a. Fish traveling snout-first upstream or downstream - <left click> on the fish snout and continue to <left click> along the midline of the fish to create a “segmented measurement.” The segments should follow the midline of the body of the fish, ending with the tail.

b. Fish backing downstream through the beam tail-first - <left click> on the fish tail and continue

across the echogram while watching the ARIS image to observe fish that are actively transiting the image. Measure fish that are actively transiting the image and that meet all criteria listed above.

8. When subjectively determining fish length under protocol #2 measure all questionably sized fish and omit fish that measure less than 75cm AL after verifying their length.

Consult with others if you come across a questionable fish image or are unclear of the rules listed above