Atlantic Salmon Escape Response

WDFW Statewide Freshwater Monitoring Protocol

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Background

On August 19, 2017, a large number of Atlantic salmon (*Salmo salar*) escaped into Puget Sound when a commercial net pen array collapsed at a fish farm located in Deepwater Bay off Cypress Island in the San Juan Islands. Cooke Aquaculture, the net pen operator, informed the Washington Department of Fish and Wildlife (WDFW) and other agencies that the collapsed pen held a total of 305,000 Atlantic salmon. At the end of the day on September 8th, Unified Incident Command reported that the total number of fish extracted from the damaged farm site is 145,851. Thus, the total number of Atlantic salmon that escaped is estimated to be approximately 159,149 fish.

For more information on the Atlantic salmon escape and recovery operations, please click on the following link for a multi-agency web site with the latest updates:

http://www.dnr.wa.gov/atlanticsalmon

Also, WDFW has established a website for anglers to record their catches. Some tribes and Canadian anglers are also logging theirs. To see where Atlantic salmon are being caught, click on the following website link:

http://wdfw.wa.gov/fishing/salmon/atlantic_catch_map.php

Purpose: WDFW Statewide Monitoring Protocol of Tributary Impacts from Atlantic Salmon Net Pen Release

The purpose of this document is to communicate WDFW's statewide protocol for monitoring Atlantic salmon following the escape of these fish from the structurally-damaged net pens near Cypress Island. This statewide monitoring plan focuses on WDFW's response protocol for our staff working in freshwater systems in particular, as the escaped Atlantic salmon may show up in our watersheds during normal sampling activities such as spawning ground surveys, fisheries sampling, hatchery racks, adult fish traps, and possibly juvenile fish traps (next spring). WDFW will coordinate and communicate with tribal co-managers during all monitoring efforts.

This comprehensive freshwater monitoring plan will apply statewide across all of Washington's river systems and tributaries. Observational data will be collected based on the presence/absence of Atlantic salmon, and samplers will collect additional biological data as possible from individual fish (e.g., scales, otoliths, length, sex, maturity status, and tissues), as detailed further below. Supervisors and sampling staff are advised to adapt existing data forms (paper and/or electronic, as applicable) to collect the additional data outlined below.

The key questions being addressed through collection of these data include: *1)* are the escaped Atlantic salmon showing up in fisheries, on the spawning grounds, in fish traps, and at hatcheries? What is the sex and maturity status of the individual fish observed? (enumerate fish, record sex, maturity); 2*)* have these fish been eating since the escape, and if so what have they been eating? (stomach content samples); *3)* have the fish grown since the escape? (length, weight, scale samples); *4)* are the observed Atlantics confirmed to be from Cooke Aquaculture's net pen escape, and how far did they travel from the net pen site? (otolith-mark samples); and *5)* have the escaped Atlantics picked up parasites and

other diseases compared to Pacific salmon counterparts in the same location? (external and internal condition observations, tissue samples).

Additionally, some Puget Sound tribes have been developing watershed-specific monitoring plans, and the Northwest Indian Fisheries Commission (NWIFC) has drafted recommended protocols for escapement sampling of Atlantic salmon. WDFW will coordinate and communicate with our tribal co-managers regarding monitoring efforts.

Atlantic salmon species identification

First, for all types of sampling, field technicians need to ensure correct species identification. Staff should take a photo of the observed Atlantic salmon, if possible, and send it to their regional supervisor for confirmation of species identification. Field staff should review the following species identification information for Atlantic salmon:

http://wdfw.wa.gov/fishing/salmon/atlantic.html

Dark spotting on the opercle plate and the lack of forking in the caudal fin are the primary distinguishing characteristics of Atlantics from Pacific salmon. Also, net pen fish will likely have a deeper bodies and eroded fins from confinement at high densities. These fish are not adipose fin-clipped. If anyone has any doubts about a fish please hold it for positive identification.

Ongoing fisheries providing Atlantic salmon data:

- Recreational fisheries are being implemented as described in the *2017-18 List of Agreed Fisheries*, with the following addition starting on August 22, in response to the Atlantic salmon escape:
    - There is no size or catch limit on Atlantic salmon. However, anglers may only fish for Atlantic salmon in marine waters that are already open to fishing for Pacific salmon or freshwater areas open for trout fishing. Anglers also must stop fishing for Atlantic salmon once they've caught their daily limit of Pacific salmon.
    - Atlantic salmon catches will be enumerated and sampled for biological data as described below.
- Tribal ceremonial & subsistence and commercial fisheries, and non-tribal commercial fisheries, are being implemented as described in the *2017-18 List of Agreed Fisheries*, and as authorized by in-season emergency rules such as through the Fraser River Panel management process. All catches will be reported on Fish Tickets. Atlantic salmon catches from commercial fisheries will be enumerated and sampled for biological data as described below.
- Atlantic salmon landed in both recreational and commercial fisheries will be opportunistically sampled for biological data. Sampling staff will sub-sample for biological data if a large number of Atlantic salmon are encountered. Sampling staff should ask their sampling supervisor for direction on the appropriate sub-sampling protocol (e.g., every 5th fish) and overall sample size goals.
  For those fish that are biologically sampled, the following data will be collected as feasible:
    - Visually inspect the fish, noting the condition of the fish and presence of external parasites if applicable (see *Fish Health* section below);
    - Length measurement (fork length, to nearest whole centimeter);
    - Weight (in grams or pounds, if a scale is available)
    - Sex (circle on scale card) and maturity status (mature, immature, or unknown);

- Otolith sample the Atlantic salmon as possible, as these fish have been otolith marked. Also take scales (using standard scale cards) for those Atlantics that are otolith sampled. Additional instructions for otoliths and scales:
    - Sub-sample for otoliths if there are numerous Atlantics; no need to sample every single fish. Ask sampling supervisor for sub-sampling instructions and direction on overall sample size goals.
    - Take 6 scales per Atlantic salmon (3 from each side of the fish); record the fork length and weight on the scale card.
    - If the otolith sample is extracted, put in vial with ethanol to preserve the sample. Link to scale card ID # and position; e.g., card number A002001pos2.
    - If not possible to extract the otolith in the field, remove the head of the Atlantic salmon as follows:
        - The cut should be made where the head and the spine joint meet.
        - Use the paper snout labels usually used for CWT recovery and complete as much information on the label as possible, to go with the head that will be placed in the usual snout collection bag. Initially freeze and store the heads.
        - Deliver the otolith samples or frozen heads to the WDFW Olympia-NRB Otolith Lab (Stefanie Karney; phone number: 360-902-2760).
- Fish health data and stomach contents: for specific tissue collection protocols, refer to the *Fish Health* sampling section below (under *Fish Traps*).

Other monitoring providing Atlantic salmon data:

- Fish traps:
    - Euthanize any live Atlantic salmon handled in fish traps using the standard protocol. Then sample for the following biological data as possible:
        - Visually inspect the fish, noting the condition of the fish and presence of external parasites if applicable (see *Fish Health* section below);
        - Length measurement (fork length, to nearest whole centimeter);
        - Weight (in grams or pounds, if a scale is available)
        - Sex (circle on scale card) and maturity status (mature, immature, or unknown);
        - Otolith sample the Atlantic salmon as possible, as these fish have been otolith marked. Also take scales (using standard scale cards) for those Atlantics that are otolith sampled. Additional instructions for otoliths and scales:
            - Sub-sample for otoliths if there are numerous Atlantics; no need to sample every single fish. Ask the sampling supervisor for sub-sampling instructions and direction on overall sample size goals.
            - Take 6 scales per Atlantic salmon (3 from each side of the fish); record the fork length and weight on the scale card.
            - If the otolith sample is extracted, put in vial with ethanol to preserve the sample. Link to scale card ID # and position; e.g., card number A002001pos2.
            - If not possible to extract the otolith in the field, remove the head of the Atlantic salmon as follows:
                - The cut should be made where the head and the spine joint meet.

- Use the paper snout labels usually used for CWT recovery and complete as much information on the label as possible, to go with the head that will be placed in the usual snout collection bag. Initially freeze and store the heads.
- Deliver the otolith samples or frozen heads to the WDFW Olympia-NRB Otolith Lab (Stefanie Karney; phone number: 360-902-2760).

- Fish Health Data: Samplers will collect tissue samples for fish health analysis if requested by WDFW Fish Epidemiologist, Dr. Jed Varney. Dr. Varney will determine tissue sampling needs on a case-by-case basis, based upon the number of samples needed for statistical significance in providing disease information. Dr. Varney has determined that adequate sampling has already been completed for Puget Sound marine areas. For Atlantic salmon observed in river systems, please call: Dr. Jed Varney, phone number: 360-522-2830. He may wish to do full necropsies or just take tissue samples which consist of extracting kidney and spleen -- remove ½ gram from each, place in separate sterile plastic bags, *kept cold but not frozen*.
  IMPORTANT NOTE: Atlantic salmon samples must be paired with native species as a comparison to what is found naturally in the water system to attach significance to any infection present.

- Stomach contents: There is interest in what/if the Atlantics are eating since their escape. As feasible, samplers should cut open the stomach of each bio-sampled Atlantic salmon to qualitatively observe if the stomach is "empty" or "full", and record this observation for each individual fish on the data form. If the stomach is full, remove the stomach and its contents and place in a sterile, sealed bag, and store on ice. Call Lance Campbell at the Olympia WDFW office (phone: 360-902-2725) for further instructions.

- Genetic samples can provide definitive species identification. Fin-clip samples should be taken on any fish for which visual identification is in doubt. Call Ken Warheit (360-902-2595) or Todd Seamons (360-902-2765) for further instructions, as needed, on appropriate methods for collecting fin clips for DNA analysis.

- Spawning grounds:
  - Stream survey crews will be on the lookout for Atlantic salmon presence during their usual spawning ground surveys during the Chinook, coho, chum, and steelhead seasons. Survey technicians will enumerate the number of Atlantic salmon observed (live or dead), river mile, date, and time, as well as noting spawning behavior if applicable.
    - Field supervisors are encouraged to provide photos and videos of mature Atlantic salmon spawning (available online) to help surveyors identify Atlantic spawners.
  - Take a photo and enumerate any Atlantic carcasses or live Atlantic salmon observed.
  - Take GPS coordinates for each location of an observed Atlantic salmon if possible.
  - Live Atlantics that can be caught easily by hand or dip net need to be removed from the spawning grounds and euthanized per standard protocol.

- Bio-sample individual dead Atlantic salmon as instructed above (see *Fish Traps*), for those data that can be collected feasibly during the stream survey – e.g., length, sex, maturity status, scales, otolith samples, and genetic (DNA samples). Spawned out carcasses will not be in good enough condition to obtain useable tissue samples.
- After bio-sampling the carcass, cut off the tail to indicate it has already been counted, per standard protocol. Leave the carcass for nutrient enhancement.
- Additionally, WDFW has an environmental DNA (eDNA) assay to detect Atlantic Salmon DNA from water samples. With the assay, the presence of Atlantic salmon can be confirmed (but not the absence). WDFW's Genetics Laboratory Director, Ken Warheit, will be coordinating the eDNA sampling crews to be deployed in Puget Sound rivers.
- Stream survey staff are reminded to disinfect wading boots, waders, and sampling gear before moving to another watershed and also at the end of the day, to prevent transfer of potential aquatic invasive species.

- Hatcheries:
  - WDFW fish hatchery staff working at hatchery rack and broodstock collection stations will identify, separate, euthanize, and enumerate all Atlantic salmon that are encountered, and record the information in the web application FishBooks and on a Form 3- Hatchery Fish and Egg Disposition Ticket.
  - Hatchery staff working at a facility not connected to FishBooks will report Atlantic salmon on an Adult Form and complete a Fish Disposition Ticket.
  - Form 3s are to be submitted to headquarters for database entry.
  - Information from FishBooks for Atlantic salmon will be reported on the weekly Hatchery In-season Escapement Report and the annual Hatchery Escapement Report.
  - Hatchery technicians will bio-sample Atlantic salmon for the data listed above (see *Fish Traps*), as feasible. Staff should ask their hatchery sampling supervisor about sub-sampling protocols (e.g., every 5th fish), as applicable if numerous Atlantics return, and the overall sample size goals.
  - Atlantic salmon collected at hatcheries will be donated to food banks, if possible, or safely disposed of.

- Juvenile Trapping:
  - Field staff operating juvenile migrant traps (fry and smolt traps) will be on alert next spring, and in subsequent springs, to look for offspring from Atlantics, or Atlantic – native salmon hybrids, in case there has been any successful spawning by escapees in the watershed. Atlantic salmon juveniles are to be retained, euthanized using a standard protocol, and delivered to WDFW. Field supervisors will provide photos and id characteristics (drawings) of Atlantic salmon parr and smolts (available online and in fish id books) to assist samplers in juvenile Atlantic salmon identification.
  - Additionally, a sampling protocol will be established at a select number of juvenile migrant traps, primarily in Puget Sound rivers, to genetically test for Atlantic-Pacific salmon hybrids. WDFW's Genetics Laboratory Director, Ken Warheit, will develop this protocol in coordination with WDFW Science Division staff.