# A RISK ASSESSMENT MATRIX FOR SMOLT WELFARE IN ATLANTIC SALMON: INSIGHTS FROM CHILE

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Salmon farming productivity strongly relies on smolt adaptability success on seawater (SW) environment after transference from the freshwater (FW) phase, especially during the first weeks after the arrival. According to current understanding, sub-optimal water quality conditions at tank level are able to alter key smolt physiological traits (e.g osmoregulation) which can be critical for fish growth and survival. Even though important advances on smolt welfare from land-based farm exist, there is a lack of quantitative tools able to better link fish physiological traits with SW smolt performance (e.g smolt index). A risk assessment on key water quality parameters, as well as smolt physiological indicators has been proposed as a first step towards a physiological smolt welfare index in Chile.

The current study is based on data from an ongoing smolt physiological monitoring program undertaken by NIVA Chile from both RAS-based and flow-through (FT) fish farms since 2015. The risk assessment is based on three components: key water quality, blood parameters and metals accumulated in target organs (gills and liver). A total of 20 consecutive batches of smolts were examined under these components only days before the smolts are transferred to the sea farms. Batch sampling was based on 3 tanks in which water quality parameters from effluents were analyzed. For each tank, 6 individuals were sampled to measure blood parameters, from which 3 individuals were randomly chosen to collect gills and liver samples.

Using the database of previous projects conducted in fresh water salmon farms, in conjunction with revising scientific literature, limits and recommended levels were established for all components considered. This enabled the categorization of each parameter by providing ranges in which they represent low, medium, or high implications on fish welfare. The frequency (or probability of occurrence) at which each variable presented low, medium or high implications was also determined. The combination of implication/severity level and frequency level results in a qualitative matrix for risk assessment considering the most critical variables.

This matrix appears as a suitable tool for visualizing the main risks for smolt welfare depending on production system (RAS or FT). Outcomes from this matrix can serve as a guideline for decision making process to correct and minimize the risk of these variables. The producer, for example, is able to prioritize and improve aspects of water quality conditions which in turn, result in better fish welfare.

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