An Analysis of the Causes of Mortality: Scottish Salmon Sector 2018-2020

Background

The Farmed Fish Health Framework (FFHF) is a 10-year collaboration between the Scottish aquaculture sector and Scottish Government, which aims to drive forward improvements in farmed fish health and welfare.

The FFHF includes a specific workstream relating to mortalities, which seeks a high-level analysis of the causes of mortality in marine grown salmon and trout. This analysis will help inform future activities within the FFHF.

This paper outlines the approach taken by the Scottish salmon farming sector in undertaking this high-level analysis, and thereafter presents the findings.

Approach

The following bullet points outline the approach that was taken for this analysis of the causes of mortality.

The analysis:

- considered all mortalities occurring in each full calendar year (Jan 1st to Dec. 31st).
- included data from all salmon farming companies.
- considered each calendar year from the formation of the Farmed Fish Health Framework (2018 to date).
- reports against the ten, previously agreed, overarching categories of mortality (Table 1. below).
- reports on the relative percentage mortality, i.e., it assesses mortalities as a percentage of the overall number of mortalities in each given year.

Table 1. Descriptions of the ten overarching categories of mortality

No.	Mortality cause	Descriptor / further detail
1.	Smolt and Transfer	Inc. fish dead on arrival or mortalities that are the result of incomplete or de- smoltification. Smolt and transfer mortalities should only be recorded as such up to 60 days post transfer.
2.	Predation	Predation mortalities are primarily due to seal or bird attacks, but this category should include any other predator related losses. Only direct mortalities will be categorised, as losses from induced stress from attacks will not be clearly identifiable.
3.	Jellyfish / plankton	Physical or toxic algal damage and jellyfish stings (inc. those impacting gills where jellyfish damage is the primary cause of mortality).
4.	Environment	Physico-chemical impacts (i.e., not biological), including dissolved oxygen levels, suspended solids, injury due to physical impact (e.g., storms).
5.	Viral disease	All viruses, inc. PD, HSMI, CMS, IPN.

6.	Bacterial disease	All bacterial diseases, inc. Vibriosis, ERM, *Moritella*, *Pasteurella*, etc.
7.	Handling	Damage that might result from essential physical handling, inc. wellboat operations, grading. This category should not include any treatment mortalities, which will be categorised. *
8.	Sea lice related	Any mortality that is due to sea lice management activities, inc. physical or medicinal treatments.
9.	Gill health related	Any mortality linked to poor gill health or gill health management, inc. AGD, PGD, CGD, Anaemia and treatment.
10.	Other	Underperforming fish (w/ deformities / those that do not grow normally leading to mortality) & any other cause of mortality, for example maturation.

* It is likely that, for the analysis undertaken here (and reported below), which considers historically collated data held in existing data management systems, the "Handing" category may include some mortalities due to treatment. With the establishment of the 10 reporting categories through the FFHF, minor adjustments to company data management systems will be made to ensure that, in the future, treatment mortalities are assigned to their relevant treatment purpose (e.g. "gill health related").

Results

The results of this analysis are provided in the pie charts, below.

In summary, in each year from 2018 to 2020, the leading cause of mortality was "gill health related". Subsequent to that, within each year, there was a subset of several other categories displaying similar levels of relative mortality (above 10%), with all other categories having a relative level of mortality below 10%.

2018

- 1. Smolt and Transfer
- 2. Predation
- 3. Jellyfish / Plankton
- 4. Environment
- 5. Viral disease
- 6. Bacterial disease
- 7. Handling
- 8. Sea lice related
- 9. Gill health related
- 10. Other

14.00%   14.56%   8.34%   2.65%   7.33%   6.90%   6.52%   15.68%   7.53%   16.49%

2019

- 1. Smolt and Transfer
- 2. Predation
- 3. Jellyfish / Plankton
- 4. Environment
- 5. Viral disease
- 6. Bacterial disease
- 7. Handling
- 8. Sea lice related
- 9. Gill health related
- 10. Other

11.52%   10.83%   5.78%   2.90%   4.75%   13.44%   7.83%   13.59%   13.43%   15.92%

2020

- 1. Smolt and Transfer
- 2. Predation
- 3. Jellyfish / Plankton
- 4. Environment
- 5. Viral disease
- 6. Bacterial disease
- 7. Handling
- 8. Sea lice related
- 9. Gill health related
- 10. Other

7.91%
5.71%
6.70%
8.19%
10.18%
1.99%
16.60%
10.67%
18.43%
13.63%