Lumpfish Health Scoring System (LHSS)

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GIFAS

Gildeskål Forskningsstasjon a.s

Overview

- Based on historical lumpfish health data sets
- Optimized and tested during lumpfish trials (Summer 2020)
- User friendly (adapted model (CHSS) for use in comemrcial cages)
- Non-destructive
- Employs morphological health indicators
- Detect small variations (even within acceptable health scores)
- Built in “triggers”. (Helps detect potentially worrying trends)
- Overall Health Score (Considers attributed “**weights”** on each category)
- Group evaluation and action guide
- Designed to be extended with additional assessments (plasma & histology)

Weighted Categories

Attributed **weights** to each category based on perceived relevance.

- Decided based on our experience paired with historical health data, growth performance and mortality.

- Ex: Skin damage (wounds, ulcers, etc) have a bigger impact than fin erosion.

  Tail fin erosion slightly higher weight than other minor fins.

- Cataract causing growth impairment

  Impaired ability to feed is attributed an additional weight.

- Fitness (K) changed to automatically score based on the deviation from the optimal predicted weight using $W = aLb$ (Based on 3500 individuals)

Scoring &Action Guides

Individual Scoring Guide

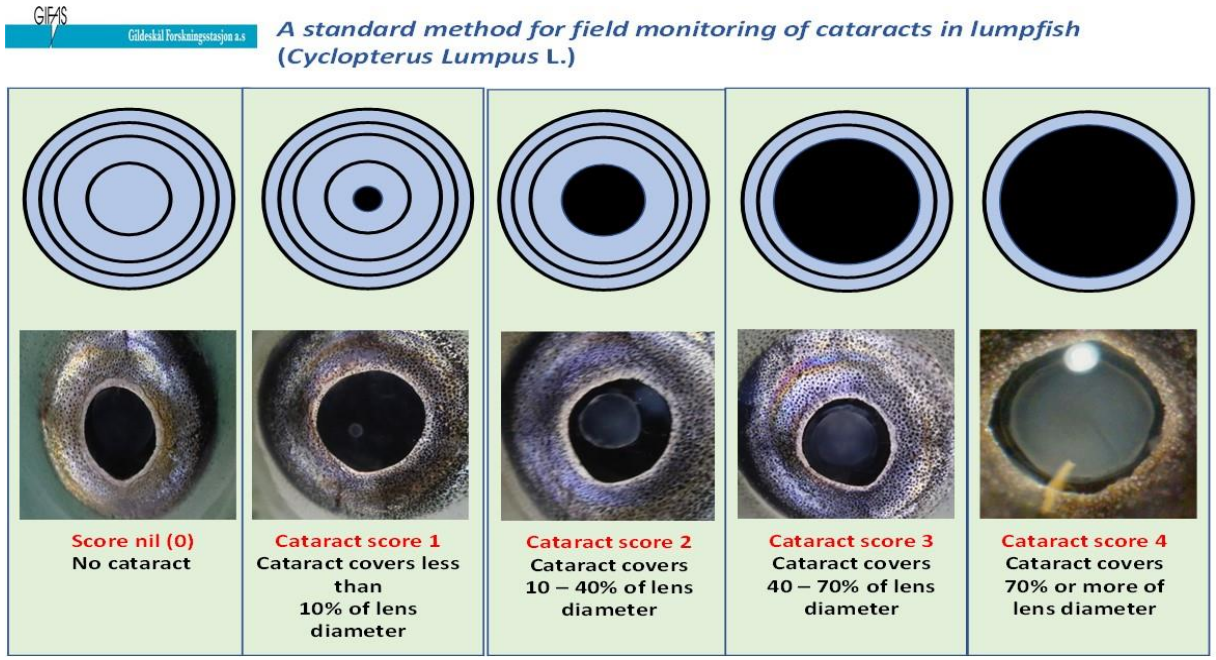
Fin Condition	*Erosion / Splitting*	No visible damage	Less than 25% of the fin eroded - minor splitting	Between 25 and 50% of erosion	More than 50% erosion	
Skin	*Body lesions / Wounds / Inflammation*	Intact	Minor injury / light inflammation	Increased localized damage	Open wounds / haemorrhaging	
Malformations	*Suction disc* *Spine*	Normal	Functional - light deformity	Functional - Obvious malformation	Non functional - Severe deformity	
Cataracts	*Size*	No cataract	0 - 10% of the eye	10 - 40% of the eye	40 - 70% of the eye	Over 70% of the eye
	Opacity		Very translucent	Slightly opaque	Totally opaque, loss of translucency	
Eye damage	*Lesions/ Ulcers/ Swelling*	No visible damage	0 - 25% of the eye	25 - 50% of the eye	50 - 75% of the eye	Over 75% of the eye
Visual K	*Nutritional fitness*	Normal	Very round	Lean	Very lean (emaciated)	
		0	**1**	**2**	**3**	**4**

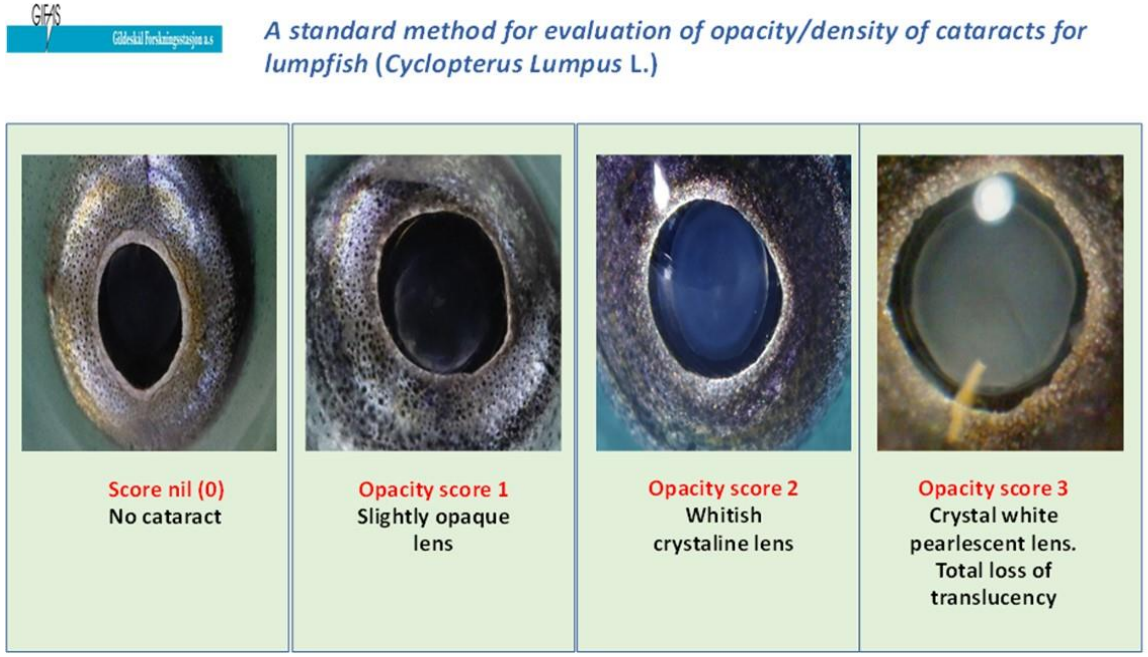
Group Evaluation & Action Guide

Health score	Evaluation	Action
0 - 3	No to minimal health deterioration	No action required
3 - 5	Signs of health deterioration	Measurements to improve health. Potential sampling to determine causes of health deterioration.
+5	Compromised welfare	Consider removal of fish. Approved veterinary should be contacted. Potential additional samples to determine causes of health deterioration.

Sampling Field Guides

- Sampling guides for all morphological assessments





Data input

Date

Tank	Weight	Length	Fin Condition		Skin	Deformities		Cataracts				Eye damage		Fitness	Health Score	Action
			Tail Fin	Others		Suction cup	Spine	Size (Score 0 to 4) L	Size (Score 0 to 4) R	Opacity L	Opacity R	L	R			
1	53.0	10.5	1	2	0	0	0	0	0	0	0	0	0		2	
2	232.0	15.9	2	0	0	0	0	0	0	0	0	0	0	2	3	None
3	59.0	11.1	0	0	0	0	0	0	0	0	0	0	0		0	
4	79.0	12.3	0	0	0	0	0	0	4	0	2	0	0		1	1.6
5	77.0	11.9	1	0	0	0	0	0	0	0	0	0	0		1	
6	75.0	13.5	0	0	0	0	0	3	3	2	2	0	0		1	
6	67.0	13.0	0	0	0	0	0	2	2	3	3	0	0		1	
6	64.0	12.2	1	0	0	0	0	0	0	0	0	0	0		1	
6	63.0	12.5	1	0	0	0	0	3	3	2	2	0	0		2	
6	67.0	12.5	0	2	0	0	0	3	3	2	2	0	0		2	
6	57.0	11.8	1	2	0	0	0	3	3	1	1	0	0		3	
6	48.0	11.0	1	1	0	0	0	1	1	1	1	0	0		2	
6	95.0	13.6	0	0	0	0	0	2	2	2	2	0	0		1	
14	65.0	11.9	0	0	0	0	0	3	3	2	2	0	0		1	
15	45.0	9.9	1	1	0	0	0	2	2	3	3	0	0		3	
16	50.0	11.5	2	2	0	0	0	3	3	3	3	0	0		4	
17	103.0	14.6	0	1	0	0	0	3	3	3	3	0	0		2	
18	72.0	12.1	0	0	0	0	0	3	3	1	2	0	0		1	
19	79.0	12.3	0	1	0	0	0	2	2	3	2	0	0		2	
20	68.0	12.5	0	0	0	0	0	2	2	1	1	0	0		1	

Lumpfish Health Scoring System

LHSS

Health evaluation of lumpfish on arrival at Gifas

Patrick Reynolds

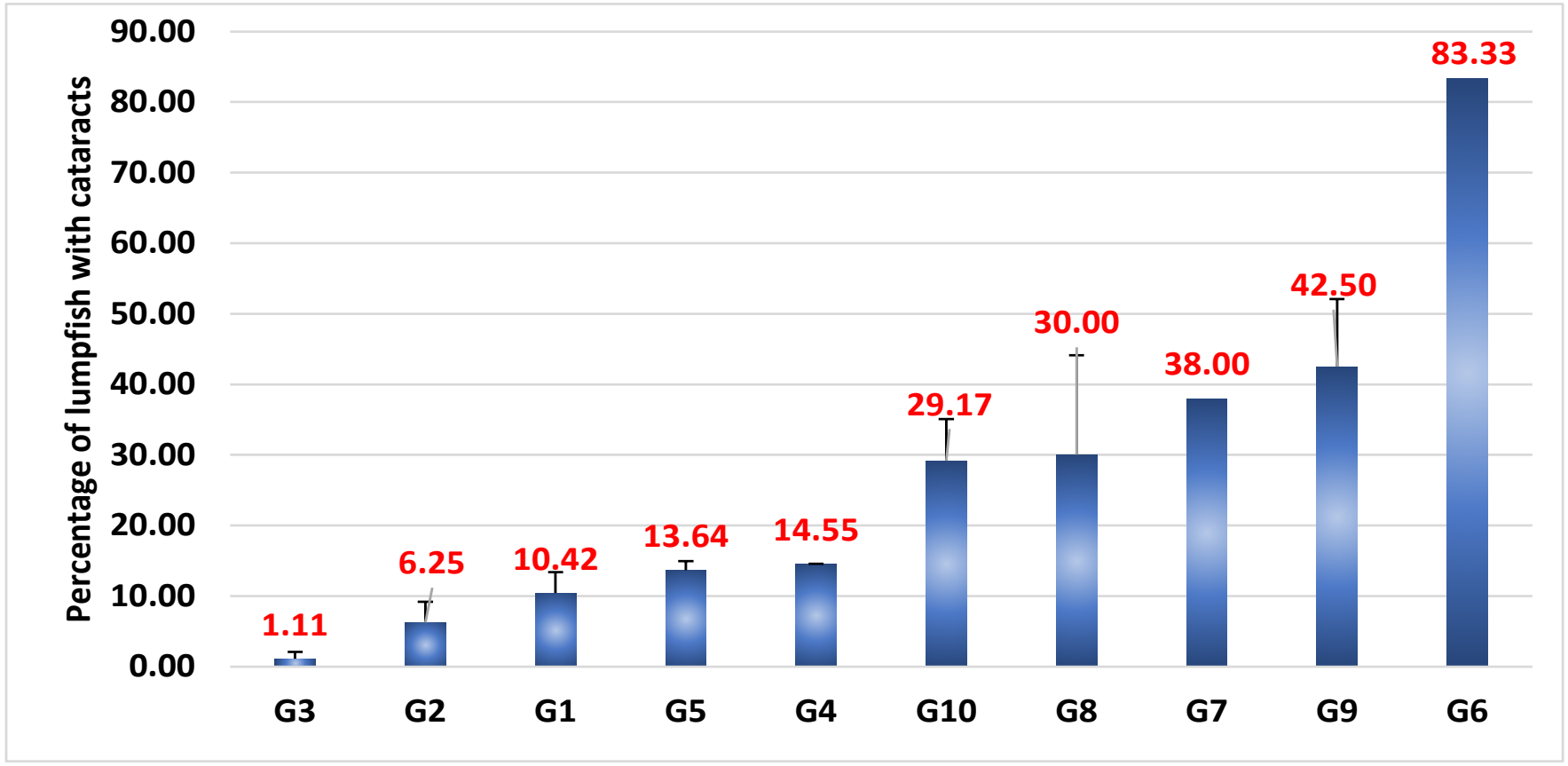
Overview

- Based on historical lumpfish health data sets (10 groups)

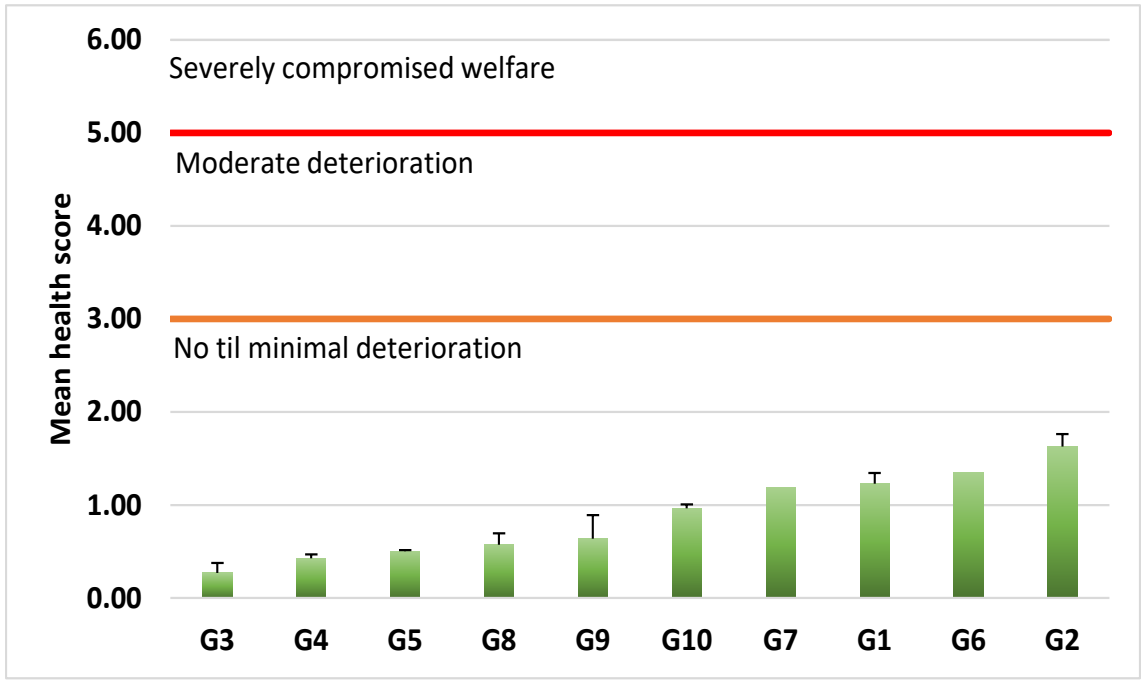
Group ID	Origin	Transfer		Start	Mortality	Site	With salmon	N/sample size	Days at site
		month	year	weight (g)	end				
G1	W	Sept.	2018	54.4	0.0	sea	Y	n = 24: N = 48	73
G2	W	Sept.	2018	50.2	0.0	sea	Y	n = 24: N = 48	73
G3	W	Sept.	2019	13.5	1.7	land based	N	n = 60: N = 180	47
G4	W	Jan.	2020	32.8	0.0	land based	N	n = 55: N = 110	61
G5	W	Jan.	2020	32.3	4.6	land based	N	n = 55: N = 110	61
G6	W	April	2020	70.4	—	sea	Y	S = 30; N = 2000	—
G7	W	Oct.	2020	48.6	—	sea	Y	S = 50; N = 2626	—
G8	W	Sept.	2018	59.2	8.1	sea	Y	S = 40; N = 15200	160
G9	W	Sept.	2019	59.2	6.1	sea	Y	S = 40; N = 15201	160
G10	B/W	June	2020	39.7	14.6	sea	Y	n = 24: N = 48	77

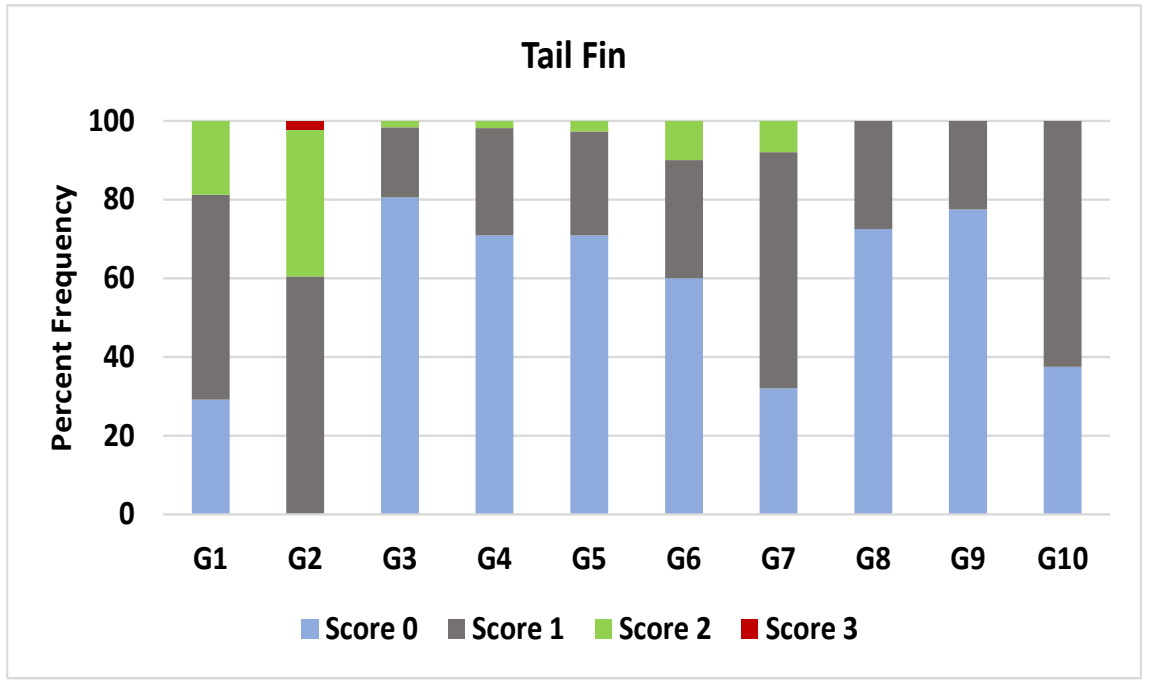
- All groups normally assessed within 3 - 5 days after arrival.
- All fish are assessed except from commercial cages (sub-samples)

Results: Cataracts

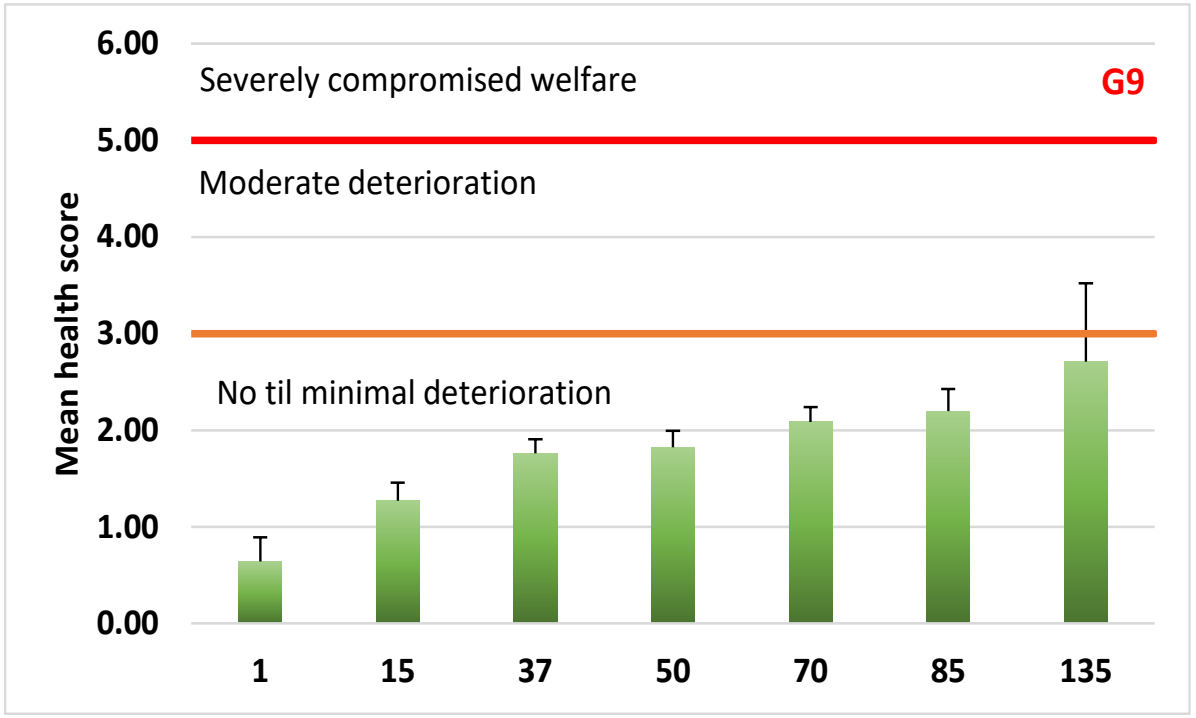


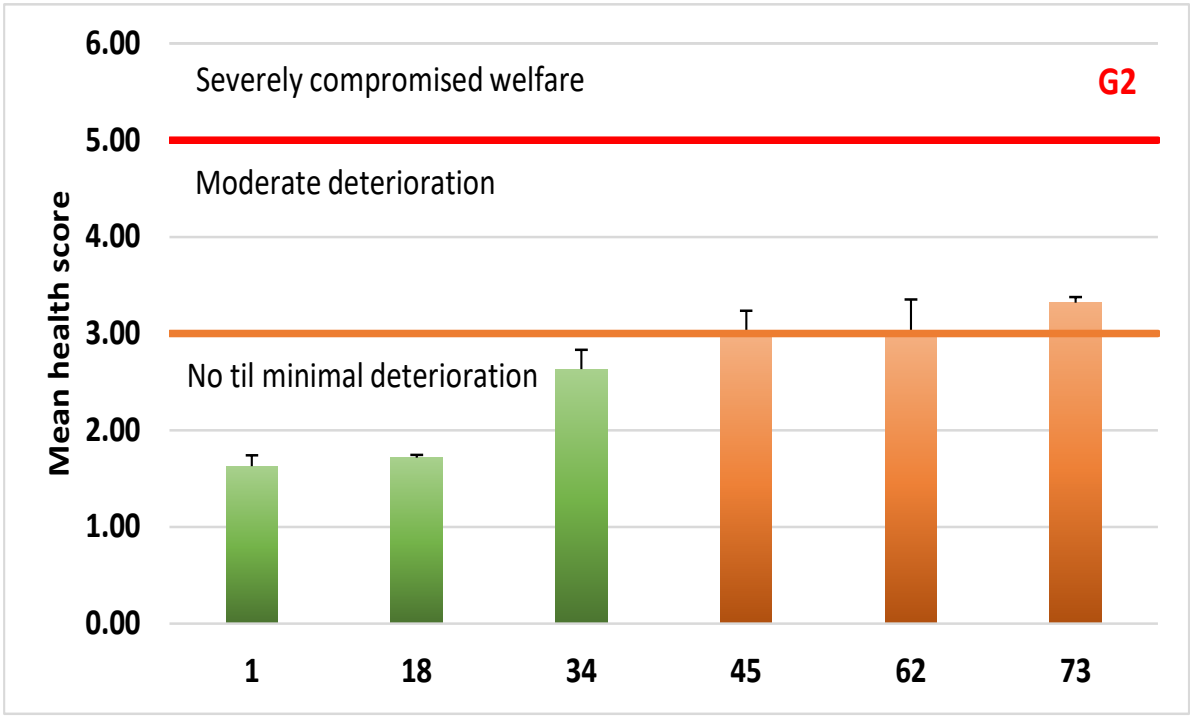
Results: welfare & fin scores





Results: welfare score through time

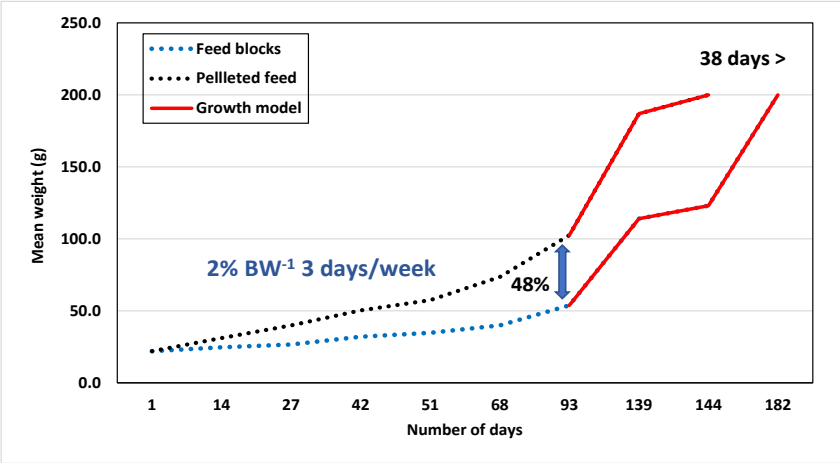




- All groups assessed show deteriorating health through time.
- Clear need for appropriate health assessment in hatcheries before transfer.
- All producers/farmers **MUST** assess welfare systematically.

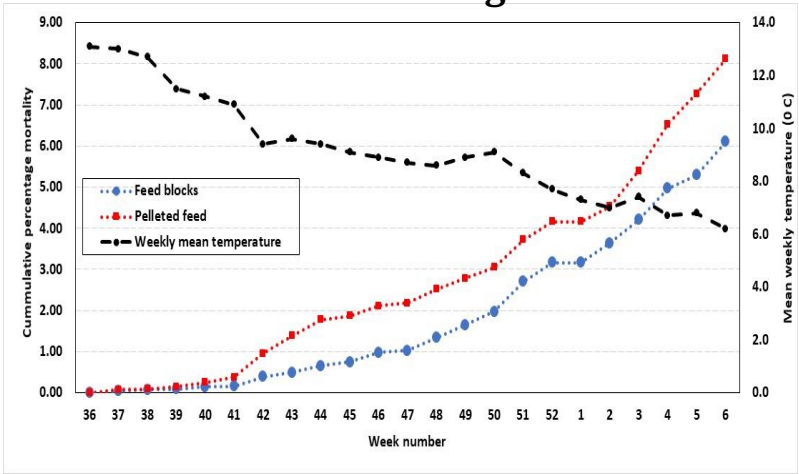
Feed blocks & Welfare:

Controlling growth:



- **High growth rates not desirable**
- **Small lumpfish = higher grazing rates.**
- **“Effective Operational Window" extended.**
- **Feed blocks maintain growth under 200g for 38 days more compared to pelleted feed.**
- **OWIs generally show better health status.**
- **Controlled growth = potential reduced repeated stocking**

Commercial cages:



- **Lower mortality with feed blocks**
- **Better health with feed blocks**
- **Controlled growth**
- **Less mortality during mechanical delousing.**

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Improving survival and health of lumpfish (*Cyclopterus lumpus* L.) by the use of feed blocks and operational welfare indicators (OWIs) in commercial Atlantic salmon cages

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Thank You

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