Operational Welfare Indicators for Sea Bream and Sea Bass

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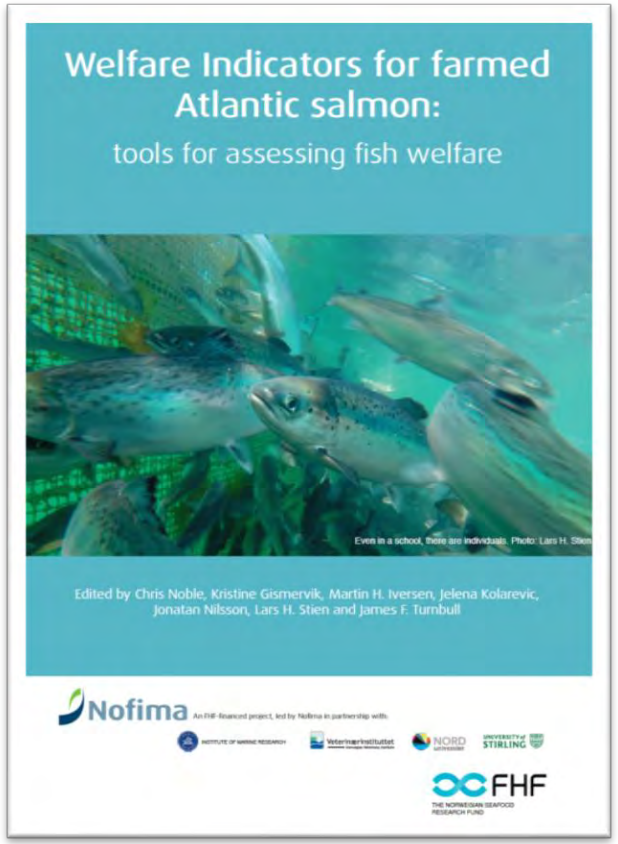
Welfare Indicators for farmed Atlantic salmon:
tools for assessing fish welfare
Edited by Chris Noble, Kristine Gismervik, Martin H. Iversen, Jelena Kolarevic, Jonatan Nilsson, Lars H. Stien and James F. Turnbull
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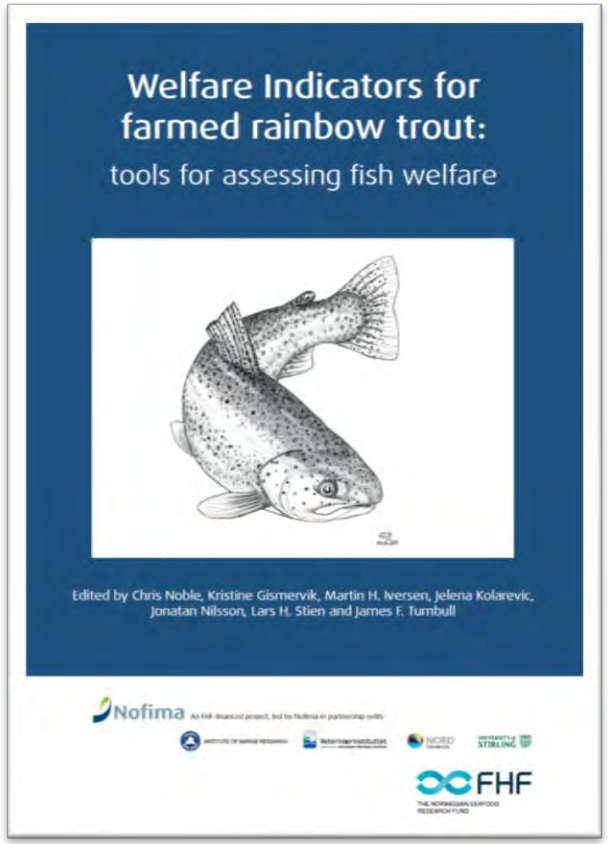
Welfare Indicators for farmed rainbow trout:
tools for assessing fish welfare
Edited by Chris Noble, Kristine Gismervik, Martin H. Iversen, Jelena Kolarevic, Jonatan Nilsson, Lars H. Stien and James F. Turnbull
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FISH
FROM GREECE
Mediterranean Fish Welfare:
Guide to good practices and assessment indicators
M. Pavlidis & A. Samaras, 2020
HAPO
HELLENIC AQUACULTURE PRODUCERS ORGANIZATION
FISH GREECE
Mediterranean Fish Welfare

Aim of the Welfare Guide

To compile an operational guide for personnel and those involved in mariculture, so that they can carry out tasks in line with current scientific knowledge on the welfare of farmed fish and well-established farming knowhow

Production phases
❖ Broodstockmanagement
❖ Pre-growing
❖ Juvenile transport
❖ On-growing
❖ Harvest

Processes
❖ Grading, transportation
❖ Sampling to monitor growth and health
❖ Administering veterinary treatments
❖ Diving work
❖ Feeding

Classifying Welfare Indicators

Indirect or Environmental

Biologicals

Operational

Laboratory-based

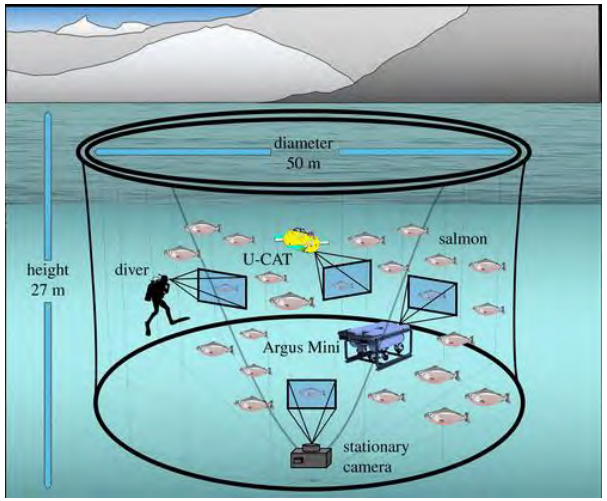
Available OWIs

Stock based

Individual based

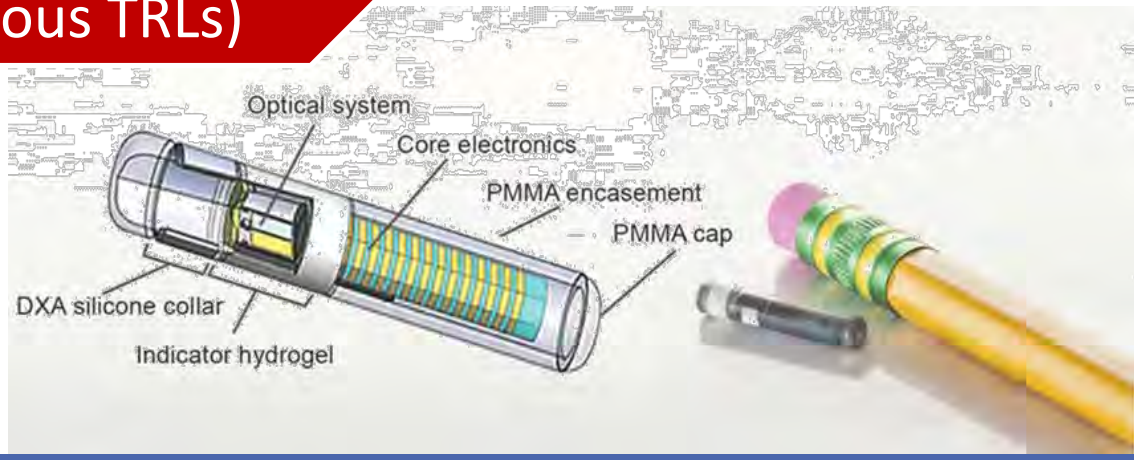
Available LabWIs

Available /not commonly used



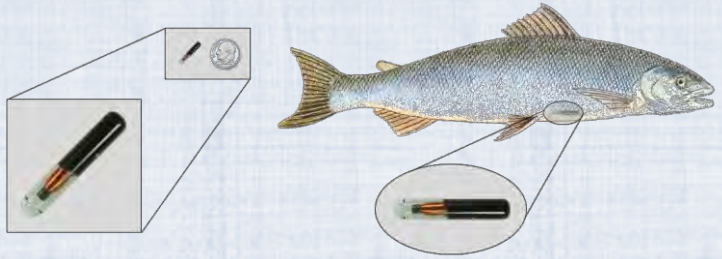
https://royalsocietypublishing.org/doi/10.1098/rsos.191220

Under development (various TRLs)



Broodstock Welfare Challenges

1. Tagging



https://www.uidevices.com

2. Sexing

(stripping/biopsy)

- ✓ **Anaesthesia**
- ✓ **Social context**
- ✓ **Sex ratio**

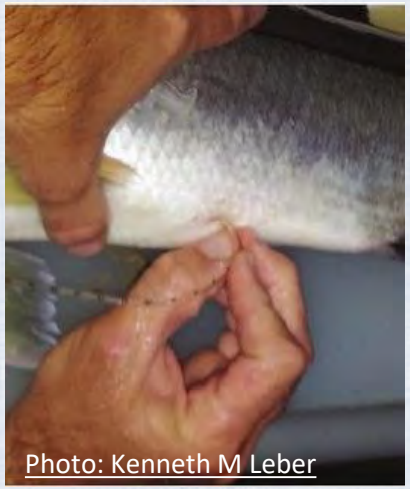


Photo: Kenneth M Leber

3. Spawning induction

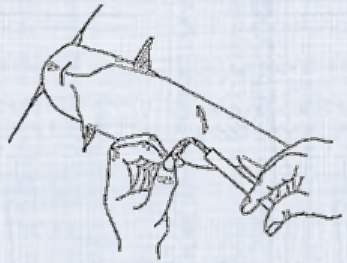


Figure 2

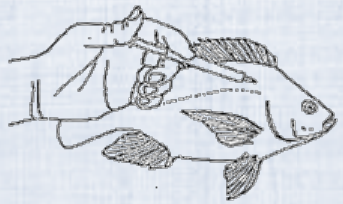
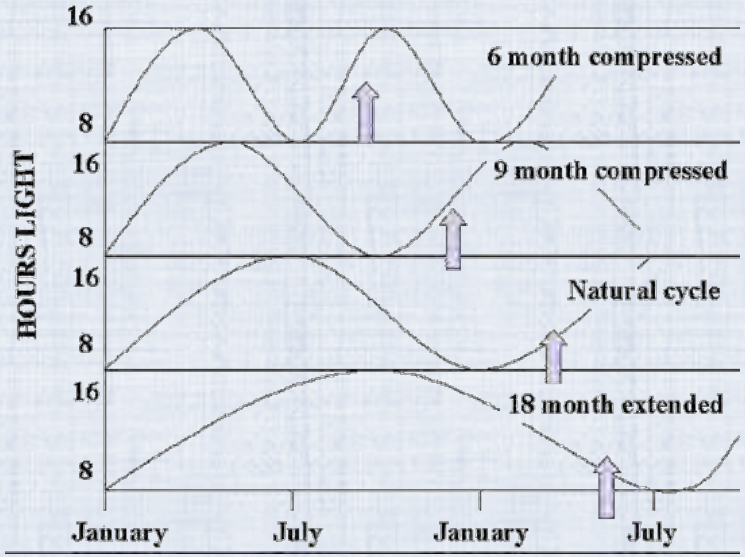


Figure 3

http://www.seagrant.umn.edu/

4. All year-round egg production



Broodstock OWIs

Environmental	Biological	
	Stock indicators	Individual indicators
Oxygen	Mortality	Health
Temperature	Appetite	Injuries
Salinity	Growth	Sexual maturation
pH	Behaviour	Spawning
Stocking density		Egg & sperm quality
Lighting		
Turbidity		

Pre-growing Welfare Challenges

A. Production Systems

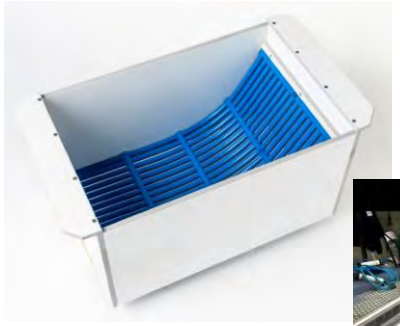
Flow-through indoor tanks

Recirculating Aquaculture System

Pre-growing Welfare Challenges

B. Operations

1. Grading



2. Counting

3. Vaccination

Pre-growing Welfare Challenges

B. Operations

4. Transportation

- Crowding
- Confinement
- Netting
- Air exposure

- Novel tank
- Social stress
- Water change
- Transportation

- Crowding
- Confinement
- Netting
- Novel tank
- Social stress

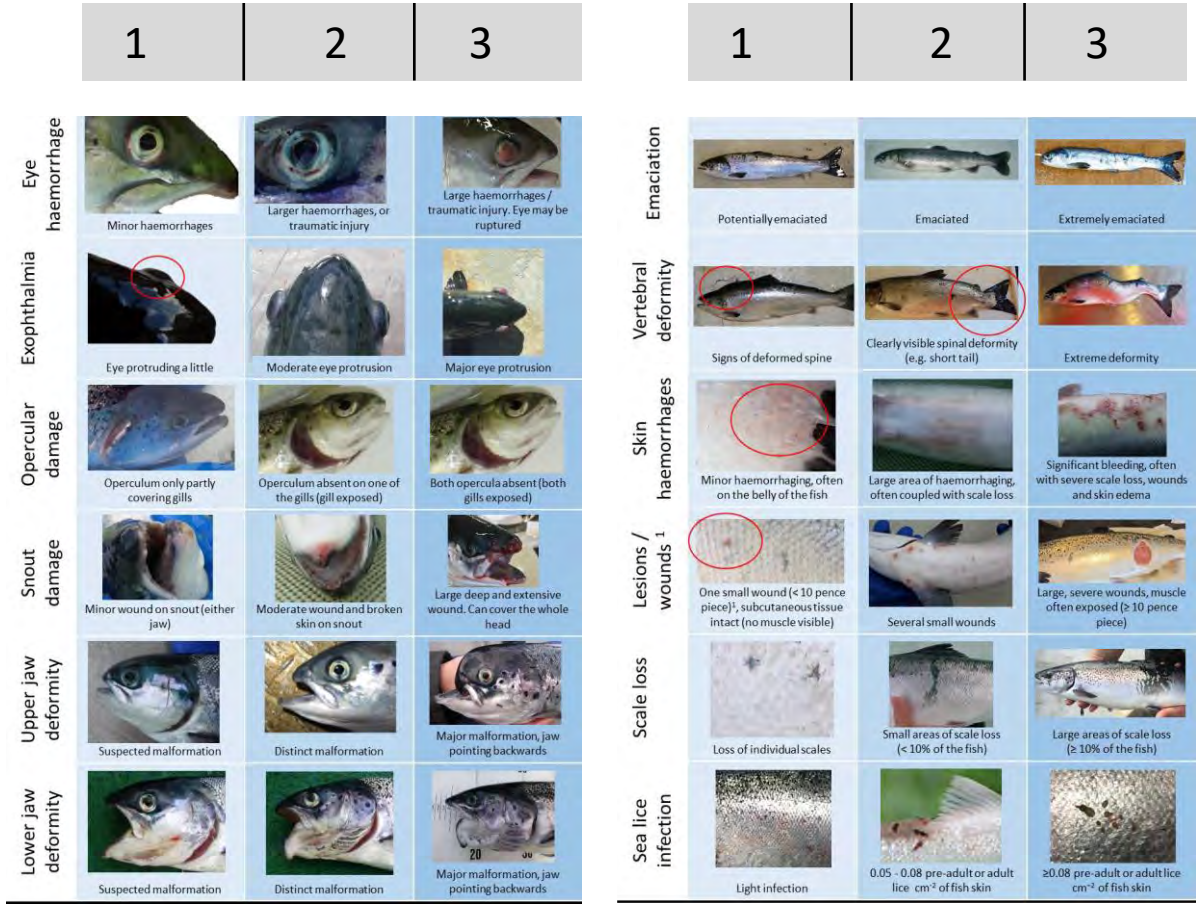
Pre-growing OWIs

Environmental	Biological	
	Stock indicators	Individual indicators
Oxygen	Mortality	Health
Temperature	Appetite	Injuries
Salinity	Growth	Respiration rate
pH	Behaviour	
Stocking density		
Lighting		
Turbidity		

On-growing OWIs

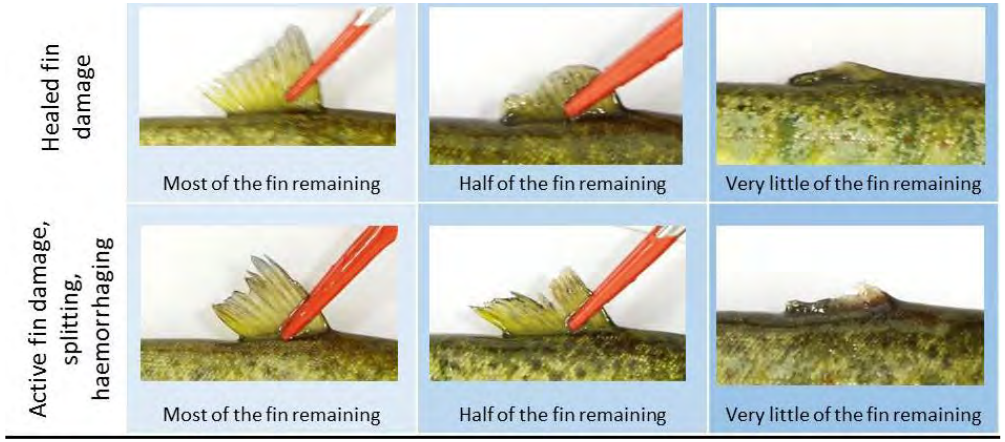
Environmental	Stock indicators	Biological Individual indicators
Oxygen	Mortality	Health
Temperature	Appetite	Injuries
Salinity	Growth	Respiration rate
pH	Behaviour	Haematocrit and haemoglobulin
Stocking density		Plasma glucose & lactate
Lighting		
Turbidity		

Follow up



Development of a ***morphological scheme for classifying*** key external morphological welfare indicators

Application of AI systems



Figures: C. Noble et al., 2018

Harvesting – Humane Slaughter

Asphyxia & *chilling*

in ice water slurry



Electro-stunning

Thank you