

Comparison of biosecurity measures in well boats used in the Chilean, Scottish and Norwegian salmon farming industries

Report to SARF

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Executive summary

Well boats are an essential part of the salmon industry in the three main production countries, Norway, Chile and Scotland. These vessels play an essential role in the transportation of live fish, grading, treatment and more recently in dead haul to processing. Vessels may navigate either with valves open exchanging water or with closed valves either re-circulating water with fish in the hold, transporting water in preparation for loading fish or to a location where the water can be off loaded. Despite their value to the industry, well boats pose a range of potential biosecurity threats both to farmed and wild populations of fish.

Infections may be spread by well boats in a number of ways i.e.

1. Through water:

- Infection may be transmitted to the fish in the well boat by loading with infected water or by navigating through contaminated water with open valves.
- Infection may be transmitted from the fish in the well boat to wild and farm fish by discharge of infected water during or after transport.

2. Through residues from previous transport:

- Inadequate cleaning or disinfection may leave infectious material in the boat which may infect fish during transport.

Potential biosecurity threats may cross geographic and political boundaries since well boats often move between disease control areas or between countries. In Chile 31% of the well boats are Norwegian owned and in Scotland all the well boats are Norwegian owned. This study was the first comparison across Norway, Chile and Scotland. It examined the strengths and vulnerabilities in existing biosecurity measures by comparing between countries and with theoretical biosecurity.

The study involved examination of regulations, codes of good practice, internal company processes and interviews with well boat operators. Time was also spent aboard working well boats in all three countries. This allowed observation of practices and the collection of samples to determine the efficacy of cleaning, disinfection and water handling.

Six critical control points (Figure 1) for biosecurity risks were identified: 1) water change zones, 2) water discharge zones, 3) fish sanitary status, 4) fasting period before transport, 5) water circulation system during transport (open or close) and 6) efficacy of cleaning and disinfection.

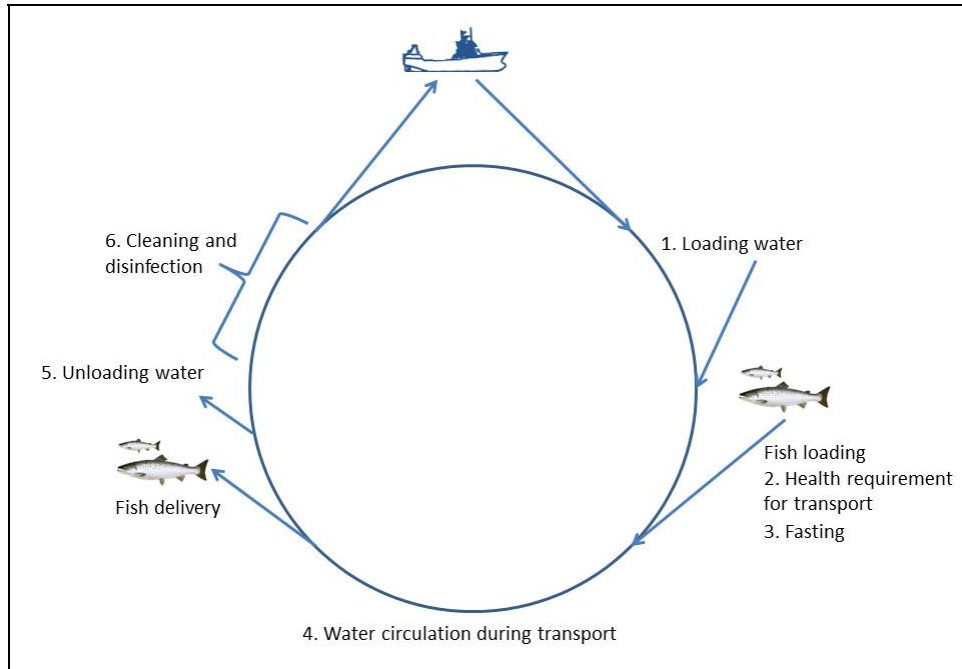


Figure 1: Critical Control Points for biosecurity during well boat operation.

Details of sampling protocols and results are available in the full report but are summarised in Figure 2.

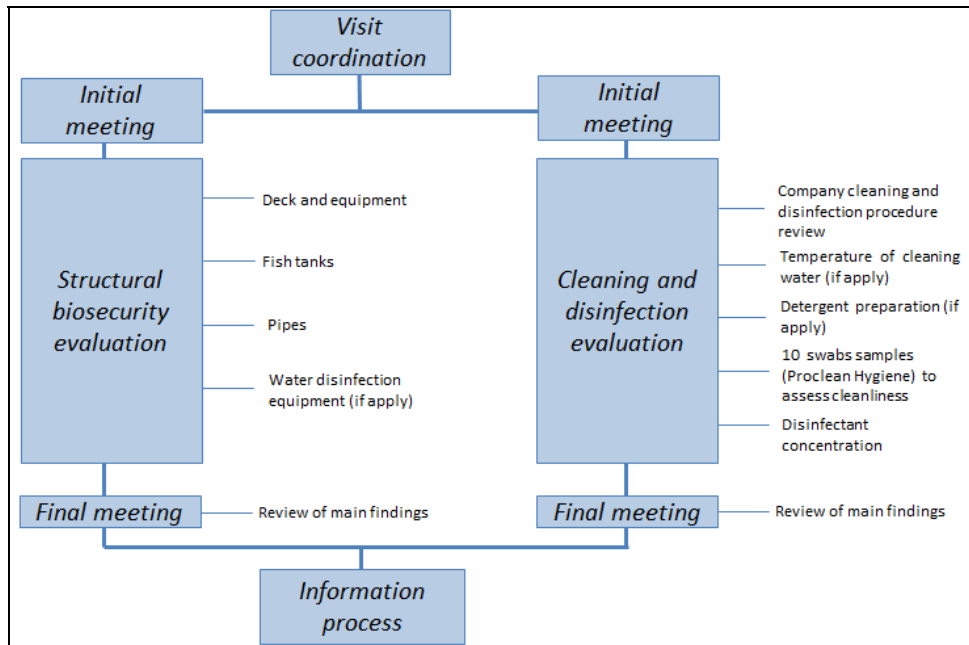


Figure 2: Visit methodology.

Visits were carried out in Scotland, Norway and Chile between March and June 2013. Well boat companies were chosen through existing contacts and their willingness to take part in this research. Individual well boats were mainly selected by the convenience of the date and boarding location. Information from Chile was acquired via biosecurity audits made by a company specializing in this type of evaluation. Three well boats were visited in each country a relatively

small proportion of the total boats and therefore recommendations or conclusion based on the visits should only be extrapolated to the whole industry with caution.

Conclusions and recommendations

In the majority of aspects well boats appear to be well regulated (Table 1), maintained and operated. Recommendations for potential improvements are summarized below.

Table 1. Comparison between regulations, codes of good practice and internal company measures

Country	Scotland			Norway			Chile		
	Reg.	Code GP	Int. M.	Reg.	Code GP	Int. M.	Reg.	Code GP	Int. M.
Location for water loading									
Health requirement before fish loading				PD zone					
Fasting period before transport									
Water circulation type between sites						PD zone			
Location for water discharge				PD zone					
Well boat cleaning and disinfection									

1. Recommendations for Scotland, Norway and Chile

1.1. General

1.1.1. Given the importance of well boats in the salmon farming industries, a larger more representative study would be useful.

1.1.2. There have been no systematic studies to compare different fasting periods versus organic matter content in the well boat tanks. Such studies would help to optimise travelling conditions for the fish.

1.1.3. Farmers and well boat companies should ensure that well boat crews have the necessary information to allow adjustment in standard procedures according the health of the fish.

1.2. Cleaning and disinfection

1.2.1. Studies should be conducted to evaluate the efficiency of different cleaning and disinfection processes in well boats.

1.2.2. Access to pipes and CO₂ extraction systems (skimmers and degasser) for evaluation of contamination should be improved, as proposed by Joint Working Group (2002)¹.

1.2.3. It would be advisable to use organic residue detection tests (e.g. PRO-Clean™ Rapid Protein Residue Test) to ensure the efficacy of the cleaning process when the risk of disease transmission is high (e.g. diagnosis of infectious disease in population).

1.2.4. External certification of the cleaning and disinfection process would be advisable. This is a voluntarily scheme for Scottish and Norwegian companies only at the start of the smolt transport season.

1.3. International standardisation of the preventive measures used in well boats.

¹ Final Report of the Joint Government/Industry Working Group on Infectious Salmon Anaemia (ISA) in Scotland. Aberdeen: Crown copyright (2000) Scottish Executive. 140 pp. (<http://www.frs-scotland.gov.uk>)

1.3.1. A common code of good practices would standardized biosecurity measures and facilitate joint research efforts, improvements in the technology and design of vessels.

2. Recommendations for Scotland and Norway

2.1. Charging with water, a minimum distance from risk areas (sea sites and processing plant) should be specified, this may be a hydrographic distance rather than a straight line distance.

2.2. Discharging water or washing and rinsing tanks

- a minimum distance from sea sites and areas with concentrations of wild salmonids should be specified, this may be a hydrographic distance rather than a straight line distance.

- areas should be defined with either currents travelling to open sea or low risk of disease spread for other reasons.

2.3. Water charge/discharge areas should be identified in public documents so they will be available for all the well boat operators.

2.4. The identification of the areas and restrictions above may require additional research to confirm the nature of the risk.

3. Recommendations for Scotland

3.1. During the Scottish visits it was apparent that not all not all the structures on the boats were considered in the cleaning and disinfection check list of CoGP (2013)², for example the cranes. This may require a re-evaluation of the structures that require cleaning and disinfection and clarification of the protocols.

4. Recommendations for Chile

4.1 Well boats should conduct on-site studies to confirm the efficacy of the UV disinfection in both entry and exit water for the vessels transporting fish for various purposes.

4.2. Within the country the well boats' operational purpose or activity (e.g. smolt transfer) should be defined and then for each purpose the necessary cleaning and disinfection requirements defined.

5. Recommendations for Norway

5.1. It is recommended that the regulations should be extended to all the management areas and not restrict them just to PD zones; this may reduce the risk from other known or emerging pathogens.

² The Code of Good Practice for Scottish Finfish Aquaculture. Scotland. 173 pp.
(<http://www.thecodeofgoodpractice.co.uk/>)

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	Chile	Scotland	Norway
Salmon farming companies	2	2	
Well boat companies		2	2

A more comprehensive report is available in:

“Comparison of biosecurity measures in well boats used in the Chilean, Scottish and Norwegian salmon farming industries. – MSc thesis in manuscript form submitted to University of Stirling August 2013”.

For copies of the full report please contact:

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