



MØREFORSKING

Higher share of superior quality salt cured and dried cod (*Gadus Morhua*), when using ice slurry during processing on board long liners.

Ann Helen Hellevik, Trygg Barnung, Kristine Kvangarsnes,
Ingebrigt Bjørkevoll og Turid Fylling

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Content:

- Short about the project
- Results production onboard long liner and further production of salt cured and dried cod
- Summary



Short presentation of the project:

- A cooperate project between industry and fleet
- Financed by
 - Innovation Norway,
 - The Norwegian Seafood Research Fund - FHF
 - Møre and Romsdal County

The overall objective:

- develop methods for bleeding that ensures good quality of cod for use in salt cured and dried cod industry
 - operating systems for the long line
 - temperature regimes in production on board
 - how this affect the quality of manufactured salt cured and dried cod



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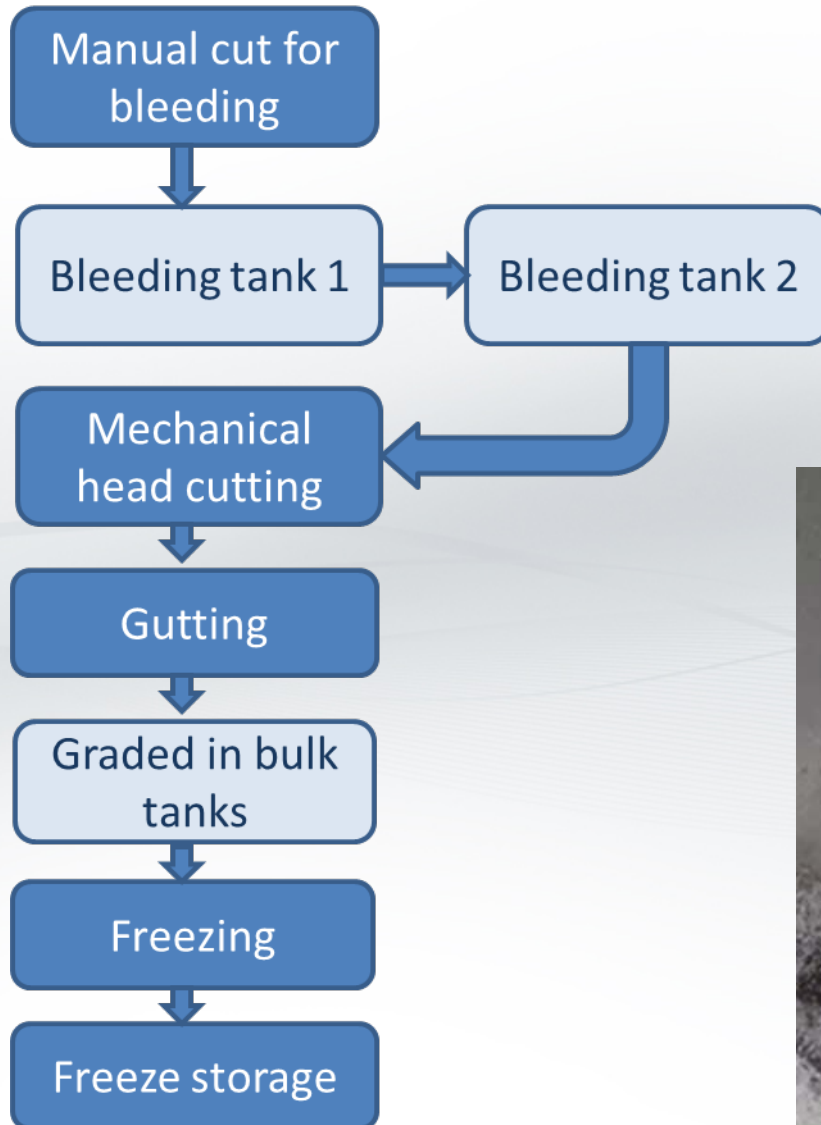


Figure 1: Ice slurry in the production line on board the long liner

Processing onboard

- Raw material: cod 2,5 – 5 kg
- Bleeding time: 30 min
- Measuring temperature in fish and tanks during production
- Series produced:

Series	Type	Description
1	Control	Seawater in bleeding and bulk tanks (normal operation of the long line)
2	Increased water flow	Increased seawater flow in bleeding tanks (otherwise treated as control)
3	Seawater and ice slurry	Seawater in bleeding tank and ice slurry in bulk tank (normal operation of the long line)
4	Ice slurry and ice slurry	Ice slurry in bleeding- and bulk tanks (normal operation of the long line)
5	Change in hauling speed	From 55 hooks/min to 40 hooks/min. Seawater in bleeding and bulk tanks

Overview of temperature conditions

Series	Temp. bleeding tank 1 (°C)	Temp. bleeding tank 2 (°C)	Temp. bulk tank (°C)	Temp. fish going in to bleeding tank (°C)	Temp. fish going in to bulk tank (°C)	Temp. fish before freezing (°C)
Control	5,2	5,2	5,4	2,8	4,3	5,1
Increased water flow	5,6	5,5	5,8	2,0	4,6	5,3
Seawater and ice slurry	5,4	5,4	-0,6	3,7	5,1	1,5
Ice slurry and ice slurry	2,5		-0,7	3,3	3,1	0,3
Change in hauling speed	6,1	6,2	6,4	2,4		6,5

Quantity of fish produced in each series

Series	Survey 1 kg	Survey 2 kg	Total kg
Control	1824	3120	4944
Increased water flow		5520	5520
Seawater and ice slurry	1872	3456	5328
Ice slurry and ice slurry	2496	3360	5856
Change in hauling speed		1032	1032

Production of salt cured and dried cod

- Cod cold stored for 3 months
- Thawed approx. 18 hours at approx. 0 – 0,5 °C
- Pickle salted 14 days at 7,9 – 9,7 °C
- Matured for 14 days at 1,2 – 2,2 °C
- Dried for 3 days at 22 °C
- Stored at approx. 2 °C for 3 months

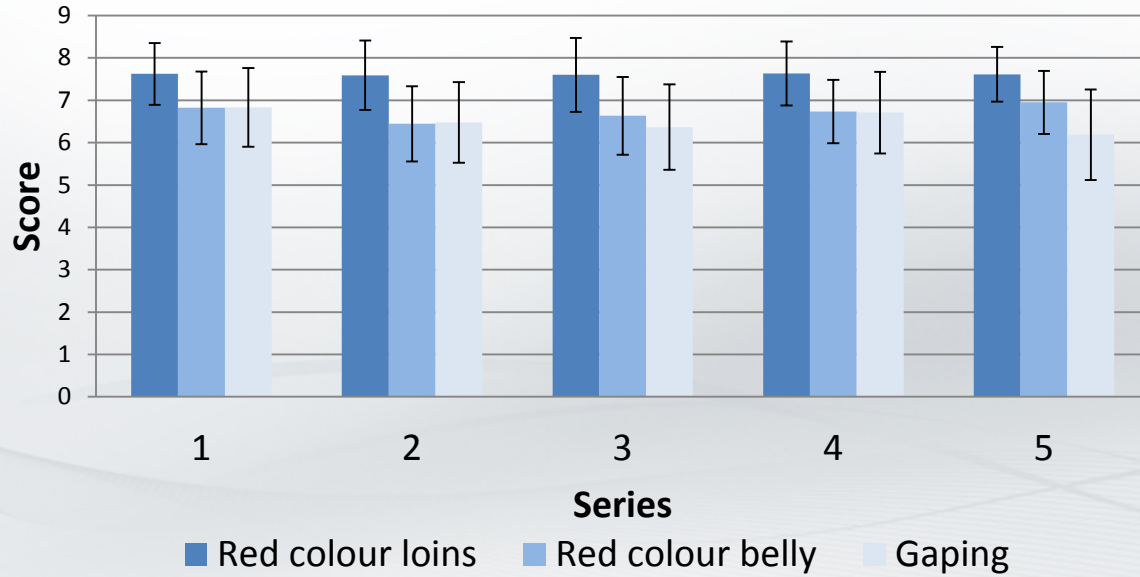


Several measures were done:

- Instrumental texture measurement
- Procedure for sensory evaluation
- Instrumental colour measurement
- Yield
- pH
- Temperature
- Sorted in superior and universal groups by qualified workers
- A smaller rehydration and shelf-life study was conducted
- Water and salt content in loin.



Raw material (split cod) description



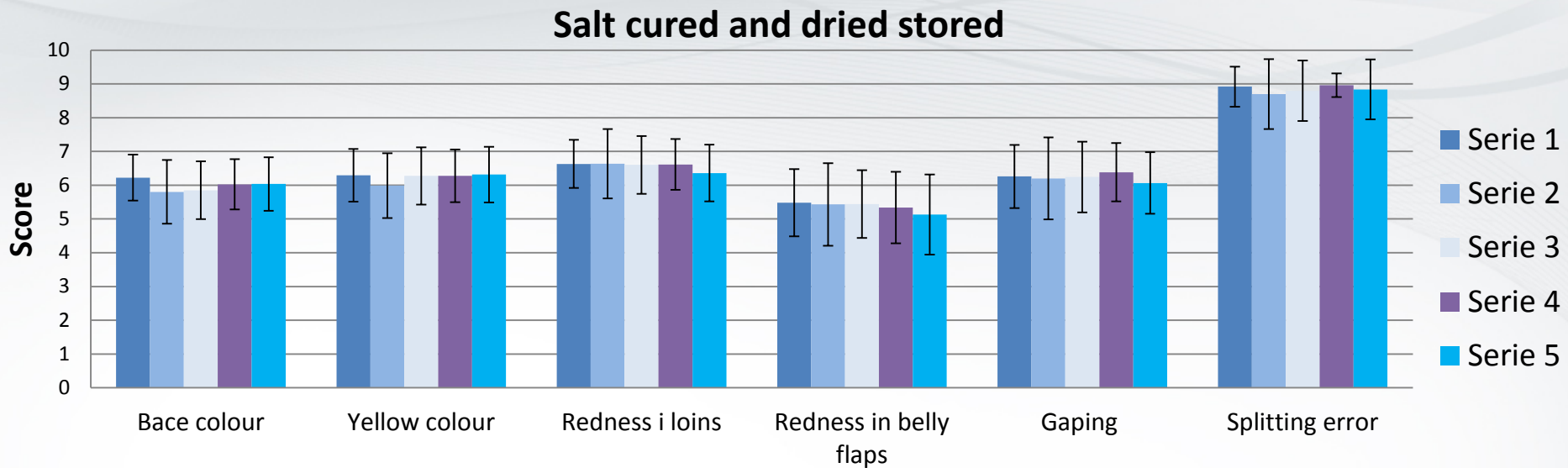
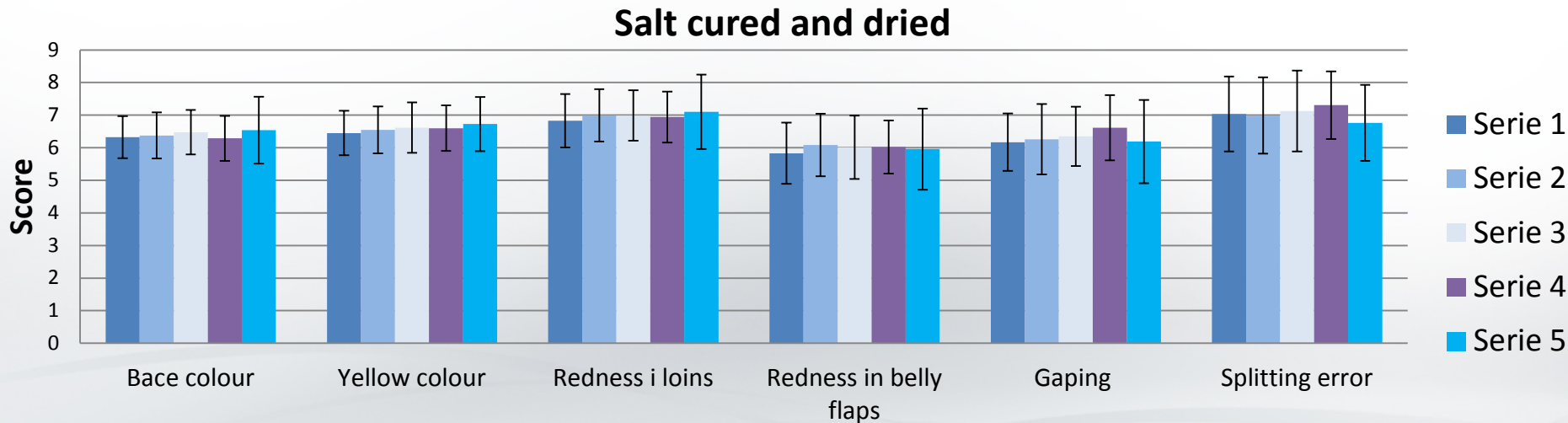
SPSS: one-way anova

Series	pH	Temperature (°C)	Weight (gram)
1 (n=45)	6,86	0,2	3076
2 (n=45)	6,74	1,4	3142
3 (n=45)	6,98	0,5	3044
4 (n=45)	7,02	1,6	2908
5 (n=40)	6,88	7,5	3187



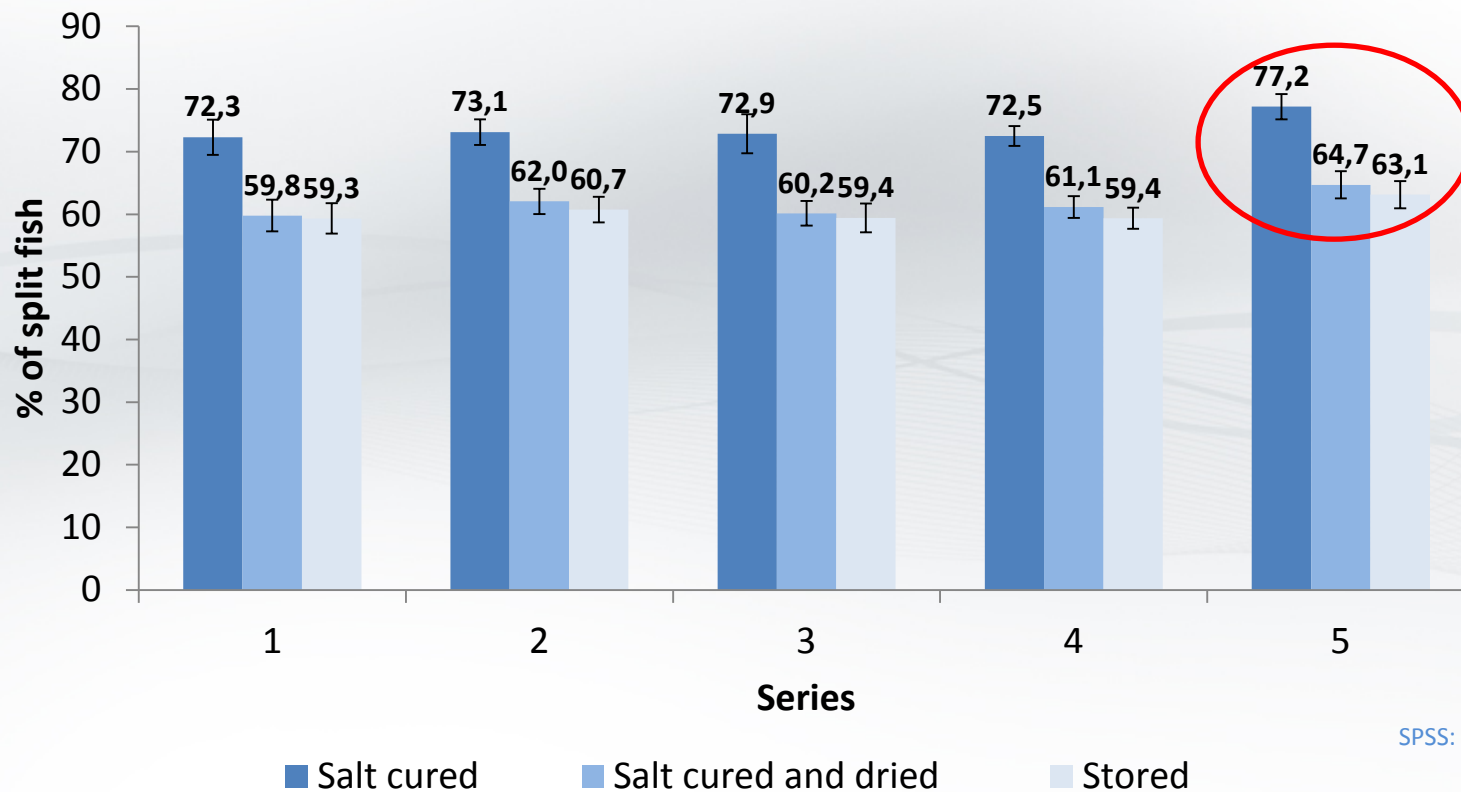
Series 1: Control. Series 2: Increased water flow. Series 3: Seawater and ice slurry. Series 4: Ice slurry and ice slurry. Series 5: Change in hauling speed

Sensory assessments



Series 1: Control. Series 2: Increased water flow. Series 3: Seawater and ice slurry. Series 4: Ice slurry and ice slurry. Series 5: Change in hauling speed

Yield



Series 1: Control. Series 2: Increased water flow. Series 3: Seawater and ice slurry. Series 4: Ice slurry and ice slurry. Series 5: Change in hauling speed

Commercial sorting

	Salt cured and dried cod				
	Control	Increased water flow	Seawater and ice slurry	Ice slurry and ice slurry	Change in hauling speed
Share of Superior (%)	91	93	88	93	88
Share of Universal (%)	9	7	12	7	12
Blood errors (%)	75	66	76	78	74
Gaping/tearing (%)	25	34	24	22	26

Summary

- Greater share of superior quality using ice slurry in bleeding and bulk tanks
- Lower share of blood error using higher water flow in bleeding tank
- Positive effects from lowering temperatures
- Higher yield when thawing fish in higher seawater temperature?





Thank you for listening

annhelen@mfaa.no