TRANSPORT OF TURBOT (*Psetta maxima*): EFFECT ON BLOOD PARAMETERS AND PRODUCT QUALITY

Hans van de Vis[1], Stéphanie Druon[1], Marie Champod[1], Melanie Poort[1], Henny Reimert[2] and Bert Lambooij[2]

[1] Wageningen IMARES, P.O. Box 68, 1970 AB IJmuiden, The Netherlands

[2] Institute for Animal Science and Health (ID-Lelystad), P.O. Box 65, 8200 AB Lelystad, The Netherlands

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Introduction

- Transport, which is part of the pre-slaughter procedures, is of interest in the context fish welfare and product quality. However, for food fish the number of published studies is limited.
- The objective of the study was to establish effects of transport on farmed turbot (*Psetta maxima*) on blood parameters and fish flesh quality.

Materials and methods

Experiment at **an SME**: no rested fish. An experiment with 50 fish and another experiment with 90 fish

no transport prior to analysis

fasted turbot

In 1 tank

transport

analysis after transport

Materials and methods

Rested turbot for blood chemistry

Rested turbot

In 4 tanks

Tank 3 and 4 combined for transport

Transported fish

Tank 3: live chilling

Tank 4 electricity and chilling

Turbot after transport for blood chemistry

Rested fish

Tank 1: live chilling

Tank 2 electricity and chilling

analysis

analysis

Materials and methods

Industrial method: flake ice was added to the tank for live chilling during 1.5 h.

Experimental method: plate electrodes were present in the tank to minimize handling stress. Across the plates (1.1 m distance) 150 V_{peak} was applied for 10 seconds. 150 A_{peak} was passed through sea water (52 uS/cm. Subsequently, the stunned turbots were killed by chilling them for 1.5 h.

The conditions for an instantaneous stunning by applying electricity were established in another project, using EEGs.

Materials and methods

- **Blood chemistry: cortisol, free fatty acids, glucose and lactate**
- **Trials at the SME: 20 fish of each batch**
- **Trial at our institute 10 fish of each batch**

- **Sampling of blood without prior anesthesia**

Materials and methods

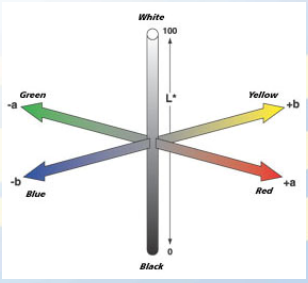
Product quality analysed during storage

- Onset and resolution of rigor mortis (n=8)
- Fillet: pH (n=8, dorsal mid-axial) and colour (n=8, dorsal mid-axial) with a Minolta CM 525i.

Materials and methods

Measurement of colour

- Chromatic values are given in the CIE-L*a*b* system. The L* value is a measure for lightness. The a* and b* are the chromacity coordinates. The a* and b* indicate colour directions: +a* is the red direction, -a* is the green direction, +b* is the yellow direction and –b* is the blue direction.



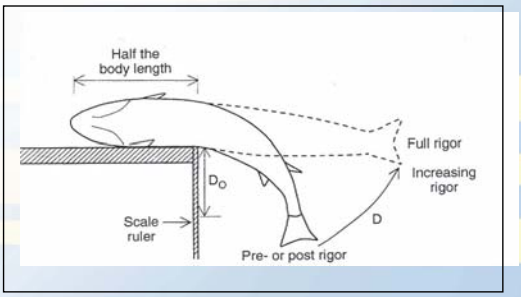
SEAFODDplus Session AQUA 2006, 11 May 2006, Firenze

Materials and methods

RIGOR MORTIS

- **Do and D represent the distance of the base of the caudal fin from the horizontal line of the table, as measured pre-rigor and at subsequent intervals during storage, respectively. The fish are stored flat between measurements.**

$$RI(\%) = 100 * \frac{(D - D_0)}{D_0}$$



Results and discussion

Experiment performed at an SME

- **Blood chemistry: a significant difference was observed for cortisol, glucose and lactate when 25 turbots (8 ^{o}C) were transported. Transport did not increase levels of FFA. However, no significant difference for cortisol was measured when 45 turbots were transported (13 ^{o}C).**

- **Handling stress due by catching turbot with a net from the fasting tank may have masked stress caused by transport. Improval of experimental design is needed. A new trial was performed at with turbot at 12 ^{o}C.**

Results and discussion

Rested turbot for blood chemistry

Rested turbot

In 4 tanks

Tank 3 and 4 combined for transport

Transported fish

Tank 3: live chilling

Tank 4 electricity and chilling

Turbot after transport for blood chemistry

Rested fish

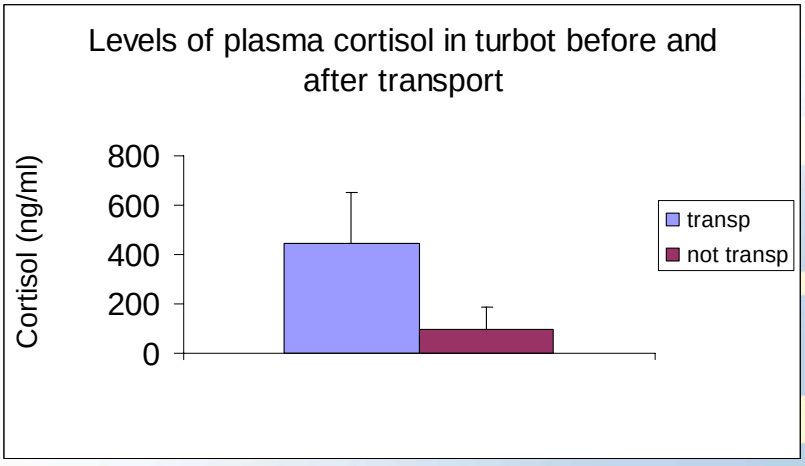
Tank 1: live chilling

Tank 2 electricity and chilling

analysis

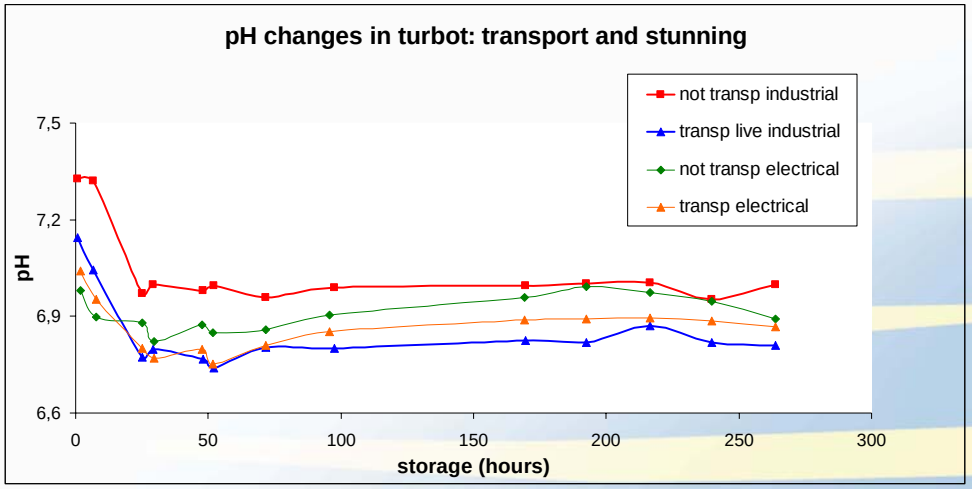
analysis

Results and discussion



A significant difference was found.

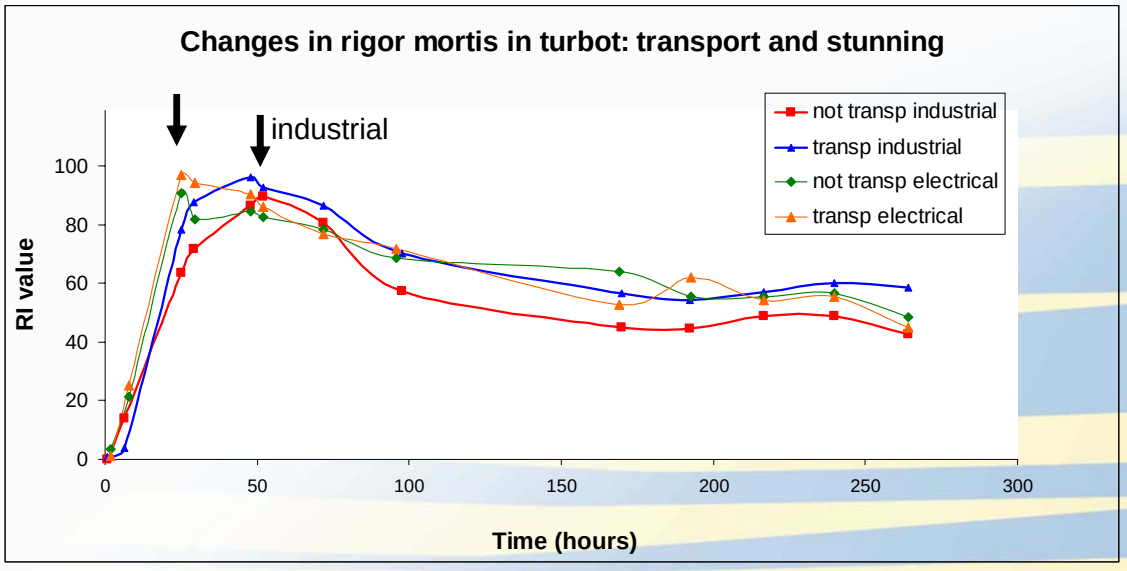
Results and discussion



Comparison not transported industrial to transported industrial revealed a persistent significant difference.

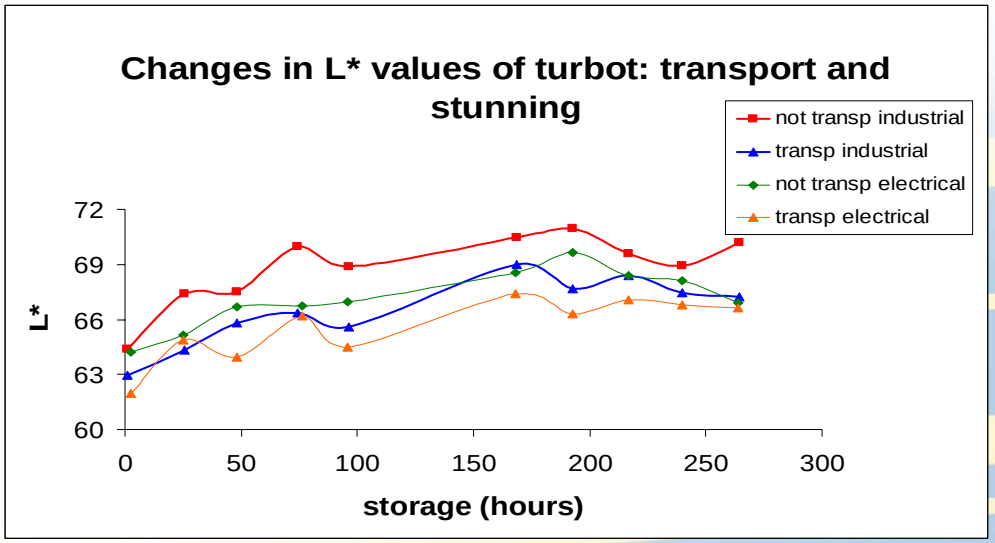
Electrical stunning lowered pH values due to electrostimulation

Results and discussion



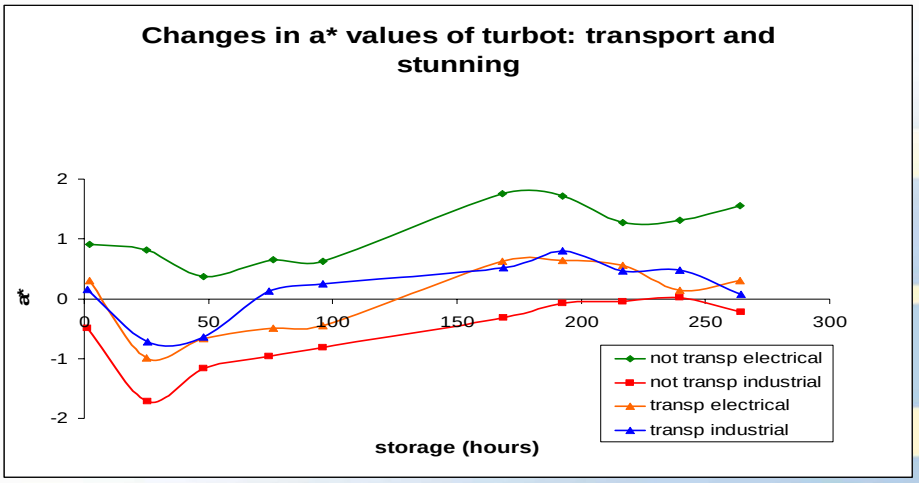
Electricity: in full rigor after 21 h. Industrial: after 49 h.
This difference can be due to electrostimulation

Results and discussion



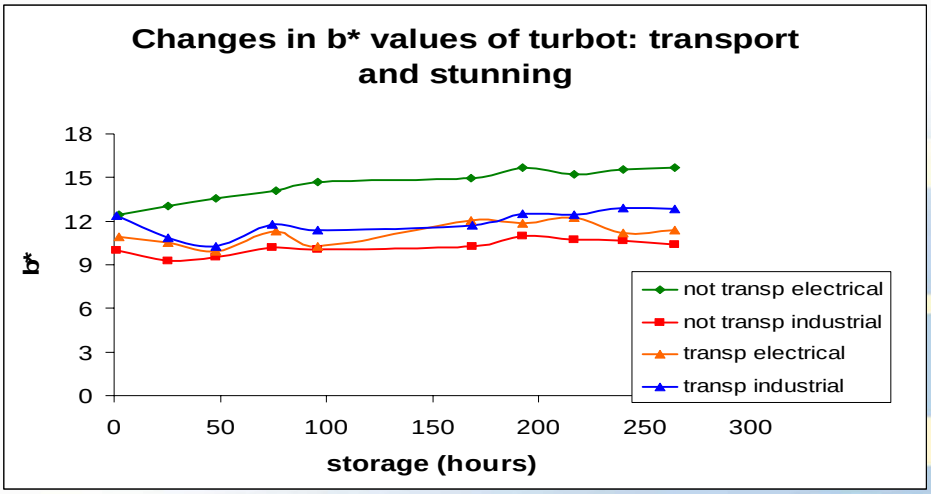
Transport did not result in a persistent significant difference.

Results and discussion



Transport did not result in a persistent significant difference.

Results and discussion



Comparison not transported electr. to transported electr. revealed a persistent significant difference, except for the first sampling point.

Conclusions

- **It was observed that transport may lead to increased levels of cortisol glucose and lactate, which indicates that this is stressful for turbot.**
- **For fish killed by live chilling transport resulted in persistently lower pH values.**
- **We observed that for a rested fish, that was stunned immediately electricity, a more rapid onset of rigor mortis occurred compared to the live chilling. This results suggest that electro-stimulation may have affected the outcome.**
- **No persistent effect of transport on changes of L* and a* was found. For electricity transport influenced b* values.**

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