

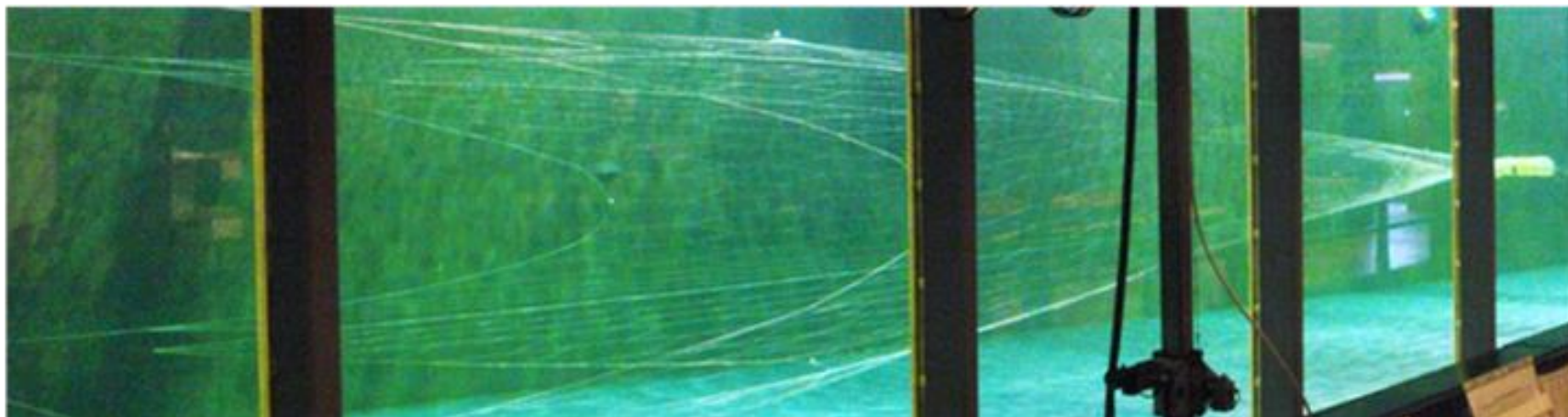
“New technology for the Nordic fishing fleet: Fishing gear and effective catch handling”
Reykjavik, Iceland,
October 1st & 2nd 2013.

Selectivity in mid-water trawls for cod



Background

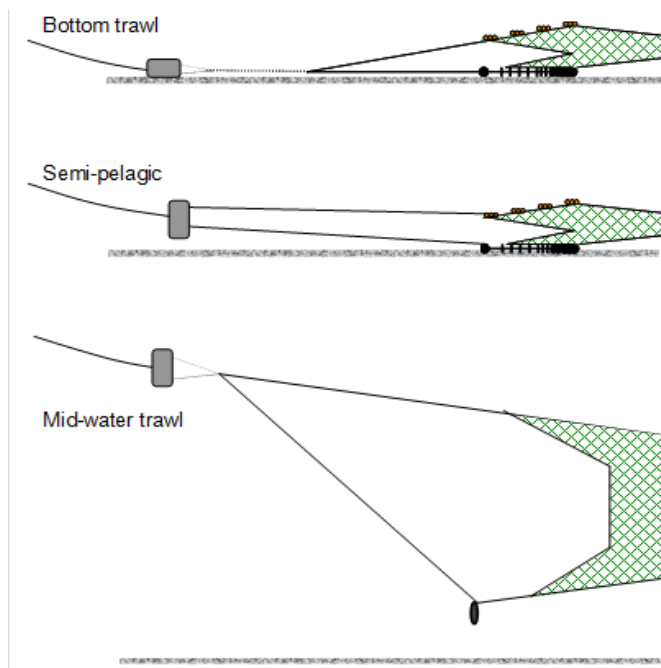
- Mid-water trawling reduces impact on the seabed and associated fauna.
- Requires less energy than bottom trawling, with consequent reduction in fuel costs and NOx emissions.
- Opens the possibility of trawlers to combine bottom and pelagic trawls.



Energy consumption comparison

We compared energy consumption (kW) of trawling with three trawl setups, each in and out a fjord, at the same depth and towing speed:

- Bottom trawl with 9m² bottom trawl doors
- Bottom trawl with 6.5m² semi-pelagic trawl doors
- Mid-water trawl with 6.5m² semi-pelagic trawl doors



17% reduction

-5% reduction

40 times bigger mouth opening area than bottom trawl

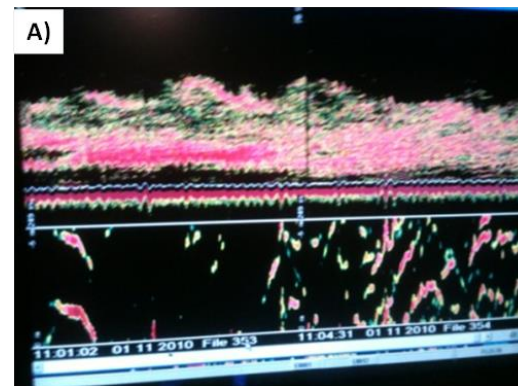
Challenges regarding selectivity

Size selectivity at extremely high catch rates (> 20 ton/hour):

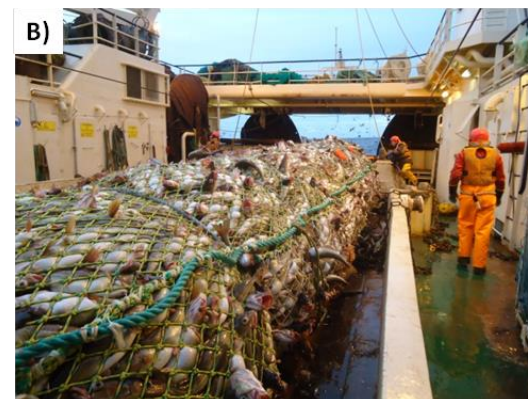
Mandatory sorting grids, originally designed for bottom trawling, have capacity problems when fishing with pelagic trawls at extremely high catch rates.

Control of catch size:

The risk of taken excessively big catches can potentially lead to reduced quality of the catch and also be associated with handling problems and other H.S.E related problems.



70 m thick layer of pelagic cod



54 tonn cod taken in 8 min tow

Selectivity experiments

Objectives:

Development of a selection system based on flexible web panels (Exit Windows or T90), which has significantly greater capacity than the current sorting grid systems,

The selection systems were :

- A codend with 130 mm lateral Exit Window panels

- A 135 mm T90 codend

- A 55 mm sorting grid (Sort-V type)

6 cruises, 112 hauls with selectivity data

- F/F "Jan Mayen" (march–april 2010)
- M/T "Atlantic Star" (october 2010)
- F/F "Helmer Hansen" (may 2011)
- M/T "Ramoen" (october 2011)
- F/F "Helmer Hansen" (april 2012)
- M/T "Arctic Swan" (october 2012)



- 55 mm grid
- 130 mm EW
- 135 mm T90 codend

Results:

- Exit Windows and T90 showed good and stable selection even with very high catch rates.

| Sekk | Parameter | <i>p</i> | <i>p</i> -verdi | 95% konfidensintervall | | Mellom-hal variasjon (cm) | |
|---------------|-----------|----------|-----------------|------------------------|-----------------|------------------------------|------|
| | | | | grenser (øvre) | grenser (nedre) | | |
| T90 sekk | L50 | 54.0 | 0.52 | 2.2397 | 45.5 | 62.5 | 14.2 |
| | SR | 7.8 | 1.2649 | 5.7 | 9.9 | 4.7 | |
| Sekk med E.W. | L50 | 56.2 | 0.58 | 1.6577 | 50.2 | 62.3 | 7.1 |
| | SR | 9.9 | 1.2649 | 5.7 | 14.3 | 5.3 | |

- EW and T90 codend caught less than 2% undersized fish in areas with 16% undersized fish

Norwegian Directorate of Fisheries:

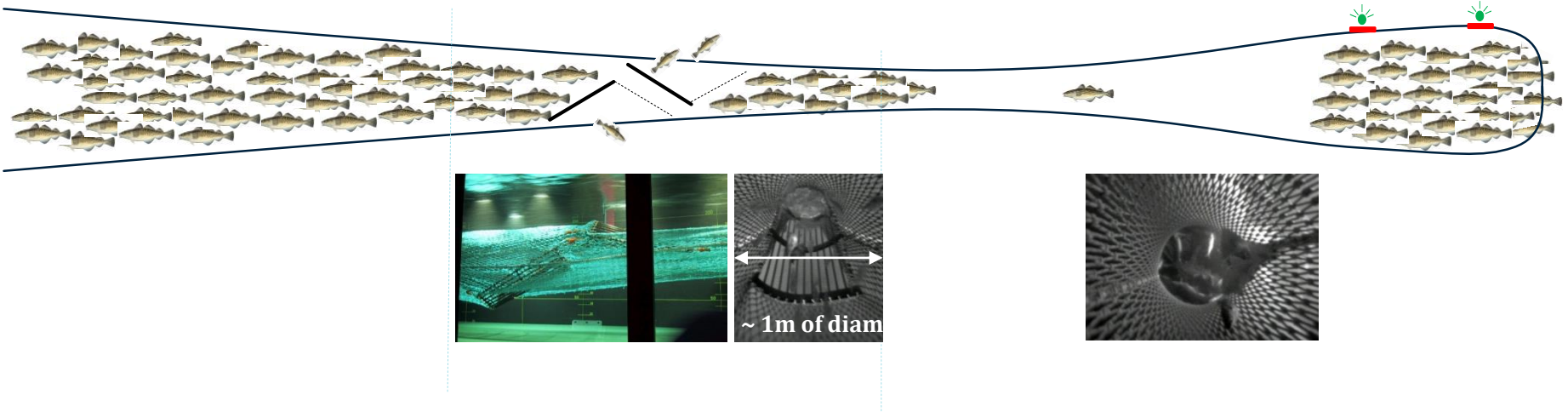
"Not accepted as technical measure for size selectivity in trawls"

Problems with the sorting grid

1) Saturation of the grid

2) Fish does not fall back to the codend

3) Catch sensors fail to give right information of catch size

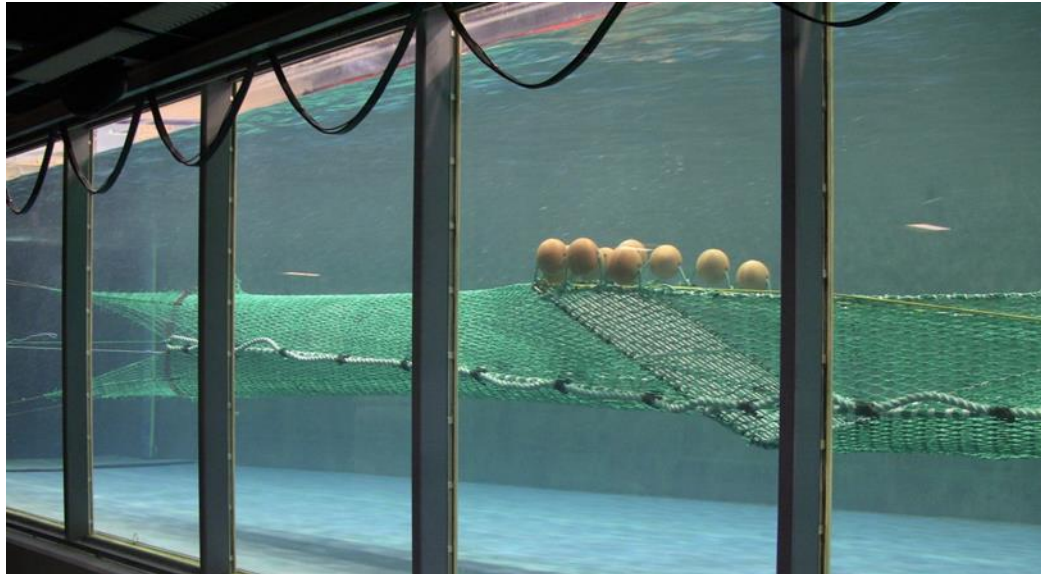


Norwegian Directorate of Fisheries:

"Sorting grids are and will be the technical measure for size selectivity in trawls"

Further development of grid sections:

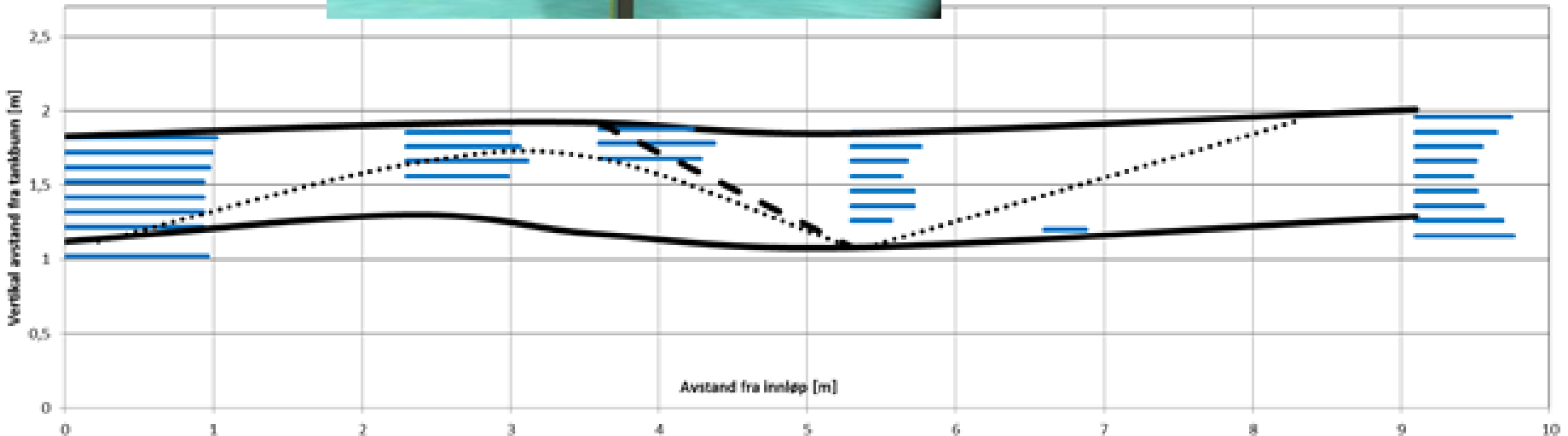
We assessed the water flow of sorting grid sections in the flume tank in Hirtshals, Denmark (juni 2013)



Measurements of water flow were performed in full scale

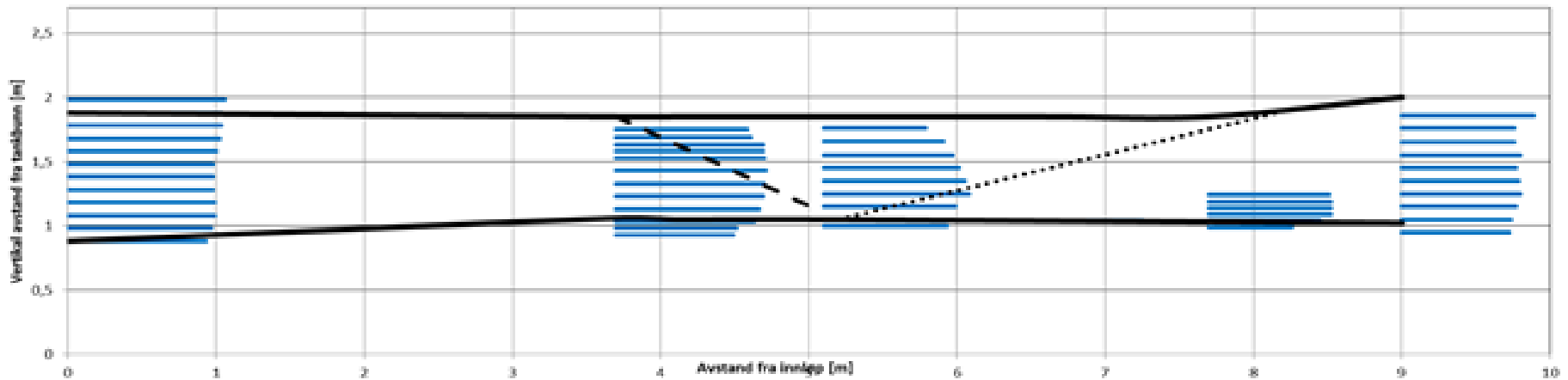
2-panel sorting grid (sort-V) with lifting panel

Lifting panel
blocked all the
section



Blue lines indicate the water flow speed reductions. 1 square is equivalent to 0,95 m/s.

4-panel sorting grid (sort-V) without lifting panel



Blue lines indicate the water flow speed reductions. 1 square is equivalent to 0,95 m/s.

A 4-panel single grid section without lifting panel, has:

- **Larger cross-sectional area,**
 - **Better stability.**
 - **Better water flow**

4-panel sorting grid (sort-V) without lifting panel

Full scale experiments with this type of grid section are planned to be performed in October 2013 on board M/T Ramoen

Thank you for your attention!



Teknologi for et bedre samfunn