Discards survival probabilities of flatfish and rays in North Sea pulse-trawl fisheries

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Research objectives

- To measure discards survival for:
  - Sole
  - Plaice
  - Turbot
  - Brill
  - Thornback ray

- To test measures aimed at increasing discards survival

- Flatfish pulse-trawling with 80mm meshes and 12m gears

Flatfish pulse-trawling

Pulse beam trawl

- Main target species: Sole (*Solea Solea*)
- Mixed demersal fishery
- 12m gear width
- 80mm mesh size
- Semi-automatic catch processing
- Monday-Friday

Experimental set-up

- Sampling of discards at sea
- Assessment of individual fish condition
- Housing of fish in survival units
- Survival monitoring at sea
- Transport to the lab
- Continued survival monitoring in the lab (15-18 days)

- Control fish to detect experiment induced mortality
- ICES guidelines for discards survival research

Sampling of discards at sea

- 3 commercial pulse-trawlers during regular fishing
- 9 trips, spread-out over 1 year
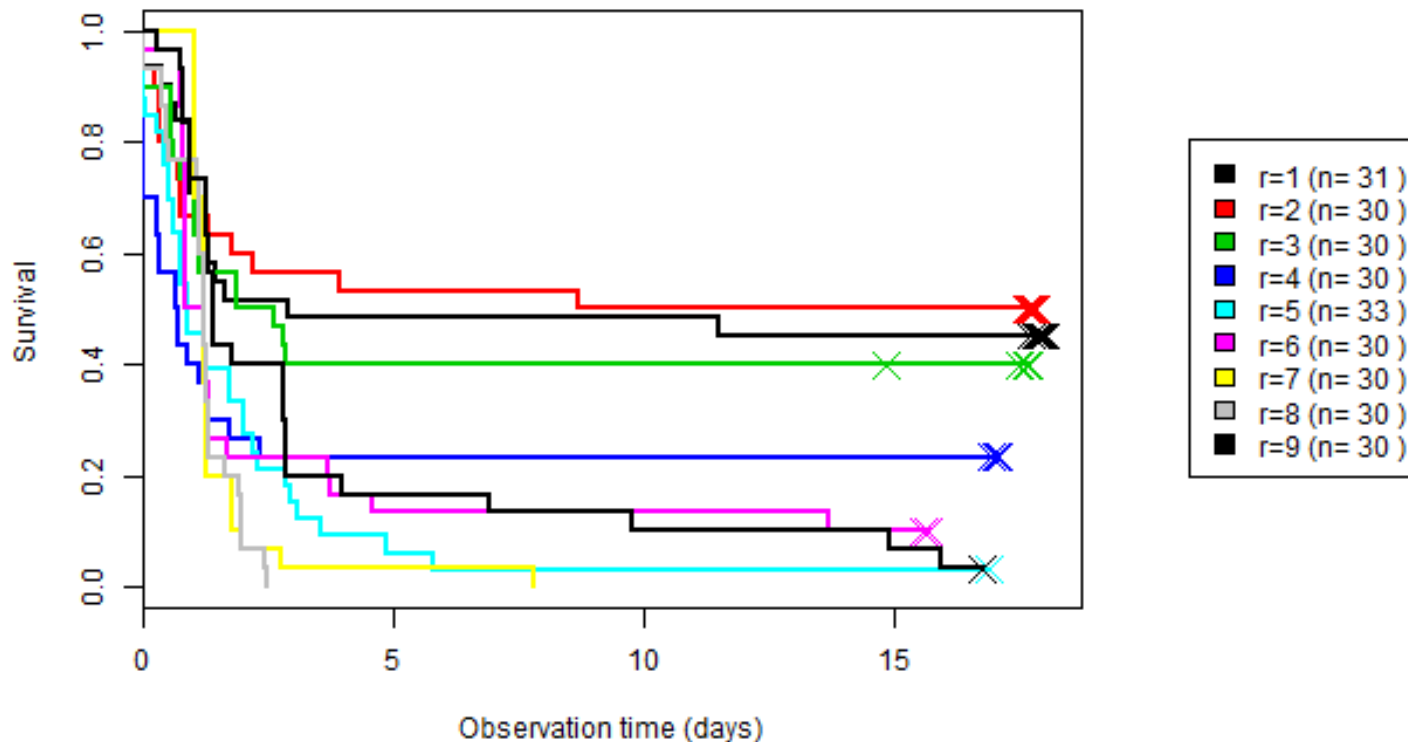- End of sorting belt – just before discarding
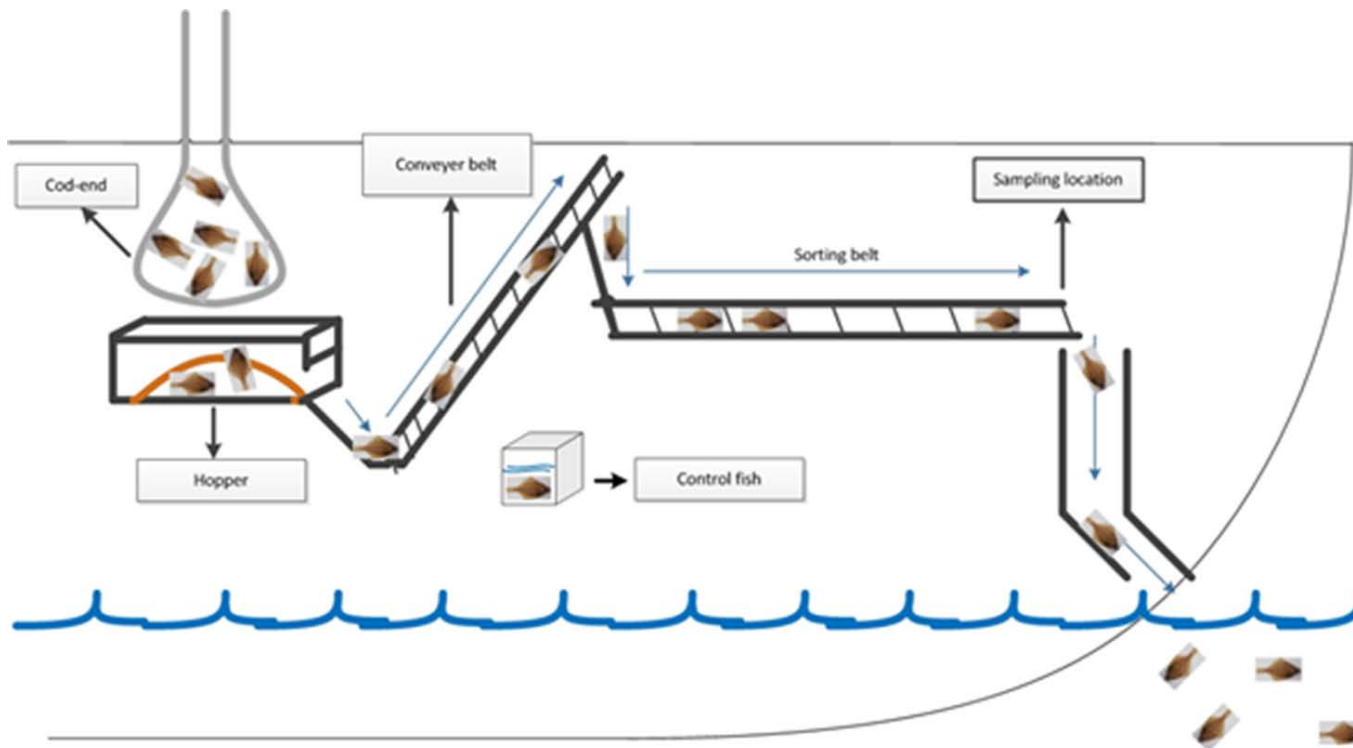
Sole (*Solea Solea*) – per trip

- Large variation among trips: 0-50%
- Varying fishing conditions throughout the year
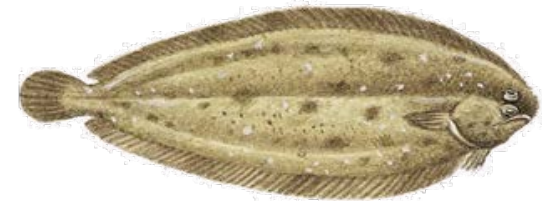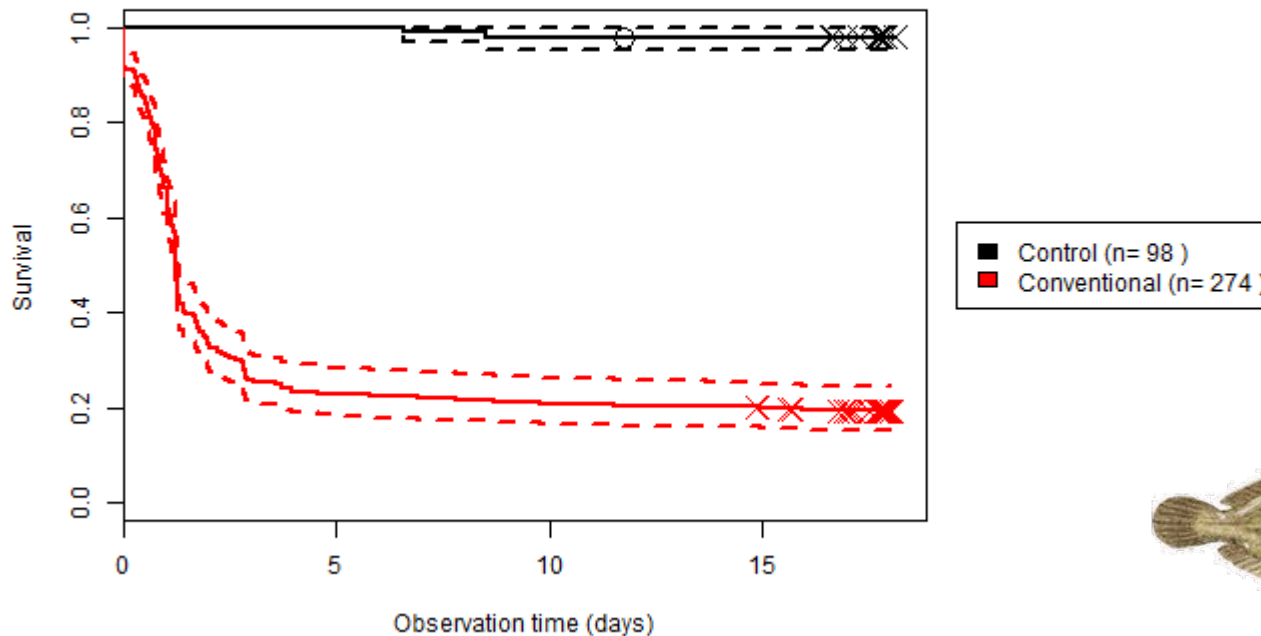

Trip 1-2-3-4-5-6-7-8-9, species = Sole

Legend:
- r=1 (n= 31)
- r=2 (n= 30)
- r=3 (n= 30)
- r=4 (n= 30)
- r=5 (n= 33)
- r=6 (n= 30)
- r=7 (n= 30)
- r=8 (n= 30)
- r=9 (n= 30)

Y-axis: Survival
X-axis: Observation time (days)

Sole (*Solea Solea*) – all 9 trips combined

- Survival control-fish ~100%
- Monitoring period was sufficiently long - stabilization

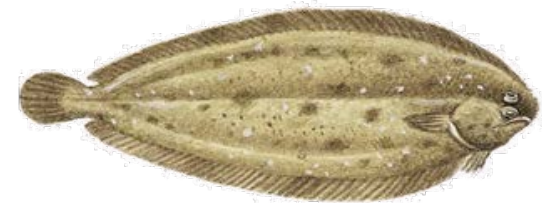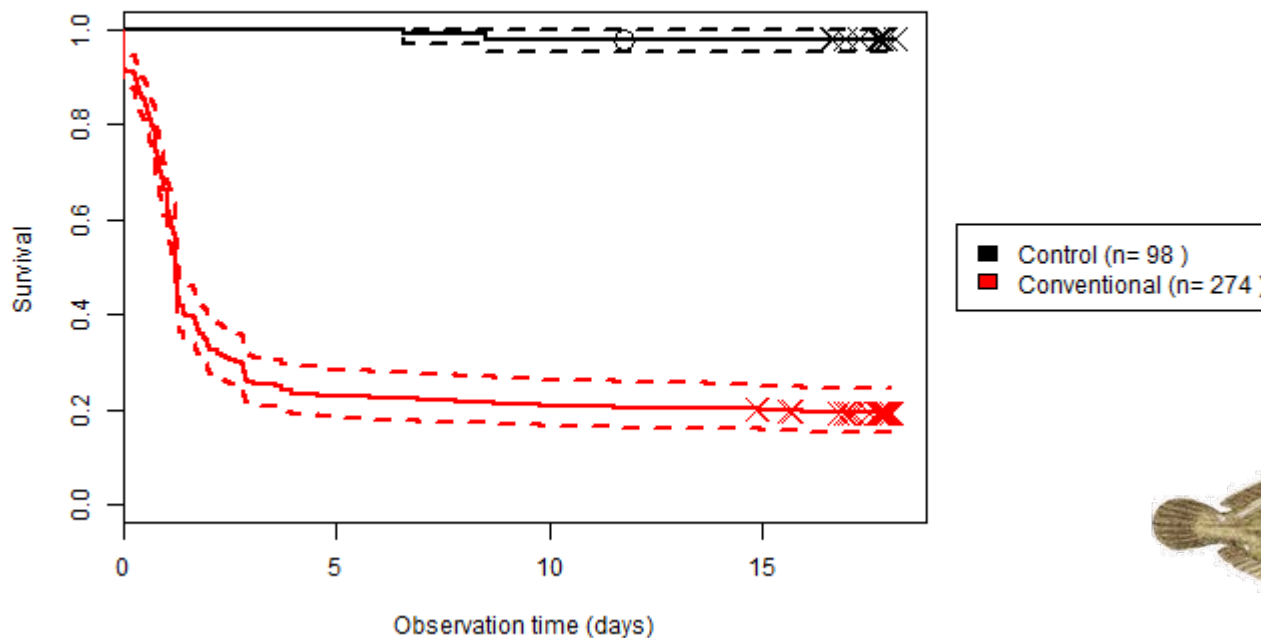=> *Experiment technically successful*

Trip 1-2-3-4-5-6-7-8-9, species = Sole

Sole (*Solea Solea*) – all 9 trips combined

- ~90% sampled discards is alive upon sampling
- Most mortality occurs within 5 days
- Survival test-fish: 19% (95%CI 13-28%)

Trip 1-2-3-4-5-6-7-8-9, species = Sole

Control (n= 98)
Conventional (n= 274)

Sole – trips combined – split by fish condition classes
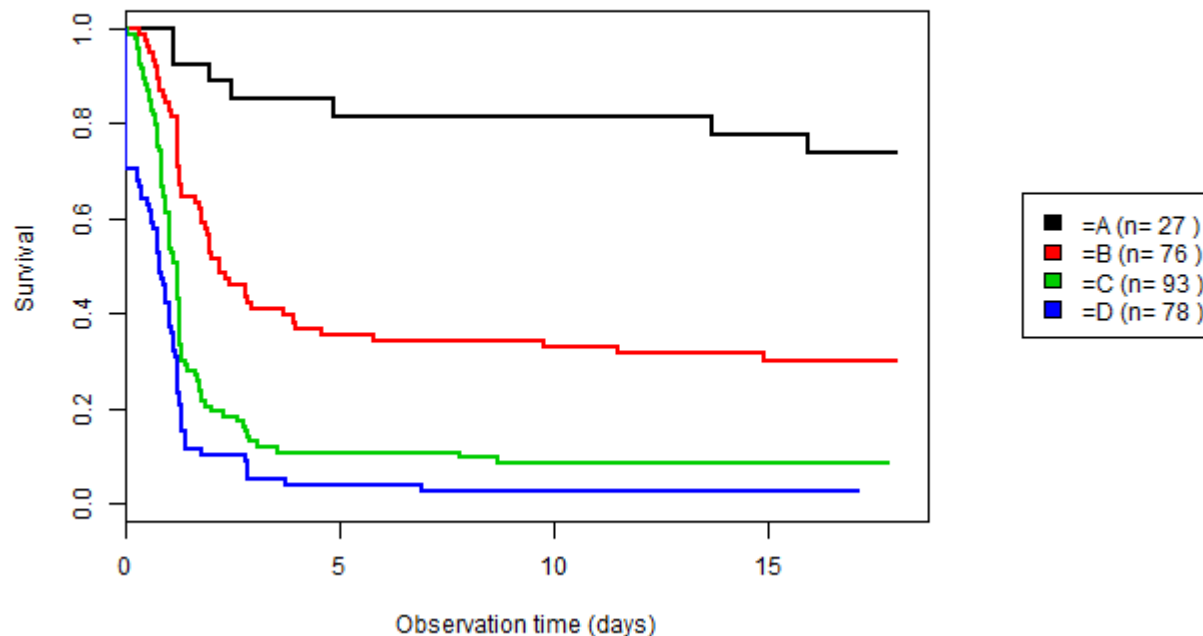
- Strong effect of fish condition on survival
- Small proportion of fish in best condition (A) in catches
- Improving fish condition = key to increase survival

Trip 1-2-3-4-5-6-7-8-9, species = Sole

Legend:
- =A (n= 27)
- =B (n= 76)
- =C (n= 93)
- =D (n= 78)

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Survival other species

Species	Number	Overall discards survival probability (%)		
	Obs.	Estimate	95% CI LL	95% CI UL
Plaice	558	14%	11%	18%
Sole	274	19%	13%	28%
Turbot*	111	30%	20%	43%
Brill*	90	13%	7%	23%
Thornback ray*	99	53%	40%	65%

What measures can be taken to increase survival?

- Investigated during (same) 9 trips

- Conventional versus modified practices

- Same methods – different samples for modified practices

- Plaice as indicator species

- Three measures:
  - Water filled hopper
  - Shorter hauls
  - Knotless cod end

Water filled vs dry hopper

- Implemented on 1 side of the vessels
- Paired comparison within hauls
- Multiple hauls per trip
- Total of 8 trips

VS

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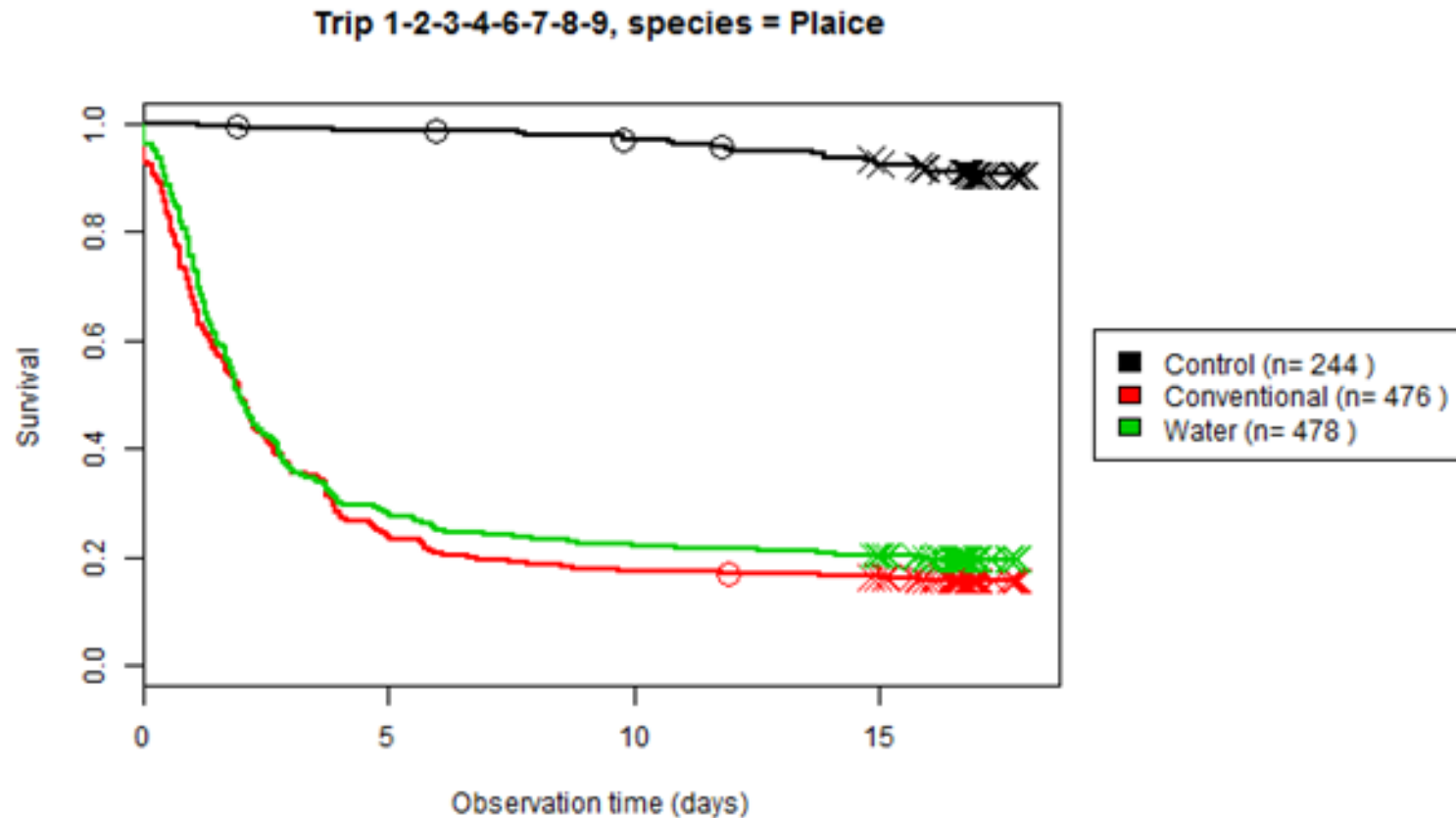
Water filled vs dry hopper - Results

- All trips combined: no effect of a water filled hopper on plaice discards survival

Trip 1-2-3-4-6-7-8-9, species = Plaice

Legend:
- Control (n= 244)
- Conventional (n= 476)
- Water (n= 478)

Water filled vs dry hopper – Trip level

- 3 trips survival water filled > dry hopper

- Some trips indicating negative effect of water filled hopper?

- Effect of conditions yet to be established

Sea trip	Dry hopper	Water filled hopper	p-value
1	15%	18%	0.69
2	15%	29%	0.0009
3	12%	15%	0.77
4	3%	10%	0.03
6	22%	18%	0.74
7	20%	10%	0.17
8	17%	12%	0.26
9	20%	45%	0.01

Water filled hopper can increase discards survival under specific conditions.

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Conclusions

- Discards survival was established for plaice and sole

- Indicative discards survival was established for turbot, brill and thornback ray

- Discards survival varies with:
    - Species
    - Trips & underlying factors
    - Fish condition

- Improving fish condition = key to increase survival

- A water filled hopper can increase discards survival under (yet to be established) specific conditions

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More information

- Reports
- Factsheets
- Infographics
- Video

All available at:

http://www.wur.eu/fishsurvival

http://www.wur.nl/overlevingvis

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