



School biomass estimates using digital omnidirectional fisheries sonar

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Fiskeleting, fangst og kvalitet: Siste nytt fra forskningsfronten
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Motivation

Omnidirectional fisheries sonar

Detailed inspection

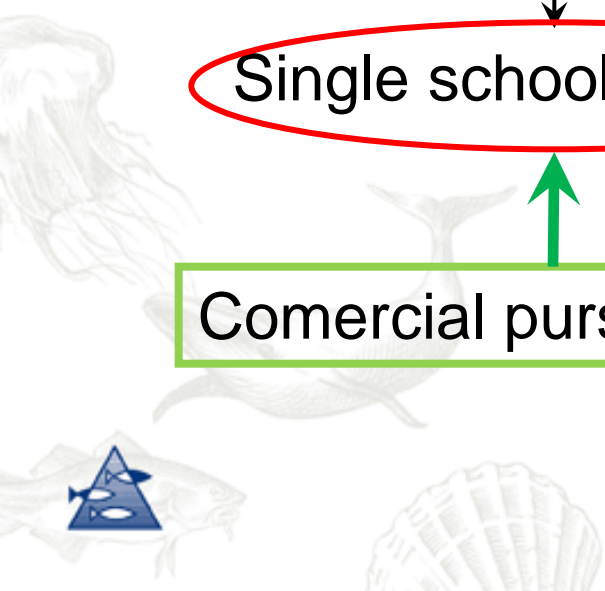
Surveying

Single school biomass

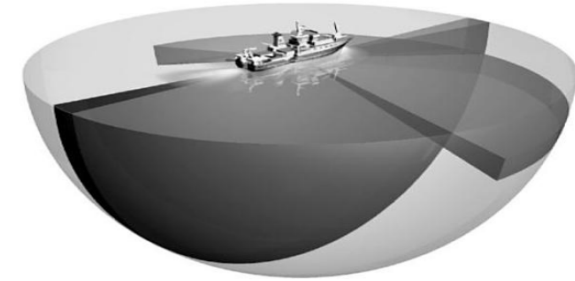
Echo integration

Comercial purse seining

WHO FISH (2012 - 2015)
CRISP (2011 - 2019)



Stages of commercial purse seining using omnidirectional fisheries sonars

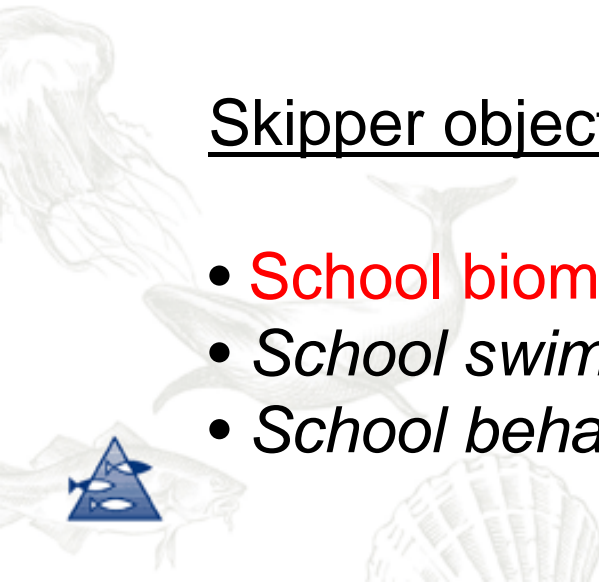


1. Searching (range: 1000 to 3000 m)
2. Preliminary inspection (range: 400 to 600 m)
3. Selection of school candidate
4. Detailed school inspection (range: 150 to 300 m)



Skipper objectives

- **School biomass**
- *School swimming direction and speed*
- *School behaviour to approaching vessel*





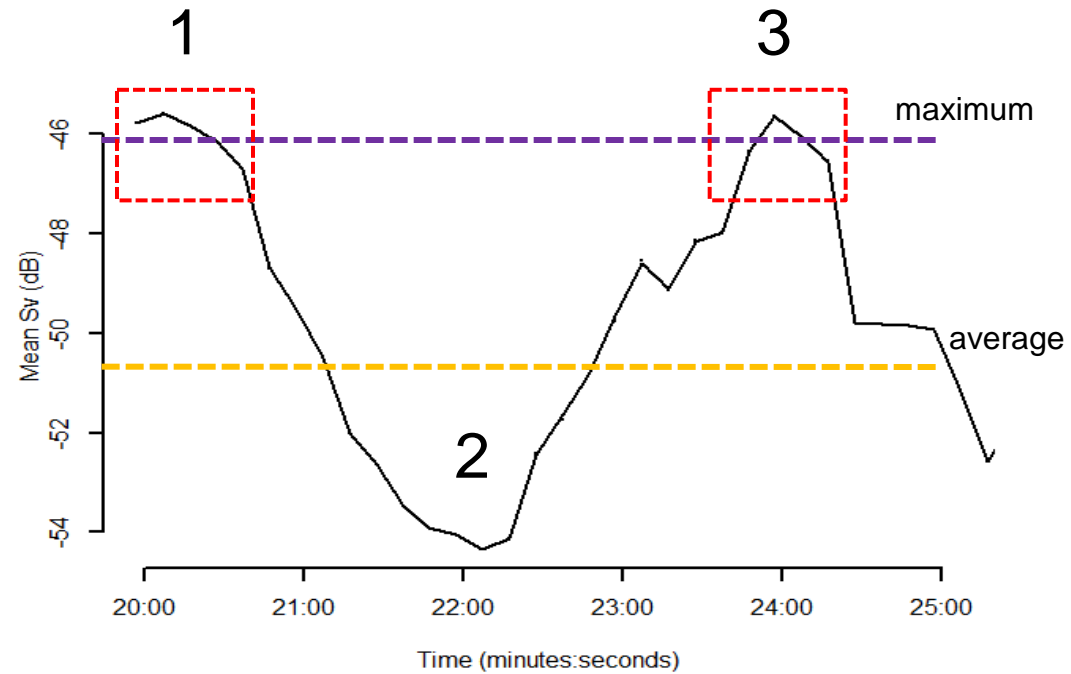
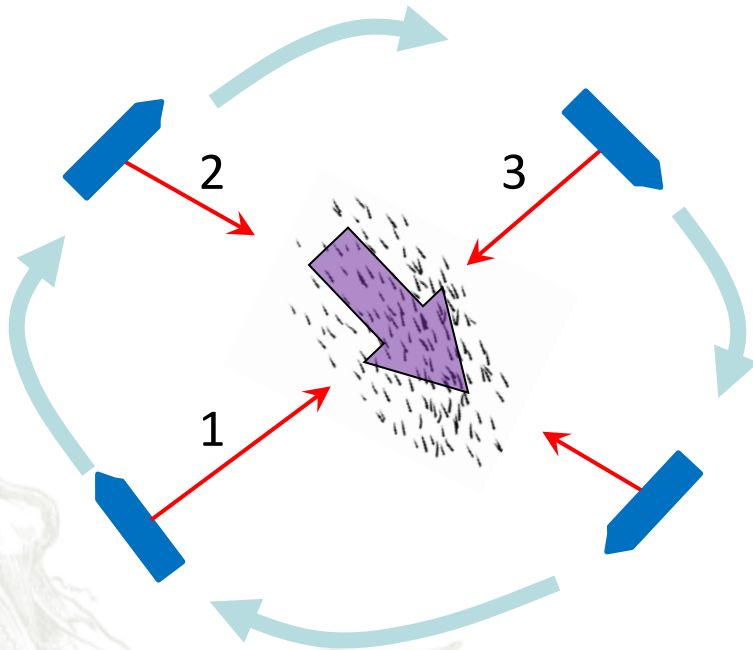
Detailed school inspection of herring school in North sea November 2013 F/V "Artus"

[Inspection.wmv](#)



Detailed school inspection

Sonar echo strength (Sv) changes during encircling a polarized school



Biomass calculation

Fish density

School volume

Fish weight

Calibrated
raw data

Horizontal
beams



$$\text{School biomass} = \frac{\sigma_{bs}}{S_v} * \text{school area} * \text{school height} * \text{fish weight}$$



Side aspect TS

Vertical beams

Catches

Simrad SX90 and SU90 at 26 and 30 kHz

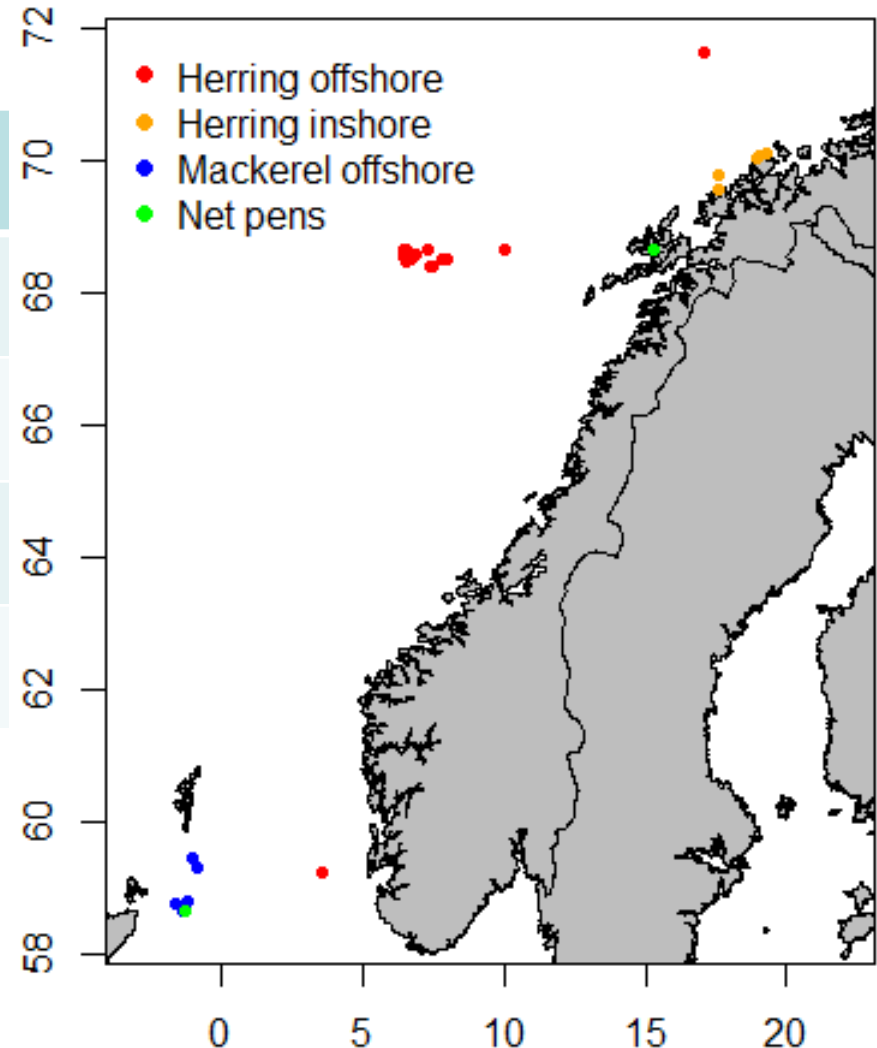


Results

Vessel	Dates	Ship days	Species	Schools
GO Sars	Nov. 2012	14	Herring	20
GO Sars Artus	Mar. 2013	28	Herring	1
GO Sars Artus	Nov. 2013	28	Herring	7
GO Sars Kings Bay	Oct. 2014	28	Mackerel	6

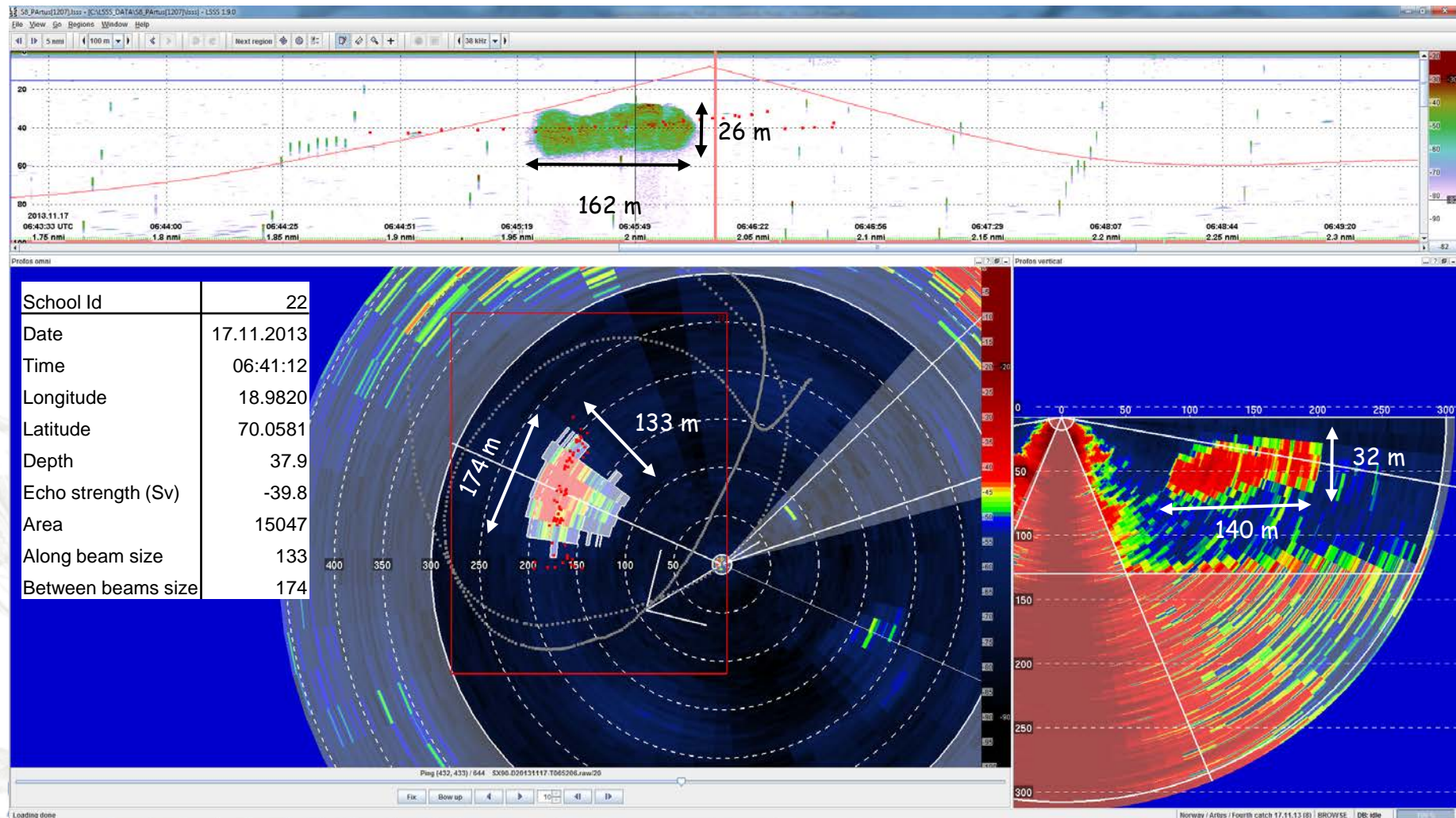
Total of 98 ship days
34 best quality schools
9 verified catches

Schools processed



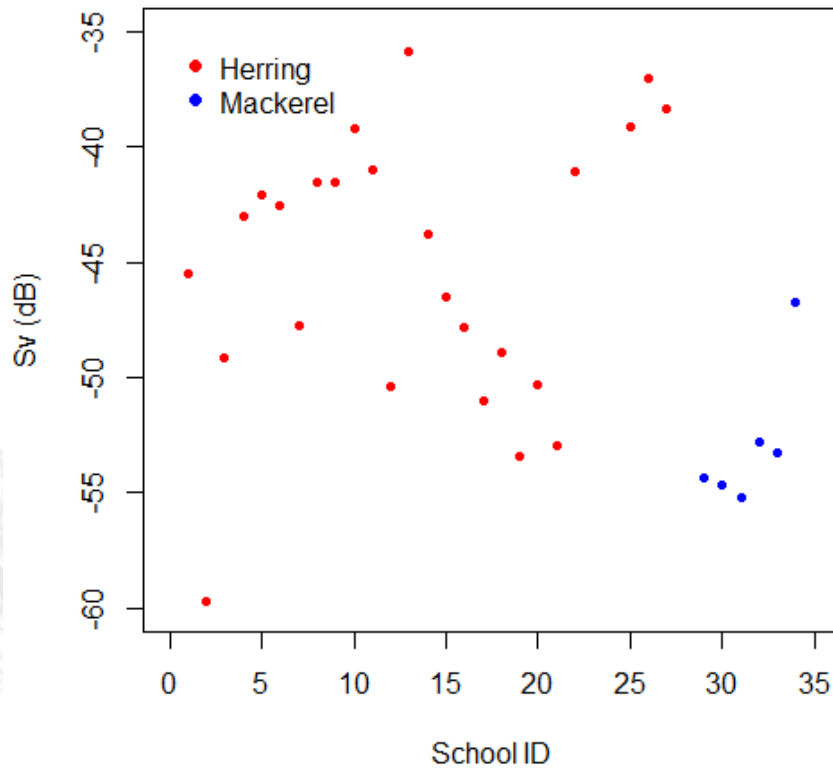
Procedure for school growing in post-processing software

School growing.wmv

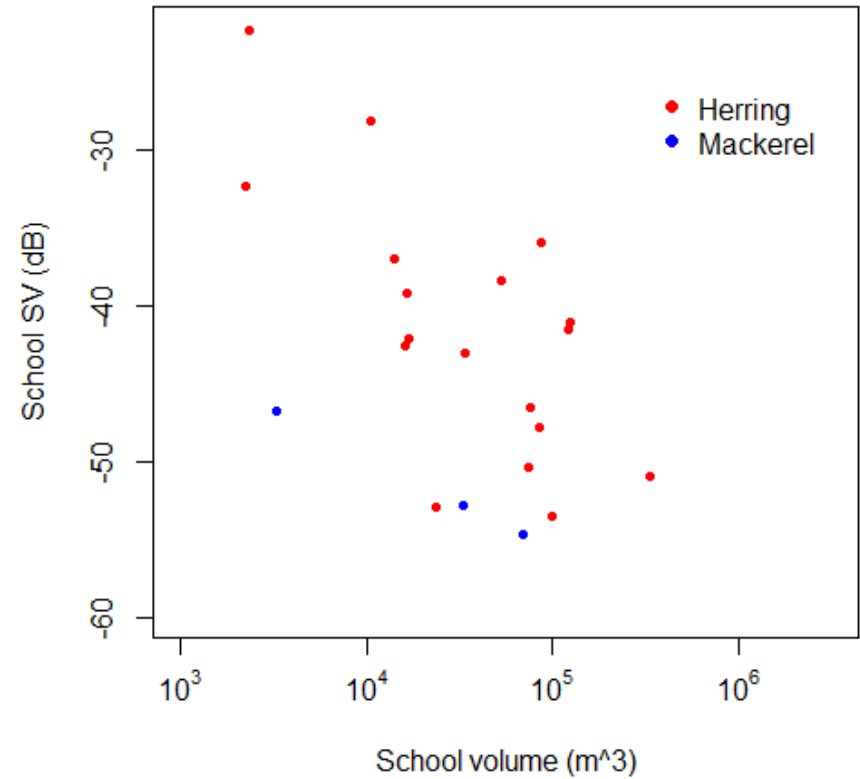


Results from sonar measurements

Mean echo strength (Sv) from sonar measurements

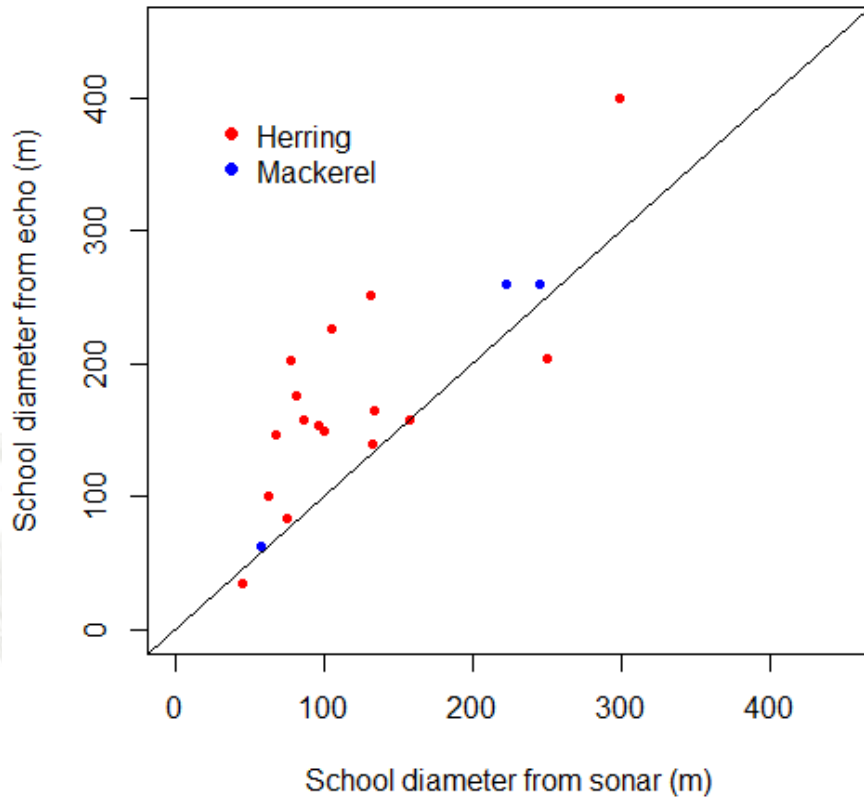


Mean echo strength (Sv) and school volume

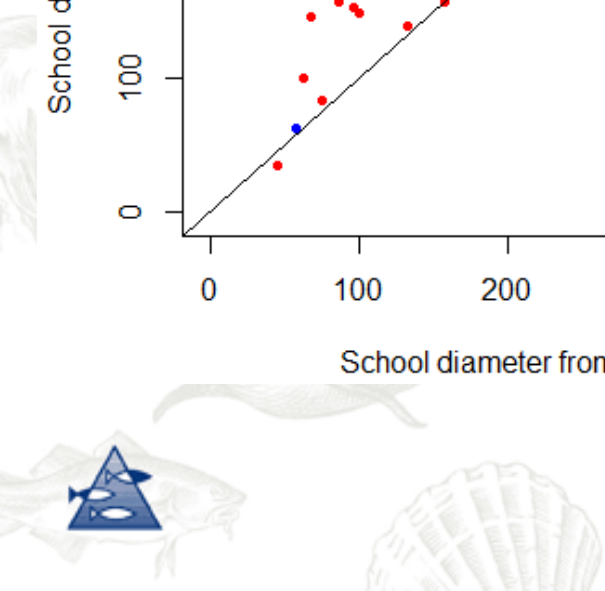
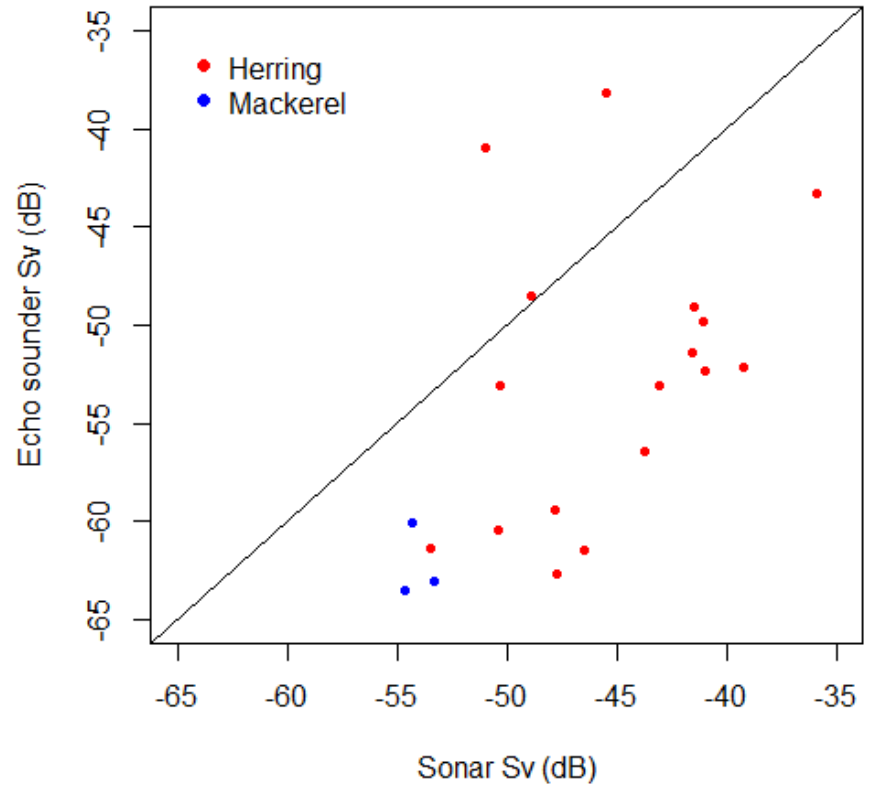


Sonar and echo sounder measurements

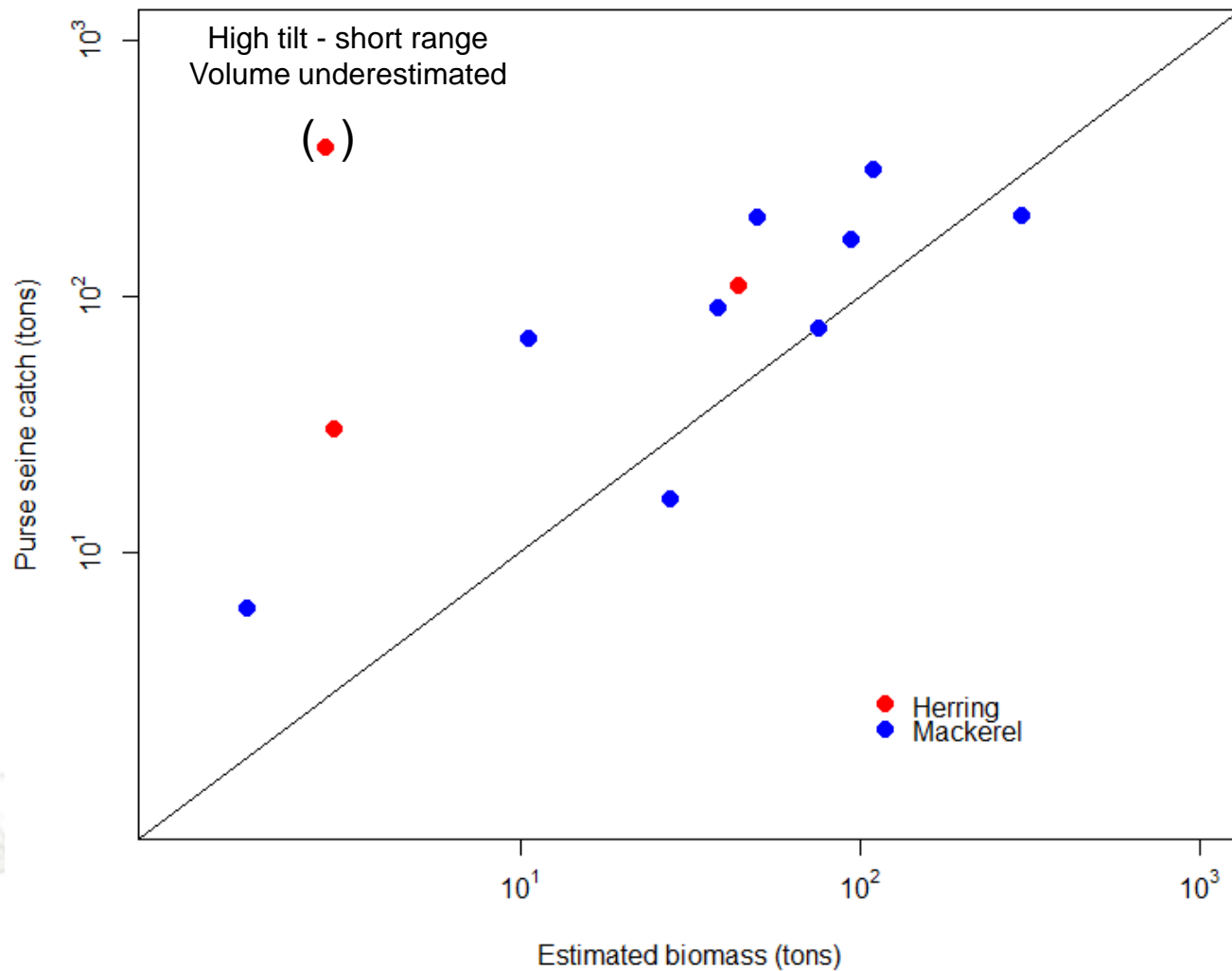
School diameter from echo and sonar



Echo strength from sonar and echo sounder



Sonar estimated and verified biomass of herring and mackerel



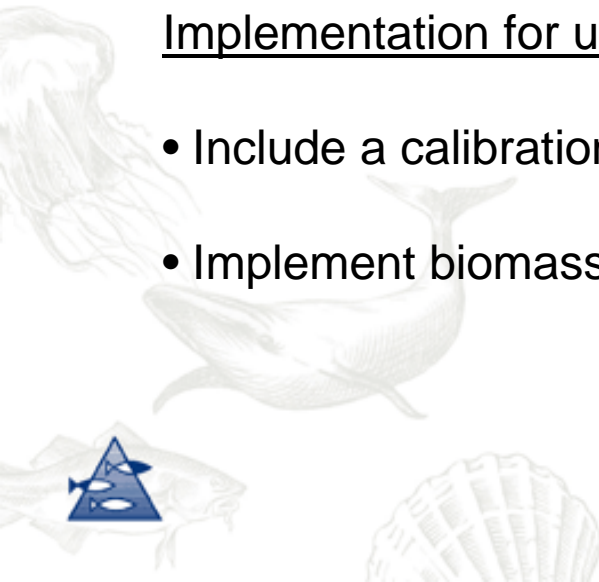
Future activities

Improvements in methodology

- Implement improved growing methods in post-processing software
- Calibration in FM mode and vertical beams (done in October 2015)
- Improve side aspect target strength (TS)

Implementation for use in commercial fishery (2016?)

- Include a calibration facility in sonar software
- Implement biomass equations in sonar software



Acknowledgements

WHOFISH – Whale counting and fish school biomass appraisal by two new omni-directional fisheries sonars. *Norwegian Research council, Proj. No.*

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203477  **Forskningrådet**

And especially to the skippers and crew of:

R/V "GO Sars"



F/V "Artus"



F/V "Kings Bay"

