



Research cruise with Selvåg Senior

28/9 to 6/10

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Agenda

- Objective and tasks of cruise
- Methods
- (Preliminary) results
- Further work

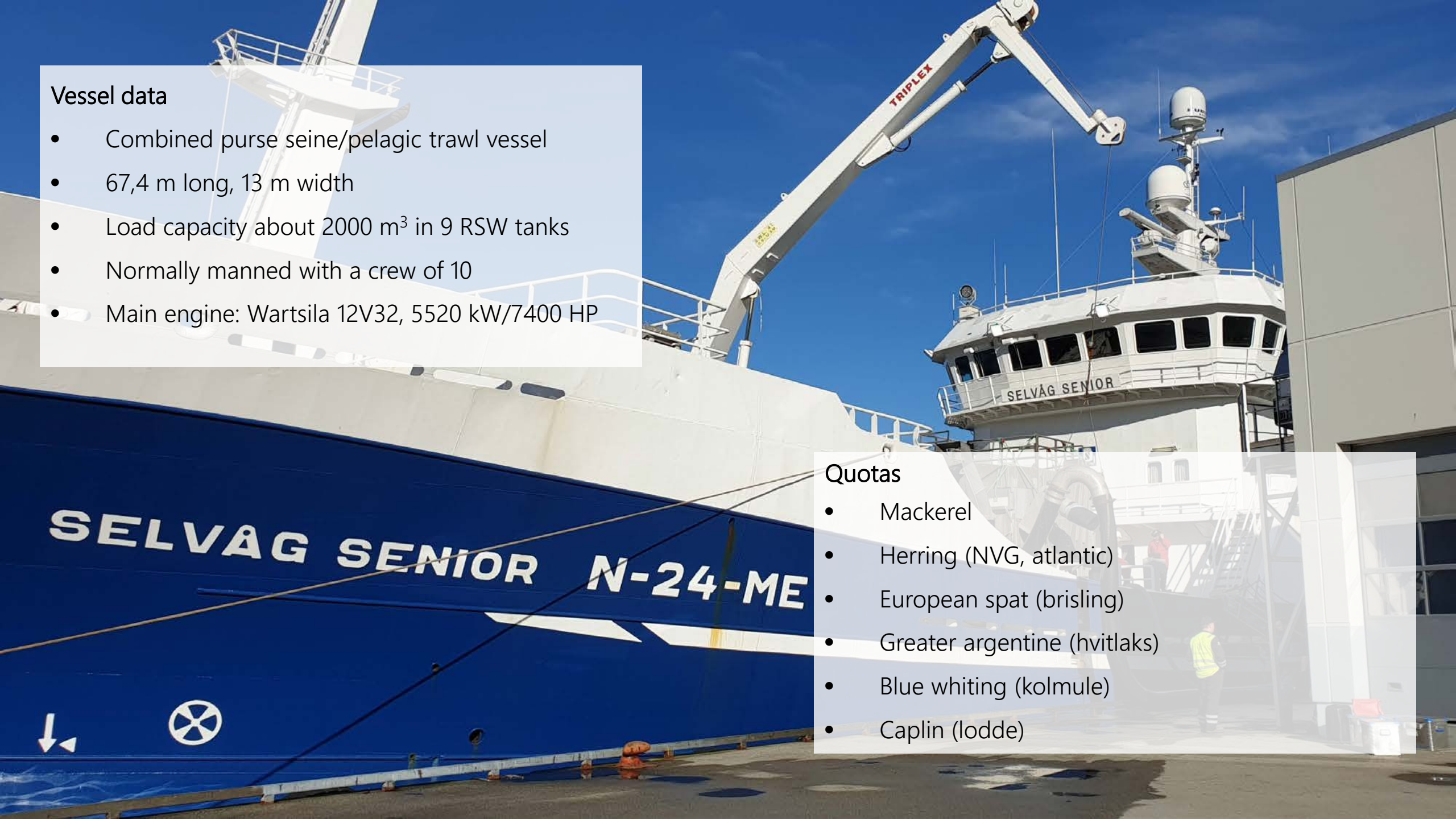


Vessel data

- Combined purse seine/pelagic trawl vessel
- 67,4 m long, 13 m width
- Load capacity about 2000 m³ in 9 RSW tanks
- Normally manned with a crew of 10
- Main engine: Wartsila 12V32, 5520 kW/7400 HP

Quotas

- Mackerel
- Herring (NVG, atlantic)
- European spat (brisling)
- Greater argentine (hvitlaks)
- Blue whiting (kolmule)
- Caplin (lodde)



Objectives

Main objective: gather data of on board energy systems

Purpose: gain knowledge of when demand for thermal energy occurs, with respect to the different stages of a fishing trip

Results will be used for modelling/simulation and as valuable input for design of energy efficiency technology



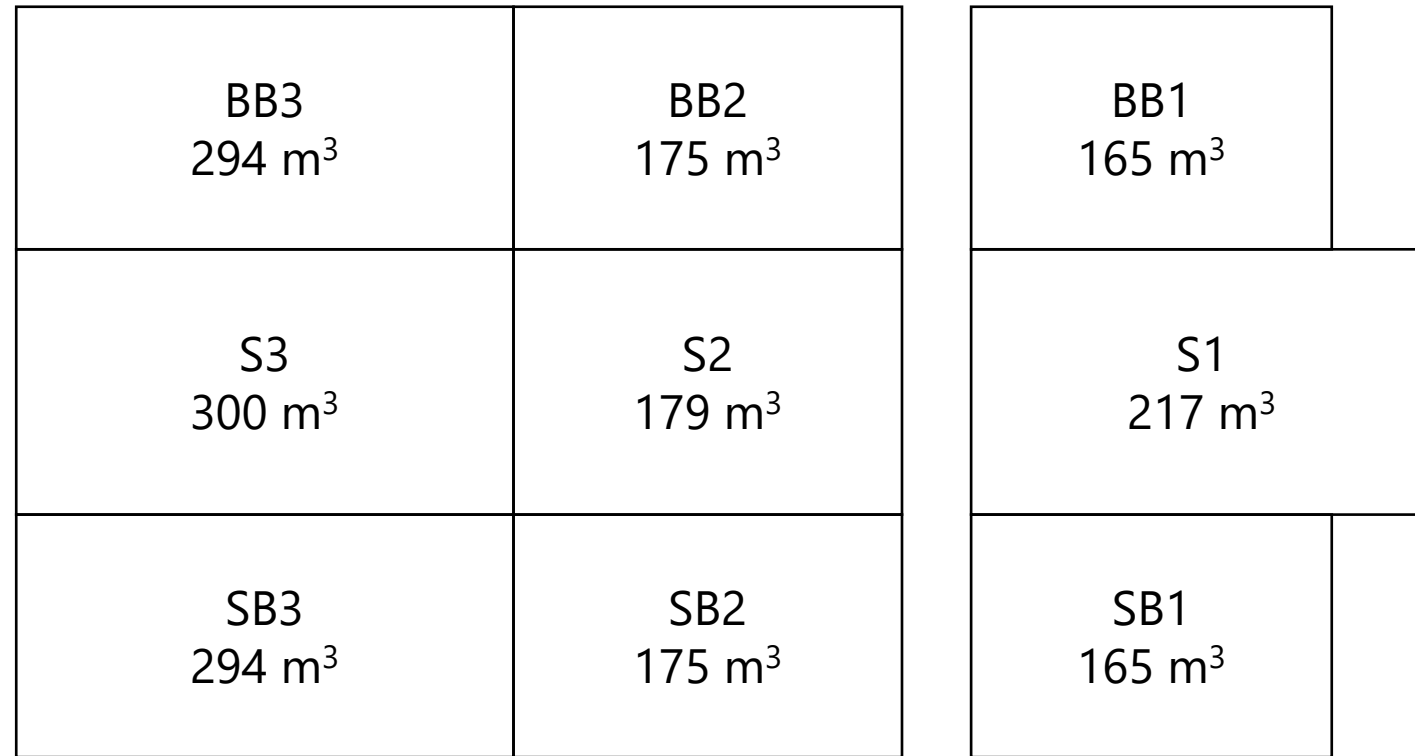


Tasks

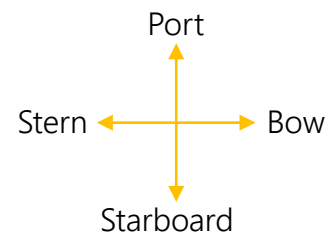
- Instrument a RSW tank with temperature loggers
- Gather fuel consumption during different stages of the trips
- Gather energy data from the refrigeration/RSW system during the whole period
- Gather relevant data of each catch
- Measure core temperature of mackerel during unloading
- Conduct talks with crew, gain knowledge of modus operandi and discuss efficiency measures

Methods

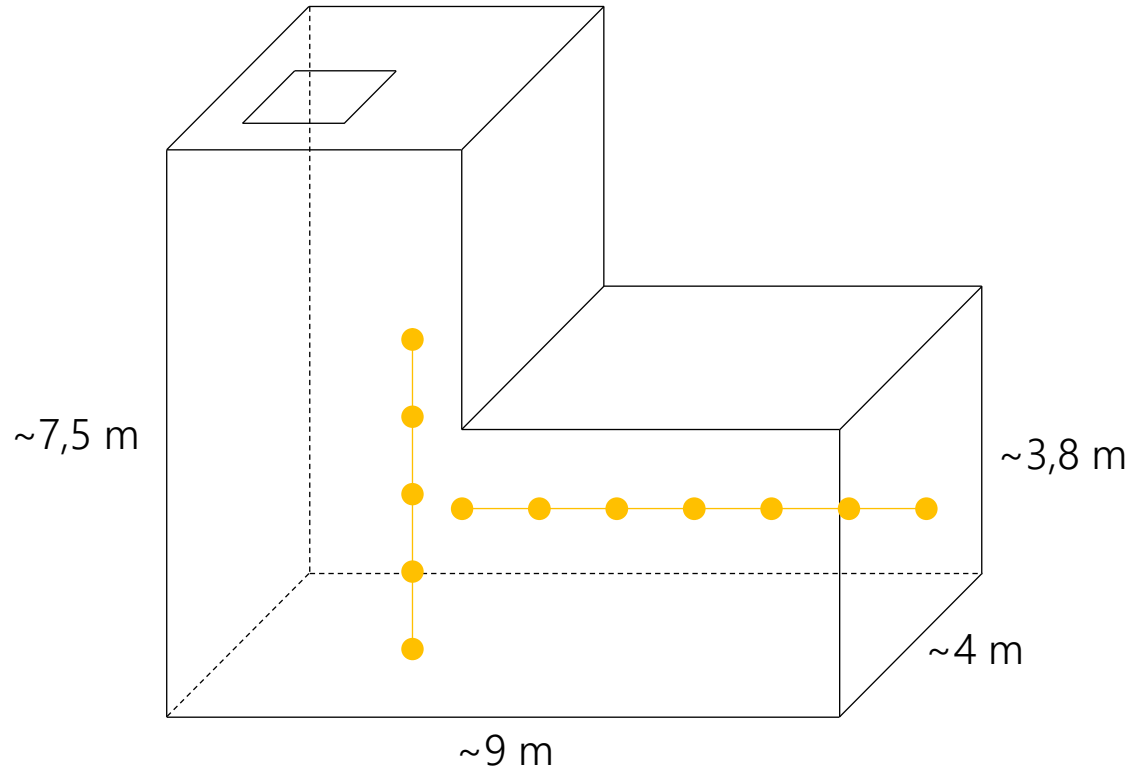
Instrumentation of RSW tanks



Top view RSW tanks



Instrumentation of RSW tanks



BB2

HOBO Pendant Temperature
Data Logger

Accuracy: $\pm 0,53$ °C

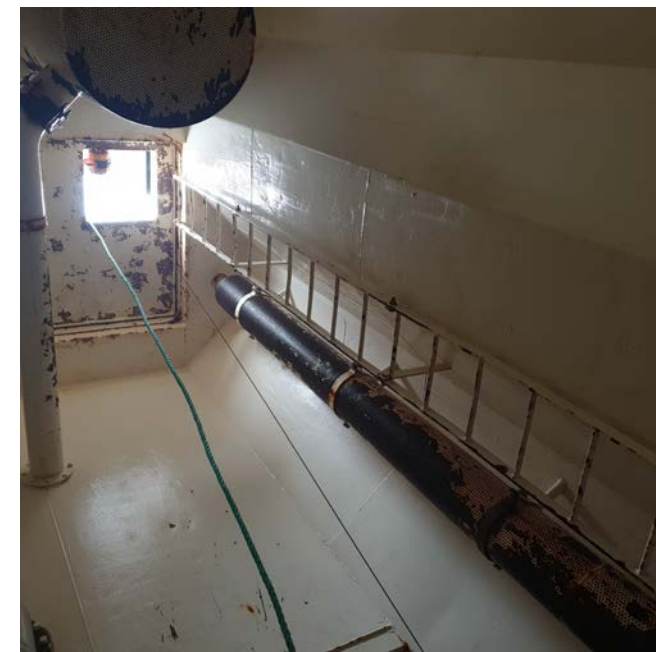
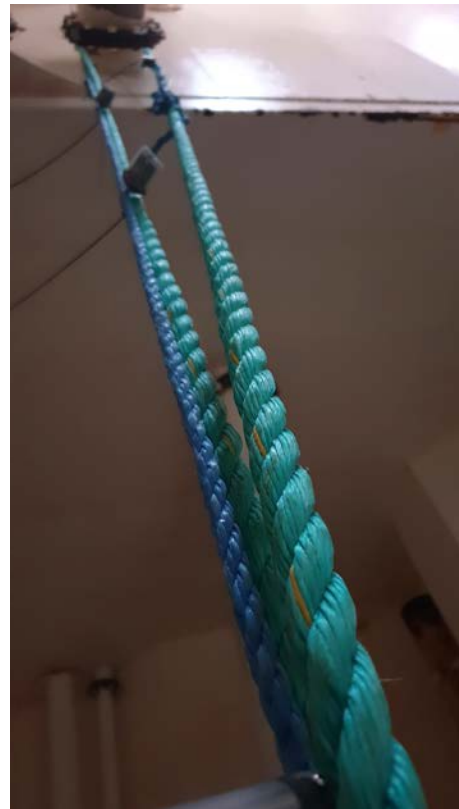
Sample rate: 30 sec

Horizontal loggers: 7

Vertical loggers: 10

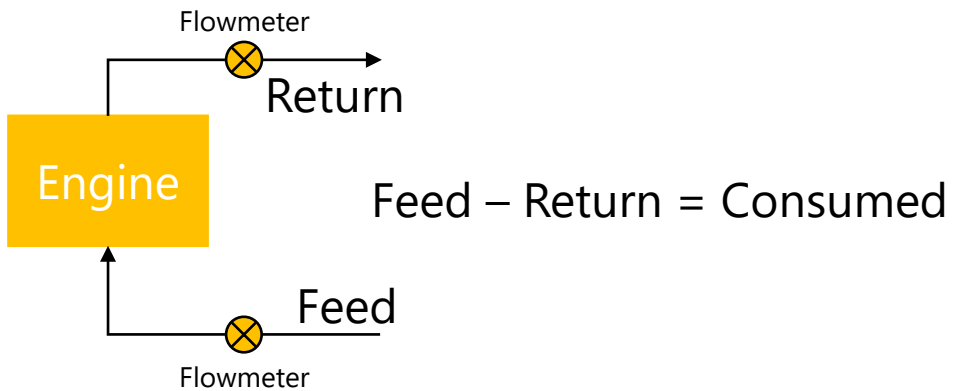


Instrumentation of RSW tanks

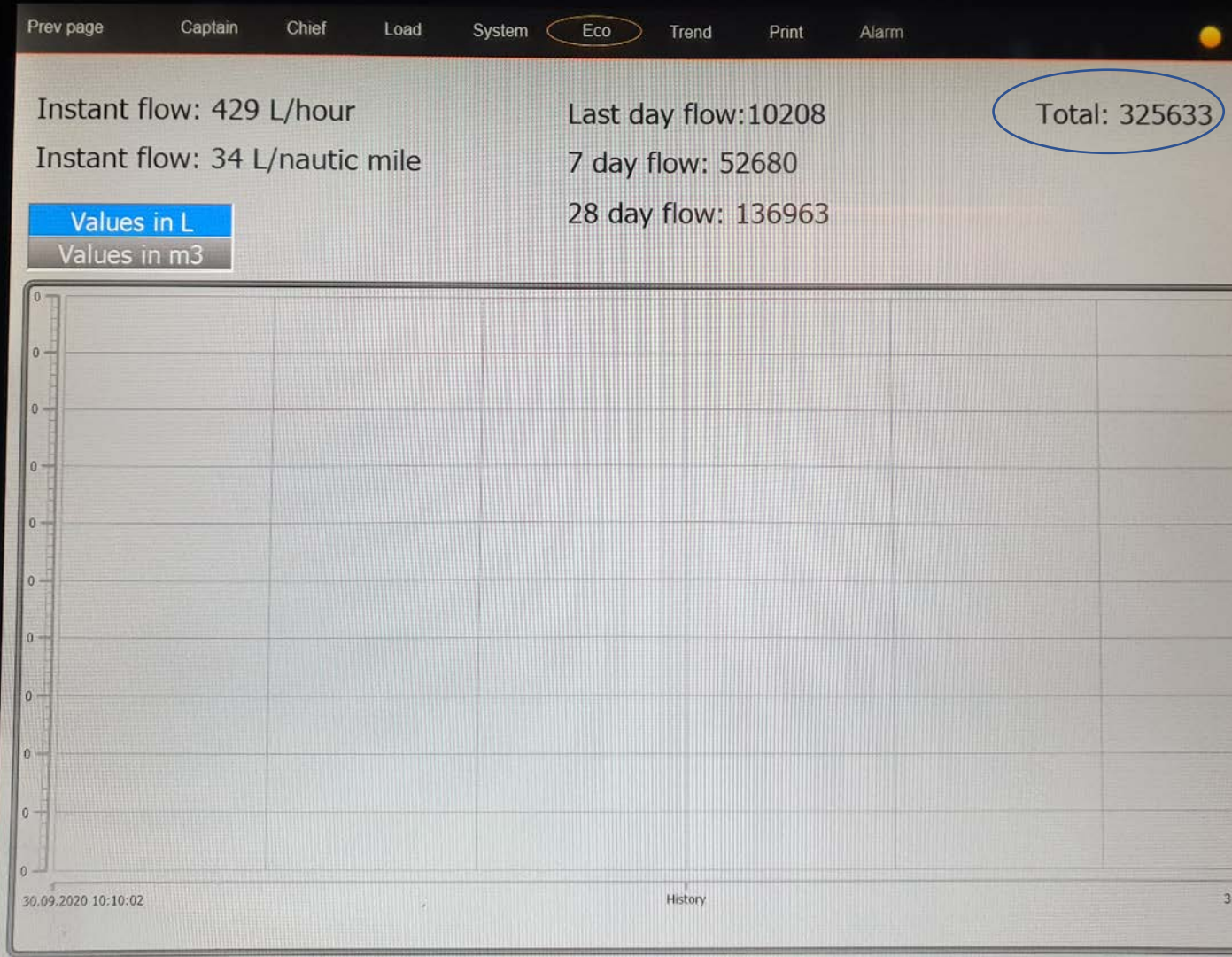


Logging fuel

- Manually logged from onboard system
- Working principle according to chief:

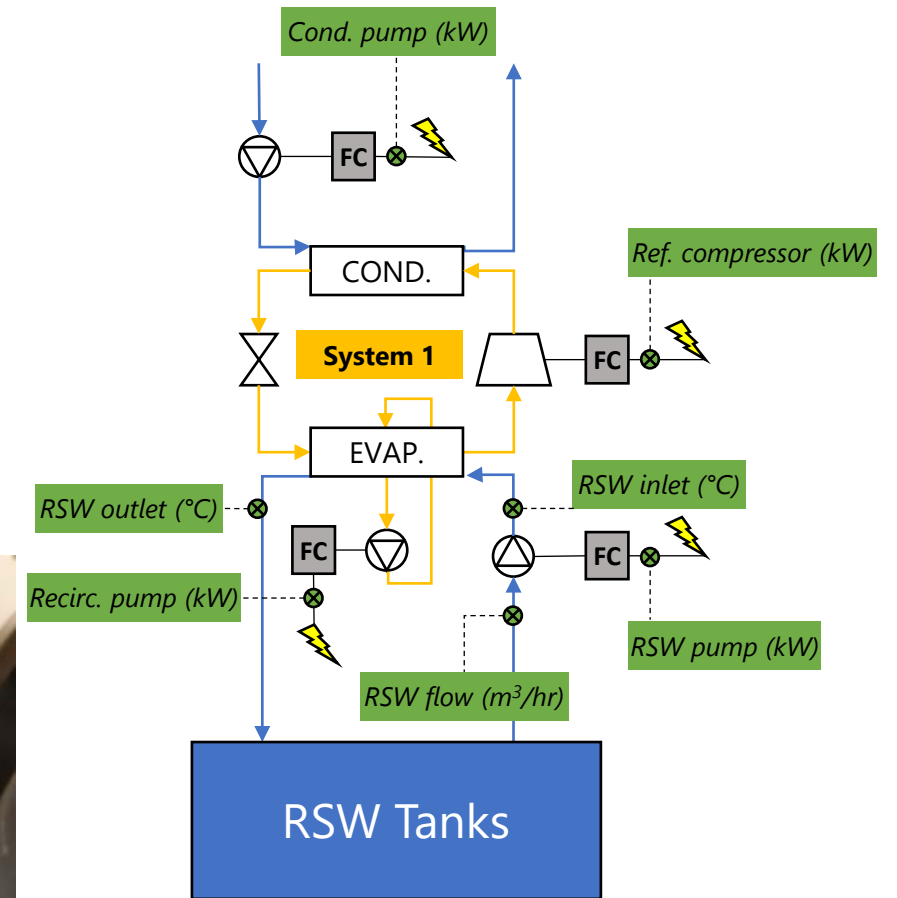


- Specifics or accuracy unknown



Energy measurements

- Simple diagram showing 1 of 2 equal refrigeration systems
- System was previously instrumented with loggers (Øyangen)
 - RSW in- & outlet temperature loggers (4-20 mA)
 - Power loggers on each frequency converter
 - Flow meter RSW
- PLC controlling the system and live view of measurements
- Temperature loggers were calibrated



Catch log

- During fishing operation, times and relevant data was logged:
 - Releasing of seine
 - Seine out
 - Pursing net start/end
 - Start/end of pumping
- Weather data
- Size of catch (total, avg. size)
- Which tanks are filled



Korrier fangstrappert

Hal 1: Oversikt

Fangst	Total estimert rund vekt: 1 Fiskeslag (170 000 kg) Makrell.		
Sone	EU-sonen		
Redskap	Flytetrål / Maskevidd: 19mm / Trål: Enkel Redskapsproblem: Ingen redskapsproblemer		
Tid og posisjon	fra	30/09/2020 18:03:00	59° 00' N, 0° 31' V
	til	30/09/2020 20:35:00	59° 01' N, 0° 31' V
	Varighet	2 timer, 32 minutter	Rutenummer: 4222
Sjøpattedyr og fugler	Bifangst: Ingen registrert bifangst		



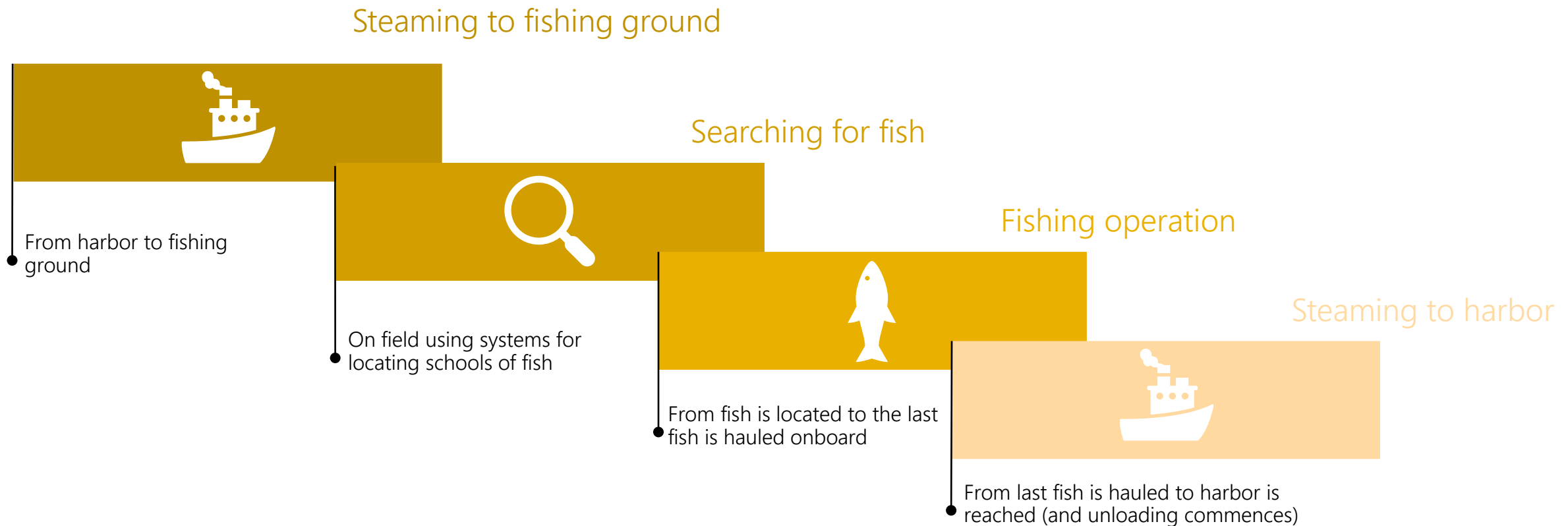
Unloading of fish

- Core temperature of mackerel was measured
- Sample size ~15 mackerels
- All mackerel from tank BB 2

Stages of a fishing trip

- Each trip was broken down in time to 4 operational stages

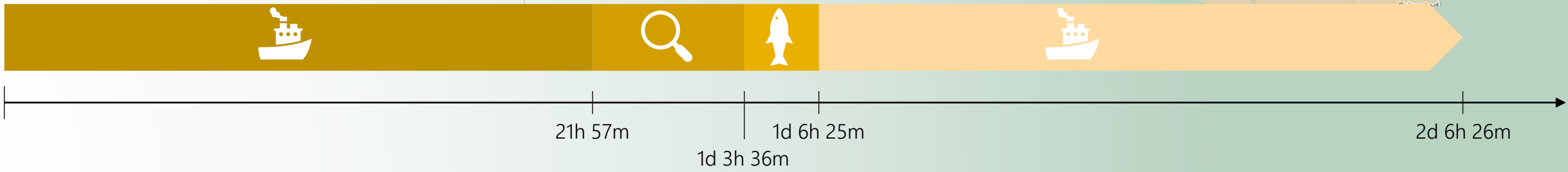
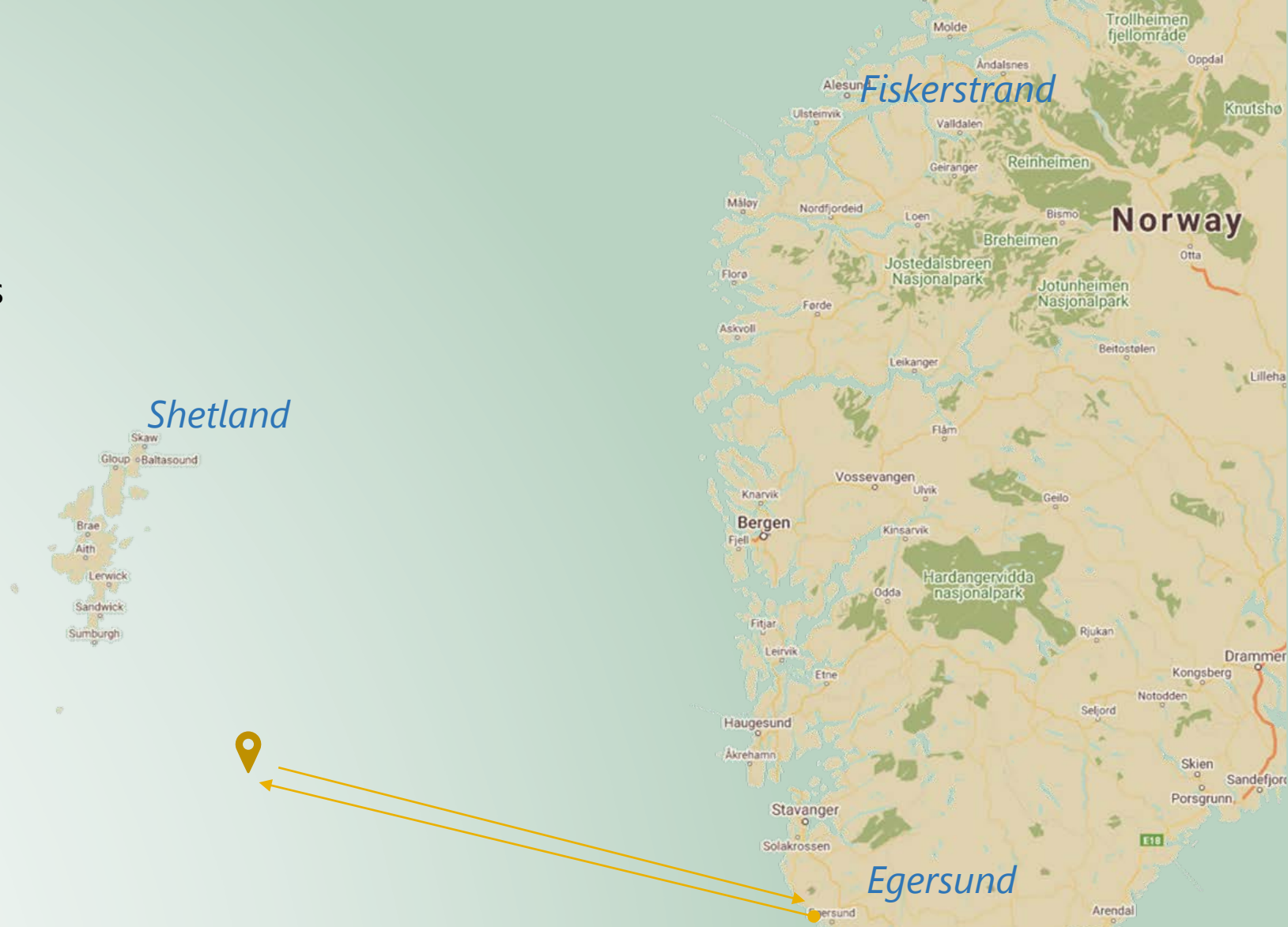
- Purpose is to illustrate the assumed difference in energy needs for each stage



Results

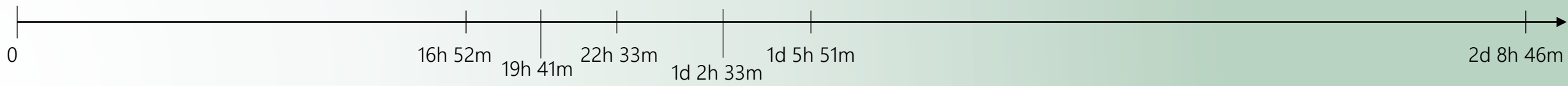
1st trip

Port of departure: Egersund
Total distance: 400 nmile
Number of catches: 1
Total catch: 170 tonnes
Port of arrival: Egersund
Total MGO consumption: - liters



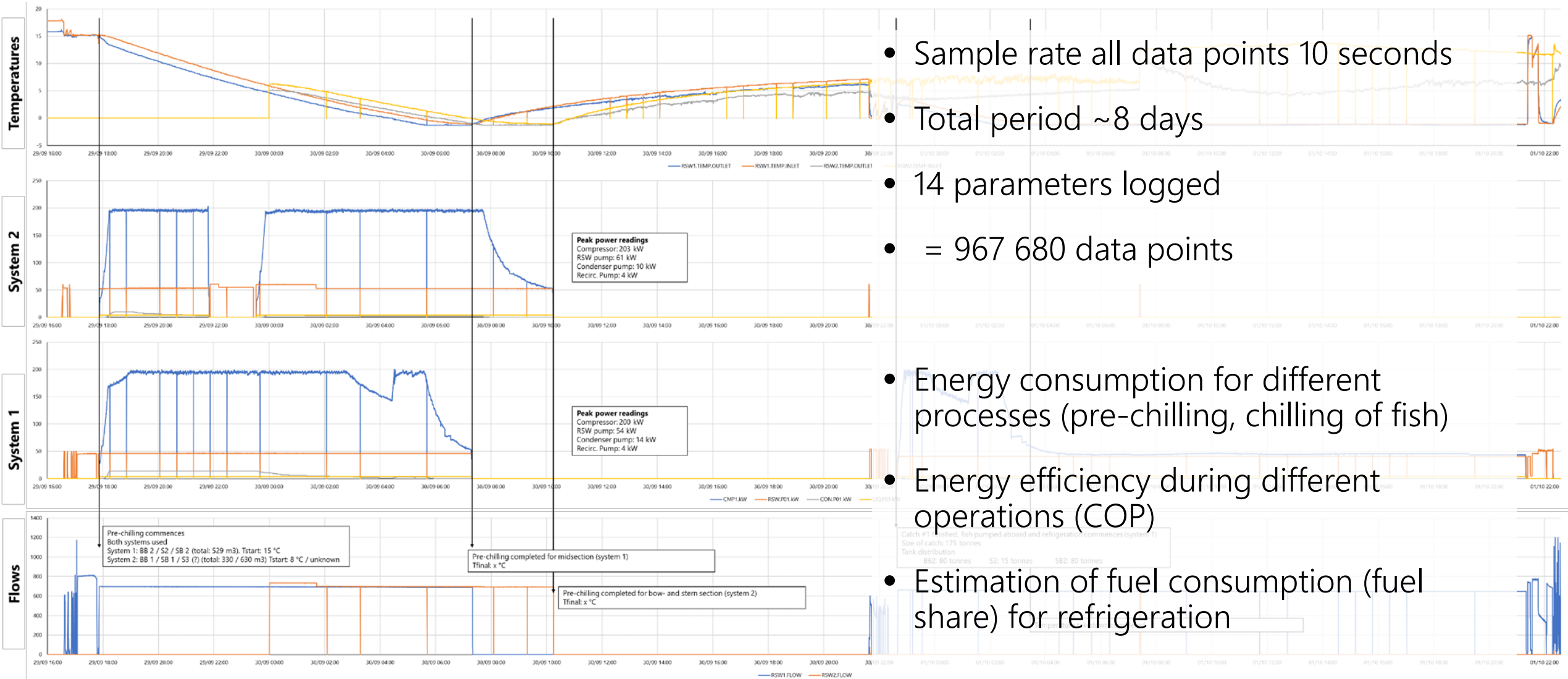
2nd trip

Port of departure: Egersund
Total distance: 500 nmile
Number of catches: 2
Total catch: 580 tonnes
Port of arrival: Fiskerstrand
Total MGO consumption: 19 835 liters



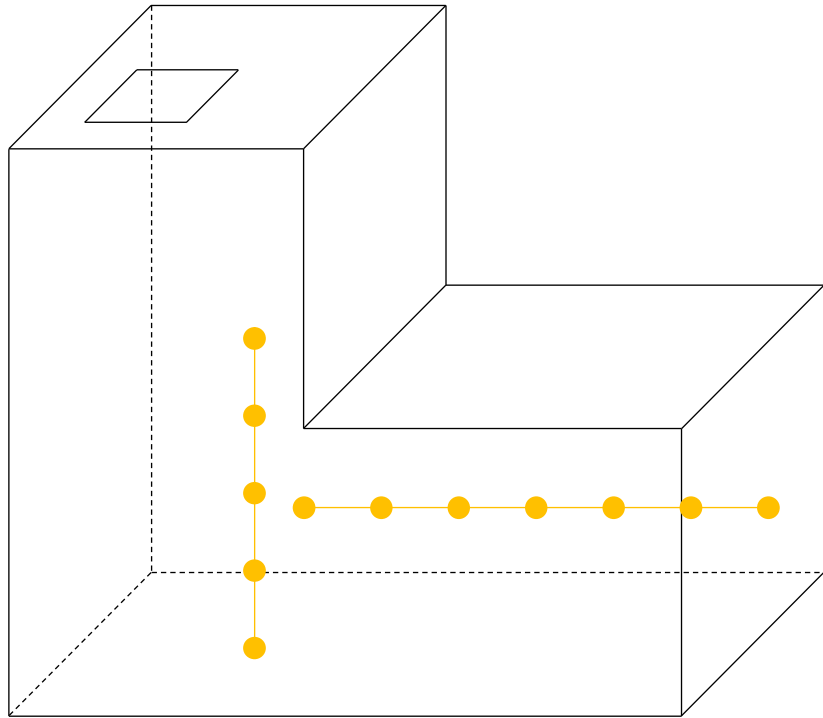
Further work

Data from energy systems

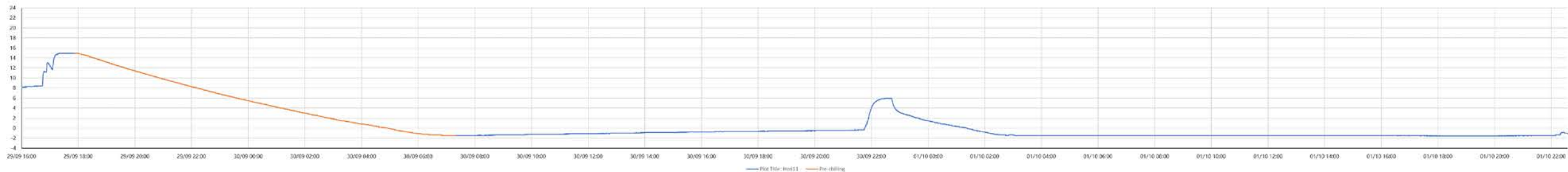


- Sample rate all data points 10 seconds
- Total period ~8 days
- 14 parameters logged
- = 967 680 data points
- Energy consumption for different processes (pre-chilling, chilling of fish)
- Energy efficiency during different operations (COP)
- Estimation of fuel consumption (fuel share) for refrigeration

Temperature measurements from BB2



- ~400 000 data points over the whole period
- Data will be analysed and visualised to reveal potential temperature gradients along the horizontal and vertical axis
- Data will be compared with measured fish temperature



Fuel consumption

- Fuel consumption will be broken down to each operational stage
- Overall energy efficiency indicators will be calculated
 - EEOI (Energy Efficiency Operational Index)
- Carbon footprint calculations
- Will provide valuable insight in particular to design of refrigeration solutions for LNG-driven vessels



Other

- Final results will be available through the deliveries
 - Research cruise report 'Research cruise autumn 2020'
 - Conference paper 'Energy measurements on board fishing vessel'
- Thoughts or inputs on further work?



Thank you for your
attention

