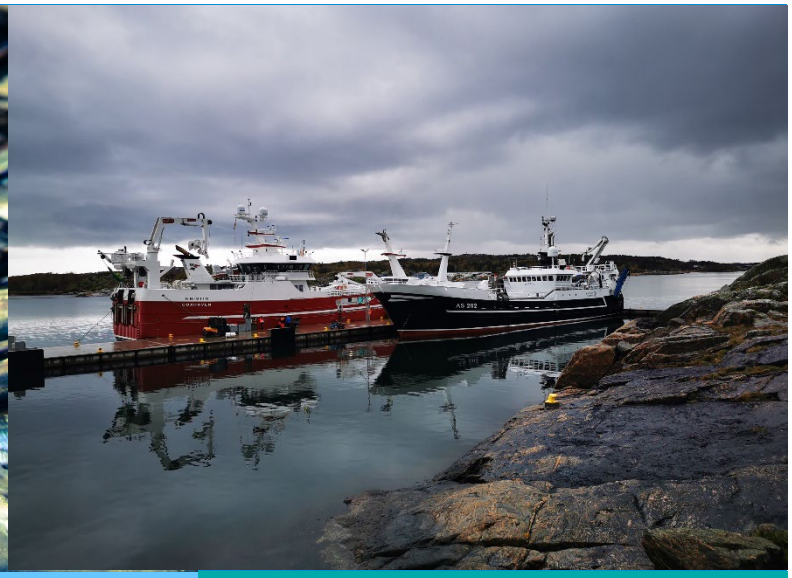
Cooperative research:

The integration of fishing industry-collected data to improve temporal coverage of hydroacoustic data collection

Stefanie Haase, Maria Golovaneva, Daniel Stepputtis, Christopher Zimmermann

Thünen Institute of Baltic Sea Fisheries



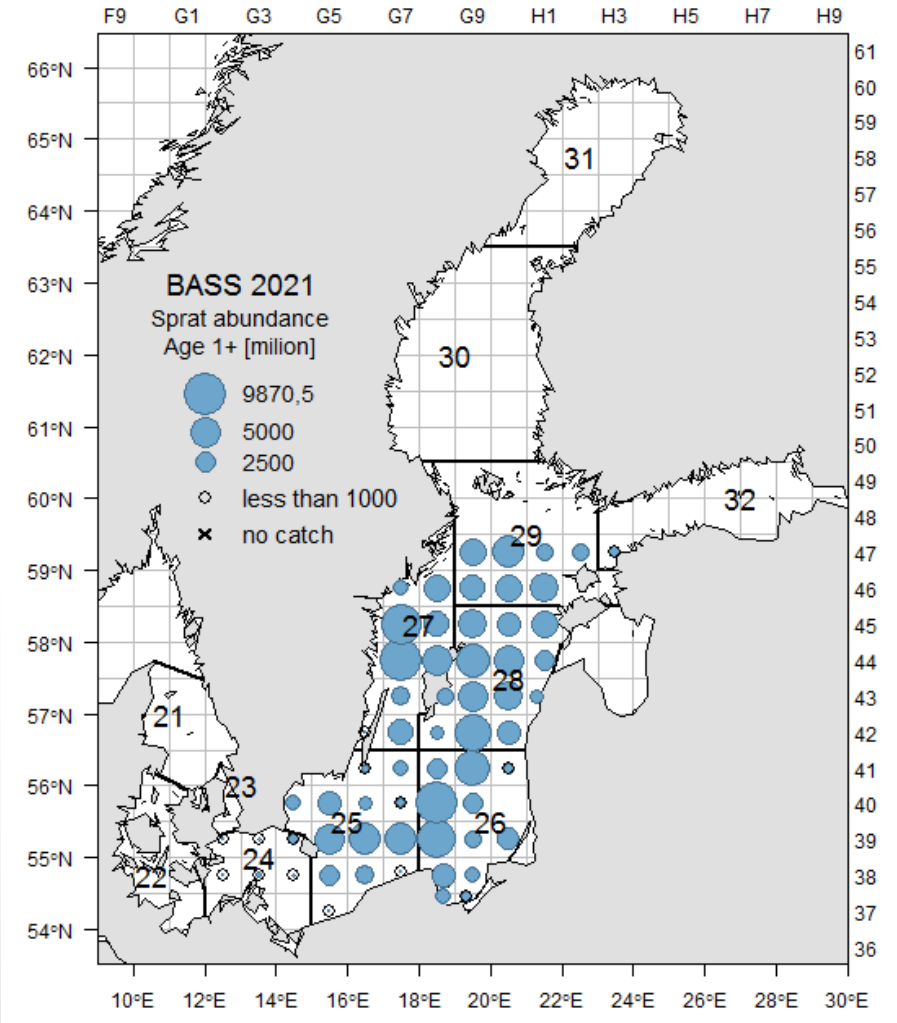
SPF Symposium

11.11.2022

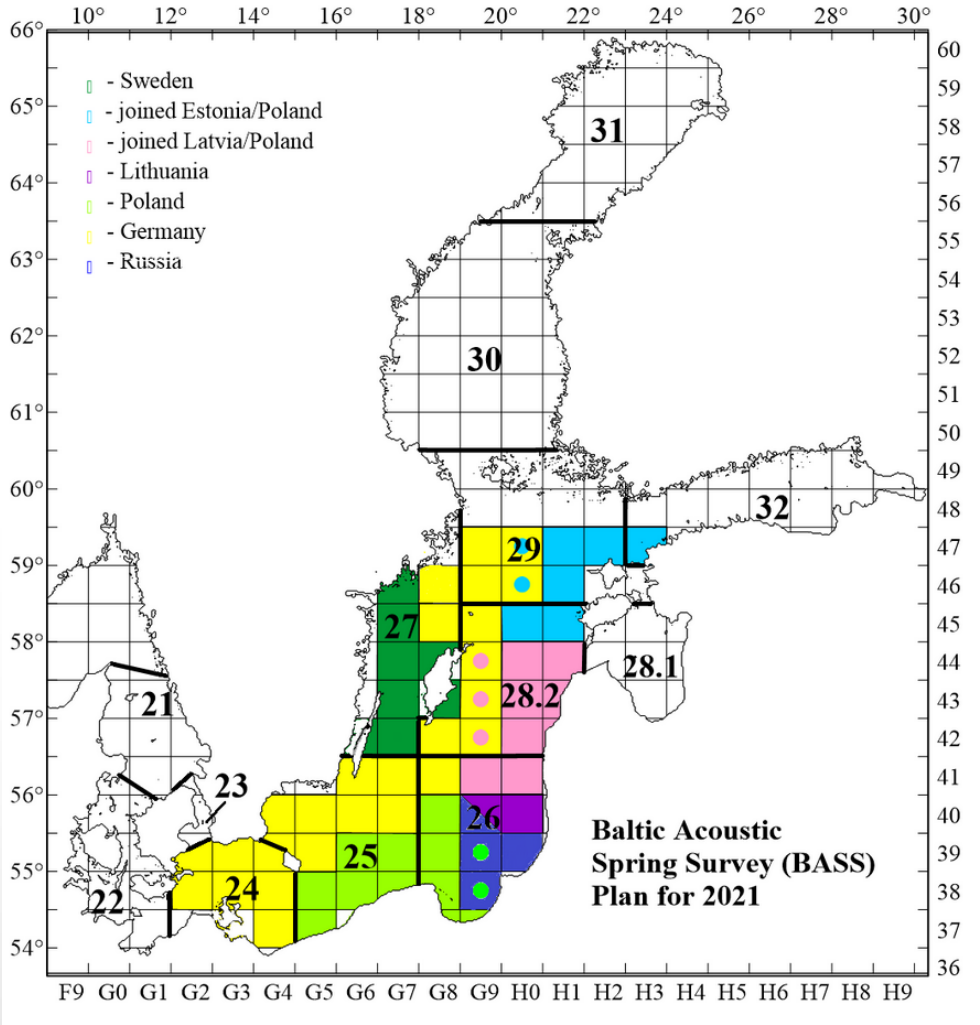
Standard hydroacoustic surveys

Abundance estimates of pelagic fish

- Echosounders continuesly record fish density data along predefined transects
- Biological samples, often trawl hauls
- Age-structured biomass index per species
- Often before or during spawning



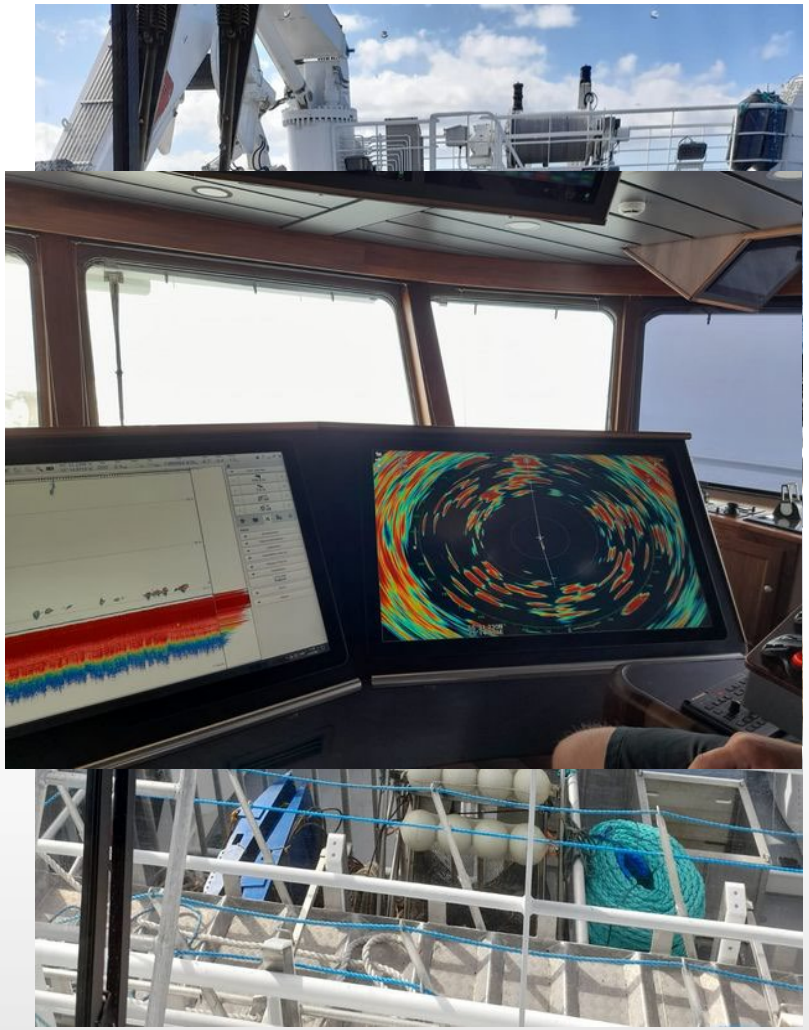
Standard scientific survey



- Baltic Acoustic Spring Survey
  - Priority 1 survey to monitor Baltic Sea sprat
  - Research vessel “Walther Herwig III” broke down several times → Gap in time series 2016
  - Commercial vessel “Kristin” as replacement

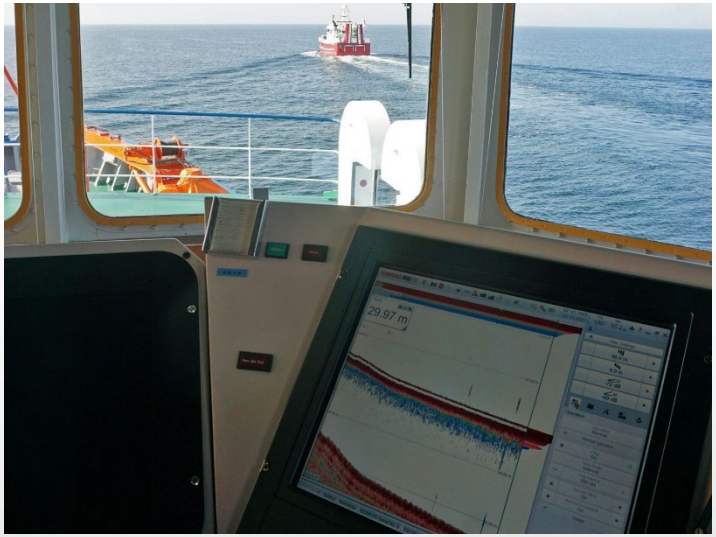
The pelagic fishing vessel “Kristin”

- Germany’s largest commercial fishing vessel “Kristin NC336”, built 2020
- During planning, the vessel was modified to be usable for scientific purposes:
  - Transducer for scientific echosounder (38 and 120 kHz)
  - Chambers for scientists
  - Small laboratory and desk workstations
  - Winch for hydrography



Intercalibration

- Continuity of the time series?
- Steaming in formation for two days during survey



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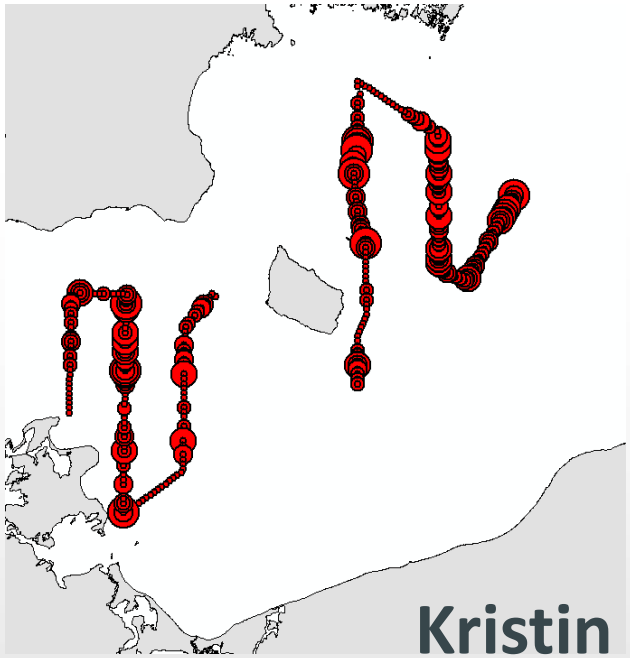
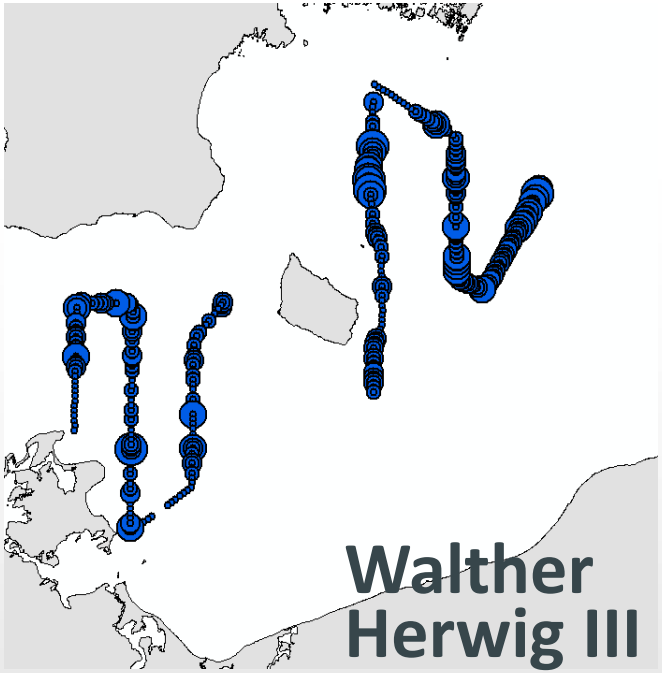
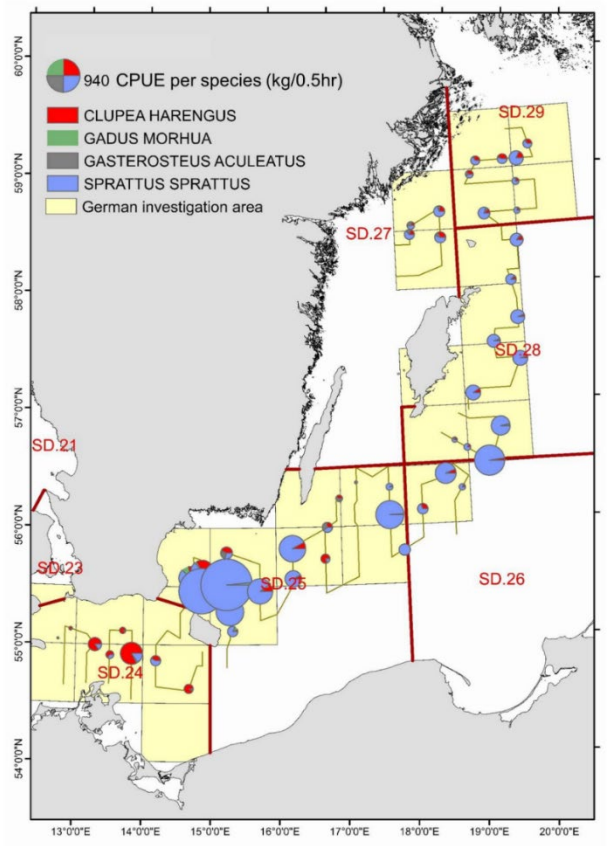
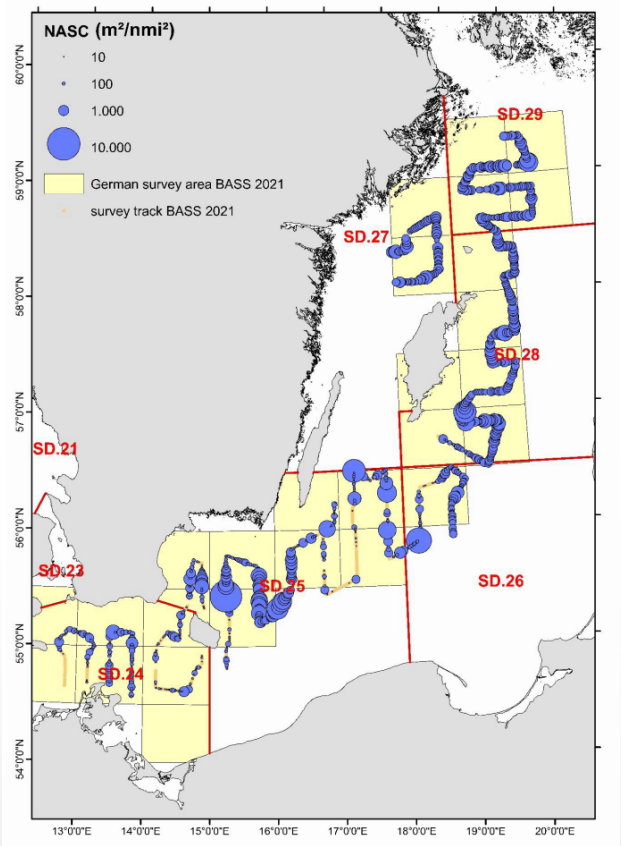




The survey

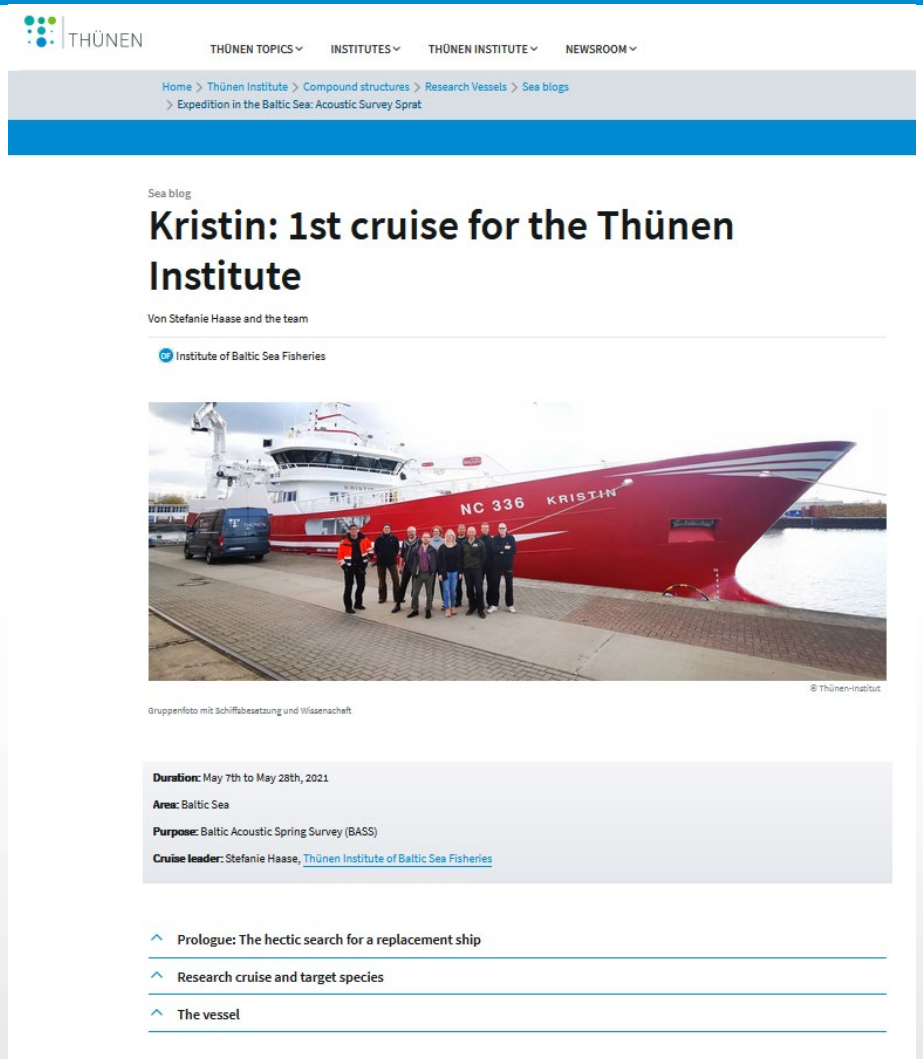




- No additional data gap in time series
- Foundation for a trustful relationship and mutual understanding

Blog about the cruise

https://www.thuenen.de/en/topics/seas/no-fisheries-research-without-research-vessels/sea-blogs/expedition-in-the-baltic-sea-acoustic-survey-sprat



Spatial-temporal ecosystem modelling

- **Standard hydroacoustic surveys**
  - Snapshot of the current spatial distribution (1 or 2 per year)
- **Information lacking:**
  - Spatial-temporal movements and behaviour
  - Predator-prey overlap
  - Rapid changes in environmental conditions
- **Goal: Ecosystem-based management**

→ More complete temporal coverage needed!

Potential of using industry data

- **Combination of different sampling platforms**
  Kowslow, 2009; Trenkel et al., 2011
- **Ships of opportunities (e.g. fishing vessels or ferries)**
  Godø et al., 2014; Karp, 2007

Cooperative research: Hydroacoustic monitoring of fishing season

Commercial fishing on Baltic sprat (*Sprattus sprattus*)

- 09.01-27.03.2022, 11 fishing trips

1. Hydroacoustic

- Simrad ES80 echo sounder (38 and 120 kHz)

2. Catch data (logbook)

- Catch composition
- Effort

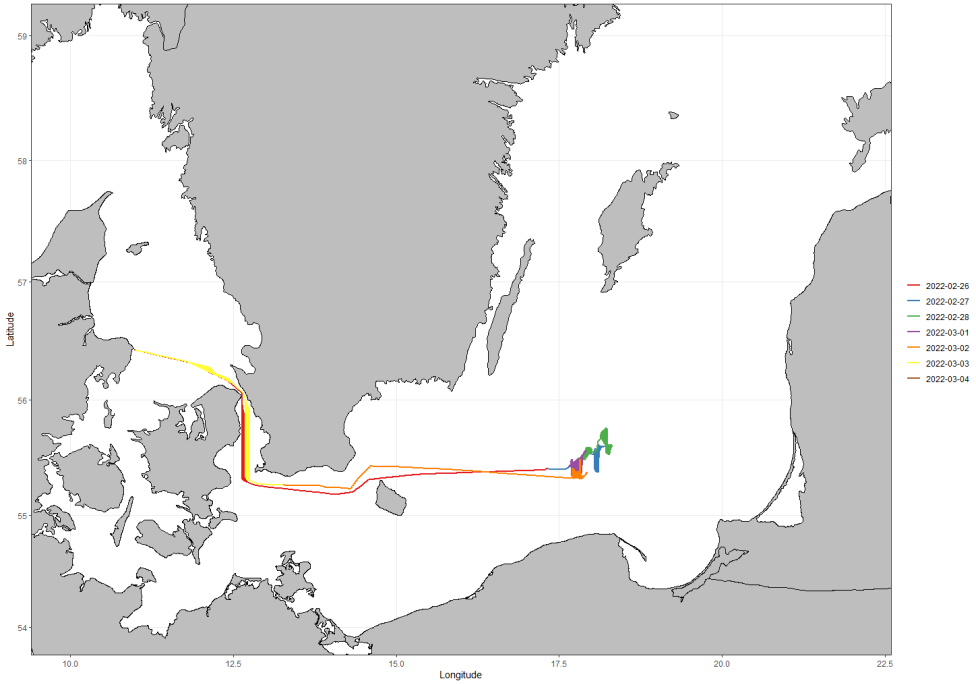
3. Hydrography

- Autonomous measurement system records during fishing

Hydroacoustic data collection

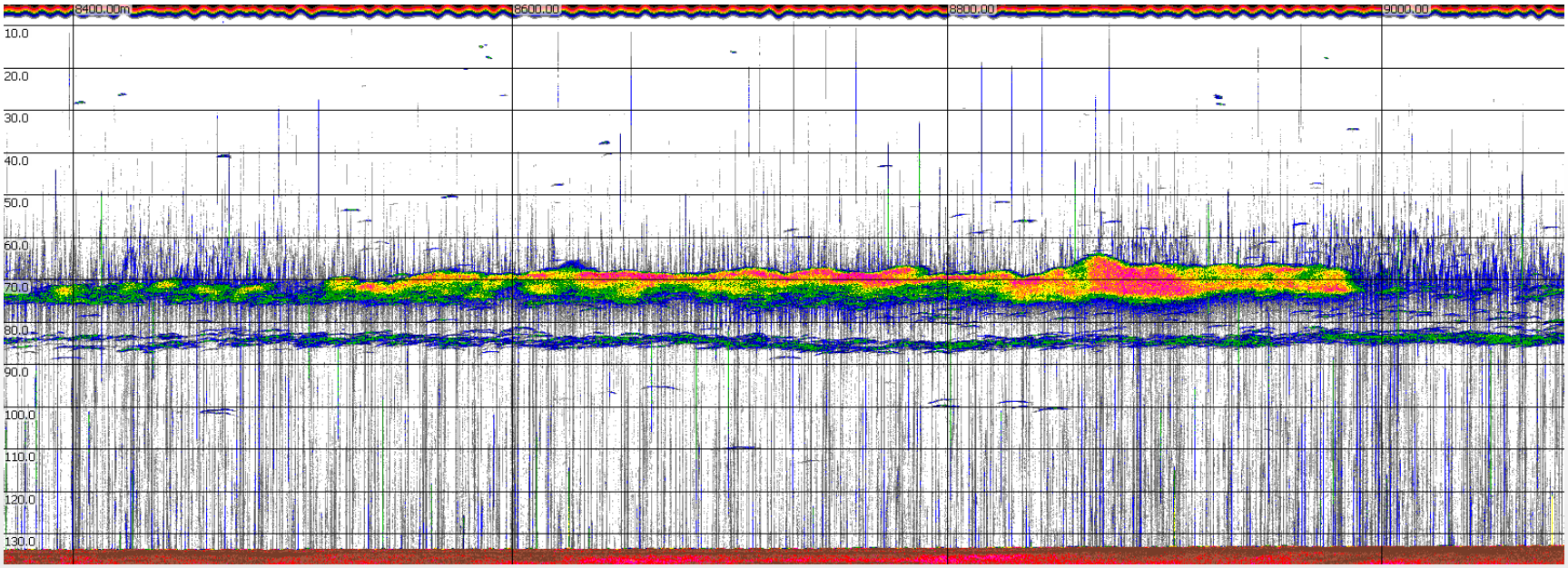
- **Activities: Steaming, searching and trawling**

  → Each comes with it‘s own noise profile



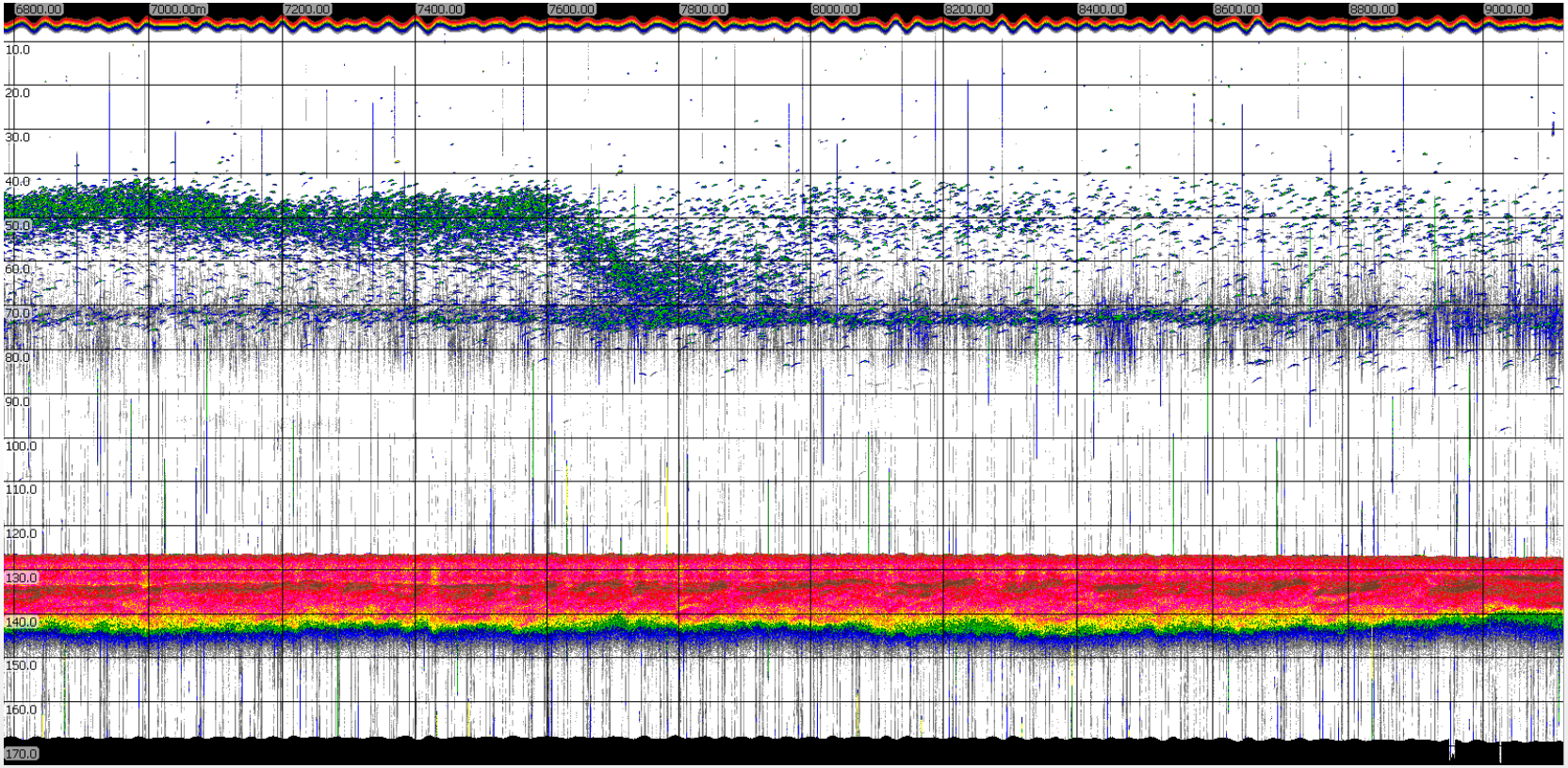
Hydroacoustic data collection

Fishing (08:30 am)



Hydroacoustic data collection

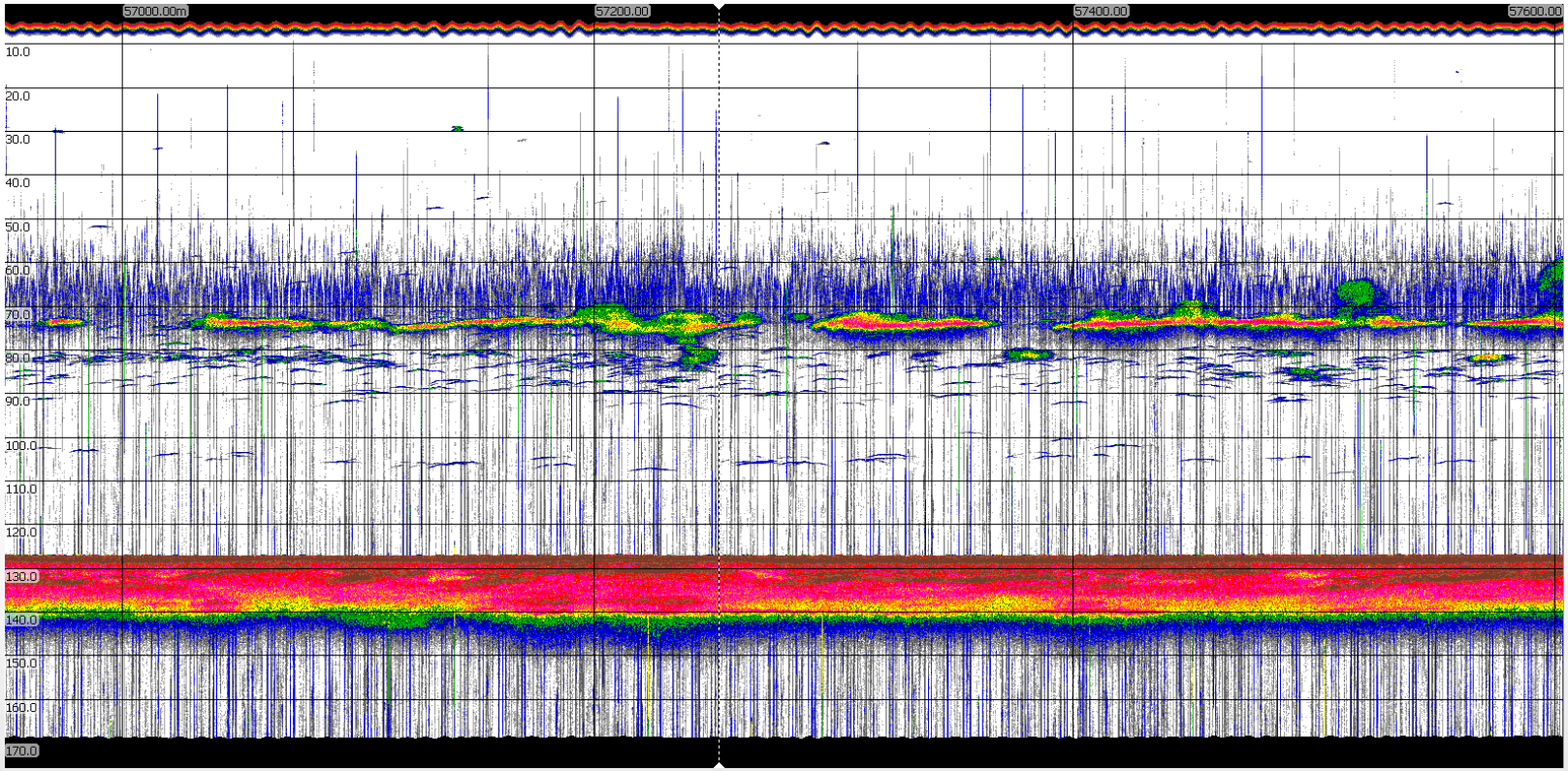
No fishing (19:30 pm)



Hydroacoustic data collection

Processing the data

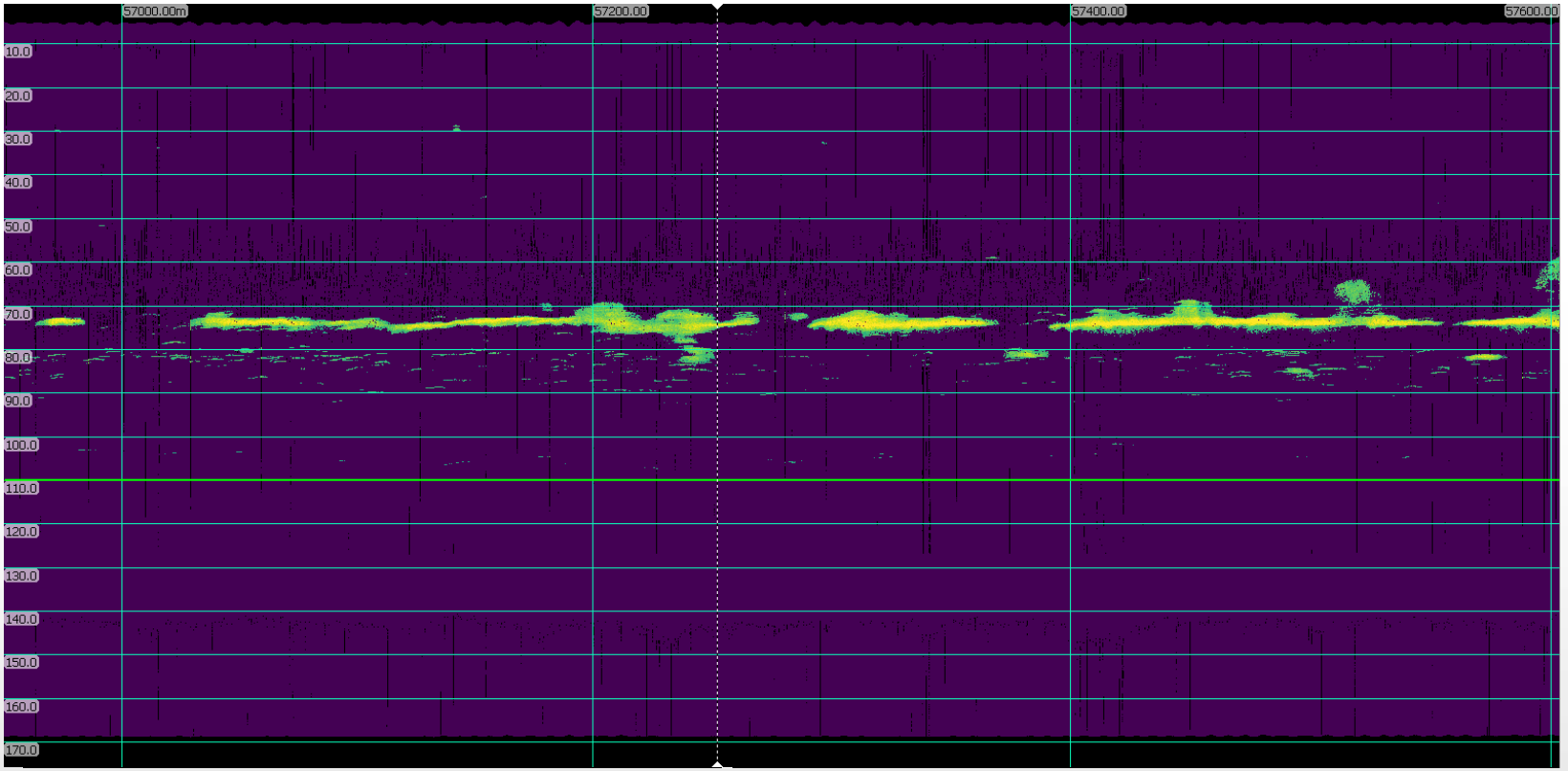
Fishing (10:30 am): Noise included



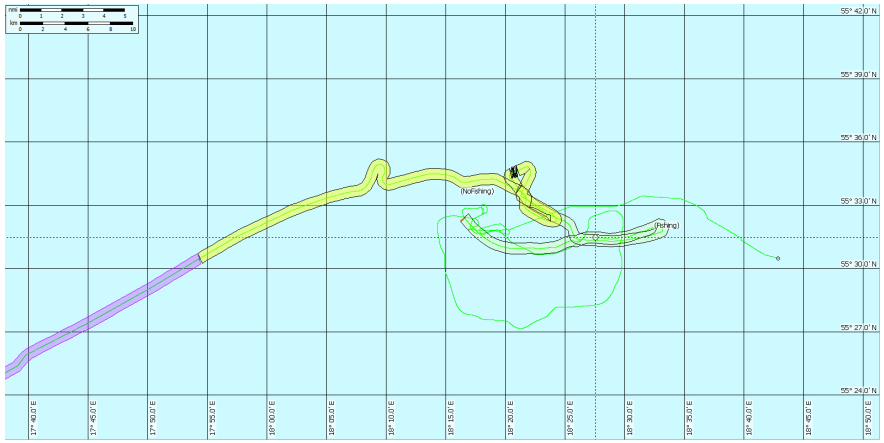
Hydroacoustic data collection

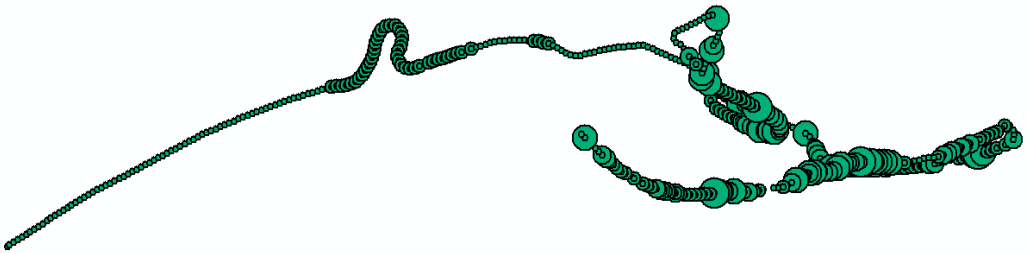
Processing the data

Fishing (10:30 am): Noise removed

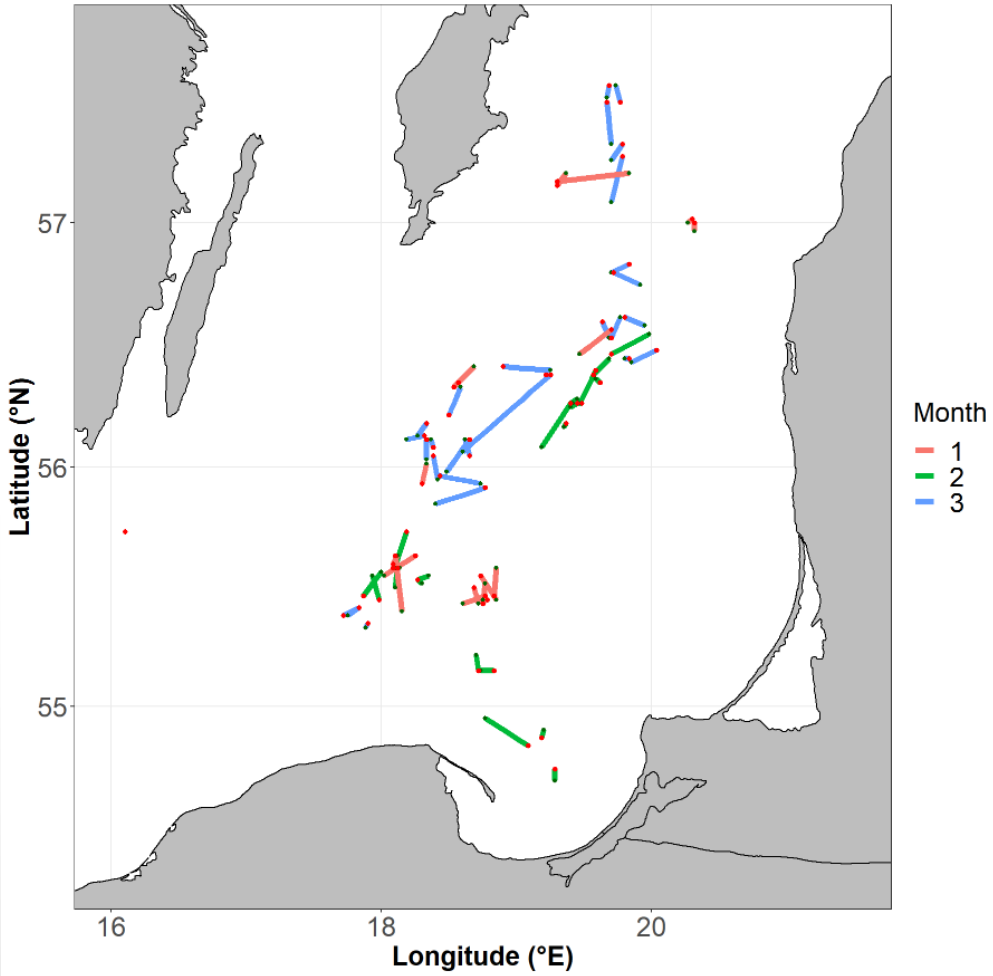


Hydroacoustic data collection





Biological sampling

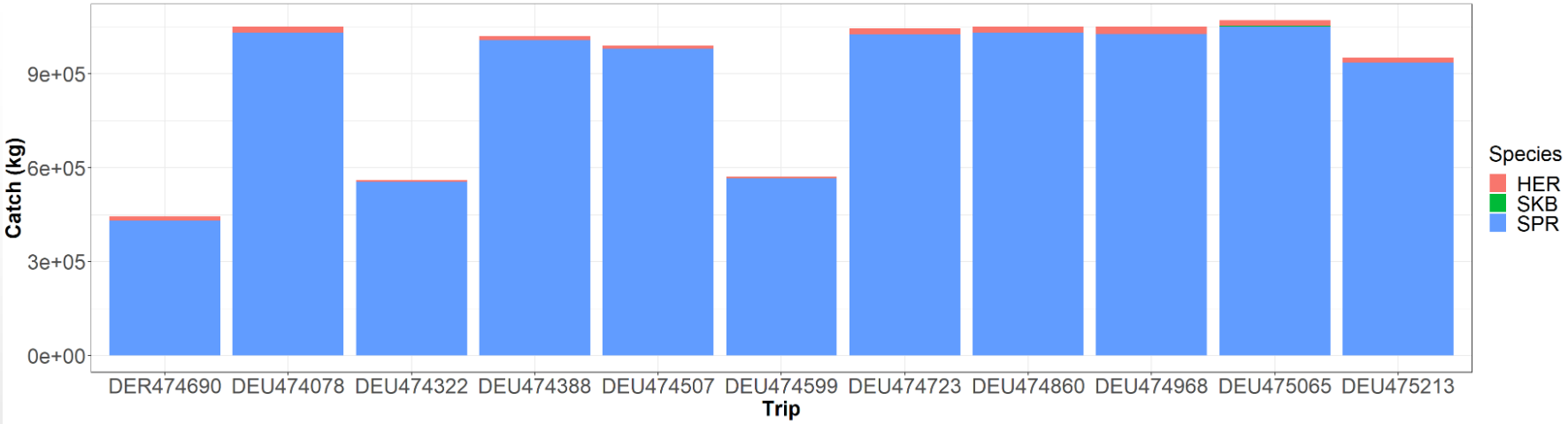


- **11 trips, 67 hauls**
- **Duration ~ 5-8 hours**
- **Subsamples of fish from the factory**
  - Length
  - Weight
  - Age
  - Maturity

Biological sampling

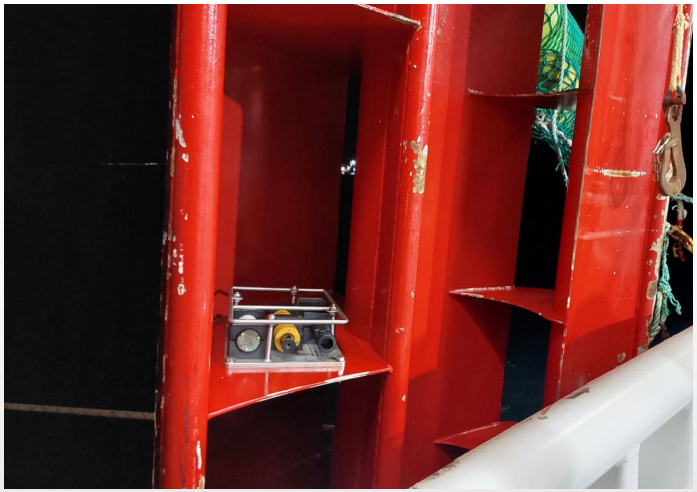
- **Total catch: 9801 t**
  - 98.3% sprat
  - 1.7% herring
  - 0.04% stickleback

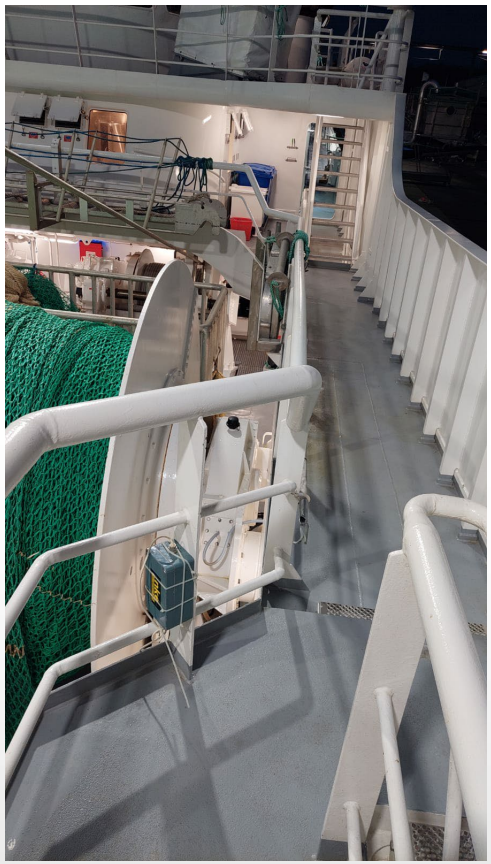
Self-reporting



Hydrography

- **Sensors attached to otter boards**
- **Decks unit sends collected data automatically via satellite**
- **Two vertical profiles per haul**
  → 134 profiles
  - GPS
  - Temperature
  - Depth
  - Turbidity





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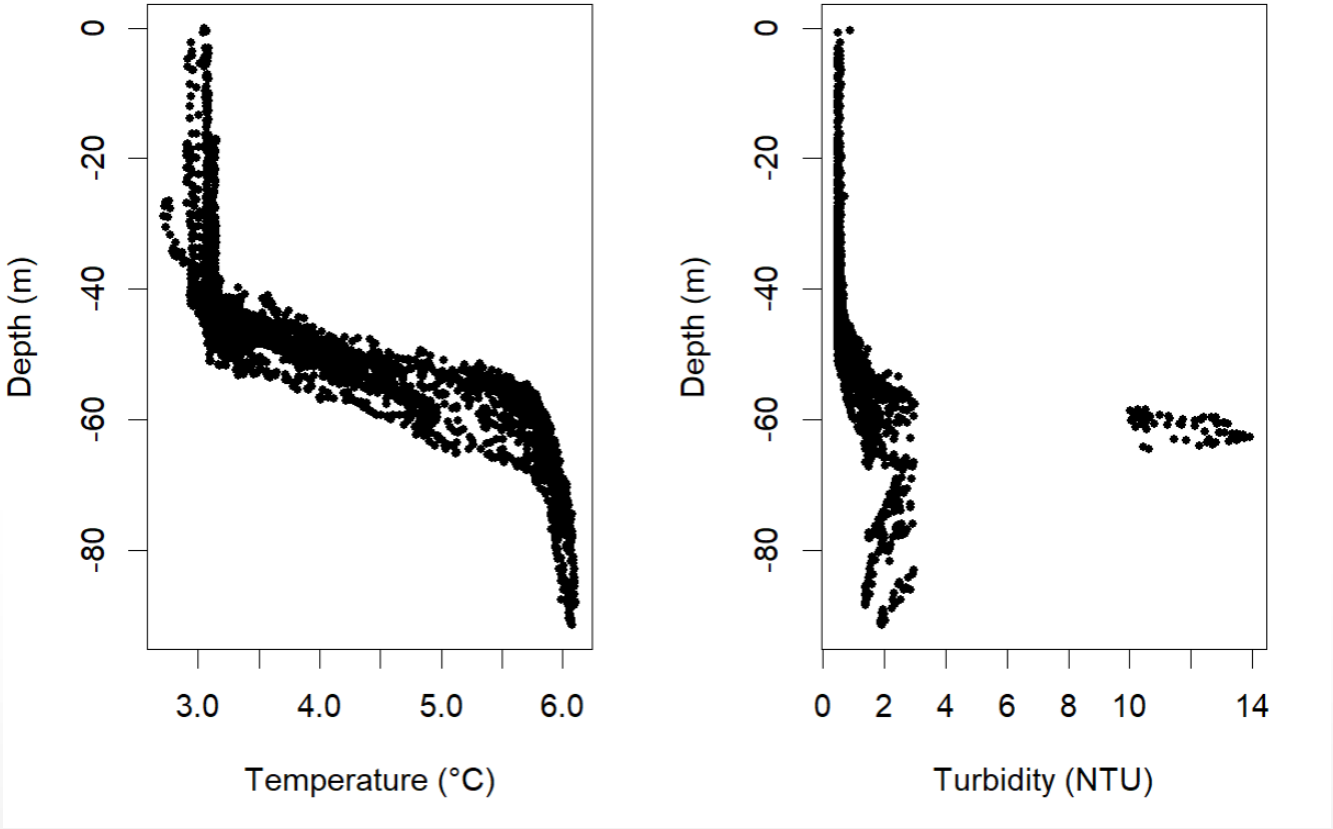

→ Extract other parameters from ocean models based on position

Challenges

- Large amount of data → automatic analysis tools
- Behaviour of fishing vessel ≠ scientific survey
- Dealing with noise in the hydroacoustic measurements
- Regular calibration (once a year)

How to continue in 2023..

- Continue sampling for at least three more years
- Solve issues with noise
- How to incorporate sampled data into monitoring programs & stock assessment?

Conclusion

- **Holistic overview over the fishing season targeting Baltic sprat**
- **Monitor changes in population structure and distribution outside the survey period**
- **Relatively low costs (chartered for 1 day calibration)**
- **Increased stakeholder involvement**
  - Building a trusting relationship and explain what the research is needed for
  - Higher acceptance

Acknowledgements

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stefanie.haase@thuenen.de