Federal Research Institute for Rural Areas, Forestry

and Fisheries

Thünen-Institute of Sea Fisheries

Herwigstraße 31, 27572 Bremerhaven Telephone +49 471 94460-452 Telefax +4 9471 94460-199 Datum: 24.08.2018 Az.: Dr.Scha./vS/4276

Cruise Report
FRV Walther Herwig III cruise 414
01.-21.03.2018

SATS – Saithe Acoustic Trawl Survey

Cruise Leader: Dr. Matthias Schaber (TI-SF)

Summary

The cruise was the initial national contribution of the Thünen-Institute to a joint Norwegian-German survey conducted on the North Sea shelf edge and along the Norwegian trench. The overall aim of the survey is to improve the stock assessment for saithe (*Pollachius virens*) in the North Sea through providing a more precise SSB index of saithe in Q1. This fishery independent SSB index is derived under the overarching assumption that stock containment is highest during the annual spawning period of North Sea saithe. Accordingly, data on distribution, abundance and stock structure of saithe were collected during their peak spawning period with hydroacoustic methods and trawl hauls.

FRV "Walther Herwig III" sampled the North Sea shelf area south of 61°N and the Skagerrak west of 10°E along the Norwegian trench in the depth range of ca. 100-250 m following parallel acoustic transects perpendicular to the depth gradients in a stratified random design. Overall, 490 nmi of hydroacoustic transects were covered in 4 strata. Depth ranges on the allocated transects in this initial survey design partly exceeded the limits known as usual saithe habitat. Hydroacoustic registrations were mostly not considered as of monospecific origin but were categorized into mixed demersal fish categories with varying contributions of saithe according to a corresponding depth range and corresponding trawl hauls.

For species allocation of hydroacoustic categories as well as the collection of biological samples for estimating stock parameters of saithe and other gadoids, 25 fishery hauls were conducted.

Verteiler:
TI - Seefischerei

per E-Mail:
BMEL, Ref. 614
BMEL, Ref. 613
Fischereiforschung BLE
Wolfgang Marle, Ingun Tveide – Auswärtiges Amt
Schiffsführung FFS "Walther Herwig III"
Präsidialbüro (Michael Welling)
Verwaltung Braunschweig
TI - Fischereiökologie
TI - Ostseefischerei Rostock
FIZ-Fischerei
TI - PR
MRI - BFEL HH, FB Fischqualität
Dr. Rohlf/SF - Reiseplanung Forschungsschiffe
Fahrtteilnehmer
Bundesamt für Seeschifffahrt und Hydrographie, Hamburg
Mecklenburger Hochseefischerei GmbH, Rostock
Doggerbank Seefischerei GmbH, Bremerhaven
Deutscher Fischerei - Verband e. V., Hamburg
Leibniz-Institut für Meereswissenschaften IFM-GEOMAR
H. Cammann-Oehne, BSH
DFFU
Deutscher Hochseefischerei-Verband e.V.

Corresponding catches of saithe from targeted and "blind" tows (that were conducted on the nearest most known trawlable positions in relation to acoustic registrations over untrawlable ground) were variable with highest CPUE in tows conducted in the two northernmost strata. Altogether, saithe were caught in a depth range of ca. 100-290 m with highest CPUE in tows conducted in the depth range 150-200 m.

Vertical profiles of ambient hydrographic parameters were measured on 55 stations.

1. Cruise objectives

The following objectives were planned for WH414 SATS:

- Hydroacoustic measurements for the estimation of stock parameters (indices of abundance, SSB etc.) of North Sea saithe (*Pollachius virens*) in 4 strata along the Norwegian trench/North Sea shelf region during their peak spawning time
- Targeted trawling according to hydroacoustic registrations (or blind tows for validation)
- Hydrographic measurements on hydroacoustic transects and after each fishery haul
- Identification and recording of species- and length-composition of trawl catches
- Collection of biological samples of saithe (and other gadoid species) for further analyses

1.1 Survey design

To cover the assumed main distribution area of spawning saithe in the allocated region, the survey area along the western/southern slope of the Norwegian Trench was split into 4 strata covering the depth range of ca. 100-250 m. Within the strata, randomized transects with equal intertransect distance running perpendicular to the depth contours were sampled (Fig. 1). Stratification of the survey area and allocation of transects was conducted using RStoX (StoX, 2015). Overall transect length in the 4 strata was 490 nmi.

2. Cruise narrative and preliminary results

2.1 Cruise narrative

The 414th cruise of FRV "Walther Herwig III" represents the first national contribution to a joint Norwegian-German Saithe Acoustic Trawl Survey (SATS) based on a Norwegian survey design initiated in 2012 and adapted through trial surveys conducted on board Norwegian research vessels until 2017. Embarkation of scientific crew and loading of equipment was conducted on the morning of March 1st in Bremerhaven harbor. Leaving of port was scheduled for noon the same day. Understaffing from several cases of influenza delayed the actual departure to Monday, March 5th. Then, "Walther Herwig III" left harbor and set course to the northernmost stratum. To make up for a certain amount of survey time lost, the survey design was adapted and total transect length per stratum was shortened leading through increased intertransect distances per stratum. Calibration of hydroacoustic equipment that originally was planned to take place in a sheltered fjord near Bergen was attempted in favorable tide and weather conditions from a drifting vessel near Helgoland Island on the evening of March 5th to save additional time.

On March 7th at 11:30 am, survey operations commenced on the northernmost transect T1. On that transect, an intercalibration with the Norwegian RV "G.O. Sars" took place through measuring bottom backscatter for later comparison of backscatter values.

Generally, survey operations were conducted during daytime, when hydroacoustic backscatter values were measured continuously on the predefined transects in each stratum with (demersal) trawl hauls targeting acoustic registrations utilized for groundtruthing of echorecordings and for the collection of biological samples to derive stock parameters of North Sea saithe. Largest catches of saithe were made in the two northernmost strata, however with variable CPUE per haul and not continuously. Altogether, saithe were caught in the depth range of ca. 100-290 m, but highest CPUE was sampled in the depth

range of 150-200 m. During the survey, it was not always possible to target acoustic registrations since on many transects either bottom slope or seafloor roughness prevented directed bottom trawls. Instead, known "saithe hauls" from earlier surveys/old commercial logbooks with trawlable ground were conducted at the nearest most position.

Weather conditions throughout the survey were generally acceptable, survey operations only occasionally had to be interrupted for several hours. Survey operations were accomplished on the evening of March 16th. FRV "Walther Herwig III" arrived at Bremerhaven port on March 18th in the afternoon.

Altogether, 490 nautical miles of hydroacoustic transects were covered in 4 strata, 25 trawl hauls and 55 CTD-casts were conducted.

2.2 Hydroacoustics

2.2.1 Calibration

All transducers of the Simrad EK60 scientific echosounder (18, 38, 120 and 200 kHz) were calibrated prior to the beginning of the survey near Helgoland island with a drifting vessel at slack tide in favorable conditions. Overall calibration results were considered very good based on calculated RMS values. Resulting transducer parameters were applied for consecutive data-collection and post-processing of hydroacoustic survey data.

2.2.2 Echo recording

Hydroacoustic data were recorded continuously along the transects with a Simrad EK60 scientific echosounder with hull-mounted 18, 38, 120 and 200 kHz transducers at a standard ship speed of 10 kn. Transducer and sample settings were in accordance with the survey protocol established for the joint SATS (1.024 ms pulse length on all frequencies, ping interval 0.66, max. power output on each transducer. Post-processing and analysis of data were conducted with Echoview 8 software (Echoview Software Pty Ltd, 2017).

Since saithe were mostly not encountered in monospecific (spawning) aggregations but in the majority of cases caught together with a range of other prevalent gadoid species (e.g. haddock, hake and cod), a clear allocation of backscatter values to saithe alone was not feasible. Instead, acoustic registrations were categorized into several "demersal fish" (DFI) categories based on the depth range of corresponding measurements and catches made: DFI_SHALLOWMIX (max. 20 m thick layer of demersal gadoid aggregations off the seafloor in "shallow" areas outside the main saithe depth range, but still containing low fractions of saithe; <120 m; DFI_SAITHEMIX (max. 20 m thick layer of demersal gadoid aggregations off the seafloor in the main saithe depth range 120-200m with a significant contribution of saithe); DFI_DEEPMIX (max. 20 m thick layer of demersal gadoid aggregations off the seafloor in the depth range >200 m with contributions of e.g. blue whiting and hake and a low fraction of saithe); INDIVIDUALS (clear single targets originating from "solitary" large gadoid fishes distributed pelagically, i.e. above the 20 m bottom-layers categorized otherwise). Echoes that clearly originated from Norway pout (*Trisopterus esmarkii*) were removed from the categorized regions. Figures 6-8 show examples of echoregistrations.

Altogether, acoustic backscatter measured was highest in the northernmost stratum and lowest in the westernmost stratum in the inner Skagerrak area. There, the slope from shallow areas to the deepest parts of the Norwegian trench was steep reducing the transect length in the depth range selected for sampling saithe. In terms of categorized echoregions, all categories were present throughout the strata in the corresponding depth ranges. The highest NASC values for DFI_SHALLOWMIX were recorded in the northernmost stratum, while DFI_SAITHEMIX showed highest NASC values south of ca. 60° N and west of 8° E. NASC values for DFI_DEEPMIX were also highest in the northernmost stratum and the southerly adjacent stratum along the western Norwegian trench slope.

Analysis of hydroacoustic data and estimates of saithe SSB indices will be finalized in Q4 of 2018 after a second post-cruise meeting for data comparison and analysis of the joint survey at the Institute of Marine Research IMR in Bergen, Norway.

2.3 Biological sampling

To validate and allocate echorecordings to an acoustic category, altogether 24 fishery hauls were conducted (Figures 1 & 3). Since in many cases a direct targeting of echoregistrations was not feasible due to seafloor slope and roughness preventing demersal/bottom trawling, hauls were conducted on the nearest position with trawlable ground (known from "historic" saithe tows in the area). In other cases, the intended tow section was scouted for obstacles prior to the haul. Altogether, this approach led to the division of bottom haul types into three categories: R (Registration, tow targeting acoustic registrations), BR (Blind w. Registrations – tow at the nearest position to registrations with continuing echoregistrations), B (Blind tow conducted in areas with no registrations to validate absence of saithe or to sample saithe close to the seafloor and possibly within the blind zone of the echosounder). Trawling times ranged between 30 and 60 minutes according to catch registrations on the net sounder/trawl eye.

Saithe (*Pollachius virens*) were caught in 21 hauls comprising all haul types. Altogether, saithe were caught in the depth range of ca. 100-290 m, but highest CPUE was sampled in the depth range of 150-200 m. Standardized catch rates were highest in the two northernmost strata, but not continuously and with variable amounts of saithe (Fig. 3). Highest CPUE of saithe did not coincide with highest NASC measurements of acoustic saithe categories.

The length range of saithe sampled was similar across all strata (Figure 4) covering lengths from ca. 35-105 cm. In the northernmost stratum 3, the relative contribution of saithe <60 cm was highest, while in the adjacent stratum 2 and –to a lesser extent- in strata 1 and 0 the fraction of bigger and older saithe >60 cm was higher than in stratum 3. Large saithe of >90 cm were sampled in all strata, albeit in comparatively low numbers.

2.4 Hydrography

Vertical profiles of temperature and salinity were measured with a SeaBird SBE CTD-probe on a station grid covering the whole survey area. Hydrography measurements were either conducted directly after a trawl haul or, in case of no fishing activity, in regular intervals along the cruise track as well as at the starting and end point of each transect. Altogether, 55 CTD casts were conducted during this survey.

Both surface temperatures and temperatures measured near the seafloor or in deep layers of the Norwegian trench ranged from ca. 3 °C in the central/northern Skagerrak to ca. 7 °C in the northernmost part of the survey area (Fig. 5). While surface salinity levels were reduced in the easternmost areas of the Skagerrak with values around 28 PSU, levels measured in the deep areas or near the seafloor were comparatively uniform at ca. 35 PSU throughout the survey area.

3. Survey participants

Dr. Matthias Schaber (cruise leader)	Hydroacoustics/cruise leader	TI-SF
Dr. Holger Haslob	Fish lab/Biology	TI-SF
Lea Hartkens	Hydroacoustics/Hydrography	TI-SF
Philipp Schweizer	Fish lab/Biology	TI-SF
Chiara Mandl	Fish lab/Biology	TI-SF (student assistant)
Clara Scheuring	Fish lab/Biology	TI-SF (student assistant)
Knut Heinatz	Fish lab/Biology	TI-SF (student assistant)
Felix Zundel	Fish lab/Biology	TI-SF (student assistant)
Christina Heidrich	Fish lab/Biology	TI-SF (student assistant)

4. References

Echoview Software Pty Ltd (2017). Echoview software, version 8. Echoview Software Pty Ltd, Hobart, Australia.

StoX (2015) StoX: An open source approach to acoustic and swept area survey calculations. Institute of Marine Research, Bergen, Norway. URL: http://www.imr.no/stox.

5. Acknowledgements

I hereby thank the crew of FRV “Walther Herwig III” and Captain H-O. Janßen as well as all participants for their outstanding support, cooperation and commitment that facilitated the successful accomplishment of this “new” survey.

(Dr. M. Schaber, TI-SF / Scientist in charge)

Figures

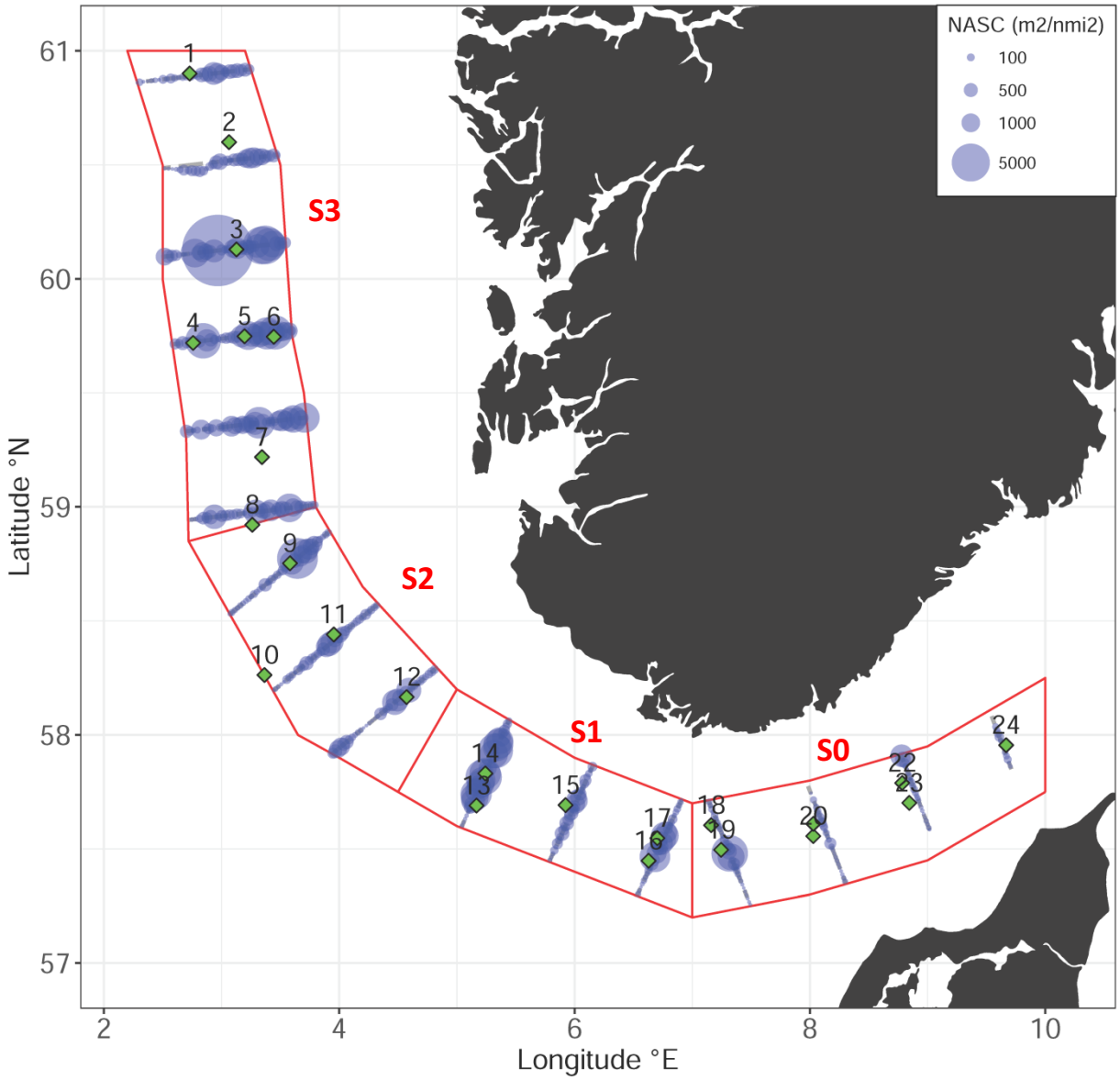

Figure 1: FRV "Walther Herwig III" cruise 414/2018. Total Nautical Area Scattering Coefficient (NASC) measured (blue dots, 1 nmi intervals). Transects covered are indicated with thin dashed lines, total survey area and strata outlined in red. Trawl hauls conducted during the survey are indicated as green diamonds with corresponding haul number. S0-S3 – Strata.

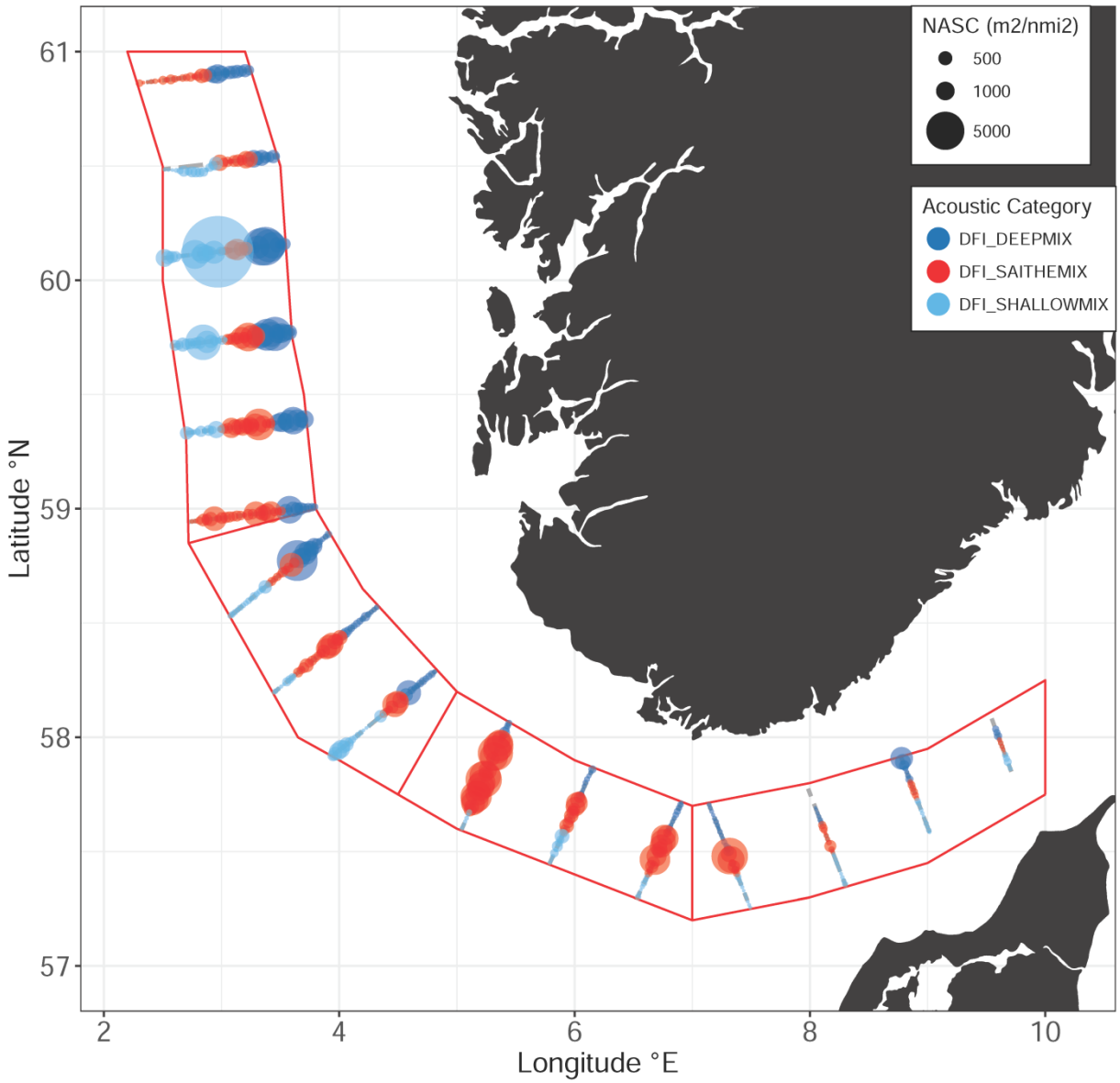

Figure 2: FRV "Walther Herwig III" cruise 414/2018. Total NASC (1 nmi intervals) of categorized acoustic measurements along the transects sampled in the 4 strata covered (outlined in red). Category "INDIVIDUALS" (see text) not included.

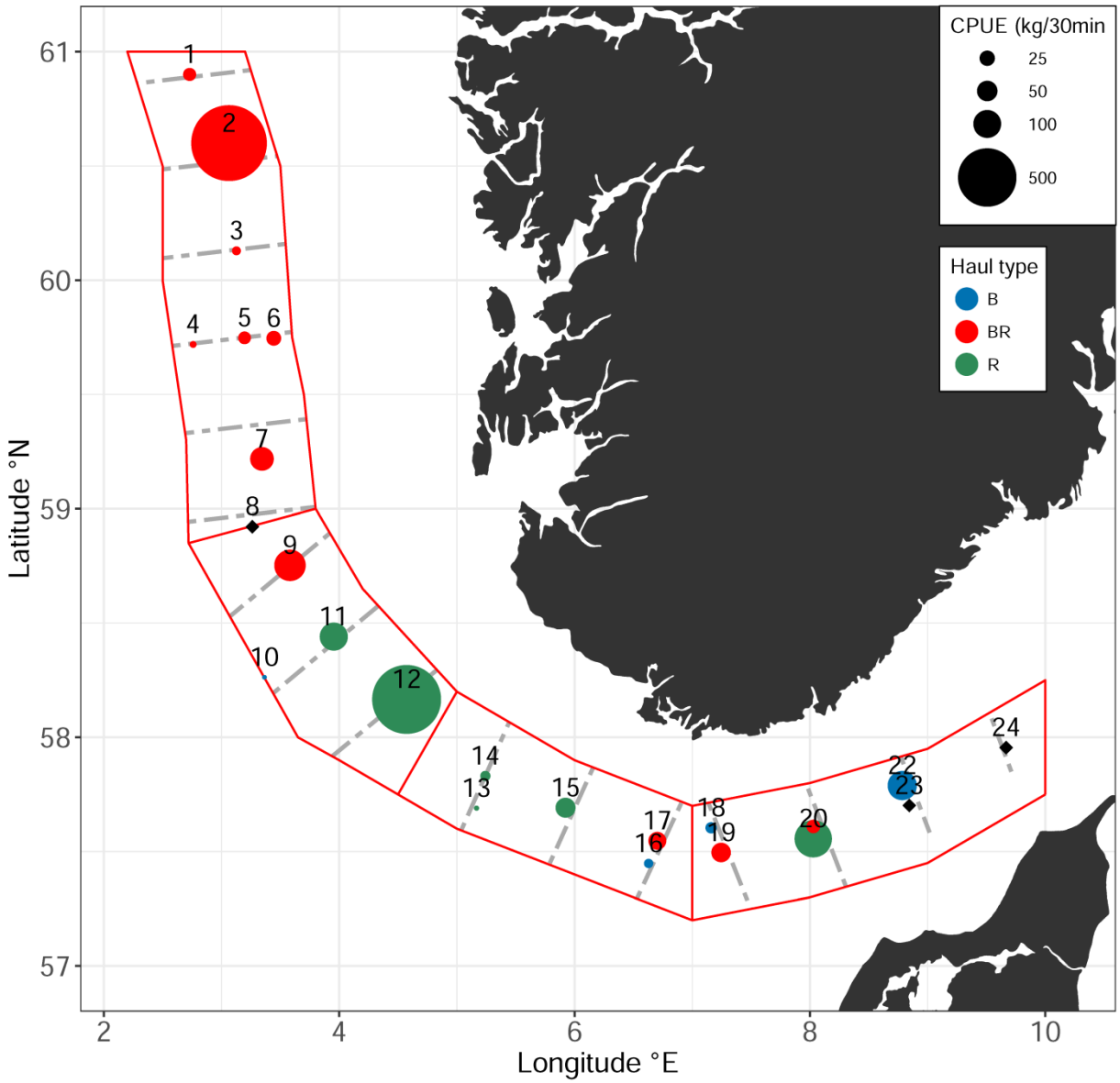

Figure 3: FRV "Walther Herwig III" cruise 414/2018. Saithe (*Pollachius virens*) catches (kg/30 min). Numbers indicate haul/station number. Colors according to demersal trawl type (B = blind, BR = blind tow with (saithe) registrations, R = directed tow on acoustic registrations; see text for description). Hauls without saithe indicated with black diamonds. Survey area/strata outlined in red. Transects depicted as dashed grey lines.

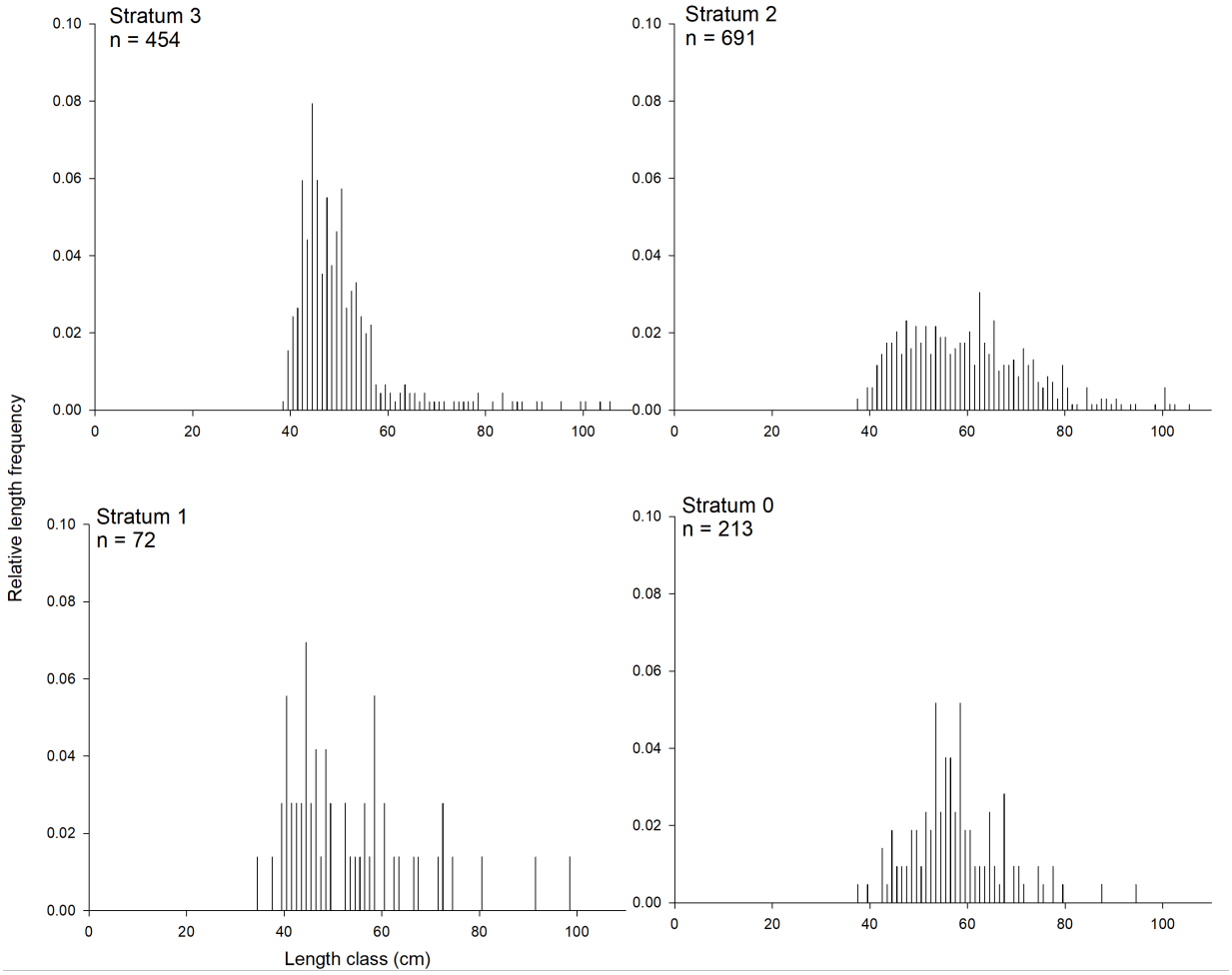

Figure 4: FRV "Walther Herwig III" cruise 414/2018. Relative length-frequency distribution of saithe (*Pollachius virens*) in the 4 strata sampled.

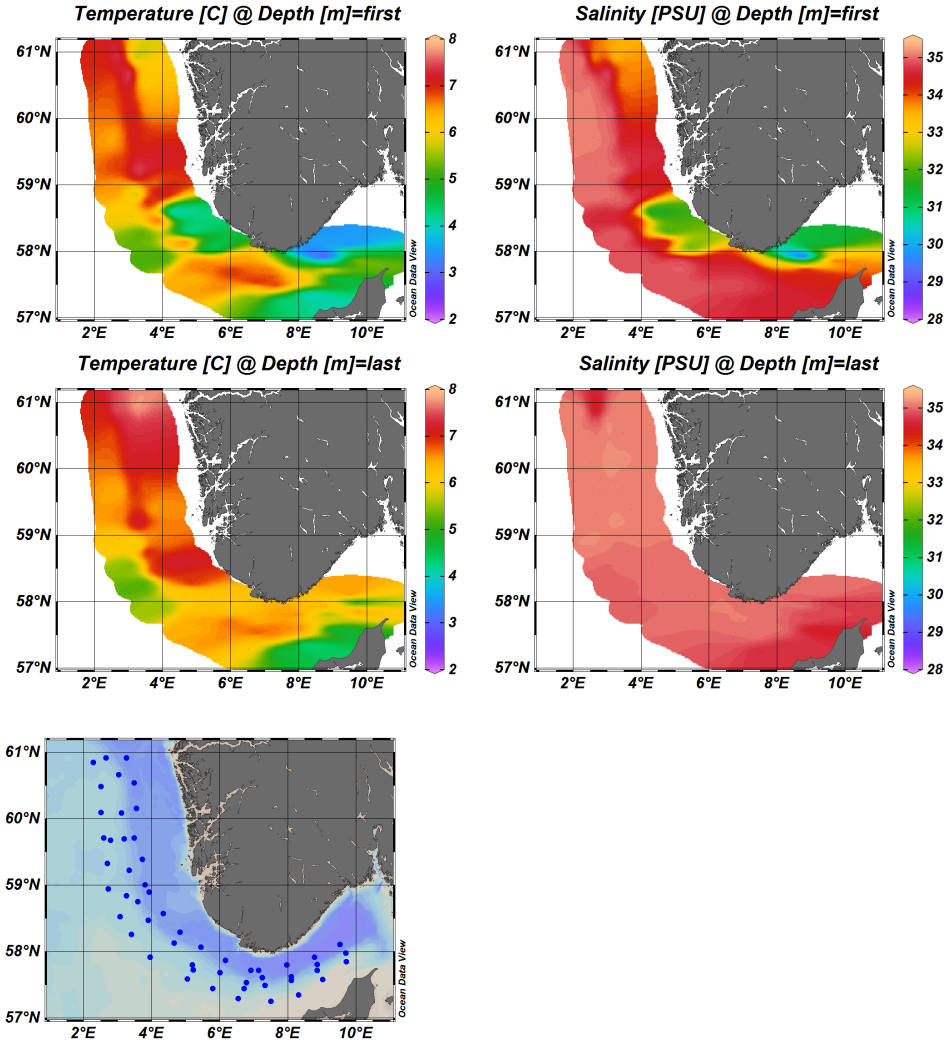

Figure 5: FRV "Walther Herwig III" cruise 414/2018: Hydrography. CTD stations are depicted as blue dots in the area map (lower panel). Temperature (°C, left panels) and salinity (PSU, right panels at the surface (top) and near the seafloor (lower).

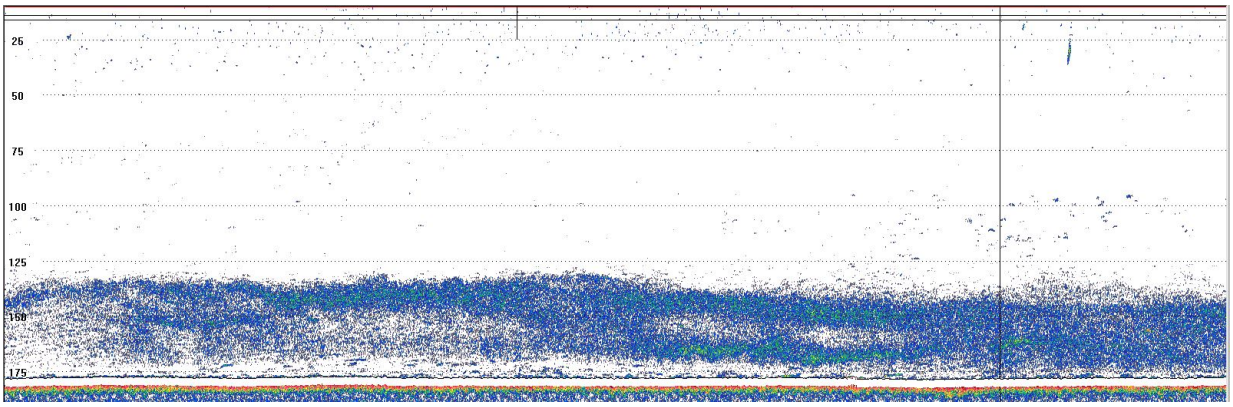

Figure 6: FRV "Walther Herwig III" cruise 414/2018. Echosounder EK60 screenshot (38 kHz) during haul 12. Echotraces from large single fishes (saithe, *Pollachius virens*) can be seen right on and above the seafloor (ca. 125 m depth). The dense echolayer below ca. 130 m depth consists of krill and velvet belly dogfish (*Etmopterus spinax*).

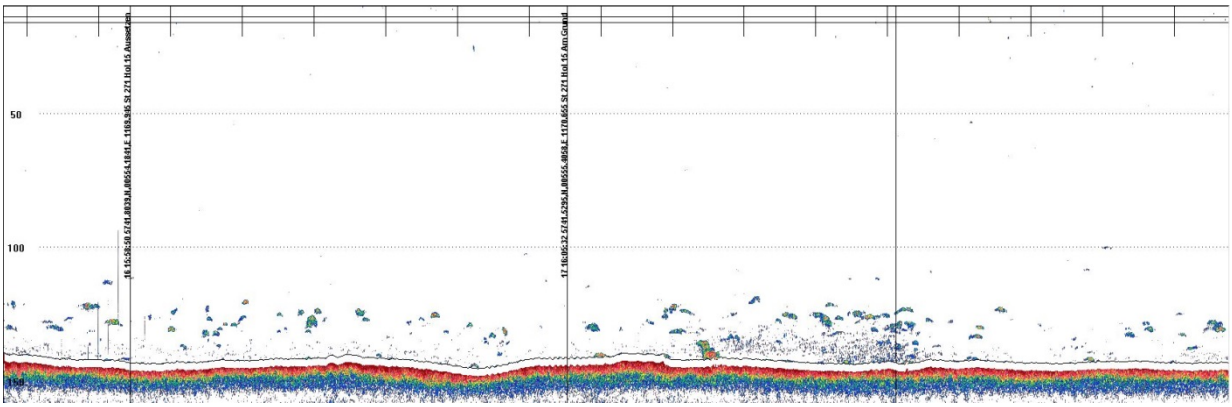

Figure 7: FRV "Walther Herwig III" cruise 414/2018. Echosounder EK60 screenshot (38 kHz) during haul 15. Haul contained saithe (*Pollachius virens*), pollock (*Pollachius pollachius*), cod (*Gadus morhua*), whiting (*Merlangius merlangus*), Norway pout (*Trisopterus esmarkii*) and Poor cod (*Trisopterus minutus*). Corresponding echotraces are categorized "DFI_SAITHEMIX" for further analysis (see main text).

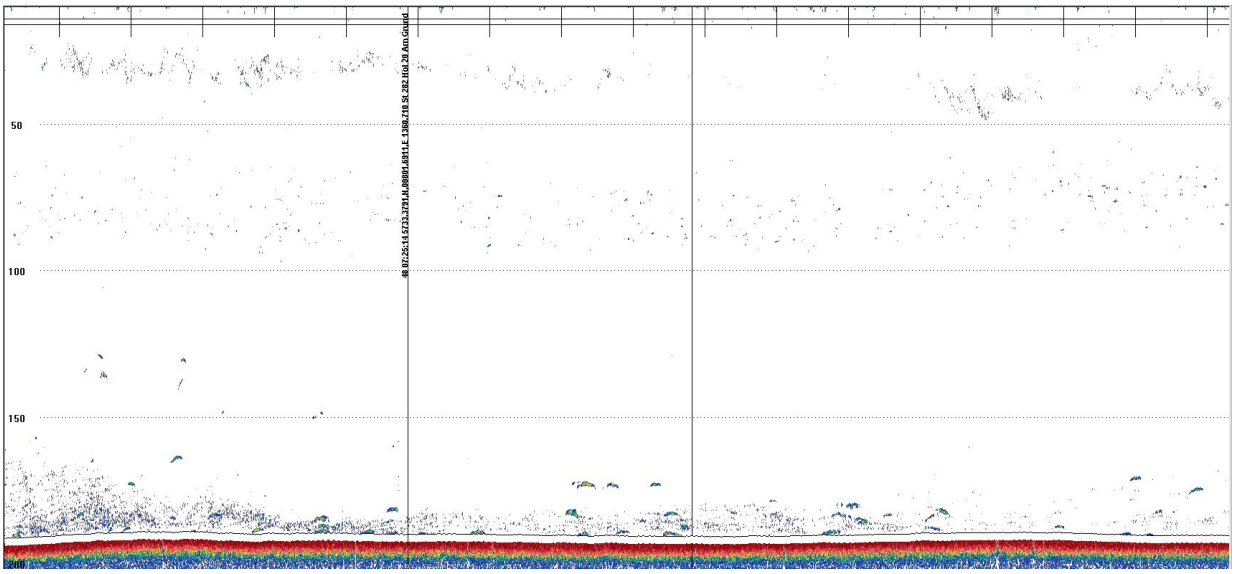

Figure 8: FRV "Walther Herwig III" cruise 414/2018. Echosounder EK60 screenshot (38 kHz) during haul 20. Echotraces from large single fishes (saithe, *Pollachius virens*) can be seen right on and above the seafloor (ca. 190 m depth).

Tables

Table 1: FRV "Walther Herwig III" cruise 414/2018. Catch composition (kg 0.5 h^{-1}) of bottom trawl hauls conducted during the survey.

Haul No.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Mean catch depth (m)	**161**	**166**	**137**	**117**	**156**	**246**	**155**	**121**	**159**	**103**	**153**	**177**
Stratum	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**2**	**2**
Agonus cataphractus	0	0	0	0	0	0	0	0	0	0	0	0
Alloteuthis subulata	0	0	0	0	0	0	0	0	0	0.02	0.02	0
Amblyraja radiata	0	0	0	0	0	0	0	0	0	0.38	0	0
Argentina silus	0	0	0	0	0.25	12.28	0.89	0.01	0.02	0	0	8.94
Argentina sphyraena	0.13	0.08	0.02	0	2.29	0.37	0.28	0.02	0.04	0	0	0
Brosme brosme	0	0	0	2.06	0	0	0	0	0	0	0	0
Callionymus maculatus	0	0	0	0	0	0	0	0	0	0	0	0
Capros aper	0.02	0	0	0	0.06	0	0	0	0	0	0	0
Chimaera monstrosa	0	0	0	0	0	1.12	0	0	0	0	0	0.21
Clupea harengus	0.27	1.29	1	0.59	0	0	2.1	0.66	0	0	5.35	0.19
Coryphaenoides rupestris	0	0	0	0	0	0.1	0	0	0	0	0	0
Cyclopterus lumpus	0	0	0	5.02	0	0	0	1.87	0	0	0	0
Etmopterus spinax	0	0	0	0	0	15.09	0	0	0	0	1.7	84.09
Eutrigla gurnardus	0.12	19.25	13.74	5.74	27.58	3.22	1.91	7.59	0.6	26.95	4.08	0.81
Gadiculus argenteus	0	0	0	0	0	19.1	0	0	0	0	0.01	3.02
Gadus morhua	0	7.65	0	0	0.66	0	2.71	0.23	5.7	0.74	7.7	24.41
Galeus melastomus	0	0	0	0	0	1.55	0	0	0	0	0	0.01
Glyptocephalus cynoglossus	0	0	0	0	0	0.12	0.06	0	0.22	0	0	0.35
Hippoglossoides platessoides	0.03	0.27	0.04	0	0.06	0	0.05	0.04	0.14	0.96	0.04	0.44
Hippoglossus hippoglossus	0	1.18	0	0	0	0	0	0	0	0	0	2.93
Illex coindetti	0	0	0	0	0	0	0	0.03	0	0	0	0
Lepidorhombus whiffiagonis	0	0	0.45	1.35	0	0	0.18	0	0	0	0	0
Limanda limanda	0	0	0	0	0	0	0	0.07	0.05	9.14	0.54	0.29
Loligo sp.	0	0.8	0.35	0.98	2.36	0	0.99	0.53	0.11	0.25	0.22	0.47
Loligo forbesi	0.32	0	0	0	0	0	0	0	0	0	0	0
Lophius piscatorius	0	0	0	0	8.44	0	0	0	0	0	0	7.2
Lycodes vahlii	0	0	0	0	0	0	0	0	0	0	0	0
Maurolicus muelleri	0	0.01	0	0	0	0.01	0	0	0	0	0.17	0.03
Melanogrammus aeglefinus	1.07	1.86	2.96	30.57	0.92	2.41	0.29	2.05	1.97	1.52	1.7	8.57
Merlangius merlangus	0	7.04	0.68	11.96	11.3	0	29.73	0.12	3.13	0.9	0.25	22.73
Merluccius merluccius	0	0.96	1.77	0	6.84	45.15	5.05	0	0	0	0.28	1.64
Micromesistius poutassou	0	0	0	0	0	8.49	0.18	0	0	0	0.86	18.79
Microstomus kitt	0	0	0	0.21	0	0	0	0	0.18	0	0	0
Molva dipterygia	0	0	0	0	0	0.32	0	0	0	0	0	0
Molva molva	2.33	0	6.66	1.16	0	0	8.8	0	12.96	0	7.36	1.84
Myxine glutinosa	0	0	0	0	0	0	0	0	0	0	0	0.03
Nephrops norvegicus	0	0	0	0	0	0	0	0	0	0	0	0.12
Phycis blennoides	0	0.02	0	0	0	4.2	0	0	0	0	0	0
Pleuronectes platessa	0	0	0	0	0	0	0	0	0	0	0	0
Pollachius pollachius	0	0	0	0	2.3	0	0	0	0	0	0	0
Pollachius virens	**16.77**	**857.14**	**5.86**	**2.48**	**15.7**	**22.96**	**69.75**	**0**	**132**	**0.52**	**102.9**	**705.68**
Rhinonemus cimbrius	0	0	0	0	0	0	0	0	0	0	0	0
Rossia macrosoma	0	0	0	0	0.01	0	0	0	0	0	0	0
Scomber scombrus	60.42	35.67	16.98	4.01	1.22	0	1.58	88.22	0	2.74	4.37	0.38
Scyliorhinus canicula	0.74	0	0	0	0	0	0	0	0	0	0	0
Sebastes sp.	0	0.21	0	0	0.05	0	0	0	0.01	0	0	0
Sebastes viviparus	0	0	0	0.49	0	0	0	0	0	0	0	0
Sepietta oweniana	0	0	0	0	0	0	0	0	0	0	0	0
Sepiola atlantica	0	0	0	0	0	0	0	0	0	0	0	0
Squalus acanthias	0	0	0	0	0	0	0	0	0	0	0	0
Todarodes sagittatus	0	0	0	0	0	1.12	0	0.41	0	0	0	0
Todaropsis eblanae	0	0	0	0	0.02	0.01	0	0.02	0	0	0.02	0
Trachurus trachurus	0	0.59	0	0	0	0	0.4	0	0	0	0	0
Triglops murrayi	0	0	0	0	0	0	0	0	0	0	0	0
Trisopterus esmarkii	0.22	1.32	0.07	0.57	0.32	0.04	2	1.68	0.85	0	0.42	0.08
Trisopterus minutus	0	0.04	0	0	0.08	0.06	0.11	0	0	0	0.1	0.3
TOTAL	**82.45**	**935.37**	**50.57**	**67.15**	**80.45**	**137.73**	**127.06**	**103.55**	**157.98**	**44.12**	**138.07**	**893.54**

Table 1 cont.: FRV "Walther Herwig III" cruise 414/2018. Catch composition (kg 0.5 h^{-1}) of bottom trawl hauls conducted during the survey.

Haul No.	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**
Mean catch depth (m)	**107**	**109**	**143**	**109**	**169**	**283**	**208**	**190**	**239**	**233**	**121**	**149**
Stratum	**1**	**1**	**1**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Agonus cataphractus	0	0	0	0	0	0	0	0	0	0	0	0
Alloteuthis subulata	0	0.03	0	0.01	0.01	0	0	0	0.01	0	0	0
Amblyraja radiata	0	0	0	0	0	0	0	0	0	0	0	0
Argentina silus	0.15	1.23	0.51	0	0.04	0	0	0	0	0	0	0
Argentina sphyraena	0	0	0.04	0	0	0	0	0.05	0	0	0	0
Brosme brosme	0	0	0	0.88	0	0	0	0	0	0	0	0
Callionymus maculatus	0	0	0	0	0	0	0	0	0	0	0	0
Capros aper	0	0	0	0	0	0	0	0	0	0	0	0
Chimaera monstrosa	0	0	0	0	0	0.22	0.1	0	0	0.19	0	0
Clupea harengus	1.44	3.6	0.05	0.09	0	0	0	0	0	0	0	0
Coryphaenoides rupestris	0	0	0	0	0	0	0	0	0	0	0	0
Cyclopterus lumpus	0	12.2	0	0	0	0	0	0	0	0	0	0
Etmopterus spinax	0	0	0	0	0	1.28	0.27	0.38	0.84	1.08	0	0
Eutrigla gurnardus	0.53	10.36	2.21	0.45	0	0	0	0	0	0	0	0
Gadiculus argenteus	0	0	0.01	0	0.02	0	0.12	0	0	0	0	0
Gadus morhua	14.2	12.12	20.86	14.38	4	0	1.64	17.14	0.38	9.16	3.05	11
Galeus melastomus	0	0	0	0	0	0	0	0	0	0	0	0
Glyptocephalus cynoglossus	0	0	0	0	0.63	0	0.13	0.23	0.21	0.23	0.46	0.55
Hippoglossoides platessoides	0.25	0.29	0.21	0	0.53	0	1.13	0.26	0.33	0.17	0.96	1.3
Hippoglossus hippoglossus	0	0	0	0	0	0	0	0	0	0	0	0
Illex coindetti	0	0	0	0	0	0	0	0	0	0	0	0
Lepidorhombus whiffiagonis	0	0	0	0	0	0	0	0	0	0	0	0
Limanda limanda	0.06	0.05	0	0.11	0	0	0	0	0	0	0	0
Loligo sp.	0.03	0.03	0	0	0.05	0	0	0	0	0.57	0	0.02
Loligo forbesi	0	0	0	0	0	0	0	0	0	0	0	0
Lophius piscatorius	0	0	5.02	11.46	0	0	9.04	0	0	0	0	0
Lycodes vahlii	0	0	0	0	0	0	0	0.03	0.03	0.01	0	0.05
Maurolicus muelleri	0	0	0	0	0.02	0.01	0.01	0	0	0	0.01	0
Melanogrammus aeglefinus	64.35	6.22	0	0.47	0.96	0	0	2.96	0.89	6.56	0	0.74
Merlangius merlangus	6.54	10.16	13.36	1.39	2.77	0.8	1.71	2.69	0.88	4.51	0.3	0.98
Merluccius merluccius	0	0	0.35	0	0.03	0.52	0	0.48	0.23	0.57	0	0
Micromesistius poutassou	0	0	0.59	0	0	0	0.14	0	0	0	0	0
Microstomus kitt	0.71	0	0	0.18	0.22	0	0	0	0.56	0	0.1	0
Molva dipterygia	0	0	0	0	0	0	0	0	0	0	0	0
Molva molva	0	0	22.88	0	1.24	0	0	0	0	0	0	0
Myxine glutinosa	0	0	0	0.11	0	0	0	0	0	0.03	0	0
Nephrops norvegicus	0	0	0.23	0.05	0	0.93	4.45	3.34	1.12	1.76	0.07	0.14
Phycis blennoides	0	0	0	0	0.58	0	0	0	0	0	0	0
Pleuronectes platessa	0.23	0.49	1.14	0	0	0	0	0	0.27	0	0.38	0
Pollachius pollachius	0	0	33.76	0	0	0	0	7.08	0	0	5.2	0
Pollachius virens	**0.78**	**8.64**	**47.4**	**6.62**	**36.6**	**11.17**	**44.78**	**191.7**	**18.46**	**112.1**	**0**	**0**
Rhinonemus cimbrius	0	0	0	0.07	0	0	0.02	0	0.12	0	0	0.04
Rossia macrosoma	0	0	0	0	0	0	0	0	0	0	0	0
Scomber scombrus	123.5	73.8	0.96	0	0	0	9.06	0.21	0	0.15	0	0
Scyliorhinus canicula	0	0	0	0	0	0	0	0	0	0	0	0
Sebastes sp.	0	0	0.3	0	0	0	0	0	0	0	0	0
Sebastes viviparus	0	0	0	16.8	0	0	0	0	0	0	0	0
Sepietta oweniana	0	0	0.01	0	0	0.01	0	0	0	0	0	0
Sepiola atlantica	0	0	0	0	0	0	0	0	0	0	0	0
Squalus acanthias	0	0	0	0	0	0	0	1.3	0	0.81	0.14	0
Todarodes sagittatus	0	0.04	0	0	0	0.44	0	0	0	0	0	0
Todaropsis eblanae	0	0.11	0	0	0	0.04	0	0	0.02	0	0	0
Trachurus trachurus	0	0	0	0	0	0	0	0	0	0	0	0
Triglops murrayi	0.01	0	0	0	0	0	0	0	0	0	0	0
Trisopterus esmarkii	1.43	4.76	0.53	1.2	0.4	0.12	0.02	0.14	0.05	0.33	0.03	0.08
Trisopterus minutus	0	0.07	1.94	0.75	0	0	0	0.04	0	0	0	0.01
TOTAL	**214.19**	**144.18**	**152.34**	**55.02**	**48.07**	**15.52**	**72.61**	**228.02**	**24.41**	**138.22**	**10.68**	**14.89**