

**Cruise Report**  
**FRV Walther Herwig III**  
**Cruise 470**  
**01.09. - 12.09.2023**

Cruise Leader: Dr. Norbert Rohlf

**International Herring Larvae Survey in the North Sea**

**Summary**

The cruise is part of the German contribution to the international herring larvae surveys in the North Sea (IHLS). These surveys are conducted during the autumn and winter herring spawning activity. The ICES coordinated studies monitor the spatial distribution and abundance of herring larvae on an annual basis. Survey outcome give information about herring spawning stock biomass and the contribution of different spawning components on the overall hatching success. The results provide valuable information for herring stock assessment and the fixation of fishing quotas.

The spatial distribution of herring larvae was found in common pattern. Most larvae hatched east of the Orkneys and on shallower banks in the Buchan area, in close vicinity of the Scottish coast line. However, the overall abundance of herring larvae was low in the whole area. It is unclear if this is a result of low hatching success or the timing of the cruise, referring to possible shifts in spawning and hatching time.

However, conclusions for North Sea herring spawning stock dynamics can only be drawn when information of larvae abundance from all spawning areas become available prior to the herring assessment working group meeting in March 2024.

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**Verteiler:**

TI - Seefischerei

**per E-Mail:**

BMEL, Ref. 614

BMEL, Ref. 613

Bundesanstalt für Landwirtschaft und Ernährung, Hamburg

Schiffsführung RV „Dana“

Schiffsführung FFS "Walther Herwig III"

Präsidiälbüro (Erik Eschbach/Beate Büttner)

Personalreferat 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

Deutscher Hochseefischerei-Verband e.V.

DFFU

## 2. Research programme

The cruise is a component of the international herring larvae surveys. Parts of ICES area 27.4.a and 27.4.b should be sampled by double oblique tows with the "Nackthai" (modified GULF III sampler), resulting in herring larval abundance estimates and spatial distribution.

## 3. Narrative

FRV "Walther Herwig III" was embarked on Friday, 09/01/23, and left the port of Bremerhaven in the afternoon.

The area under investigation was reached on Sunday early morning, 09/03/23. Wind speed was around 5 Beaufort, and the sea was relatively calm. Within the next eight and a half days, all 160 plankton tows could be conducted as scheduled, supported by very good weather conditions. The first 91 stations were done in the Orkney and Shetland area. Here, two stations could not be sampled at all because their positions are now within a wind park.

In the Buchan area, 69 stations were completed. One had to be left out due to growing wind farm areas.

All stations were completed on Sunday evening, 09/10/23. The vessel steamed back to the port of Bremerhaven. The cruise ended as scheduled on Tuesday, 09/12/23, at noon.

## 4. Preliminary results

In total, 160 plankton tows were done within the IHLS framework. Physical measurements, e.g. temperature, salinity and conductivity, were conducted via a CTD mounted directly onto the gulf sampler.

Plankton sampling was achieved according to the manual of the herring larvae surveys. Fish eggs and larvae were sorted from the plankton samples after the end of the cruise. Herring larvae were counted and their abundance per square metre estimated. Length measurements are still in progress and thus length-frequency plots cannot be shown yet.

The spatial distribution of herring larvae was found in common pattern. Most larvae hatched east of the Orkneys and on shallower banks in the Buchan area, in close vicinity of the Scottish coast line (Figure 1). The unusual spatial distribution found in the Orkney area in September 2022 was not observed again. However, the overall abundance of herring larvae was low in the whole area. It is unclear if this is a result of low hatching success or the timing of the cruise, referring to possible shifts in spawning and hatching time.

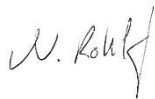
The cruise track and the spatial distribution of herring larvae are given in figure 1. Figure 2 depicts the distribution of near-bottom water temperature. Abundance estimates and available physical water parameters are listed in table 1.

## 5. Participants

<b>Name</b>	<b>Institution</b>	<b>Function</b>
1. Norbert Rohlf	TI-SF	Cruise leader
2. Birgit Suer	TI-SF	Technician
3. Karin Krüger	TI-SF	Technician
4. Friederike Beußel	TI-SF	Technician
5. Jörg Appel	TI-SF	Technician
6. Lisanne Hoch	TI-SF	Student Assistant
7. Martina Hefter-Siebold	TI-SF	Technician

## 6. Acknowledgement

Sincere thanks are given to Captain Werner Stumpp and FRV "Walther Herwig III" crew members for their excellent support and hospitality and to all participants for their reliable and responsible teamwork.



(Dr. Norbert Rohlf)

## 7. Tables and Figures

Table 1: Main data of Ichthyoplankton hauls made during WH 470 in the Orkney Shetland area.

Stat. Nr.	Haul Nr.	Lat. (° N)	Long.	E/ W	Date (UTC)	Time (UTC)	Duration (min)	Water depth (m)	Catch depth (m)	Flow (m <sup>3</sup> )	Hela (n/m <sup>2</sup> )	Surface T (°C)	Bottom T (°C)
501	1	58°04.49	001°09.96	W	03.09.23	02:49	19.02	109	105	107.0	0	14.75	9.77
502	2	58°05.08	001°29.77	W	03.09.23	04:01	14.32	81	78	81.8	0	14.16	11.38
503	3	58°05.12	001°49.70	W	03.09.23	05:06	16.15	86	83	96.1	0	14.15	12.17
504	4	58°05.10	002°10.02	W	03.09.23	06:12	10.54	68	65	63.4	0	14.12	13.03
505	5	58°05.02	002°29.40	W	03.09.23	07:12	10.18	66	61	59.0	0	14.25	13.35
506	6	58°03.40	002°49.90	W	03.09.23	08:20	6.51	51	48	37.0	0	14.47	13.35
507	7	58°04.74	003°30.15	W	03.09.23	10:28	6.24	43	40	38.6	8	15.44	13.00
508	8	58°14.74	003°10:49	W	03.09.23	11:49	10.03	63	60	57.5	0	13.74	13.54
509	9	58°15.00	002°30.21	W	03.09.23	14:01	8.27	57	53	49.0	3	13.59	13.47
510	10	58°14.94	002°10.02	W	03.09.23	15:01	9.01	58	55	52.5	1	13.60	12.28
511	11	58°15.00	001°50.17	W	03.09.23	15:59	20.42	102	98	127.3	0	14.09	11.41
512	12	58°15.10	001°29.81	W	03.09.23	17:05	20.57	110	106	128.5	0	14.43	10.34
513	13	58°14.80	001°10.40	W	03.09.23	18:11	17.58	102	98	100.0	0	14.07	10.45
514	14	58°24.80	001°09.60	W	03.09.23	19:13	19.00	106	103	108.0	0	14.71	9.76
515	15	58°25.00	001°29.10	W	03.09.23	20:21	20.32	103	99	126.0	0	14.09	10.43
516	16	58°24.90	001°49.90	W	03.09.23	21:29	17.55	101	96	109.0	0	14.03	11.29
517	17	58°24.96	002°09.52	W	03.09.23	22:39	16.15	82	79	82.0	3	13.56	12.19
518	18	58°24.95	002°29.43	W	03.09.23	23:47	10.51	65	62	62.6	4	13.52	13.45
519	19	58°24.98	002°49.29	W	04.09.23	00:52	11.05	67	64	63.8	4	13.44	13.43
520	20	58°34.92	002°50.66	W	04.09.23	02:08	11.17	69	66	62.8	12	13.37	13.35
521	21	58°35.07	002°30.30	W	04.09.23	03:14	12.58	77	73	81.7	2	13.57	12.40
522	22	58°34.88	002°10.23	W	04.09.23	04:17	14.18	81	78	81.7	1	13.61	12.04
523	23	58°34.94	001°50.27	W	04.09.23	05:19	18.34	98	95	106.9	0	13.44	10.72
524	24	58°35.02	001°30.80	W	04.09.23	06:23	19.50	110	107	119.0	0	14.20	9.77
525	25	58°34.84	001°10.74	W	04.09.23	07:30	19.47	107	104	114.0	0	14.41	9.49
526	26	58°44.75	001°09.50	W	04.09.23	08:31	22.21	111	107	130.0	0	14.14	9.48
527	27	58°45.04	001°28.60	W	04.09.23	09:39	20.56	111	109	126.8	1	13.83	10.05
528	28	58°44.99	001°49.03	W	04.09.23	10:49	16.35	91	88	93.7	6	13.36	11.59
529	29	58°45.00	002°09.09	W	04.09.23	11:56	14.41	81	78	85.7	6	13.75	11.86
530	30	58°45.02	002°29.24	W	04.09.23	13:02	12.49	76	73	71.3	11	13.68	12.53
531	31	58°44.73	002°44.73	W	04.09.23	13:53	11.29	72	69	64.6	75	13.74	12.42
532	32	58°54.82	002°30.38	W	04.09.23	15:15	12.00	76	72	63.7	18	13.56	12.84
533	33	58°55.00	002°10.71	W	04.09.23	16:22	13.18	80	77	71.4	20	14.00	12.76
534	34	58°54.99	001°50.64	W	04.09.23	17:27	16.21	91	88	87.6	16	13.43	12.55
535	35	58°55.00	001°31.30	W	04.09.23	18:31	19.51	110	106	116.0	1	13.01	10.65
536	36	58°54.80	001°11.10	W	04.09.23	19:37	21.23	122	118	121.0	0	14.70	8.99
537	37	59°04.70	001°09.30	W	04.09.23	20:41	22.30	120	117	124.0	0	13.90	8.84
538	38	59°05.04	001°29.19	W	04.09.23	21:49	19.30	103	100	111.9	6	14.14	10.02
539	39	59°04.99	001°49.25	W	04.09.23	22:58	15.44	83	80	96.5	100	13.62	12.91
540	40	59°04.99	002°09.14	W	05.09.23	00:03	13.55	82	80	75.6	150	13.51	12.93
541	41	59°04.43	002°24.46	W	05.09.23	00:56	11.26	72	69	63.7	400	13.72	13.61

Stat. Nr.	Haul Nr.	Lat. (° N)	Long.	E/W	Date (UTC)	Time (UTC)	Duration (min)	Water depth (m)	Catch depth (m)	Flow (m³)	Hela (n/m²)	Surface T (°C)	Bottom T (°C)
542	42	59°14.90	002°11.08	W	05.09.23	02:21	11.37	77	74	58.8	170	13.64	13.51
543	43	59°14.88	001°50.34	W	05.09.23	03:42	13.54	79	75	73.1	265	13.18	12.80
544	44	59°14.98	001°30.88	W	05.09.23	04:45	17.46	98	94	98.2	12	12.33	11.44
545	45	59°14.70	001°11.10	W	05.09.23	06:11	20.18	112	108	109.0	0	13.74	9.78
546	46	59°24.68	001°09.46	W	05.09.23	07:17	21.46	119	115	134.0	1	13.31	8.78
547	47	59°25.03	001°29.20	W	05.09.23	08:21	16.14	88	85	97.0	9	12.24	12.21
548	48	59°25.05	001°45.76	W	05.09.23	09:13	15.26	88	83	88.0	29	12.44	12.44
549	49	59°25.02	002°09.03	W	05.09.23	10:26	13.15	77	74	71.8	434	13.30	13.29
550	50	59°24.98	002°29.83	W	05.09.23	11:48	6.41	46	43	37.7	22	13.77	13.70
551	51	59°24.75	002°49.47	W	05.09.23	12:57	7.54	53	50	43.2	12	13.87	13.87
552	52	59°34.68	002°50.39	W	05.09.23	14:00	13.54	77	73	79.8	3	14.10	13.40
553	53	59°34.92	002°30.40	W	05.09.23	14:59	15.41	83	79	93.2	22	13.30	13.04
554	54	59°34.93	002°10.74	W	05.09.23	15:59	18.56	99	95	108.9	153	13.29	13.07
555	55	59°34.90	001°49.65	W	05.09.23	17:08	16.35	95	91	91.7	11	13.48	12.44
556	56	59°34.99	001°31.26	W	05.09.23	18:09	16.02	90	87	93.0	6	12.68	12.14
557	57	59°34.81	001°11.19	W	05.09.23	19:16	20.39	110	107	102.0	10	12.55	9.35
558	58	59°44.63	001°10.07	W	05.09.23	20:22	16.49	102	98	96.0	1	14.84	8.71
559	59	59°55.87	001°09.65	W	05.09.23	21:33	19.15	101	97	114.0	4	12.94	11.24
560	60	59°44.69	001°29.65	W	05.09.23	23:10	12.40	74	71	70.7	2	11.87	11.87
561	61	59°54.58	001°30.04	W	06.09.23	00:10	22.02	107	104	132.5	4	12.81	11.66
562	62	59°55.59	001°49.50	W	06.09.23	01:25	17.53	98	95	97.0	6	12.29	11.43
563	63	59°45.53	001°49.91	W	06.09.23	02:27	20.28	108	105	117.7	8	12.63	12.05
564	64	59°44.48	002°09.36	W	06.09.23	03:46	19.31	107	104	106.0	5	13.65	12.05
565	65	59°54.52	002°09.93	W	06.09.23	04:54	16.48	97	94	90.5	0	13.64	12.07
566	66	59°55.27	002°28.45	W	06.09.23	05:59	16.24	93	89	90.0	29	13.75	12.40
567	67	59°45.32	002°29.62	W	06.09.23	07:09	16.24	91	88	97.0	28	13.58	13.02
568	68	59°44.82	002°49.60	W	06.09.23	08:10	12.28	75	72	76.0	95	13.03	13.04
569	69	59°54.59	002°49.42	W	06.09.23	09:09	12.26	75	73	71.0	56	13.24	12.75
570	70	59°55.01	003°09.10	W	06.09.23	10:09	16.45	86	83	89.2	3	12.71	12.14
571	71	59°54.98	003°29.19	W	06.09.23	11:15	23.00	117	114	123.6	1	14.17	10.18
572	72	59°55.49	003°48.89	W	06.09.23	12:27	25.23	149	120	138.0	0	14.20	10.10
573	73	59°46.27	003°51.90	W	06.09.23	13:44	22.45	135	120	128.1	0	14.16	9.94
574	74	59°45.05	003°30.67	W	06.09.23	14:53	18.34	102	97	108.3	5	14.30	10.76
575	75	59°45.18	003°10.37	W	06.09.23	15:59	10.52	60	57	67.9	3	13.93	12.79
576	76	59°35.35	003°09.06	W	06.09.23	17:04	23.18	121	117	127.7	7	14.06	12.51
577	77	59°35.13	003°28.42	W	06.09.23	18:13	23.10	149	120	121.0	0	14.28	11.81
578	78	59°35.28	003°49.20	W	06.09.23	19:23	26.00	164	120	149.0	1	14.22	10.57
579	79	59°25.51	003°50.87	W	06.09.23	20:33	22.59	146	120	122.0	0	14.39	10.09
580	80	59°25.00	003°30.79	W	06.09.23	21:44	21.47	121	118	122.5	0	14.27	11.56
581	81	59°25.53	003°11.12	W	06.09.23	22:52	10.40	68	65	59.4	21	13.78	13.54
582	82	59°15.11	003°09.33	W	06.09.23	23:59	10.59	66	63	64.7	12	14.18	13.85
583	83	59°15.01	003°29.10	W	07.09.23	01:03	16.08	93	90	88.4	136	14.04	12.61
584	84	59°15.47	003°49.04	W	07.09.23	02:13	22.12	129	120	107.1	28	14.10	11.05
585	85	59°05.25	003°50.92	W	07.09.23	03:28	19.32	103	100	108.9	0	14.01	13.01
586	86	59°05.20	003°30.23	W	07.09.23	04:38	12.03	77	73	67.9	0	14.40	13.61
587	87	58°55.49	003°29.96	W	07.09.23	05:40	12.57	76	73	75.0	2	14.49	13.71
588	88	58°55.34	003°49.11	W	07.09.23	06:47	16.45	92	89	99.0	0	14.07	13.63
589	89	58°45.48	003°50.08	W	07.09.23	07:52	14.21	79	76	85.0	0	14.36	13.31
590	90	58°37.58	003°50.46	W	07.09.23	08:44	15.15	80	76	78.0	0	14.64	13.73
591	91	58°44.76	003°30.81	W	07.09.23	10:03	16.10	88	85	92.1	22	13.53	13.50

Table 1 continued: Main data of Ichthyoplankton hauls made during WH 470 in the Buchan area.

Stat. Nr.	Haul Nr.	Lat. (° N)	Long.	E/ W	Date (UTC)	Time (UTC)	Duration (min)	Water depth (m)	Catch depth (m)	Flow (m <sup>3</sup> )	Hela (n/m <sup>2</sup> )	Surface T (°C)	Bottom T (°C)
592	92	57°55.30	002°49.63	W	07.09.23	16:06	15.45	95	92	86.3	1	15.62	12.68
593	93	57°45.28	002°49.33	W	07.09.23	17:10	4.11	32	29	24.2	0	16.55	13.49
594	94	57°44.72	002°31.27	W	07.09.23	18:05	21.08	109	106	124.0	0	16.43	12.61
595	95	57°54.61	002°30.66	W	07.09.23	19:11	10.16	65	62	58.0	0	15.45	13.04
596	96	57°35.28	002°11.15	W	07.09.23	20:13	13.45	79	76	81.0	0	14.97	13.00
597	97	57°44.80	002°09.38	W	07.09.23	21:25	14.10	104	80	83.0	0	15.92	12.88
598	98	57°44.60	001°50.56	W	07.09.23	22:29	6.01	46	43	34.2	3	15.81	13.78
599	99	57°54.57	001°50.11	W	07.09.23	23:24	12.04	75	72	64.3	0	15.14	12.12
600	100	57°55.03	001°31.07	W	08.09.23	00:29	18.50	106	103	108.4	1	14.56	11.46
601	101	57°45.41	001°30.83	W	08.09.23	01:42	12.27	73	70	69.1	0	14.79	12.91
602	102	57°44.70	001°10.29	W	08.09.23	02:51	15.47	95	92	89.6	0	14.64	10.69
603	103	57°54.67	001°10.58	W	08.09.23	03:58	18.45	108	105	101.1	0	14.65	10.78
604	104	57°54.60	000°50.50	W	08.09.23	05:11	18.10	97	96	99.2	0	14.82	9.61
605	105	57°46.14	000°49.97	W	08.09.23	06:20	19.41	113	111	108.0	0	14.73	9.93
606	106	57°35.11	000°49.33	W	08.09.23	07:27	18.55	103	100	105.0	0	14.15	10.58
607	107	57°34.98	001°09.05	W	08.09.23	08:35	18.00	100	97	95.0	0	13.99	11.03
608	108	57°35.40	001°29.42	W	08.09.23	09:44	14.06	79	79	80.6	58	13.79	12.85
609	109	57°25.24	001°31.32	W	08.09.23	10:46	17.10	92	88	90.9	40	14.80	12.40
610	110	57°25.04	001°10.89	W	08.09.23	11:54	13.11	79	76	74.4	7	14.35	12.11
611	111	57°25.02	000°50.84	W	08.09.23	12:57	11.58	70	67	69.1	0	15.57	12.06
612	112	57°25.02	000°30.56	W	08.09.23	14:01	14.49	84	81	83.9	1	15.72	11.36
613	113	57°25.31	000°10.44	W	08.09.23	15:04	12.56	77	74	72.8	0	15.74	11.47
614	114	57°15.25	000°09.55	W	08.09.23	16:05	14.45	82	79	83.0	0	16.05	10.55
615	115	57°14.76	000°29.84	W	08.09.23	17:13	12.32	76	73	66.0	0	16.49	11.09
616	116	57°14.74	000°49.80	W	08.09.23	18:21	12.08	71	67	65.0	0	15.66	12.21
617	117	57°14.64	001°09.27	W	08.09.23	19:26	13.04	79	76	75.0	36	14.91	12.69
618	118	57°14.71	001°29.49	W	08.09.23	20:33	14.04	75	72	75.0	26	14.59	12.41
619	119	57°15.15	001°49.84	W	08.09.23	21:40	9.02	60	60	52.0	186	15.70	13.50
620	120	57°05.28	001°51.14	W	08.09.23	22:39	14.04	82	79	78.6	378	14.81	13.29
621	121	57°04.96	001°30.66	W	08.09.23	23:45	14.01	78	75	80.1	79	14.56	13.00
622	122	57°04.99	001°10.76	W	09.09.23	00:49	9.58	60	57	55.9	23	14.52	12.49
623	123	57°04.97	000°50.39	W	09.09.23	01:52	11.50	72	69	66.1	20	15.66	11.67
624	124	57°05.01	000°29.34	W	09.09.23	02:57	15.44	85	82	88.3	0	16.32	9.81
625	125	57°04.96	000°10.70	W	09.09.23	04:00	14.01	82	79	80.0	0	16.62	9.72
626	126	56°55.37	000°08.94	W	09.09.23	05:11	13.03	76	73	69.5	0	16.69	9.42
627	127	56°55.00	000°29.30	W	09.09.23	06:21	14.00	79	76	82.0	0	16.21	10.03
628	128	56°54.97	000°49.18	W	09.09.23	07:28	10.20	66	63	59.0	0	15.81	11.30
629	129	56°55.00	001°09.25	W	09.09.23	08:33	11.34	70	67	66.0	0	14.70	11.92
630	130	56°55.00	001°29.06	W	09.09.23	09:39	11.00	69	66	62.6	0	14.49	12.89
631	131	56°55.49	001°49.78	W	09.09.23	10:48	16.18	86	83	92.4	10	14.69	13.02
632	132	56°45.28	001°48.96	W	09.09.23	11:51	10.47	66	63	63.7	1	14.65	13.16
633	133	56°45.35	002°09.89	W	09.09.23	12:59	10.16	61	58	47.2	0	14.93	13.38
634	134	56°35.22	002°10.06	W	09.09.23	14:01	5.40	42	39	30.9	1	15.10	13.70
635	135	56°25.25	002°10.51	W	09.09.23	14:59	8.04	56	53	42.8	0	15.13	13.60
636	136	56°24.41	001°49.23	W	09.09.23	16:06	9.35	64	61	50.9	0	15.36	12.97
637	137	56°24.83	001°30.27	W	09.09.23	17:07	8.55	57	54	48.7	0	15.34	12.42
638	138	56°34.84	001°28.67	W	09.09.23	18:05	8.54	60	57	48.0	0	15.44	12.26
639	139	56°44.66	001°30.49	W	09.09.23	19:03	9.10	57	54	53.0	0	15.16	13.00
640	140	56°44.97	001°10.76	W	09.09.23	20:05	13.07	70	67	78.0	0	16.33	11.54
641	141	56°45.01	000°50.77	W	09.09.23	21:09	12.23	68	65	74.0	0	17.08	10.37

Stat. Nr.	Haul Nr.	Lat. (° N)	Long.	E/W	Date (UTC)	Time (UTC)	Duration (min)	Water depth (m)	Catch depth (m)	Flow (m³)	Hela (n/m²)	Surface T (°C)	Bottom T (°C)
642	142	56°44.97	000°30.74	W	09.09.23	22:13	12.25	73	70	69.3	0	16.76	10.60
643	143	56°45.61	000°10.35	W	09.09.23	23:19	13.42	76	75	79.5	0	16.73	9.33
644	144	56°35.13	000°09.11	W	10.09.23	00:21	16.04	87	84	87.3	0	17.02	8.91
645	145	56°35.02	000°29.21	W	10.09.23	01:30	12.29	74	71	68.4	0	17.07	9.89
646	146	56°35.07	000°49.57	W	10.09.23	02:37	10.48	70	67	58.2	0	16.81	10.37
647	147	56°35.27	001°09.88	W	10.09.23	03:45	10.10	66	63	55.6	0	16.18	11.10
648	148	56°25.11	001°10.62	W	10.09.23	04:49	10.02	66	63	53.8	0	16.21	11.13
649	149	56°25.02	000°50.79	W	10.09.23	05:52	11.31	72	68	66.0	0	17.23	10.08
650	150	56°15.27	000°49.56	W	10.09.23	06:56	9.59	68	66	53.0	0	17.25	9.90
651	151	56°15.00	001°09.02	W	10.09.23	08:00	9.21	65	62	50.0	0	17.25	10.39
652	152	56°14.97	001°29.19	W	10.09.23	09:05	8.03	59	56	42.0	0	16.69	11.40
653	153	56°14.96	001°49.35	W	10.09.23	10:08	9.39	56	53	53.3	0	14.90	13.01
654	154	56°15.22	002°07.16	W	10.09.23	11:07	8.19	57	54	47.0	0	16.16	13.03
655	155	56°15.34	002°29.99	W	10.09.23	12:36	7.01	47	44	38.8	0	16.23	12.90
656	156	56°04.98	002°10.44	W	10.09.23	13:58	9.15	65	62	47.6	0	16.64	12.30
657	157	56°04.81	002°50.10	W	10.09.23	15:04	10.05	64	61	52.1	0	17.07	11.96
658	158	56°05.03	001°30.68	W	10.09.23	16:08	12.03	74	71	62.4	0	17.58	10.60
659	159	56°05.10	001°10.40	W	10.09.23	17:17	9.47	65	62	52.8	0	17.68	10.29
660	160	56°05.02	000°51.00	W	10.09.23	18:20	10.38	65	62	56.0	0	17.86	9.65

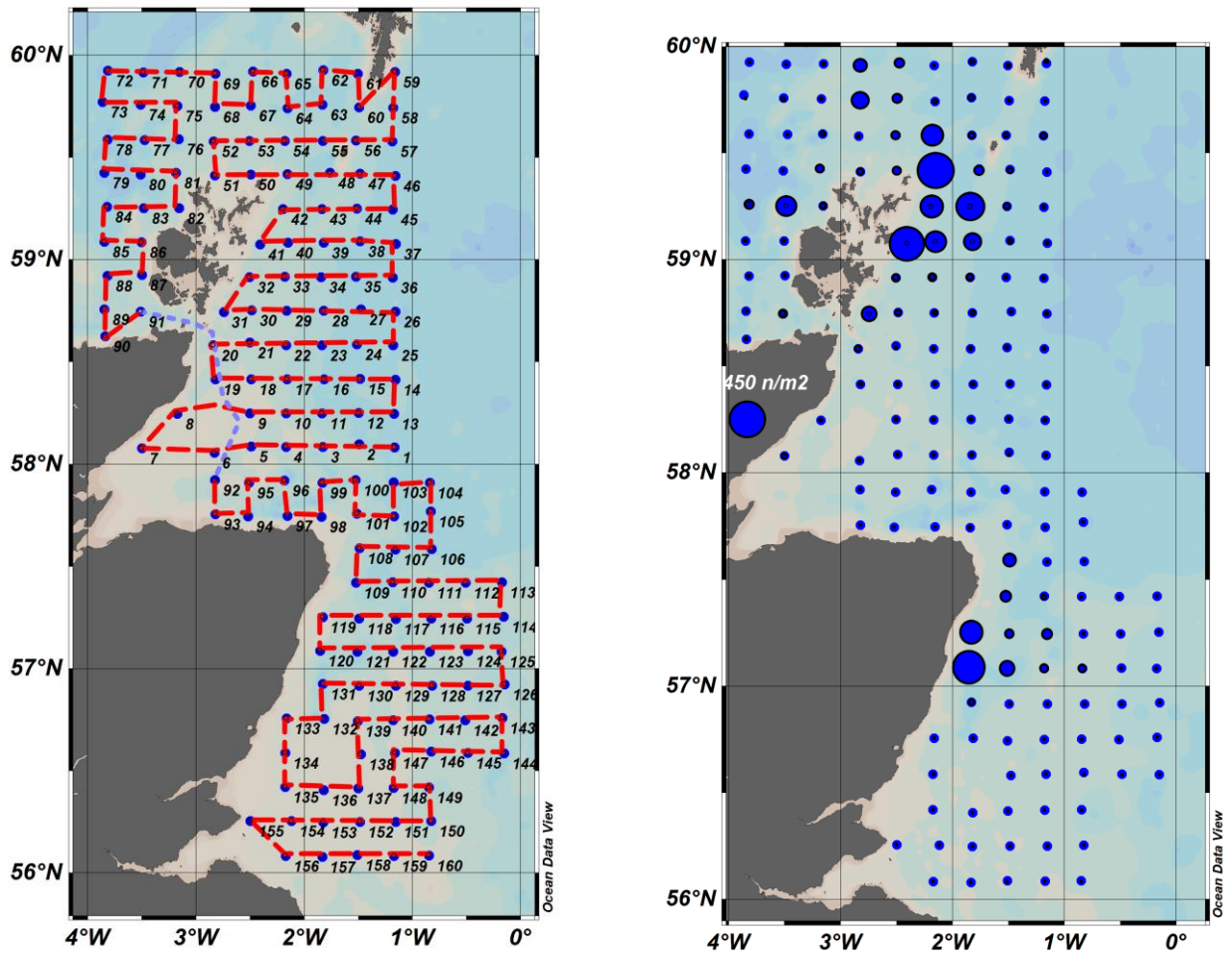


Figure 1: WH 470 cruise track in the Orkney/Shetland area (by station number, left panel) and corresponding abundance of herring larvae (n/m<sup>2</sup>, right panel). The reference circle in the right panel corresponds to 450 larvae per square metre.

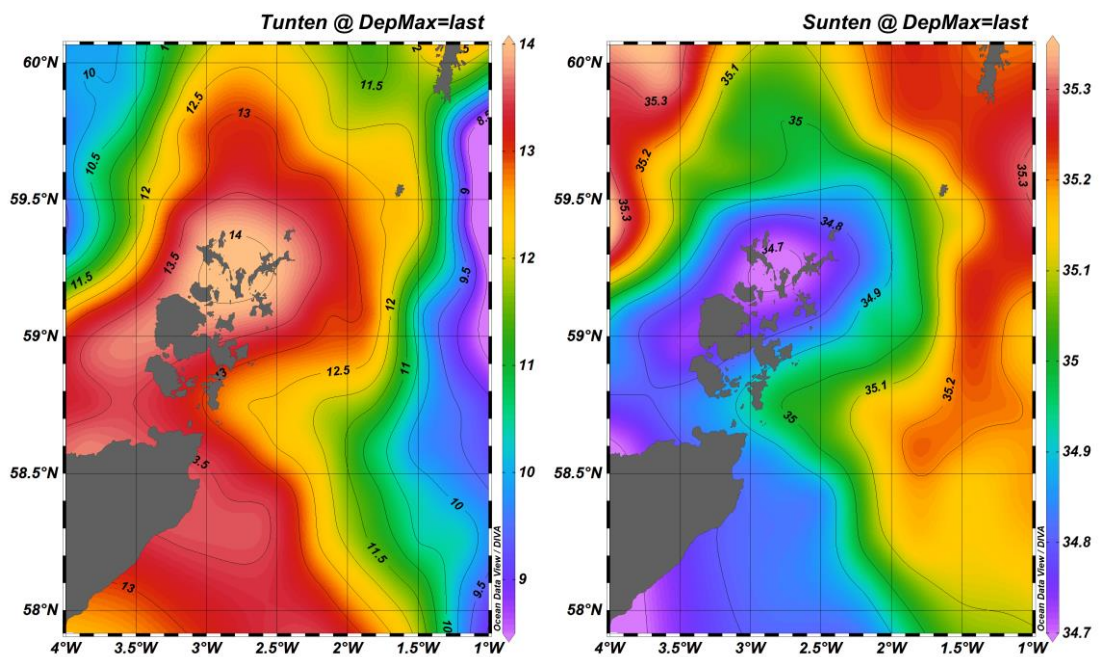


Figure 2: Distribution of near-bottom temperature (°C, left panel) and salinity (psu, right panel) in the area under investigation.