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Thünen-Institute of Sea Fisheries

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Cruise Report
FRV Walther Herwig III
Cruise 439
14.09.-28.09.2020

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 results 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 to be in common pattern. Most larvae hatched east of the Orkneys and on shallower banks in the Buchan area. The overall abundance in the Orkney/Shetland area was relatively low compared to previous years.
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 2021.

Verteiler:
TI - Seefischerei

per E-Mail:
BMEL, Ref. 614
BMEL, Ref. 613
Bundesanstalt für Landwirtschaft und Ernährung, Hamburg
Schiffsführung FFS "Walther Herwig III"
Präsidialbüro (Michael Welling)
Personalreferat Braunschweig
TI - Fischereiökologie
TI - Ostseefischerei Rostock
FIZ-Fischerei
TI - PR
MRI - BFEL HH, FB Fischqualität

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

Dr. Rohlf/SF - Reiseplanung Forschungsschiffe
Fahrtteilnehmer

2. Research programme

The cruise is a component of the international herring larvae surveys. Parts of ICES area 4a 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" left Bremerhaven on 09/14/20 around midday. The area under investigation was reached after midnight, 09/16/20. Wind speed was 6 to 7 Beaufort, but decreasing, and the sea was calm.

All plankton tows could be done as scheduled, supported by good to moderate weather conditions. The field work was finished early Wednesday morning, 09/23/20. The vessel steamed back to Bremerhaven. The cruise ended on Friday, 09/25/20.

4. Preliminary results

In total, 161 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 samples yielded in total 25,104 herring larvae (10,496 larvae around the Orkneys, 14,608 in the Buchan area). Fish larvae of other taxa amounted to 4,986 and 597 fish eggs were caught, too. Species identification of fish eggs and larvae is pending.

The spatial distribution of herring larvae was found to be in common pattern. Most larvae hatched east of the Orkneys and on shallower banks in the Buchan area. The overall abundance in the Orkney/Shetland area was relatively low compared to previous years (12,000 to 20,000 larvae). 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

Name	Institution	Function
1. Norbert Rohlf	TI-SF	Cruise leader
2. Birgit Suer	TI-SF	Technician
3. Friederike Beußel	TI-SF	Technician
4. Karin Krüger	TI-SF	Technician
5. Sakis Kroupis	TI-SF	Technician
6. Sandra Krüger	TI-SF	Student

6. Acknowledgement

Thanks to Captain Arne Schwegmann and FRV "Walther Herwig III" crew members for their excellent support and hospitality and to all participants for their reliable and responsible teamwork.

N. Rohlf

(Dr. Norbert Rohlf)

7. Tables and Figures

Table 1: Main data of Ichthyoplankton hauls made during WH 439.

Stat. Nr.	Haul Nr.	Lat. (° N)	Long.	E/ W	Date (UTC)	Time (UTC)	Dura tion (min)	Water depth (m)	Catch depth (m)	Flow (m³)	Hela (n/m²)	Sur- face T (°C)	Bottom T (°C)
544	1	58°34.91	001°08.15	W	15.09.20	23:33	19.58	109	104	109.2	14	11.9	10.1
545	2	58°35.05	001°28.46	W	16.09.20	00:40	21.32	110	107	130.2	191	12.6	11.0
546	3	58°35.05	001°48.01	W	16.09.20	01:45	17.10	97	93	97.3	229	12.5	12.1
547	4	58°35.32	002°09.68	W	16.09.20	02:50	10.30	68	64	57.5	335	12.7	12.5
548	5	58°35.23	002°27.29	W	16.09.20	03:43	10.24	68	64	63.0	59	12.5	12.3
549	6	58°35.02	002°51.02	W	16.09.20	04:59	12.19	78	75	65.0	25	12.7	12.7
550	7	58°44.99	003°29.95	W	16.09.20	08:10	15.09	91	86	80.3	1	12.8	12.8
551	8	58°38.00	003°49.83	W	16.09.20	09:28	12.23	80	75	68.2	0	12.8	12.7
552	9	58°44.56	003°49.97	W	16.09.20	10:16	15.40	80	77	76.4	0	12.8	12.8
553	10	58°54.34	003°51.21	W	16.09.20	11:13	17.53	89	86	104.5	0	12.8	12.8
554	11	58°54.60	003°30.94	W	16.09.20	12:16	13.31	75	72	71.9	0	12.9	12.9
555	12	59°04.80	003°29.70	W	16.09.20	13:14	13.55	75	72	70.2	0	13.1	12.9
556	13	59°04.40	003°48.89	W	16.09.20	14:11	17.20	101	97	93.6	0	12.8	12.7
557	14	59°14.28	003°51.29	W	16.09.20	15:09	23.50	129	120	139.5	0	12.8	11.3
558	15	59°14.99	003°32.06	W	16.09.20	16:12	15.11	91	87	79.3	367	12.9	12.7
559	16	59°14.33	003°10.40	W	16.09.20	17:14	12.09	66	63	48.7	28	12.9	12.9
560	17	59°24.36	003°09.07	W	16.09.20	18:08	11.40	72	72	61.0	18	12.9	12.8
561	18	59°24.98	003°29.20	W	16.09.20	19:14	22.03	158	120	116.6	16	12.8	12.7
562	19	59°24.93	003°49.46	W	16.09.20	20:24	22.45	147	120	126.8	0	12.7	11.1
563	20	59°34.53	003°50.17	W	16.09.20	21:29	22.27	154	120	118.8	7	12.7	12.4
564	21	59°35.04	003°31.00	W	16.09.20	22:38	26.05	131	119	139.0	33	12.8	12.2
565	22	59°34.18	003°11.00	W	16.09.20	23:46	23.00	110	107	129.4	25	12.8	12.5
566	23	59°44.83	003°09.73	W	17.09.20	00:57	9.43	59	56	49.4	46	12.8	12.8
567	24	59°44.71	003°29.39	W	17.09.20	01:55	17.09	112	95	86.5	20	12.7	12.1
568	25	59°44.40	003°48.78	W	17.09.20	03:02	20.39	141	120	114.6	0	12.7	10.6
569	26	59°54.68	003°51.50	W	17.09.20	04:11	23.39	150	120	125.6	0	12.2	10.0
570	27	59°55.05	003°31.41	W	17.09.20	05:17	20.42	119	115	103.2	0	12.3	10.3
571	28	59°55.00	003°10.72	W	17.09.20	06:21	14.59	86	83	77.0	74	12.6	12.6
572	29	59°55.14	002°51.77	W	17.09.20	07:14	13.01	78	75	66.1	28	12.6	12.5
573	30	59°45.18	002°49.72	W	17.09.20	08:21	11.41	77	73	56.3	94	12.8	12.7
574	31	59°36.13	002°49.96	W	17.09.20	09:13	12.09	76	73	66.5	265	12.9	12.9
575	32	59°25.04	002°50.35	W	17.09.20	10:14	8.29	52	49	41.9	7	12.9	12.9
576	33	59°24.72	002°29.90	W	17.09.20	11:04	7.22	46	43	36.3	4	12.9	12.9
577	34	59°34.39	002°30.01	W	17.09.20	11:55	14.48	86	83	70.2	28	12.9	12.7
578	35	59°44.47	002°30.02	W	17.09.20	12:56	14.46	89	86	66.9	6	12.6	12.5
579	36	59°54.76	002°31.34	W	17.09.20	13:56	16.01	93	88	78.8	4	12.5	12.2
580	37	59°55.05	002°11.18	W	17.09.20	14:59	16.10	96	85	77.2	0	12.1	12.1
581	38	59°55.01	001°51.40	W	17.09.20	16:01	18.22	103	98	89.1	15	11.9	11.2
582	39	59°55.45	001°31.13	W	17.09.20	17:04	18.05	114	112	87.8	39	11.2	11.0
583	40	59°54.45	001°10.63	W	17.09.20	18:33	15.20	97	93	81.2	3	11.9	10.7
584	41	59°45.88	001°09.81	W	17.09.20	19:39	17.28	103	98	93.9	5	12.1	9.6
585	42	59°44.49	001°28.71	W	17.09.20	20:47	12.18	80	76	60.2	11	11.9	11.7
586	43	59°44.95	001°49.81	W	17.09.20	21:58	20.23	112	109	93.2	9	12.2	11.7
587	44	59°45.46	002°08.85	W	17.09.20	23:06	20.29	105	102	101.3	4	12.3	12.3
588	45	59°35.08	002°10.55	W	18.09.20	00:09	17.36	95	92	86.5	7	12.4	12.4
589	46	59°35.00	001°50.90	W	18.09.20	01:07	18.45	98	95	99.2	18	12.3	12.3
Stat. Nr.	Haul Nr.	Lat. (° N)	Long.	E/ W	Date (UTC)	Time (UTC)	Dura tion (min)	Water depth (m)	Catch depth (m)	Flow (m³)	Hela (n/m²)	Sur- face T (°C)	Bottom T (°C)

590	47	59°35.12	001°31.00	W	18.09.20	02:09	17.01	94	90	85.2	22	12.0	11.9
591	48	59°35.25	001°11.03	W	18.09.20	03:12	21.44	114	110	115.4	28	11.9	9.6
592	49	59°24.54	001°09.49	W	18.09.20	04:20	24.14	121	117	126.8	18	11.9	8.5
593	50	59°25.05	001°28.54	W	18.09.20	05:22	14.33	88	85	67.0	97	12.2	11.8
594	51	59°25.07	001°48.60	W	18.09.20	06:18	16.24	99	96	76.0	188	12.6	12.5
595	52	59°25.14	002°08.95	W	18.09.20	07:21	12.31	78	74	59.8	86	12.8	12.9
596	53	59°15.53	002°10.28	W	18.09.20	08:15	14.55	83	80	77.9	1975	12.9	12.9
597	54	59°14.93	001°51.19	W	18.09.20	09:10	13.36	79	76	74.3	68	12.8	12.7
598	55	59°14.97	001°30.94	W	18.09.20	10:05	20.09	99	96	103.9	150	12.6	11.9
599	56	59°15.45	001°10.67	W	18.09.20	11:05	22.25	114	111	110.9	27	12.1	10.2
600	57	59°04.34	001°09.20	W	18.09.20	12:09	24.03	120	117	119.3	93	12.6	9.9
601	58	59°04.55	001°29.38	W	18.09.20	13:19	17.52	104	101	85.1	505	12.7	11.9
602	59	59°04.72	001°50.09	W	18.09.20	14:23	14.44	83	79	76.3	396	12.9	12.7
603	60	59°04.80	002°09.85	W	18.09.20	15:21	14.23	81	78	72.6	966	12.8	12.8
604	61	59°05.62	002°24.21	W	18.09.20	16:08	10.47	66	62	54.0	175	12.9	12.9
605	62	58°55.50	002°31.07	W	18.09.20	17:12	11.22	74	70	56.3	288	12.8	12.7
606	63	58°55.04	002°10.85	W	18.09.20	18:09	13.05	78	74	67.4	520	12.8	12.5
607	64	58°54.98	001°51.27	W	18.09.20	19:04	16.20	90	86	91.3	261	12.7	12.2
608	65	58°54.93	001°31.64	W	18.09.20	20:01	20.48	107	104	112.3	36	12.6	11.8
609	66	58°55.37	001°11.57	W	18.09.20	21:01	21.57	117	113	117.9	74	12.5	9.4
610	67	58°45.32	001°08.90	W	18.09.20	22:02	21.53	111	108	109.6	23	12.4	10.9
611	68	58°44.43	001°29.31	W	18.09.20	23:09	21.31	114	111	109.6	43	12.4	11.3
612	69	58°44.56	001°49.30	W	19.09.20	00:17	16.10	91	88	75.6	1020	12.7	12.4
613	70	58°44.66	002°09.49	W	19.09.20	01:20	14.15	81	78	66.1	290	12.9	12.6
614	71	58°44.77	002°29.75	W	19.09.20	02:20	12.38	76	72	62.9	186	12.9	12.6
615	72	58°45.19	002°44.59	W	19.09.20	03:04	12.37	71	67	65.6	261	12.8	12.6
616	73	58°25.34	002°50.35	W	19.09.20	04:55	10.19	65	62	52.3	17	12.8	12.8
617	74	58°25.16	002°30.63	W	19.09.20	05:52	9.12	60	56	46.0	12	12.8	12.7
618	75	58°24.99	002°11.36	W	19.09.20	06:46	13.17	80	77	71.2	208	12.6	12.3
619	76	58°25.03	001°51.54	W	19.09.20	07:44	18.08	100	97	89.3	146	12.6	12.1
620	77	58°24.96	001°30.61	W	19.09.20	08:46	19.42	104	100	100.6	45	12.4	11.3
621	78	58°25.30	001°11.46	W	19.09.20	09:44	18.50	102	102	97.1	25	12.6	11.1
622	79	58°14.53	001°09.01	W	19.09.20	10:49	20.17	107	104	89.1	10	12.6	10.4
623	80	58°14.59	001°29.28	W	19.09.20	11:57	23.14	135	120	122.5	40	12.7	11.1
624	81	58°14.60	001°49.34	W	19.09.20	13:06	18.17	100	97	96.9	73	12.8	12.0
625	82	58°14.71	002°09.77	W	19.09.20	14:13	7.58	58	53	42.5	37	13.1	12.4
626	83	58°15.00	002°29.71	W	19.09.20	15:10	8.59	57	54	47.7	4	13.0	12.8
627	84	58°16.65	003°06.75	W	19.09.20	17:00	10.40	67	64	57.0	2	13.0	12.9
628	85	58°05.51	003°29.68	W	19.09.20	18:27	5.50	43	39	31.8	1	13.4	13.1
629	86	58°03.78	003°09.43	W	19.09.20	19:25	6.23	46	43	35.5	0	13.6	13.0
630	87	58°03.67	002°51.24	W	19.09.20	20:15	7.58	52	49	42.5	0	13.6	13.0
631	88	58°04.96	002°30.88	W	19.09.20	21:12	11.28	66	62	61.5	2	13.4	12.9
632	89	58°04.93	002°10.54	W	19.09.20	22:10	11.50	67	64	62.6	5	13.1	12.6
633	90	58°04.94	001°50.62	W	19.09.20	23:11	18.29	90	87	97.5	20	12.9	12.1
634	91	58°04.66	001°30.93	W	20.09.20	00:10	14.27	78	75	76.9	6	12.8	11.7
635	92	58°05.14	001°14.46	W	20.09.20	00:59	21.32	107	104	113.1	8	12.7	11.0
636	93	57°54.28	001°08.95	W	20.09.20	02:04	18.38	105	101	98.0	4	12.7	11.2
637	94	57°54.35	001°29.22	W	20.09.20	03:14	19.48	109	104	103.6	4	12.8	12.0
638	95	57°55.19	001°48.68	W	20.09.20	04:22	14.09	82	78	75.9	65	12.9	12.4
639	96	57°55.07	002°09.21	W	20.09.20	05:23	13.27	78	75	71.7	1	13.0	12.7
640	97	57°54.97	002°29.22	W	20.09.20	06:20	8.42	60	27	46.8	0	13.3	12.8
Stat. Nr.	**Haul Nr.**	**Lat. (° N)**	**Long.**	**E/ W**	**Date (UTC)**	**Time (UTC)**	**Dura tion (min)**	**Water depth (m)**	**Catch depth (m)**	**Flow (m^3)**	**Hela (n/m^2)**	**Sur- face T (°C)**	**Bottom T (°C)**

641	98	57°54.96	002°48.79	W	20.09.20	07:14	15.29	90	86	82.1	0	13.4	12.4
642	99	57°45.78	002°51.05	W	20.09.20	08:12	3.29	29	26	20.4	0	13.5	13.1
643	100	57°45.05	002°31.13	W	20.09.20	09:06	19.42	105	101	105.4	0	13.2	12.5
644	101	57°44.94	002°14.91	W	20.09.20	10:00	23.33	182	120	122.8	0	13.4	12.5
645	102	57°44.99	001°51.71	W	20.09.20	11:11	6.38	43	40	38.5	405	13.0	12.8
646	103	57°44.93	001°31.62	W	20.09.20	12:04	13.16	73	70	83.0	5320	12.9	12.7
647	104	57°44.94	001°11.47	W	20.09.20	13:00	16.27	92	89	95.8	507	12.7	11.2
648	105	57°45.51	000°51.26	W	20.09.20	13:59	21.40	115	104	131.5	4	12.9	10.0
649	106	57°34.36	000°49.42	W	20.09.20	15:03	18.38	104	100	102.1	0	13.0	10.3
650	107	57°34.51	001°09.31	W	20.09.20	16:11	16.43	100	96	86.6	9	13.0	11.7
651	108	57°35.33	001°29.62	W	20.09.20	17:18	15.24	78	75	94.5	1410	13.0	12.7
652	109	57°25.57	001°30.97	W	20.09.20	18:17	14.43	86	81	87.8	1146	12.8	12.8
653	110	57°25.02	001°11.05	W	20.09.20	19:18	13.24	79	76	78.0	463	12.7	12.3
654	111	57°25.00	000°51.14	W	20.09.20	20:17	10.42	69	66	61.4	143	13.0	12.3
655	112	57°25.01	000°31.14	W	20.09.20	21:12	14.16	80	77	86.9	47	12.9	12.0
656	113	57°25.32	000°10.77	W	20.09.20	22:11	13.58	77	75	74.5	20	12.9	11.7
657	114	57°15.30	000°09.10	W	20.09.20	23:13	15.04	80	77	83.3	54	12.9	11.0
658	115	57°14.95	000°28.75	W	21.09.20	00:15	13.52	78	75	75.0	38	12.8	11.9
659	116	57°14.39	000°48.91	W	21.09.20	01:18	12.21	73	70	66.6	144	12.9	12.6
660	117	57°14.55	001°09.73	W	21.09.20	02:25	13.23	78	74	78.5	346	12.6	12.5
661	118	57°14.54	001°29.61	W	21.09.20	03:31	11.30	76	72	63.0	517	12.7	12.4
662	119	57°15.13	001°49.72	W	21.09.20	04:36	9.54	62	59	53.4	1019	13.0	13.0
663	120	57°05.02	001°50.38	W	21.09.20	05:32	13.57	86	82	76.9	458	12.9	12.7
664	121	57°05.03	001°31.15	W	21.09.20	06:31	12.15	76	73	67.8	259	12.7	12.6
665	122	57°04.99	001°10.82	W	21.09.20	07:30	9.32	60	58	54.3	136	12.7	12.8
666	123	57°04.98	000°50.63	W	21.09.20	08:31	11.34	70	67	65.9	130	12.8	12.6
667	124	57°05.00	000°31.15	W	21.09.20	09:32	12.02	76	73	66.8	26	12.8	11.1
668	125	57°05.38	000°10.93	W	21.09.20	10:35	13.15	81	78	74.6	25	12.9	10.6
669	126	56°55.30	000°08.99	W	21.09.20	11:42	12.43	76	73	70.1	20	13.3	10.0
670	127	56°54.97	000°29.25	W	21.09.20	12:50	12.50	77	74	66.7	22	12.7	11.5
671	128	56°54.47	000°49.46	W	21.09.20	13:59	11.35	67	64	63.8	21	12.6	12.2
672	129	56°54.82	001°10.10	W	21.09.20	15:12	11.39	71	67	63.5	277	12.7	12.6
673	130	56°54.40	001°29.29	W	21.09.20	16:18	11.58	72	69	64.9	231	12.8	12.7
674	131	56°55.94	001°49.60	W	21.09.20	17:29	20.07	103	100	113.7	177	12.9	12.8
675	132	56°45.39	002°09.63	W	21.09.20	18:57	9.43	63	60	55.2	73	12.9	12.9
676	133	56°44.98	001°50.72	W	21.09.20	19:59	10.35	63	60	63.6	376	12.7	12.8
677	134	56°45.05	001°30.61	W	21.09.20	20:59	9.08	56	53	53.8	271	12.7	12.7
678	135	56°44.98	001°10.52	W	21.09.20	21:59	11.15	68	65	63.5	135	12.4	12.2
679	136	56°44.96	000°50.80	W	22.09.20	23:00	11.45	67	64	66.4	8	12.5	11.7
680	137	56°44.96	000°30.78	W	22.09.20	00:03	13.50	72	69	80.6	14	12.6	10.9
681	138	56°45.33	000°10.71	W	22.09.20	01:06	13.51	76	73	83.1	6	13.2	9.6
682	139	56°34.55	000°09.24	W	22.09.20	02:13	15.03	88	83	79.2	1	13.5	9.4
683	140	56°34.75	000°29.79	W	22.09.20	03:28	13.25	73	70	73.4	2	13.4	10.1
684	141	56°34.67	000°50.25	W	22.09.20	04:41	12.30	72	69	66.4	9	12.8	11.0
685	142	56°34.49	001°09.69	W	22.09.20	05:50	10.50	68	65	57.8	83	12.2	11.9
686	143	56°34.74	001°29.61	W	22.09.20	06:59	9.42	61	58	55.2	40	12.7	12.6
687	144	56°35.05	001°49.29	W	22.09.20	08:04	8.02	52	49	44.8	88	12.9	13.0
688	145	56°35.23	002°09.48	W	22.09.20	09:10	6.12	46	43	34.9	47	13.1	13.1
689	146	56°25.35	002°10.61	W	22.09.20	10:13	8.57	55	52	48.9	1	13.2	13.2
690	147	56°24.90	001°50.56	W	22.09.20	11:16	9.21	57	54	51.8	0	13.2	13.2
691	148	56°24.95	001°30.72	W	22.09.20	12:16	7.58	56	53	45.0	0	12.6	12.4

Stat. Nr.	Haul Nr.	Lat. (° N)	Long.	E/ W	Date (UTC)	Time (UTC)	Dura tion (min)	Water depth (m)	Catch depth (m)	Flow (m^3)	Hela (n/m^2)	Sur- face T (°C)	Bottom T (°C)

692	149	56°24.95	001°10.80	W	22.09.20	13:17	10.55	66	63	59.8	0	12.8	11.4
693	150	56°25.54	000°50.45	W	22.09.20	14:21	10.24	73	70	56.0	1	13.0	10.2
694	151	56°14.62	000°49.49	W	22.09.20	15:21	9.16	72	53	50.0	0	13.7	9.7
695	152	56°14.72	001°09.31	W	22.09.20	16:24	10.35	66	63	55.2	0	12.9	10.9
696	153	56°14.81	001°29.91	W	22.09.20	17:33	9.29	59	56	48.3	0	12.8	12.3
697	154	56°14.82	001°49.25	W	22.09.20	18:36	9.02	58	55	48.7	0	13.2	13.1
698	155	56°15.18	002°05.62	W	22.09.20	19:27	8.17	54	50	47.7	1	13.1	13.1
699	156	56°13.99	002°27.25	W	22.09.20	20:44	8.03	53	50	48.5	7	13.0	12.9
700	157	56°05.20	002°10.40	W	22.09.20	21:49	11.13	64	61	63.7	1	13.2	12.0
701	158	56°04.87	001°50.81	W	22.09.20	22:48	8.17	55	52	43.9	0	12.9	11.9
702	159	56°05.00	001°31.07	W	22.09.20	23:47	12.50	76	73	68.8	0	13.0	10.6
703	160	56°04.99	001°10.85	W	23.09.20	00:48	9.01	64	61	52.1	0	12.6	11.1
704	161	56°04.96	000°50.83	W	23.09.20	01:47	10.19	66	63	56.6	0	13.8	9.8

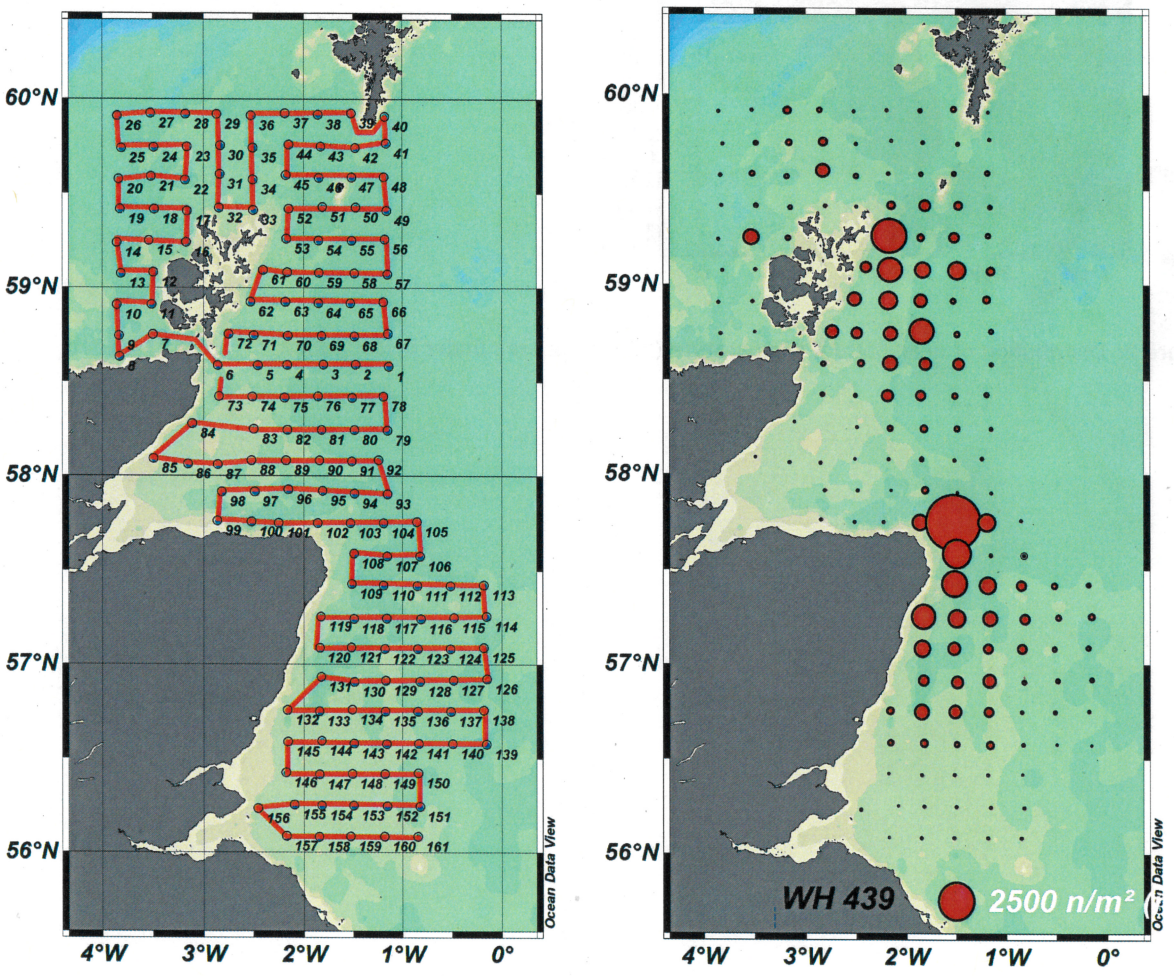

Figure 1: WH 439 cruise track in the Orkney/Shetland (north of 58°N) and Buchan area (by station number, left panel) and corresponding abundance of herring larvae (n/m², right panel). The reference circle in the right panel corresponds to 2500 larvae per square metre.

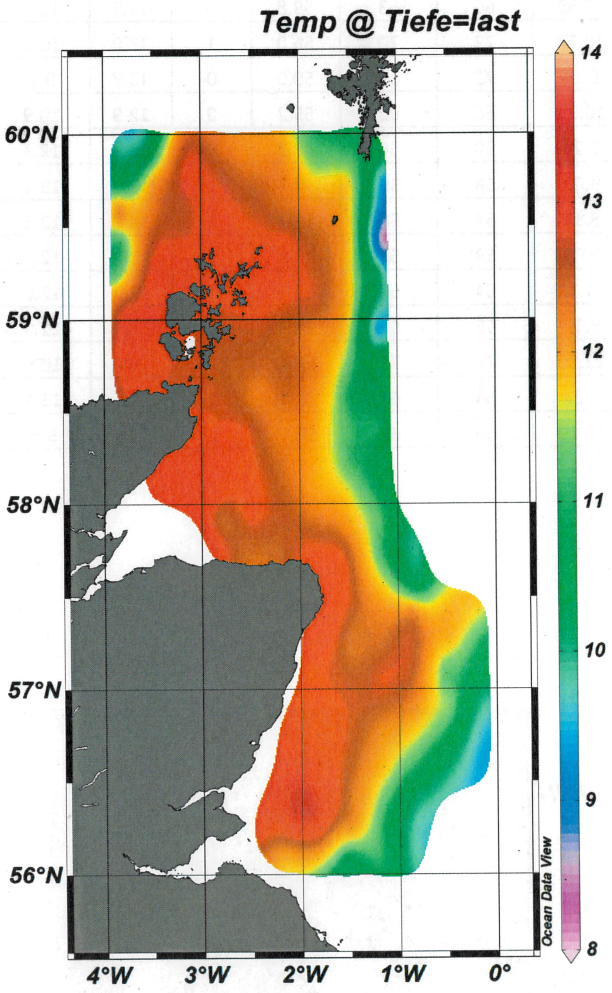

Figure 2: Distribution of near-bottom temperature (°C) in the area under investigation