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Cruise report
FRV "Walther Herwig III"
Cruise 388
22.09. – 02.10.2015

International Herring Larvae Survey in the North Sea

Scientist in charge: Dr. Norbert Rohlf

Summary

The cruise was 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 studies monitor the spatial distribution and abundance of herring larvae on an annual basis. They are coordinated by ICES. The survey time series dates back to 1972. Almost all countries surrounding the North Sea have participated in the history of the IHLS, while in recent years the Netherlands and Germany contribute most to the surveys. The resulting survey index is used as an important estimator of herring spawning stock biomass and provides valuable information for herring stock assessment and the fixation of fishing quotas.

All stations were covered as scheduled in the Orkney/Shetland area and some additional samples were obtained from the Buchan area.
The spatial distribution of the herring larvae was found to be in the usual pattern with larger concentrations of newly hatched larvae east of the Orkneys.
However, conclusions for North Sea herring stock spawning biomass 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 2016.

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2. Research programme

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

In total, 112 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. Sampling was achieved according to the manual of the herring larvae surveys.

3. Narrative

The scientific crew members embarked FRV “Walther Herwig III” on Tuesday, 09/22/15, at noon. Due to ongoing repairing and calibration exercises of the single conductor winch, the vessel left the port of Bremerhaven with the high tide the next morning. The area under investigation was reached on Thursday evening, 09/24/15. Plankton tows were done in the Orkney/Shetland area within the next three and a half days, operating in comfortable weather conditions. All 93 stations were covered as scheduled until midnight to 09/29/15 and the vessel used the remaining time for 19 additional hauls in the Buchan area. Field work was completed around midnight to 09/30/15. FRV “Walther Herwig III” steamed back to Bremerhaven, where the cruise was finished on Thursday evening (10/01/15). The scientists disembarked the vessel the next day.

4. Preliminary results

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 to be in the typical pattern. Most larvae hatched east of the Orkneys and on shallower banks in the Buchan area. 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 and salinity. 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. Jörg Appel	TI-SF	Technician
3. Michael Sasse	TI-SF	Technician
4. Inken Rottgardt	TI-SF	Student
5. Constanze Hammerl	Uni Oldenburg	Student
6. Peggy Weist	Uni Oldenburg	Student
7. Lydia Kohlmorgen	Uni Oldenburg	Student
8. Tobias Lasner	TI-FI	Scientist

6. Acknowledgement

Thanks to Captain Jürgen Vandrei and FRV “Walther Herwig III” crew members for their great support and hospitality and to all participants for their reliable and responsible teamwork.

7. Tables and Figures

Table 1: Main data of Ichthyoplankton hauls made during WH 388. Hauls 1-93 were done around the Orkneys, while 94-112 were conducted in the Buchan area.

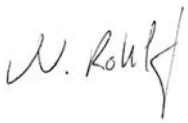
Stat. Nr.	Haul Nr.	Lat. (° N)	Long.	E/W	Date (UTC)	Time (UTC)	Duration (m.s)	Water depth (m)	Catch depth (m)	Flow (m^3)	Hela (n/m^2)	Surface		Bottom	
												T (°C)	Sal (psu)	T (°C)	Sal (psu)
761	1	58°05.02	001°09.47	W	24.09.15	16:30	19.21	105	100	124.0	7	12.56	35.47	11.02	35.53
762	2	58°05.02	001°29.49	W	24.09.15	17:38	13.24	82	72	85.3	16	12.45	35.31	11.78	35.47
763	3	58°04.98	001°48.73	W	24.09.15	18:42	15.38	90	85	95.1	22	12.41	35.30	11.91	35.43
764	4	58°04.99	002°08.89	W	24.09.15	19:52	11.39	66	61	75.6	48	12.49	35.17	12.13	35.36
765	5	58°05.04	002°28.89	W	24.09.15	20:59	11.28	67	62	71.9	9	12.49	35.17	12.49	35.18
766	6	58°04.98	002°48.88	W	24.09.15	22:07	6.58	48	43	44.4	5	12.50	35.15	12.51	35.15
767	7	58°04.32	003°08.96	W	24.09.15	23:13	7.32	48	43	49.8	2	12.58	35.16	12.59	35.16
768	8	58°04.45	003°29.63	W	25.09.15	00:20	5.33	42	37	35.6	2	12.62	35.08	12.54	35.16
769	9	58°15.10	003°10.87	W	25.09.15	01:37	9.29	60	55	62.2	8	12.54	35.16	12.55	35.16
770	10	58°14.98	002°50.77	W	25.09.15	02:35	6.02	43	39	39.7	4	12.59	35.15	12.60	35.15
771	11	58°14.99	002°30.69	W	25.09.15	03:32	8.13	54	51	51.4	8	12.47	35.17	12.48	35.17
772	12	58°15.05	002°11.19	W	25.09.15	04:29	10.29	63	59	69.7	63	12.28	35.27	12.04	35.37
773	13	58°14.99	001°51.10	W	25.09.15	05:29	17.43	99	96	100.3	97	12.34	35.29	11.65	35.50
774	14	58°15.03	001°31.69	W	25.09.15	06:31	26.24	129	120	180.4	32	12.32	35.36	10.87	35.55
775	15	58°14.72	001°11.23	W	25.09.15	07:39	19.47	103	97	131.4	45	12.32	35.44	10.26	35.59
776	16	58°24.27	001°09.60	W	25.09.15	08:48	20.01	102	97	122.6	37	12.35	35.44	10.07	35.60
777	17	58°25.00	001°28.20	W	25.09.15	10:01	19.41	106	101	114.6	159	12.26	35.47	10.27	35.60
778	18	58°25.04	001°48.67	W	25.09.15	11:14	19.43	103	98	117.3	91	12.22	35.38	11.07	35.56
779	19	58°25.00	002°08.75	W	25.09.15	12:23	13.33	83	78	79.7	117	12.26	35.32	11.88	35.47
780	20	58°25.06	002°29.11	W	25.09.15	13:28	9.24	64	59	55.4	16	12.46	35.20	12.43	35.20
781	21	58°24.77	002°49.19	W	25.09.15	14:30	9.55	65	61	57.0	5	12.49	35.17	12.47	35.17
782	22	58°34.59	002°50.97	W	25.09.15	15:28	11.16	69	65	71.6	13	12.48	35.19	12.45	35.20
783	23	58°44.56	002°45.35	W	25.09.15	16:27	11.16	72	67	65.3	244	12.47	35.19	12.22	35.32
784	24	58°45.15	002°31.32	W	25.09.15	17:13	12.21	75	71	73.7	342	12.39	35.23	12.21	35.32
785	25	58°45.00	002°10.60	W	25.09.15	18:15	14.42	81	76	101.0	2015	12.28	35.28	12.14	35.36
786	26	58°45.05	001°52.09	W	25.09.15	19:10	18.02	91	86	122.1	457	12.10	35.37	10.55	35.60
787	27	58°45.39	001°31.88	W	25.09.15	20:14	21.36	112	107	139.9	672	12.22	35.52	9.71	35.62
788	28	58°36.07	001°29.68	W	25.09.15	21:17	20.02	113	108	114.7	101	12.31	35.47	10.09	35.60
789	29	58°35.03	001°48.56	W	25.09.15	22:28	17.19	98	93	102.9	800	12.06	35.38	11.54	35.53
790	30	58°35.05	002°08.70	W	25.09.15	23:34	13.17	79	74	79.9	1428	12.32	35.25	12.18	35.36
791	31	58°35.05	002°29.08	W	26.09.15	00:37	12.00	76	71	70.5	40	12.29	35.25	12.17	35.31
792	32	58°44.97	003°28.99	W	26.09.15	03:15	14.34	88	84	89.6	94	12.39	35.21	12.46	35.19
793	33	58°38.09	003°48.89	W	26.09.15	04:33	12.53	82	77	77.4	227	12.76	35.04	12.77	35.09
794	34	58°44.48	003°50.02	W	26.09.15	05:19	13.53	82	77	82.3	301	12.72	35.09	12.75	35.13
795	35	58°54.40	003°50.63	W	26.09.15	06:19	17.43	95	89	120.4	95	12.65	35.24	12.61	35.36
796	36	58°54.74	003°31.29	W	26.09.15	07:17	13.09	76	71	84.4	410	12.74	35.12	12.71	35.10
797	37	59°04.64	003°29.33	W	26.09.15	08:18	11.33	77	72	74.4	852	12.74	35.10	12.67	35.23
798	38	59°04.78	003°48.38	W	26.09.15	09:20	19.00	102	97	126.3	19	12.51	35.41	12.19	35.49
799	39	59°14.94	003°51.45	W	26.09.15	10:27	24.22	125	120	146.7	0	12.43	35.48	10.88	35.57
800	40	59°14.98	003°31.17	W	26.09.15	11:36	14.20	88	83	76.8	206	12.66	35.16	12.58	35.36
801	41	59°14.46	003°10.01	W	26.09.15	12:43	9.25	63	58	56.0	273	12.68	35.10	12.67	35.12
802	42	59°24.91	003°08.65	W	26.09.15	13:46	12.56	74	69	78.4	229	12.68	35.14	12.67	35.15
803	43	59°25.01	003°28.57	W	26.09.15	14:45	21.17	169	120	117.4	115	12.57	35.30	11.80	35.49
804	44	59°24.29	003°49.19	W	26.09.15	15:55	23.28	146	120	138.2	1	12.39	35.55	10.26	35.61
805	45	59°34.36	003°50.39	W	26.09.15	17:03	24.21	159	120	153.0	0	12.45	35.53	10.46	35.59
806	46	59°43.95	003°49.91	W	26.09.15	18:04	26.55	142	120	179.5	0	12.45	35.52	10.53	35.58
807	47	59°53.94	003°50.57	W	26.09.15	19:09	24.54	152	120	158.8	0	12.34	35.57	10.25	35.65

Table 1 continued

Stat. Nr.	Haul Nr.	Lat. (° N)	Long.	E/ W	Date (UTC)	Time (UTC)	Duration (min)	Water depth (m)	Catch depth (m)	Flow (m^3)	Hela (n/m^2)	T (°C)	Sal (psu)	T (°C)	Sal (psu)
808	48	59°55.18	003°32.45	W	26.09.15	20:11	18.19	125	84	117.2	2	12.39	35.57	10.70	35.58
809	49	59°45.96	003°29.65	W	26.09.15	21:18	16.41	97	92	94.0	49	12.48	35.23	11.84	35.46
810	50	59°35.57	003°31.38	W	26.09.15	22:31	26.21	135	120	166.6	23	12.44	35.45	11.57	35.49
811	51	59°34.86	003°11.73	W	26.09.15	23:42	22.36	117	112	134.2	34	12.44	35.25	12.32	35.34
812	52	59°44.43	003°10.01	W	27.09.15	00:55	8.02	59	52	48.7	13	12.29	35.37	12.29	35.38
813	53	59°54.50	003°11.14	W	27.09.15	01:53	10.44	68	65	68.8	3	12.35	35.54	11.89	35.50
814	54	59°55.36	002°51.30	W	27.09.15	02:56	12.44	76	72	74.3	86	12.17	35.39	12.18	35.39
815	55	59°45.92	002°49.90	W	27.09.15	04:00	10.45	74	70	64.7	154	12.17	35.38	12.18	35.38
816	56	59°35.29	002°49.85	W	27.09.15	05:05	11.30	75	70	65.7	621	12.51	35.17	12.52	35.18
817	57	59°25.93	002°50.14	W	27.09.15	06:05	7.14	52	47	46.0	124	12.61	35.13	12.63	35.14
818	58	59°24.95	002°30.33	W	27.09.15	06:57	6.59	45	40	46.9	242	12.53	35.14	12.54	35.14
819	59	59°34.29	002°30.02	W	27.09.15	07:54	14.56	87	82	93.3	214	12.15	35.38	12.12	35.39
820	60	59°44.28	002°29.98	W	27.09.15	09:00	16.36	90	85	101.5	185	12.12	35.41	11.95	35.44
821	61	59°54.45	002°30.72	W	27.09.15	10:08	16.33	91	86	100.2	513	12.17	35.41	12.07	35.42
822	62	59°54.89	002°11.02	W	27.09.15	11:10	16.06	94	89	93.8	817	12.04	35.44	11.59	35.55
823	63	59°55.06	001°51.32	W	27.09.15	12:13	17.54	101	96	106.7	1496	11.81	35.57	11.67	35.57
824	64	59°55.62	001°30.90	W	27.09.15	13:19	18.20	107	102	107.0	292	11.88	35.55	11.59	35.57
825	65	59°54.95	001°09.98	W	27.09.15	15:25	15.35	98	93	89.2	119	12.46	35.55	10.50	35.62
826	66	59°45.30	001°09.50	W	27.09.15	06:00	18.30	108	96	116.6	13	12.75	35.54	9.41	35.67
827	67	59°44.33	001°29.31	W	27.09.15	17:30	12.52	76	72	79.9	205	11.64	35.54	11.65	35.54
828	68	59°44.46	001°48.91	W	27.09.15	18:38	19.37	107	102	125.8	689	11.75	35.56	11.65	35.57
829	69	59°45.02	002°08.39	W	27.09.15	19:54	21.36	109	104	131.8	446	11.99	35.48	11.58	35.54
830	70	59°35.65	002°10.55	W	27.09.15	20:56	19.24	90	85	145.3	191	12.27	35.34	12.03	35.42
831	71	59°34.98	001°50.69	W	27.09.15	21:54	18.28	96	91	116.9	248	11.96	35.43	11.90	35.45
832	72	59°34.94	001°31.39	W	27.09.15	22:51	14.43	86	82	87.5	191	11.82	35.49	11.68	35.52
833	73	59°35.72	001°11.08	W	27.09.15	23:53	21.40	111	106	142.1	337	11.64	35.54	10.97	35.60
834	74	59°25.50	001°08.71	W	28.09.15	00:58	24.10	120	115	154.5	176	12.65	35.55	9.27	35.66
835	75	59°25.11	001°28.57	W	28.09.15	02:02	15.21	88	83	93.0	370	11.74	35.50	11.78	35.49
836	76	59°25.12	001°48.06	W	28.09.15	02:57	15.23	98	94	87.2	301	11.91	35.44	11.96	35.43
837	77	59°25.38	002°07.55	W	28.09.15	03:54	11.39	76	72	65.2	338	12.26	35.33	12.28	35.32
838	78	59°15.26	002°10.57	W	28.09.15	05:13	12.36	81	76	79.9	3453	12.45	35.22	12.41	35.26
839	79	59°14.98	001°51.60	W	28.09.15	06:09	14.18	77	72	98.8	1355	12.29	35.32	12.24	35.34
840	80	59°15.01	001°31.85	W	28.09.15	07:05	20.01	97	92	143.3	416	11.82	35.47	11.69	35.52
841	81	59°15.27	001°11.81	W	28.09.15	08:05	21.29	113	108	138.0	174	12.58	35.55	8.83	35.66
842	82	59°04.69	001°09.16	W	28.09.15	09:13	25.08	122	117	158.6	110	12.67	35.56	9.02	35.65
843	83	59°04.18	001°28.84	W	28.09.15	10:27	18.00	102	97	104.7	207	11.87	35.49	10.28	35.60
844	84	59°04.45	001°49.18	W	28.09.15	11:42	13.58	83	78	79.5	1567	12.25	35.34	12.16	35.36
845	85	59°04.36	002°09.46	W	28.09.15	12:49	13.23	82	77	76.9	1536	12.25	35.34	12.24	35.33
846	86	59°04.52	002°24.08	W	28.09.15	13:42	10.22	70	65	60.5	1349	12.51	35.21	12.51	35.20
847	87	58°55.50	002°31.00	W	28.09.15	14:52	12.58	74	69	78.0	2856	12.35	35.30	12.27	35.33
848	88	58°55.07	002°09.59	W	28.09.15	15:58	13.14	78	73	88.2	808	12.26	35.36	11.95	35.46
849	89	58°55.00	001°50.32	W	28.09.15	16:58	14.59	90	85	93.9	205	12.05	35.43	11.86	35.49
850	90	58°55.02	001°30.57	W	28.09.15	17:59	25.23	111	106	181.1	42	12.55	35.57	9.38	35.65
851	91	58°55.33	001°12.46	W	28.09.15	18:59	16.22	118	113	86.6	71	12.43	35.56	8.88	35.65
852	92	58°46.02	001°09.45	W	28.09.15	20:07	21.29	112	107	128.9	153	12.26	35.56	9.47	35.64
853	93	58°35.43	001°10.29	W	28.09.15	21:16	20.17	108	103	134.0	368	12.10	35.45	9.97	35.63
854	94	57°55.86	000°50.23	W	29.09.15	01:01	17.15	97	92	105.8	8	12.36	35.52	10.57	35.60
855	95	57°54.73	001°08.20	W	29.09.15	02:19	19.24	107	102	124.6	18	12.38	35.43	11.13	35.56
856	96	57°55.15	001°29.39	W	29.09.15	03:31	18.47	101	97	115.1	22	12.32	35.35	11.91	35.44
857	97	57°45.72	001°30.98	W	29.09.15	04:39	11.41	72	67	74.0	299	12.35	35.23	12.37	35.23

Table 1 continued

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)	T (°C)	Sal (psu)	T (°C)	Sal (psu)
858	98	57°45.00	001°10.04	W	29.09.15	05:48	17.24	98	93	107.6	6	12.33	35.36	11.53	35.53
859	99	57°45.31	000°51.60	W	29.09.15	06:50	16.35	109	97	104.3	6	12.36	35.49	10.96	35.56
860	100	57°35.73	000°49.41	W	29.09.15	08:00	20.38	102	97	136.3	133	12.22	35.31	11.96	35.37
861	101	57°34.94	001°08.55	W	29.09.15	09:09	21.11	98	93	138.6	19	12.29	35.29	12.08	35.33
862	102	57°34.68	001°28.76	W	29.09.15	10:18	12.10	78	74	68.0	288	12.41	35.19	12.36	35.20
863	103	57°25.55	001°29.67	W	29.09.15	11:16	16.39	92	87	102.6	239	12.49	35.16	12.35	35.21
864	104	57°24.96	001°11.51	W	29.09.15	12:24	15.13	83	78	89.4	564	12.28	35.27	12.22	35.27
865	105	57°25.00	000°51.25	W	29.09.15	13:22	10.59	71	66	63.4	520	12.22	35.30	12.06	35.32
866	106	57°25.03	000°31.38	W	29.09.15	14:57	14.41	83	79	93.7	389	12.38	35.31	11.88	35.39
867	107	57°25.51	000°11.66	W	29.09.15	16:02	13.33	78	74	91.8	255	12.41	35.35	11.74	35.39
868	108	57°15.49	000°09.19	W	29.09.15	17:10	14.34	80	75	96.7	71	12.40	35.26	11.72	35.42
869	109	57°15.18	000°28.43	W	29.09.15	18:15	13.56	76	71	99.5	374	12.12	35.27	11.97	35.34
870	110	57°15.05	000°48.39	W	29.09.15	19:22	10.41	72	67	67.1	1040	12.18	35.23	12.19	35.23
871	111	57°15.03	001°07.84	W	29.09.15	20:27	14.06	75	70	94.8	954	12.23	35.21	12.24	35.22
872	112	57°14.98	001°28.88	W	29.09.15	21:39	13.01	73	68	80.0	641	12.35	35.20	12.36	35.20



(Dr. Norbert Rohlf)

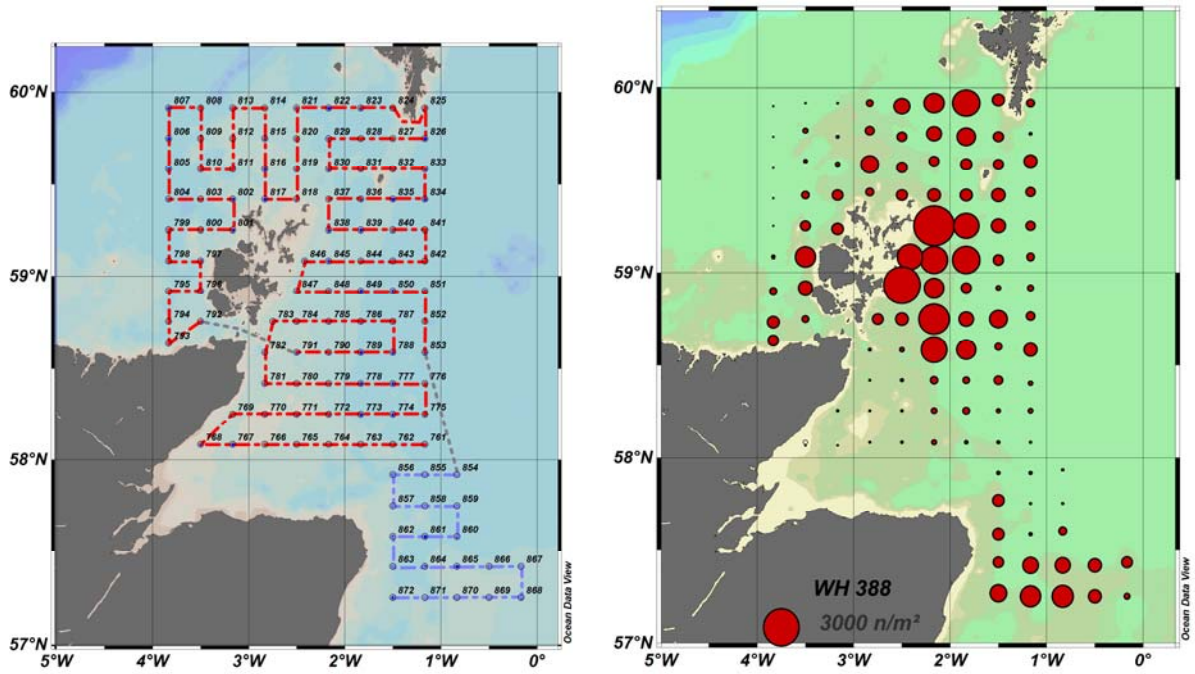


Figure 1: Cruise track in Orkney/Shetlands (dotted red line) and the Buchan area (dotted blue), (by station number, left panel) and corresponding abundance of herring larvae in the Orkney/Shetland and Buchan area (n/m², right panel). The symbol size corresponding to 3000 larvae per square metre is indicated in the figure.

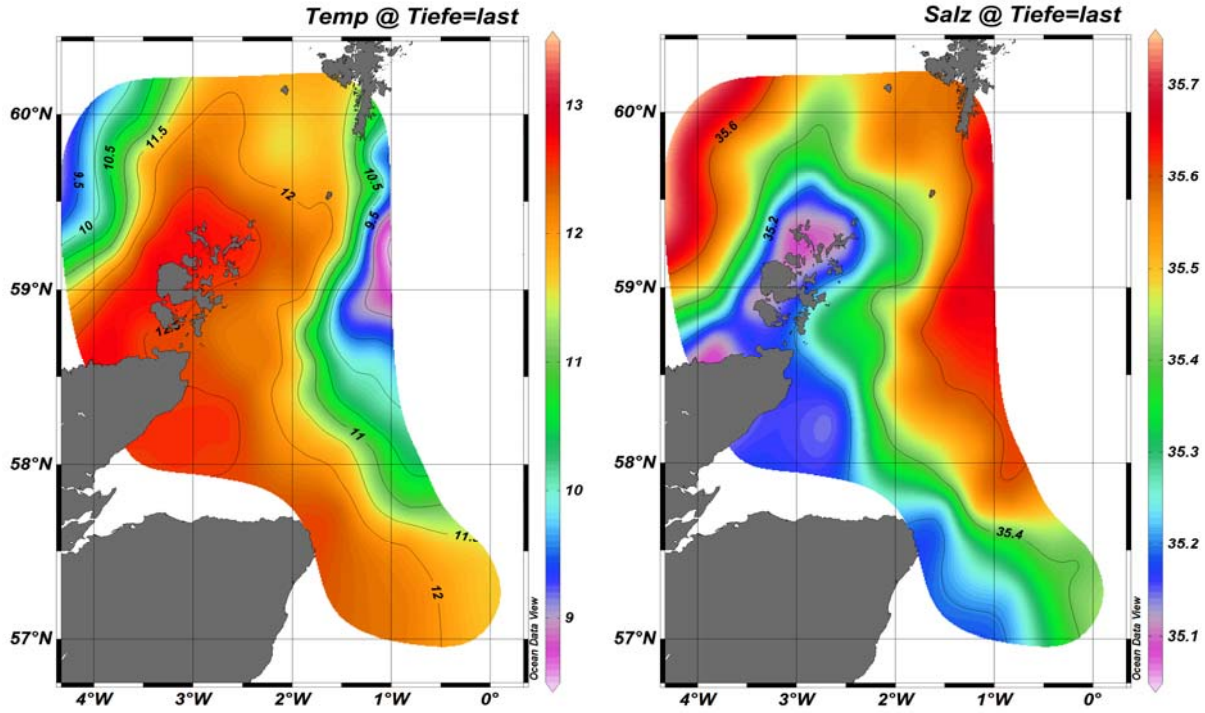


Figure 2: Distribution of near-bottom temperature (°C, left panel) and salinity (psu, right panel) in the area under investigation