

Institute of Sea Fisheries

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Cruise report
FRV "Walther Herwig III"
Cruise 361
02.01. – 11.01.2013

**International Herring Larvae Survey in the North Sea
and German Small-scale Bottom Trawl Survey**

Scientist in charge: Dr. Norbert Rohlf

Summary

The cruise had two main objectives. The first part was the German contribution to the international herring larvae surveys in the North Sea (IHLS). These surveys are conducted annually during the autumn and winter herring spawning activity and monitor the spatial distribution and abundance of herring larvae. 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 could be covered as scheduled. Large quantities of newly hatched larvae were found in the survey area. 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 2013.

The second objective, the German Small-scale Bottom Trawl Survey (GSBTS), continued the long-term investigation of winter bottom fish assemblages through sampling of the standard area „Box A“ in the German Bight. The mean catch yielded more fish biomass compared to the period 2007-2011. Within the 10-by-10 nautical mile area, the small-scale survey with a GOV bottom trawl was accompanied by monitoring of the benthic epifauna with a 2-m beam trawl. Compared to preceding years, high abundances of juvenile starfish (*Asterias rubens*) and solenette (*Buglossidium luteum*) disappeared, while contrary high abundances of the brittle stars *Ophiura ophiura* and *O. albida* were found. High abundances of brittle stars are a characteristic result of colder winter temperatures in preceding years.

Verteiler:

TI - Institut für Seefischerei
Saßnitzer Seefischerei e. G.
DFFU

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per E-Mail:

Bundesanstalt für Landwirtschaft und Ernährung, Hamburg
Schiffsführung FFS "Walther Herwig"
BMELV, Ref. 614
BMELV, Ref. 613
TI - Präsidialbüro (Michael Welling)
TI - Verwaltung Hamburg
TI - Institut für Fischereiökologie
TI - Institut für Ostseefischerei Rostock
TI - FIZ-Fischerei
TI - PR
MRI - BFEL HH, FB Fischqualität

2. Research programme

2.1 Herring larvae survey

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

The whole survey area could be sampled as scheduled, 67 plankton tows in total. 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.

2.2 Monitoring (TI-SF)

21 GOV hauls were taken to qualitatively and quantitatively analyze the development of abundance and diversity in the bottom fish assemblages. Methods are in accordance with the International Bottom Trawl Survey, in order to allow comparison of results between the two surveys. Epibenthos sampling with a 2-m beam trawl complemented the GOV hauls in order to allow simultaneous investigations of benthic invertebrates and bottom fish.

2.3 Measurement of relevant environmental parameters (TI-SF, University of Hamburg)

15 temperature and salinity profiles were taken with a Seabird CTD. Nine additional water samples for nutrient analyses were obtained by a rosette sampler. The analyses will be done at the University of Hamburg.

2.4 Epibenthos (Senckenberg Research Institute, Wilhelmshaven)

The 2-m beam trawl for the sampling of epibenthos had a mesh size of 20 x 20 mm in the main net and 4 x 4 mm in the cod end and was applied with 5-min towing duration at 1.5 knots. Samples were sieved over 5 and 2 mm, before the > 5-mm fraction was sorted on board, and the 2-5 mm fraction preserved in alcohol for later analyses in the laboratory. Selected species were taken from the GOV and beam-trawl hauls and preserved in alcohol for further genetic analysis (barcoding).

Investigations of epibenthos were accompanied by sampling of sediments using a 0.1 m² Van Veen grab for the analysis of sediment composition and total organic carbon (TOC).

3. Narrative

FRV "Walther Herwig III" left Bremerhaven at 4:30 p.m. on Wednesday, 01/02/13. The area of investigation was reached the next day at noon. Plankton sampling could be conducted as planned and was finished three days later. In total, 67 plankton tows were done without any disturbance due to weather or technical malfunctions.

The vessel steamed into the German Bight, where the fish and benthos monitoring was conducted within three days (01/07 – 01/09) in the area of investigation in Box A. The programme could be completed as planned, with 21 randomly assigned GOV trawl hauls and nine beam trawls and grab samples. The field work was finished in the late afternoon, 01/09/13. FRV "Walther Herwig III" was back in the port of Bremerhaven the same evening at 9:00 p.m.

4. Preliminary results

4.1 Ichthyoplankton (TI-SF)

Fish eggs and larvae were sorted from the plankton samples after the end of the cruise. Herring larvae were counted and length measured to millimetre below and their abundance per square metre estimated.

The samples yielded high numbers of herring larvae, in total 34,260 larvae. Species identification of the remaining fish larvae is not finished yet as is the identification of eggs.

The cruise track by haul number is given in Figure 1 and the spatial distribution of herring larvae in Figure 2. Abundance estimates and available physical parameters are listed in Table 1. Herring larvae length-frequencies are plotted in Figure 3. Figure 4 depicts the distribution of near-bottom water temperature and salinity.

4.2 Bottom Fishes (TI-SF)

The mean total catch of all bottom fishes in Box A (Figure 5) amounted to 179 kg per 30-min haul. This is much higher compared to the years 2007-2011 (there was no survey in Box A in 2012) and more in line with the period 2001-2006 (Figure 6). Herring (*Clupea harengus*), dab (*Limanda limanda*) and sprat (*Sprattus sprattus*) dominated the catches with on average 75, 70 and 24 kg/haul, respectively. The biomass of the three species has also increased compared to the last five years. Cod (*Gadus morhua*), plaice (*Pleuronectes platessa*) and flounder (*Platichthys flesus*) were caught with 4.1 (cod), 2.2 (plaice) and 1.4 (flounder) kg/30 min. haul.

4.3 Epibenthos (Senckenberg, Wilhelmshaven)

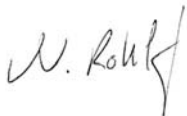
Nine beam trawl hauls and nine van Veen grab samples were taken in Box A. The sediment consisted of muddy fine sand. The epifauna in Box A was dominated by high numbers of the goby *Pomatoschistus minutus* as well as the shrimps *Crangon allmanni* and *Crangon crangon*. High abundances of *Processa* spp. occurred in the samples taken in the morning. Compared to preceding years, high abundances of juvenile starfish (*Asterias rubens*) and solenette (*Buglossidium luteum*) disappeared, while contrary high abundances of the brittle stars *Ophiura ophiura* and *O. albida* were found. High abundances of brittle stars are a characteristic result of colder winter temperatures in previous years.

5. Participants

Name	Institution	Function
1. Norbert Rohlf	TI-SF	Cruise leader
2. Birgit Suer	TI-SF	Technician
3. Julia Wolske	TI-SF	Technician
4. Ulrike Bräuer	TI-SF	Student
5. Inken Rottgardt	TI-SF	Student
6. Annabel Schuhn	TI-SF	Volunteer
7. Dr. Hermann Neumann	Senckenberg	Scientist
8. Kristina Gall	Senckenberg	Volunteer

6. Acknowledgement

Thanks to Captain Hans-Otto Janßen and FRV "Walther Herwig III" crew members for their great 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 361

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)	Surface		Bottom	
												T (°C)	Sal (psu)	T (°C)	Sal (psu)
1	1	52°25.56	003°30.83	E	03.01.13	11:06	4.40	29	26	24.2	56	8.80	34.85	8.8	35.0
2	2	52°25.03	003°10.77	E	03.01.13	12:11	7.2	40	37	42.9	222	9.34	35.17	9.3	35.2
3	3	52°23.05	002°50.82	E	03.01.13	13:13	5.47	35	32	34.9	32	9.75	35.30	9.8	35.3
4	4	52°15.51	002°30.79	E	03.01.13	14:32	7.31	42	39	47.7	2	10.18	35.28	10.2	35.3
5	5	52°14.97	002°49.19	E	03.01.13	15:38	7.07	41	38	43.1	343	9.85	35.30	9.8	35.3
6	6	52°15.06	003°09.74	E	03.01.13	16:42	5.47	35	32	33.4	494	9.20	35.13	9.2	35.2
7	7	52°14.90	003°29.77	E	03.01.13	14:42	4.32	26	23	28.0	277	8.80	34.95	8.8	35.0
8	8	52°14.98	003°48.15	E	03.01.13	18:38	3.46	25	22	22.6	155	8.16	34.71	8.2	34.7
9	9	52°05.67	003°50.70	E	03.01.13	19:55	3.50	25	22	21.8	197	7.46	34.07	7.5	34.1
10	10	52°04.92	003°31.91	E	03.01.13	21:06	3.56	25	22	24.0	533	8.62	34.77	8.6	34.8
11	11	52°04.96	003°11.38	E	03.01.13	22:08	5.13	32	29	31.8	1049	9.33	35.10	9.3	35.1
12	12	52°04.90	002°50.12	E	03.01.13	23:16	7.32	39	36	45.3	1046	9.96	35.27	10.0	35.3
13	13	52°05.01	002°30.36	E	04.01.13	00:20	7.35	42	39	47.6	598	10.33	35.29	10.3	35.3
14	14	51°55.41	002°29.93	E	04.01.13	01:09	6.53	38	35	44.3	1740	10.32	35.27	10.3	35.3
15	15	51°45.32	002°10.44	E	04.01.13	02:27	9.21	48	45	58.2	968	10.56	35.29	10.6	35.3
16	16	51°35.61	002°09.89	E	04.01.13	03:25	6.35	37	34	39.6	744	10.55	35.30	10.6	35.3
17	17	51°35.15	001°50.46	E	04.01.13	04:40	6.42	39	36	37.5	599	10.24	35.22	10.3	35.2
18	18	51°25.45	001°50.59	E	04.01.13	05:45	7.54	44	41	46.6	604	10.49	35.27	10.5	35.3
19	19	51°15.27	001°50.06	E	04.01.13	06:42	8.37	41	38	51.9	451	10.74	35.32	10.7	35.3
20	20	51°05.54	001°31.37	E	04.01.13	08:07	8.58	51	48	52.8	744	10.54	35.27	10.5	35.3
21	21	50°54.84	001°11.23	E	04.01.13	09:26	4.55	33	31	28.7	297	10.65	35.29	10.7	35.3
22	22	50°45.55	001°09.65	E	04.01.13	10:13	3.59	28	25	23.5	259	10.84	35.33	10.9	35.3
23	23	50°45.03	000°50.81	E	04.01.13	11:11	5.34	35	32	34.8	94	10.00	35.05	10.2	35.2
24	24	50°35.36	000°49.99	E	04.01.13	12:02	7.48	43	40	49.2	504	10.96	34.93	11.0	35.3
25	25	50°35.06	000°30.71	E	04.01.13	13:14	10.43	55	52	64.5	163	10.67	35.27	10.7	35.3
26	26	50°27.61	000°29.96	E	04.01.13	14:01	8.21	46	43	48.0	335	10.96	35.29	11.0	35.3
27	27	50°25.08	000°10.74	E	04.01.13	15:12	9.48	52	49	56.2	103	10.93	35.33	10.9	35.3
28	28	50°16.09	000°09.97	E	04.01.13	16:06	8.35	45	42	51.8	1712	11.08	35.34	11.1	35.3
29	29	50°14.96	000°09.27	W	04.01.13	17:08	12.00	53	50	74.9	830	10.99	35.23	11.0	35.4
30	30	50°04.99	000°09.79	W	04.01.13	18:05	9.17	48	45	55.7	293	11.07	35.31	11.1	35.3
31	31	50°05.05	000°29.54	W	04.01.13	19:06	9.02	46	43	53.9	1336	11.10	35.35	11.1	35.4
32	32	49°55.92	000°30.20	W	04.01.13	19:56	8.16	44	41	48.1	17	11.04	35.22	11.0	35.3
33	33	49°43.34	000°29.98	W	04.01.13	20:51	6.35	38	35	40.0	7	10.47	35.02	10.6	35.1
34	34	49°34.94	000°30.22	W	04.01.13	21:44	4.12	29	26	24.3	5	9.91	34.69	9.9	34.7
35	35	49°35.01	000°13.94	W	04.01.13	22:36	4.24	27	24	28.3	2	9.04	30.56	9.4	33.7
36	36	49°44.52	000°09.99	W	04.01.13	23:26	7.28	37	34	43.8	2	9.86	34.13	10.1	34.7
37	37	49°54.38	000°10.59	W	05.01.13	00:18	9.00	45	42	55.0	19	10.82	35.20	10.9	35.2
38	38	49°45.87	000°07.99	E	05.01.13	01:35	4.56	31	28	31.7	1	9.38	32.43	9.4	33.0
39	39	49°54.44	000°09.96	E	05.01.13	02:20	7.46	38	35	46.9	14	9.92	34.18	10.0	34.2
40	40	50°04.67	000°09.63	E	05.01.13	03:12	8.24	43	40	51.0	6037	10.85	35.21	10.9	35.2
41	41	50°14.70	000°29.68	E	05.01.13	04:31	7.36	43	40	42.6	1776	10.86	35.26	10.9	35.3
42	42	50°05.82	000°29.28	E	05.01.13	05:29	6.28	38	35	39.9	127	10.55	35.00	10.5	35.0
43	43	49°55.22	000°29.25	E	05.01.13	06:24	4.53	30	27	29.3	27	9.30	33.04	9.3	33.1
44	44	49°56.39	000°44.94	E	05.01.13	07:22	3.37	26	23	20.0	16	9.18	32.60	9.2	32.9
45	45	50°04.86	000°49.93	E	05.01.13	08:10	4.18	29	27	27.1	82	9.66	34.36	9.7	34.5
46	46	50°14.81	000°50.10	E	05.01.13	09:01	5.54	35	32	35.7	105	10.24	35.07	10.2	35.1
47	47	50°24.82	000°49.71	E	05.01.13	09:55	5.25	33	30	33.6	137	10.77	35.20	10.8	35.3
48	48	50°15.28	001°09.10	E	05.01.13	11:12	5.52	29	23	36.5	28	9.65	34.32	9.7	34.5

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)
49	49	50°24.64	001°10.04	E	05.01.13	12:06	4.34	29	26	30.5	81	9.78	34.63	10.3	35.1
50	50	50°32.86	001°10.10	E	05.01.13	12:49	5.34	34	31	33.3	230	10.51	35.15	10.6	35.2
51	51	50°35.43	001°22.34	E	05.01.13	13:41	6.23	32	29	39.9	164	9.77	34.48	9.9	34.7
52	52	50°44.67	001°25.07	E	05.01.13	14:35	7.19	43	40	43.0	218	10.04	34.67	10.4	34.9
53	53	50°54.87	001°30.24	E	05.01.13	15:25	8.13	47	44	50.6	649	9.69	34.42	10.5	35.1
54	54	51°05.45	001°49.39	E	05.01.13	16:34	5.27	32	29	30.8	121	9.69	34.65	9.7	34.7
55	55	51°14.90	002°09.59	E	05.01.13	17:41	5.52	37	34	34.0	139	10.01	35.00	9.9	35.0
56	56	51°27.74	002°10.14	E	05.01.13	18:32	6.03	38	33	33.4	205	10.35	35.23	10.4	35.2
57	57	51°22.97	002°22.88	E	05.01.13	19:18	4.41	31	28	28.7	175	10.03	35.11	10.0	35.1
58	58	51°24.82	002°49.72	E	05.01.13	20:48	3.41	23	20	23.6	35	10.03	35.11	10.0	35.1
59	59	51°34.79	002°50.58	E	05.01.13	21:36	3.49	25	22	22.4	163	9.53	35.05	9.6	35.1
60	60	51°34.73	002°30.01	E	05.01.13	22:40	5.34	31	28	31.1	110	10.04	35.08	10.1	35.2
61	61	51°44.55	002°29.93	E	05.01.13	23:31	5.39	34	31	32.7	430	10.27	35.25	10.3	35.3
62	62	51°54.66	002°49.48	E	06.01.13	00:53	5.59	34	31	34.4	904	9.96	35.26	10.0	35.3
63	63	51°45.58	002°49.96	E	06.01.13	01:43	5.01	29	26	30.9	333	9.73	35.11	9.7	35.1
64	64	51°45.03	003°09.34	E	06.01.13	02:47	3.02	22	19	17.7	411	9.19	35.03	9.0	34.9
65	65	51°55.23	003°09.24	E	06.01.13	03:47	4.51	29	26	28.5	936	8.49	34.68	9.2	35.0
66	66	51°55.43	003°29.48	E	06.01.13	04:52	3.16	25	22	17.3	1116	7.44	30.45	8.5	34.7
67	67	52°14.75	004°09.82	E	06.01.13	07:22	3.19	21	18	20.1	115	9.78	34.63	7.6	33.2

Tab 2: Boundaries of Box A in the German EEZ

LAT		LON		Center	
From	to	from	to		
54°17,00´ N	54°27,00´ N	006°58,00´ E	007°15,00´ E	54°22,00´ N	007°06,50´ E

Tab.3: Type and amount of samples obtained in Box A

Number of stations	GOV	2-m Beam trawl	Hydrography	Nutrients	Sediment + Meiofauna
9	X	X	X	X	X
6	X		X		
6	X				
	21	9	15	9	9

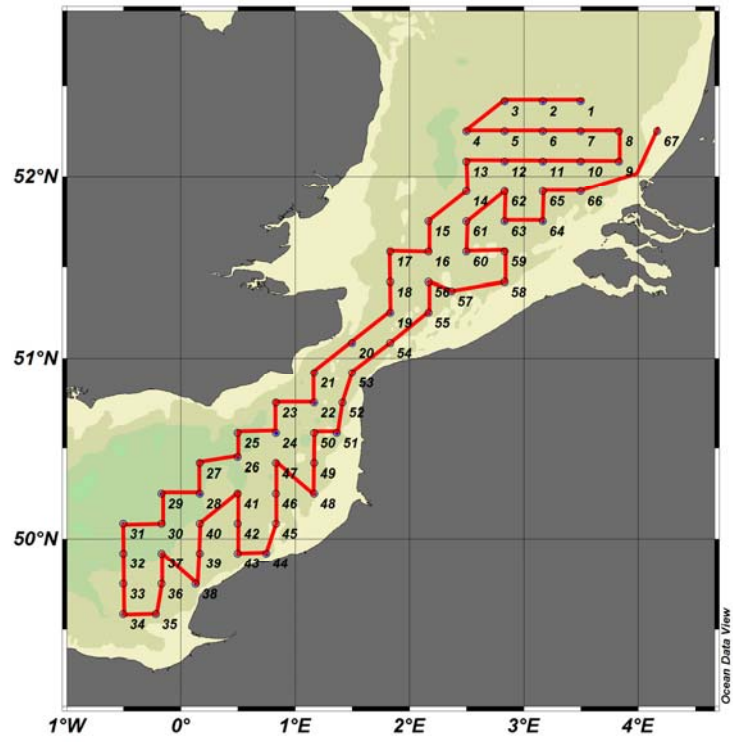


Figure 1: Cruise track (by haul number) in the southern North Sea and the English Channel.

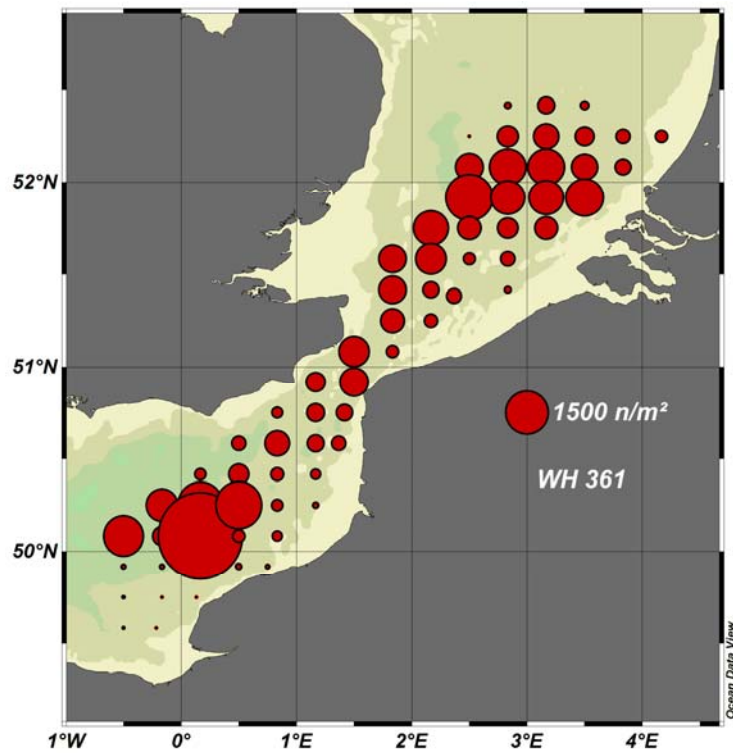


Figure 2: Corresponding abundance of herring larvae (n/m^2). The circle size equivalent to 1500 larvae per square metre is indicated.

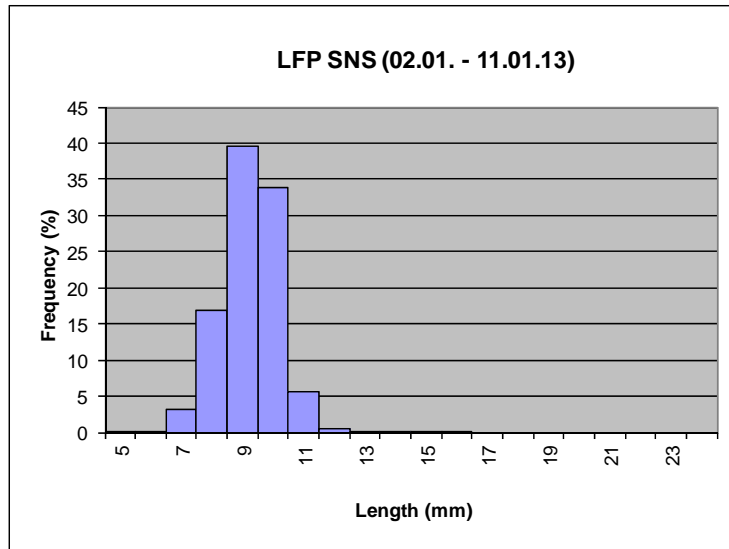


Figure 3: Length-frequency plot of herring larvae (mm) caught in the southern North Sea.

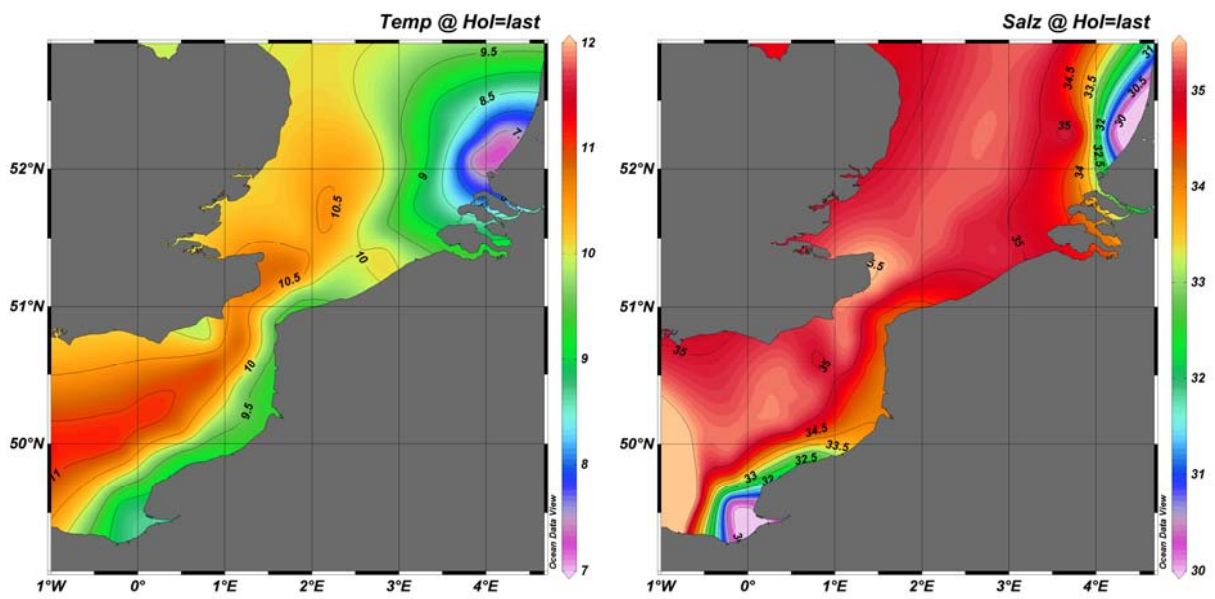


Figure 4: Distribution of near-bottom temperature ($^{\circ}\text{C}$, left panel) and salinity (psu, right panel) in the southern North Sea.

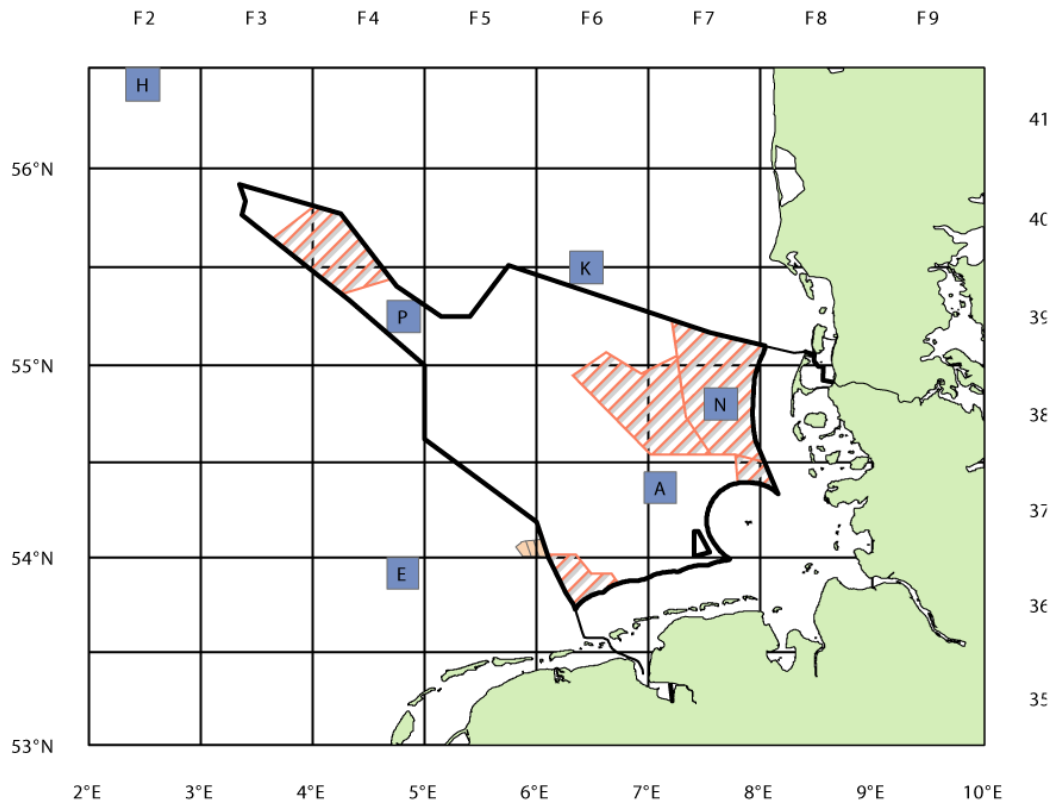


Figure 5: Location of Box A in the German EEZ

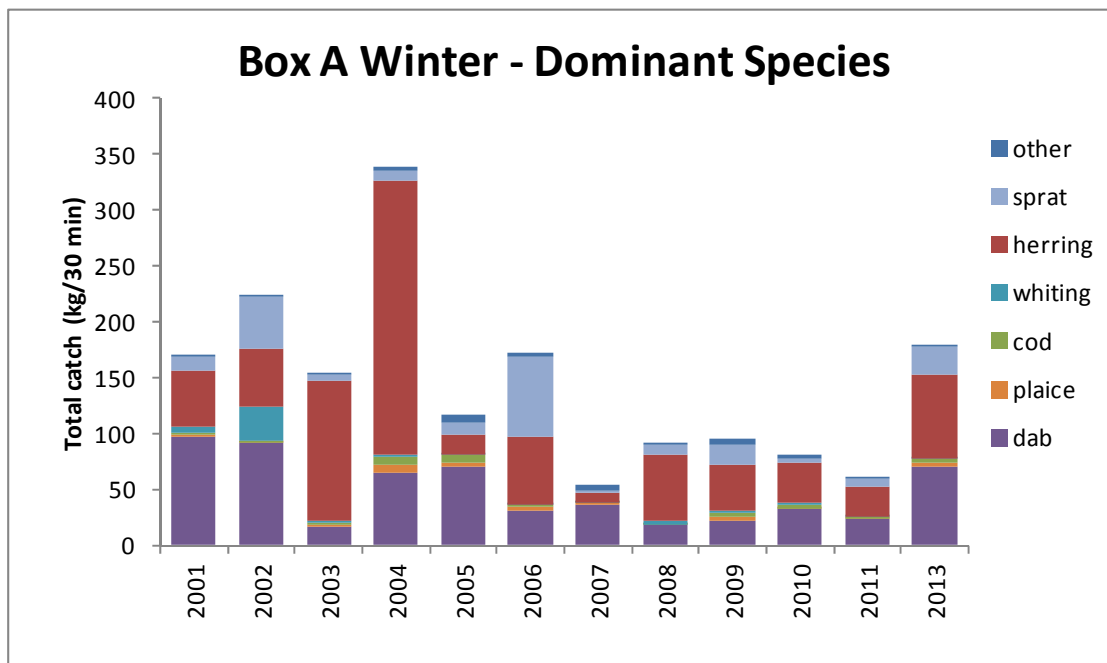


Figure 6: Catch ratios (kg/30min) in Box A in the German Bight from January 2001 to January 2013.