

**FRV Walther Herwig III
Cruise 377
28.08. – 17.09.2014**

**Integrated Monitoring of Contaminants and their Biological
Effects (INMON)**

NATO project MODUM

Scientist in Charge: Dr. Thomas Lang

Summary

As part of the integrated monitoring programme of the Thünen Institute of Fisheries Ecology (FI) on contaminants and biological effects (incl. fish diseases) in fish from the North Sea and Baltic Sea, studies were carried out in eight Baltic Sea and seven North Sea areas. In addition to the onboard examination of dab (*Limanda limanda*), flounder (*Platichthys flesus*) and cod (*Gadus morhua*) for externally visible diseases and parasites, a large range of fish samples were taken for a subsequent analysis of contaminants and their biological effects. As part of the NATO-funded MODUM project (2013-2016), extensive studies were carried out on the health status of cod in dumping areas for chemical munitions and reference areas. Samples of diverse fish species were frozen for studies on radionuclides and for contaminant analyses in the framework of national and international marine monitoring programmes (BLMP, OSPAR, HELCOM). Hydrographical measurements were carried out (water temperature, salinity, oxygen content, turbidity). The following preliminary findings were noted:

Dab: No new trends of disease prevalence in the North Sea and Baltic Sea; as in 2013, increasing prevalence of some diseases on a north-westerly transect in the German North Sea EEZ from the inner German Bight to the Dogger Bank;

Flounder: no new trends regarding disease prevalence;

Baltic cod: Again, low prevalence of acute/healing skin ulcerations and skeletal deformities; nematodes in the body cavity in all Baltic Sea areas, especially in sampling areas east of Bornholm; Increase in prevalence of *Loma morhua* (= *branchialis*) in the gills, but very likely due to the application of more accurate examination procedures; cod east of Bornholm were characterized by a markedly lower condition factor than cod west of Bornholm.

Participants:

Name	Function	Institution
Dr. Thomas Lang	Scientist in Charge	TI-FI Cuxhaven
Jennifer Ipse	Technician	TI-FI Cuxhaven
Alexander Schulz	Technician	TI-FI Hamburg
Jan Neukirchen	Scientist	TI-FI Hamburg
Dr. Marc-Oliver Aust	Scientist	TI-FI Hamburg
Dr. Victoria Magath	Scientist	TI-FI Hamburg
Horst Bahl	Scientist	TI-FI Hamburg
Lina Weirup	Student	University Hamburg
Kolja Franssen	Student	University Hamburg
Christoph Rummel	Volunteer	University Mainz
Shauna Grassmann	Volunteer	University Göttingen
Bianca Haas	Volunteer	University Graz

Objectives of the Cruise

1. Studies on fish diseases and parasites in the North Sea and Baltic Sea;
2. Studies on biological effects of contaminants;
3. Studies for the MODUM project;
4. Sampling of fish for chemical analysis of contaminants;
5. Hydrographical measurements (salinity, temperature, oxygen, turbidity).

Dates of the Cruise

FRV Walther Herwig III left Bremerhaven in the early afternoon of 28.08. and sailed to the first sampling area in the North Sea, where work started in the morning of 29.08. in area GB1. After the passage of Kiel Channel, technical problems had to be fixed in Kiel. In the afternoon of 31.08., work started in the Baltic Sea in area B01 (Kiel Bight). The next morning, a member of the scientific staff was taken on board from FRV Clupea off Saßnitz and work was resumed in area B11. In the following days, sampling was conducted in areas BHB, B09, B15, B14, B13, B10 and B01. In the evening of 08.09., after the end of the Baltic Sea programme, Walther Herwig III arrived in Kiel due to the need for medical treatment of a crew member.

On 09.09., WHIII again passed Kiel Channel. In the period 10.-15.09., sampling was continued in five North Sea areas (N01, GB4, P02, N06, N04, GB3). In the evening of 16.09., WH III arrived in Bremerhaven, where the cruise ended in the morning of 17.09. according to schedule.

The location of the sampling areas and the cruise dates are shown in Fig. 1 and 2 and Tab. 1. In 15 sampling areas (Fig. 1), a total of 59 fishing hauls was performed (towing time 30–60 min. each) (geographical coordinates in Tab. 1, catch composition in Tab. 2). In the Baltic Sea, a 140 ft bottom trawl and a pelagic PSN 205 net were used, in the North Sea a GOV net, all with standard configuration. Hydrographical measurements were made at all fishery stations (geographical coordinates in Tab. 1a, results in Tab. 3).

Preliminary Results

1 Dab (*Limanda limanda*)

In total, 4,919 dab (total length ≥ 10 cm below) from one Baltic Sea and six North Sea areas were examined for the occurrence of externally visible diseases and parasites (Tab. 4) and 641 dab (total length ≥ 20 cm below) for the occurrence of liver anomalies (Tab. 5).

The prevalence of some diseases in the North Sea was comparable with those from previous cruises in 2013. The prevalence of lymphocystis was in range of 0.3 - 16.9 %, with the lowest value in the inner German Bight (area GB1) and the highest values off the Scottish coast (area N06). The prevalence of epidermal hyperplasia/papilloma was in the range of 0.5 % (inner German Bight, area GB1) to 4.6% (south-eastern Dogger Bank, area GB4). Marked regional variation was again recorded for hyperpigmentation, with values between 6.0 % (inner German Bight, area GB1) to 58.0 % (south-eastern Dogger Bank, area GB4). The strongest regional differences were noted for the parasite *Stephanostomum baccatum* (juvenile digenean trematode under the skin), the prevalence of which ranged from 2.4 % (inner German Bight, area GB1) to 99.5 % (Ekofisk, area P02).

For the majority of diseases, there was a prevalence gradient – as during the previous cruises in 2013 - in the German EEZ in north-westerly direction, with increasing values from the inner German Bight (area GB1) to the south-eastern Dogger Bank (area GB4) (see Fig. 3. and Tab. 4). When interpreting this finding, it has to be taken into account that the mean size of the dab examined increased in north-westerly direction, too, possibly affecting the prevalence, but not exclusively responsible for the gradient recorded.

The prevalence of liver nodules >2 mm (= tumours and pre-stages) was low and comparable to values recorded during previous cruises in 2013. For dab of the size range 20-24 cm total length, the prevalence was in the range of 0.0 % (inner German Bight, area GB1) to 9.1 % (south-eastern

Dogger Bank, area GB4), for dab of the size group ≥ 25 cm the prevalence ranged from 0.0 % (Scottish coast, area N06) to 28.0 % (Dogger Bank, area N04).

Baltic Sea dab from Kiel Bight (area B01) displayed differences in disease prevalence to the North Sea dab especially for hyperpigmentation and the parasites *Stephanostomum baccatum*, *Acanthochondria cornuta* (copepode on the gills) and *Lepeophtheirus pectoralis* (copepode on the skin and under the pectoral fins). These diseases/parasites are extremely rare in the Baltic Sea. The prevalence of the other diseases recorded does not differ from the North Sea in contrast.

2 Flounder (*Platichthys flesus*)

1,099 flounder from six Baltic Sea areas and one of the North Sea areas (inner German Bight, area GB1) were examined for the occurrence of externally visible diseases and parasites (Tab. 6). The prevalence of lymphocystis in the Arkona Sea was low compared to the previous cruise in winter 2013 (WH 370, 30.11.-20.12.2013) (area B10: 15.8 %; area B11: 15.6 %). For *Lepeophtheirus pectoralis*, the marked regional pattern previously known was confirmed. A high prevalence occurred in the inner German Bight (90.6 %; area GB1, North Sea) and Kiel Bight (42.6 %; area B01, Baltic Sea), whereas flounder from all other areas were not affected.

3 Cod (*Gadus morhua*)

In total, 3,986 cod from eight Baltic Sea areas and one North Sea area were examined for externally visible diseases and parasites and for nematodes in the body cavity (Tab. 7). The disease prevalence was low in general, and for acute/healing stages it ranged from 0.0 % (Kiel Bight, area B01) to 10.2 % (Arkona Sea, area B11). Skeletal deformities were rare, too, with maximum values of 2.7 % (in Gdansk Deep, area B15). The prevalence of the gill parasite *Loma morhua* (= *branchialis*) was higher compared to previous cruises; very likely due to the application of improved and more accurate examination techniques. Larval nematodes in the body cavity were recorded in cod from all Baltic Sea areas, with the highest prevalence in the sampling areas east of Bornholm (exception: Kiel Bight, area B01). It is not yet clear if this infestation is linked to the bad fitness of the eastern cod (fishes are lean and have low condition factors; see Fig. 3). Markedly lower condition factors were recorded in cod from the major dumpsite for chemical warfare agents in the Bornholm Basin (area B13).

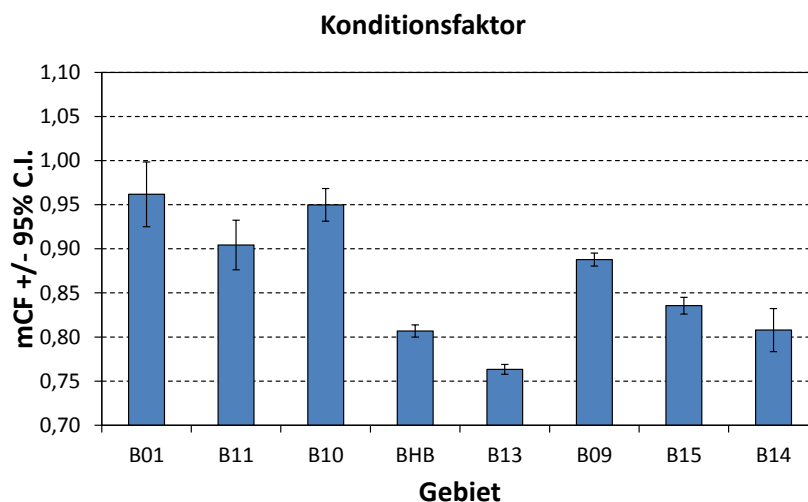


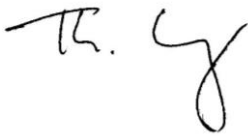
Fig. 3: Cruise 377 RV „Walther Herwig III“, 28.08. – 17.09.2014:
Mean condition factors of cod (with 95 % confidence intervals)
(CF = [total weight/length³]*100)

4 Miscellaneous

The mean catch data of the most frequent fish species are provided in Tab. 2; Tab. 3 gives results of the hydrographical measurements.

Acknowledgements

Thanks are due to Captain Vandrei and his crew and to the scientific staff for constructive and hard work and a very good atmosphere on board.

A handwritten signature in black ink, appearing to read 'Th. Lang'.

Dr. Thomas Lang

(Scientist in Charge)

Annex

3 Figures, 7 Tables

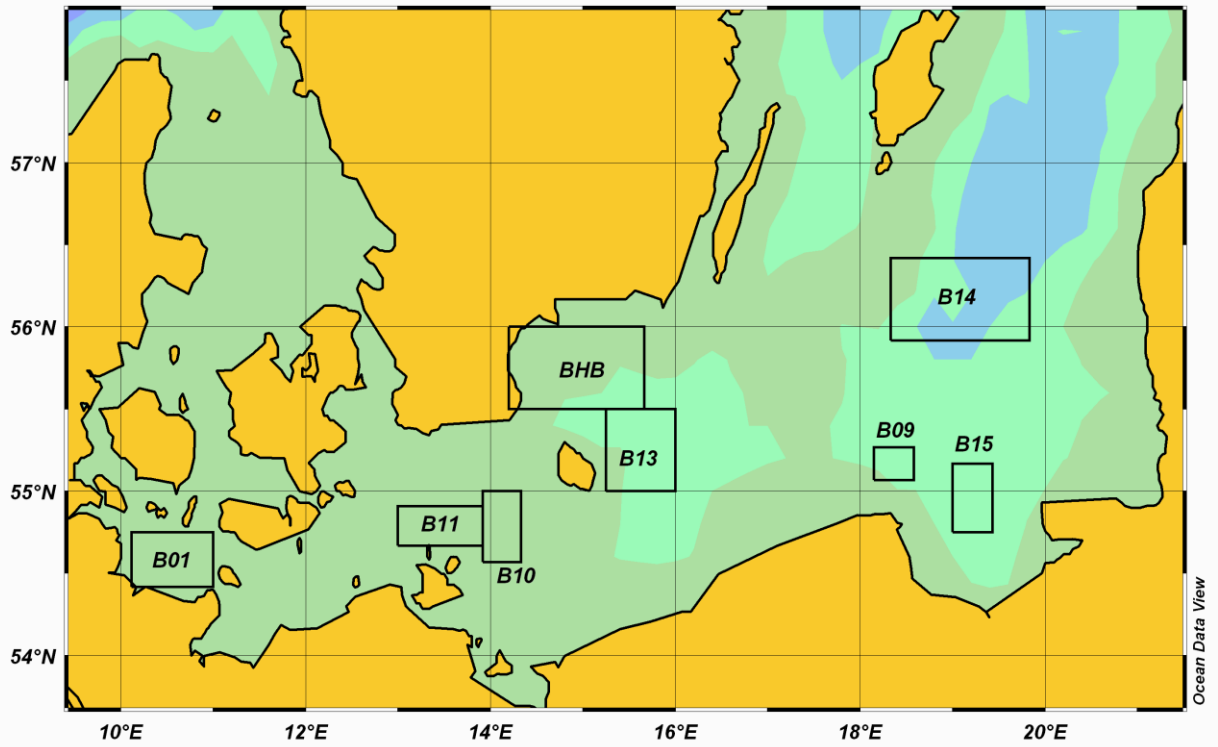


Fig. 1: *Cruise 377 RV 'Walther Herwig III', 28.08. – 17.09.2014:*
Location of sampling sites in the Baltic Sea

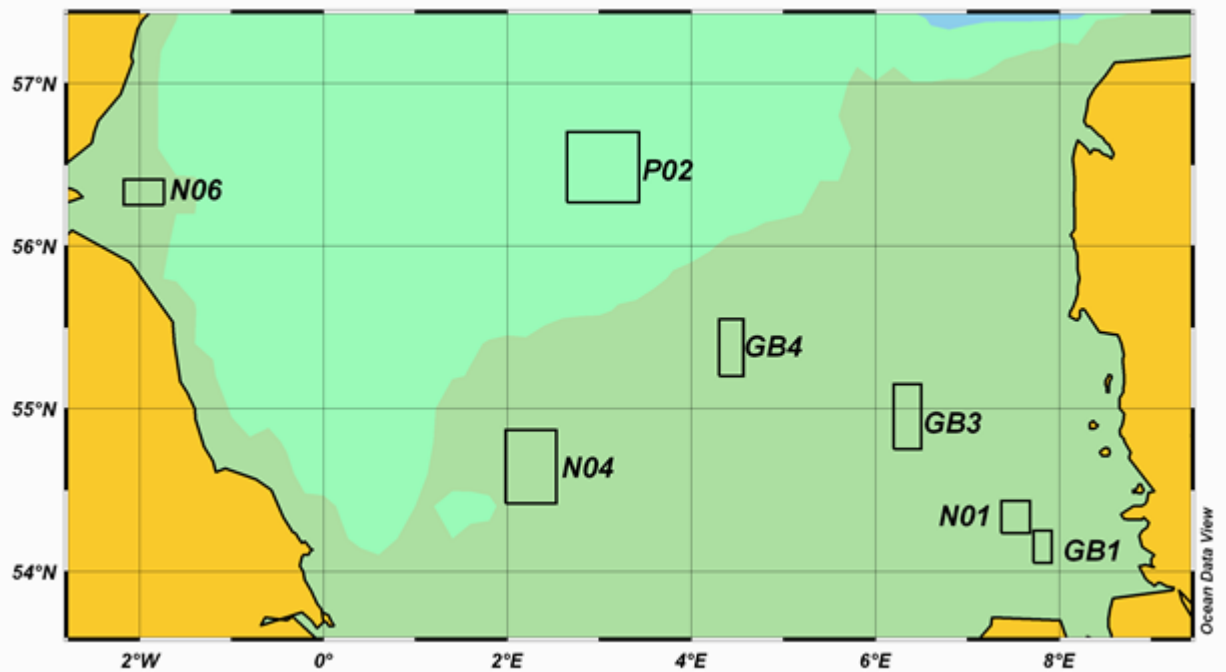


Fig. 2: *Cruise 377 RV 'Walther Herwig III', 28.08. – 17.09.2014:*
Location of sampling sites in the North Sea

Tab. 1: *Cruise 377 RV 'Walther Herwig III', 28.08. – 17.09.2014:*
Geographical coordinates of trawling stations in the Baltic Sea and North Sea

DATE	STATION	Area	ICES-RECTANGLE	Latitude	Longitude	B: Bottom trawl P: Pelagic trawl
29.08.14	1	GB1	37F7	54°04,65N	07°53,09E	B
29.08.14	2	GB1	37F7	54°06,55N	07°46,82E	B
29.08.14	3	GB1	37F7	54°04,58N	07°53,48E	B
29.08.14	4	GB1	37F7	54°06,04N	07°47,77E	B
31.08.14	5	B01	38G0	54°32,04N	10°38,92E	B
01.09.14	6	B11	38G3	54°41,13N	13°46,82E	B
01.09.14	7	B11	38G3	54°47,79N	13°49,41E	B
01.09.14	8	B11	38G3	54°45,76N	13°27,64E	B
02.09.14	9	BHB	40G4	55°34,51N	14°56,43E	B
02.09.14	10	BHB	40G5	55°37,87N	15°01,92E	B
02.09.14	11	BHB	40G4	55°39,74N	14°56,88E	B
02.09.14	12	BHB	40G4	55°34,22N	14°54,46E	B
03.09.14	13	B09	39G8	55°14,02N	18°10,58E	B
03.09.14	14	B09	39G8	55°08,26N	18°11,03E	B
03.09.14	15	B09	39G8	55°12,39N	18°22,16E	B
04.09.14	16	B15	38G9	54°57,34N	19°07,01E	P
04.09.14	17	B15	38G9	54°53,64N	19°06,97E	P
04.09.14	18	B15	38G9	54°57,86N	19°09,45E	P
04.09.14	19	B15	38G9	54°54,48N	19°11,62E	P
04.09.14	20	B15	38G9	54°57,77N	19°09,17E	P
05.09.14	21	B14	41G8	56°02,36N	18°50,28E	P
05.09.14	22	B14	40G8	55°59,10N	18°47,13E	P
05.09.14	23	B14	41G8	56°02,82N	18°48,52E	P
05.09.14	24	B14	40G8	55°59,89N	18°50,74E	P
05.09.14	25	B14	41G8	56°02,99N	18°45,44E	P
05.09.14	26	B14	40G8	55°59,17N	18°46,94E	P
06.09.14	27	B13	39G5	55°19,12N	15°41,69E	P
06.09.14	28	B13	39G5	55°22,91N	15°35,01E	P
06.09.14	29	B13	39G5	55°21,97N	15°35,75E	P
07.09.14	30	B10	38G4	54°53,05N	14°03,86E	B
07.09.14	31	B10	38G3	54°41,74N	13°56,83E	B
07.09.14	32	B10	38G3	54°40,84N	13°56,82E	B
07.09.14	33	B10	38G3	54°41,94N	13°57,43E	B
08.09.14	34	B01	38G0	54°31,89N	10°37,12E	B
08.09.14	35	B01	38G0	54°32,03N	10°38,25E	B
10.09.14	36	N01	37F7	54°15,54N	07°26,33E	B
10.09.14	37	N01	37F7	54°18,79N	07°26,41E	B
10.09.14	38	N01	37F7	54°15,60N	07°30,15E	B

Tab. 1: cont.

DATE	STATION	Area	ICES-RECTANGLE	Latitude	Longitude	B: Bottom trawl P: Pelagic trawl
11.09.14	39	GB4	39F4	55°23,03N	04°32,69E	B
11.09.14	40	GB4	39F4	55°23,66N	04°26,02E	B
11.09.14	41	GB4	39F4	55°23,34N	04°33,27E	B
11.09.14	42	GB4	39F4	55°23,70N	04°25,74E	B
12.09.14	43	P02	41F3	56°28,04N	03°24,06E	B
12.09.14	44	P02	42F3	56°41,11N	03°11,84E	B
12.09.14	45	P02	42F3	56°34,52N	03°04,21E	B
12.09.14	46	P02	41F3	56°29,66N	03°09,28E	B
13.09.14	47	N06	41F2	56°19,93N	02°00,25E	B
13.09.14	48	N06	41F1	56°17,64N	01°56,59E	B
13.09.14	49	N06	41F2	56°17,46N	02°02,12E	B
13.09.14	50	N06	41F2	56°19,82N	02°03,02E	B
13.09.14	51	N06	41F2	56°21,65N	02°01,58E	B
14.09.14	52	N04	38F2	54°46,55N	02°00,88E	B
14.09.14	53	N04	38F2	54°47,02N	02°01,43E	B
14.09.14	54	N04	38F2	54°48,40N	02°12,23E	B
14.09.14	55	N04	38F2	54°45,16N	02°14,48E	B
15.09.14	56	GB3	38F6	54°55,66N	06°16,28E	B
15.09.14	57	GB3	38F6	54°58,52N	06°22,25E	B
15.09.14	58	GB3	38F6	54°58,32N	06°22,86E	B
15.09.14	59	GB3	38F6	54°58,51N	06°22,54E	B

Tab. 1a: *Cruise 377 RV 'Walther Herwig III', 28.08. – 17.09.2014:*
Geographical coordinates of hydrography stations in the Baltic Sea and North Sea

DATE	STATION	FISHING STATION	AREA	ICES-RECTANGLE	LATITUDE	LONGITUDE
29.08.14	1	1	GB1	37F7	54°07,01N	07°45,91E
29.08.14	2	2	GB1	37F7	54°04,19N	07°54,38E
29.08.14	3	3	GB1	37F7	54°06,49N	07°47,81E
29.08.14	4	4	GB1	37F7	54°04,11N	07°54,08E
31.08.14	5	5	B01	38G0	54°31,27N	10°35,65E
01.09.14	6	6	B11	38G3	54°40,45N	13°46,19E
01.09.14	7	7	B11	38G3	54°48,19N	13°50,09E
01.09.14	8	8	B11	38G3	54°45,74N	13°28,63E
02.09.14	9	9	BHB	40G4	55°34,55N	14°55,84E
02.09.14	10	10	BHB	40G5	55°37,43N	15°00,47E
02.09.14	11	11	BHB	40G4	55°39,73N	14°56,96E
02.09.14	12	12	BHB	40G4	55°34,62N	14°55,05E

Tab. 1a: cont.

DATE	STATION	FISHING STATION	AREA	ICES-RECTANGLE	LATITUDE	LONGITUDE
03.09.14	13	13	B09	39G8	55°14,88N	18°10,65E
03.09.14	14	14	B09	39G8	55°08,36N	18°09,74E
03.09.14	15	15	B09	39G8	55°12,70N	18°21,21E
04.09.14	16	16	B15	38G9	54°58,45N	19°06,79E
04.09.14	17	17	B15	38G9	54°52,56N	19°06,67E
04.09.14	18	18	B15	38G9	54°58,85N	19°08,70E
04.09.14	19	19	B15	38G9	54°53,23N	19°11,16E
04.09.14	20	20	B15	38G9	54°58,58N	19°10,09E
05.09.14	21	21	B14	41G8	56°03,47N	18°51,45E
05.09.14	22	22	B14	40G8	55°58,06N	18°46,92E
05.09.14	23	23	B14	41G8	56°03,40N	18°48,55E
05.09.14	24	24	B14	40G8	55°58,91N	18°51,82E
05.09.14	25	25	B14	41G8	56°03,58N	18°46,16E
05.09.14	26	26	B14	40G8	55°59,15N	18°47,61E
06.09.14	27	27	B13	39G5	55°18,38N	15°42,27E
06.09.14	28	28	B13	39G5	55°23,68N	15°34,08E
06.09.14	29	29	B13	39G5	55°22,84N	15°34,71E
07.09.14	30	30	B10	38G4	54°53,49N	14°04,17E
07.09.14	31	31	B10	38G3	54°41,15N	13°56,91E
07.09.14	32	32	B10	38G3	54°39,36N	13°56,11E
07.09.14	33	33	B10	38G3	54°42,22N	13°58,10E
08.09.14	34	34	B01	38G0	54°31,73N	10°36,32E
08.09.14	35	35	B01	38G0	54°32,03N	10°36,80E
10.09.14	36	36	N01	37F7	54°15,31N	07°26,32E
10.09.14	37	37	N01	37F7	54°19,16N	07°25,20E
10.09.14	38	38	N01	37F7	54°15,37N	07°30,60E
11.09.14	39	39	GB4	39F4	55°22,81N	04°32,94E
11.09.14	40	40	GB4	39F4	55°23,80N	04°25,15E
11.09.14	41	41	GB4	39F4	55°23,40N	04°33,29E
11.09.14	42	42	GB4	39F4	55°24,01N	04°24,77E
12.09.14	43	43	P02	41F3	56°27,56N	03°24,27E
12.09.14	44	44	P02	42F3	56°41,58N	03°12,03E
12.09.14	45	45	P02	42F3	56°35,35N	03°04,25E
12.09.14	46	46	P02	42F3	56°30,49N	03°09,42E
13.09.14	47	47	N06	41F1	56°19,98N	01°59,69E
13.09.14	48	48	N06	41F1	56°17,75N	01°55,22E
13.09.14	49	49	N06	41F2	56°17,53N	02°03,27E
13.09.14	50	50	N06	41F2	56°19,32N	02°03,20E
13.09.14	51	51	N06	41F2	56°22,30N	02°01,16E

Tab. 1a: cont.

DATE	STATION	FISHING STATION	AREA	ICES-RECTANGLE	LATITUDE	LONGITUDE
14.09.14	52	52	N04	38F1	54°46,88N	01°59,90E
14.09.14	53	53	N04	38F2	54°47,36N	02°01,11E
14.09.14	54	54	N04	38F2	54°48,28N	02°11,08E
14.09.14	55	55	N04	38F2	54°44,80N	02°13,76E
15.09.14	56	56	GB3	38F6	54°55,62N	06°16,16E
15.09.14	57	57	GB3	38F6	54°59,18N	06°22,32E
15.09.14	58	58	GB3	38F6	54°58,84N	06°23,68E
15.09.14	59	59	GB3	38F6	54°58,89N	06°23,38E

Tab. 2: *Cruise 377 RV 'Walther Herwig III', 28.08. – 17.09.2014:*
Mean catches of selected abundant fish species in the Baltic Sea and North Sea
(n = number, kg = weight per 1 h trawling)

Area	Cod	Whiting	Haddock	Herring	Sprat	Mackerel	Dab	Plaice	Flounder
GB1	< 1	8902		6	177		950	16	8
	< 0,5	302		< 0,5	1		21	< 0,5	2
B01	13	78		313	2182		2081	128	18
	50	5		9	38		330	38	7
B11	17	60		426	3627	3		140	449
	12	8		20	35	1		25	60
BHB	674	1		113				1	< 1
	189	< 0,5		8				< 0,5	< 0,5
B09	346			70					2
	131			4					< 0,5
B15	130			1745	110				
	48			121	1				
B14	23			795	7				
	8			39	< 0,5				
B13	489			1115	217				
	151			64	3				
B10	68	212		3836	30932	14	3	6	118
	48	33		193	293	7	< 0,5	1	25
N01		854		77459	64653	40	662	3	1
		28		464	412	4	38	1	< 0,5
GB4	< 1	174		5578	2137	26	670	5	
	< 0,5	5		93	28	6	55	1	
P02		189	140	101	2	8	1885	18	
		28	25	5	< 0,5	1	134	6	
N06		23737	8738	257		72	387	2	
		213	437	41		25	33	< 0,5	
N04	2	76		3739	2544	203	379	24	
	1	2		73	36	21	24	9	
GB3	6909			7609	189467	34	1742	27	
	199			39	640	3	88	6	

Tab. 3: *Cruise 377 RV 'Walther Herwig III', 28.08. – 17.09.2014: Water depth, temperature (T), salinity (S), O₂ in mg/l and O₂ saturation (%), Baltic Sea and North Sea*

DATE	STATION	AREA	DEPTH (m)	S (PSU)	T (°C)	O ₂ (mg/L)	O ₂ -SATURATION (%)
29.08.2014	001	GB1	10	32,937	17,70	7,32	93,65
			34	32,924	17,61	7,11	90,85
	002	GB1	3	32,814	17,93	7,69	98,77
			35	32,764	17,40	7,08	89,92
	003	GB1	10	33,094	17,93	7,51	96,59
			35	33,081	17,86	7,45	95,71
	004	GB1	2	32,908	17,83	7,32	93,93
			34	32,900	17,74	7,16	91,61
31.08.2014	005	B01	10	22,803	15,25	8,32	95,38
			12	22,863	15,20	8,25	94,47
01.09.2014	006	B11	3	7,736	17,62	9,25	101,52
			27	16,110	16,91	5,15	58,56
	007	B11	4	7,738	17,56	9,15	100,34
			36	17,375	16,64	6,76	77,14
	008	B11	5	7,826	17,47	9,24	101,12
			36	16,504	16,57	7,51	85,06
02.09.2014	009	BHB	2	7,444	17,03	9,37	101,44
			72	15,033	7,02	2,57	23,37
	010	BHB	7	7,538	17,03	9,36	101,41
			69	15,081	6,89	2,47	22,45
	011	BHB	4	7,546	17,19	9,47	102,93
			59	12,422	9,57	4,90	46,55
	012	BHB	3	7,440	17,19	9,57	103,95
			71	14,912	6,88	2,92	26,47
03.09.2014	013	B09	3	7,191	17,14	9,38	101,68
			56	7,844	4,51	9,15	74,56
	014	B09	14	7,227	17,11	9,18	99,4
			61	9,160	5,17	5,55	46,41
	015	B09	4	7,194	17,31	9,43	102,55
			70	9,067	4,97	5,05	41,94
04.09.2014	016	B15	2	7,079	16,95	9,30	100,28
			92	11,916	5,60	2,54	21,83
	017	B15	8	7,078	16,93	9,27	99,92
			94	12,262	5,66	2,12	18,35
04.09.2014	018	B15	10	7,069	16,99	9,31	100,54
			94	12,006	5,63	2,84	24,5
	019	B15	10	7,116	17,01	9,39	101,42
			97	12,370	5,65	1,38	11,94
	020	B15	4	7,068	17,23	9,60	104,17
			91	11,777	5,50	3,72	31,93

Tab. 3: cont.

DATE	STATION	AREA	DEPTH (m)	S (PSU)	T (°C)	O ₂ (mg/L)	O ₂ -SATURATION (%)
05.09.2014	021	B14	8	7,093	16,51	9,70	103,69
			111	11,449	5,65	0,25	2,12
	022	B14	22	7,139	14,79	9,25	95,48
			104	10,784	5,38	2,17	18,41
	023	B14	28	6,893	5,20	11,06	91,18
			110	11,204	5,51	2,41	20,57
	024	B14	12	7,140	16,52	9,62	102,92
			109	11,357	5,51	2,25	19,26
	025	B14	2	7,050	16,68	9,85	105,63
			110	11,099	5,45	2,16	18,41
	026	B14	3	7,157	16,84	9,79	105,43
			109	11,445	5,54	2,57	21,98
06.09.2014	027	B13	2	7,436	17,05	9,63	104,28
			86	10,395	5,98	7,15	61,47
	028	B13	10	7,409	17,09	9,49	102,85
			85	16,196	6,12	1,05	9,41
	029	B13	8	7,426	17,18	9,56	103,87
			86	16,218	6,11	1,50	13,45
07.09.2014	030	B10	2	7,672	17,37	9,29	101,39
			34	13,391	16,51	6,96	77,33
	031	B10	10	7,726	17,46	9,32	102
			22	8,932	7,01	7,00	61,11
	032	B10	8	7,886	17,77	9,31	102,65
			18	8,029	10,02	7,33	68,4
	033	B10	11	7,702	17,05	9,26	100,49
			22	8,677	7,24	8,16	71,59
08.09.2014	034	B01	11	24,401	14,27	5,75	65,25
			12	24,409	14,27	5,75	65,26
	035	B01	5	18,495	16,35	8,14	92,98
			11	23,971	14,34	4,51	51,08
10.09.2014	036	N01	3	33,443	17,91	7,74	99,77
			32	33,453	17,91	7,78	100,31
	037	N01	3	33,503	17,69	7,93	101,78
			36	33,504	17,69	7,96	102,17
10.09.2014	038	N01	6	33,465	17,88	7,78	100,23
			39	33,464	17,87	7,78	100,19

Tab. 3: cont.

DATE	STATION	AREA	DEPTH (m)	S (PSU)	T (°C)	O ₂ (mg/L)	O ₂ -SATURATION (%)
11.09.2014	039	GB4	3	34,808	15,68	8,08	100,52
			43	34,775	10,19	6,35	70,58
	040	GB4	5	34,760	15,76	8,04	100,23
			40	34,772	10,33	6,07	67,65
	041	GB4	2	34,825	15,73	8,14	101,39
			42	34,768	10,40	6,16	68,79
	042	GB4	8	34,754	15,88	8,15	101,76
			40	34,771	10,44	5,96	66,55
12.09.2014	043	P02	2	34,958	15,02	8,47	104,18
			66	34,965	7,92	7,59	80,36
	044	P02	8	34,953	14,82	8,49	103,96
			63	34,995	7,94	7,69	81,46
	045	P02	9	34,935	14,81	8,51	104,22
			66	34,978	7,92	7,67	81,13
	046	P02	11	34,924	14,84	8,48	103,88
			68	34,953	7,91	7,62	80,56
13.09.2014	047	N06	12	34,298	13,13	8,36	98,46
			52	34,308	13,05	8,25	97,09
	048	N06	11	34,250	13,38	8,37	99,12
			43	34,296	13,12	8,24	97,06
	049	N06	13	34,277	12,95	8,03	94,29
			46	34,278	12,88	7,89	92,44
	050	N06	15	34,271	13,02	8,16	95,98
			48	34,283	12,90	7,97	93,42
	051	N06	10	34,293	13,10	8,26	97,32
			48	34,304	13,03	8,22	96,73
14.09.2014	052	N04	6	34,502	15,79	8,17	101,72
			24	34,501	15,79	8,21	102,18
	053	N04	2	34,516	15,83	8,27	102,98
			23	34,515	15,83	8,28	103,17
	054	N04	3	34,583	15,92	8,21	102,45
			19	34,582	15,88	8,20	102,31
	055	N04	4	34,551	16,01	8,24	103,03
			18	34,546	15,93	8,26	103,11
15.09.2014	056	GB3	2	34,400	17,35	7,98	102,27
			38	34,590	16,19	6,84	85,8
	057	GB3	3	34,239	17,58	7,95	102,27
			38	34,587	16,22	6,72	84,37
	058	GB3	3	34,207	17,58	7,93	101,99
			40	34,566	16,31	6,52	81,97
	059	GB3	3	34,221	17,58	7,97	102,59
			39	34,555	16,37	6,43	81,02

Tab. 4: Cruise 377 RV 'Walther Herwig III', 28.08. – 17.09.2014:
Prevalence (%) of externally visible diseases and parasites in dab (*Limanda limanda*) from the Baltic Sea and North Sea

Area	N unt	Ly	Ep Hyp/Pap	Ulc Ak/Hei	Flo Ak/Hei	KieHy	Skel Def	Hyp Pig	Steph	Acanth	Lepe
GB1	580	0,3	0,5	0,9	0,2	0,0	0,0	6,0	2,4	1,7	5,3
B01	549	4,6	1,6	2,4	0,7	0,0	0,2	0,9	0,4	0,2	0,9
N01	654	2,3	3,1	3,2	0,3	0,2	0,3	22,9	3,8	2,6	19,0
GB4	714	14,0	4,6	4,8	2,1	0,1	0,8	53,1	87,4	3,5	12,0
P02	566	15,7	1,6	0,0	0,2	0,4	0,4	23,5	99,5	2,8	1,4
N06	627	16,9	3,3	3,8	1,1	3,0	0,8	38,8	71,1	2,9	1,1
N04	729	6,0	3,0	1,2	1,0	0,4	1,1	58,0	32,9	7,0	24,8
GB3	500	6,2	2,0	0,6	0,4	0,0	0,4	30,4	14,0	0,8	10,6
Sum	4.919										

Tab. 5: Cruise 377 RV 'Walther Herwig III', 28.08. – 17.09.2014:
Prevalence (%) of liver anomalies in dab (*Limanda limanda*) from the Baltic Sea and North Sea

Area	Length (cm)		N unt	Liver nodules (mm)			Green Livers	Nematode L	Acanthoceph
	von	bis		≥ 2	≥ 5	≥ 10			
GB1	20	24	40	0	0	0	0	0	0
	25	40	1	0	0	0	0	0	0
B01	20	24	52	1,9	0	0	5,8	0	0
	25	40	58	8,6	1,7	0	3,4	0	0
N01	20	24	56	1,8	0	0	0	3,6	0
	25	40	17	5,9	5,9	0	0	0	0
GB4	20	24	55	9,1	3,6	0	1,8	1,8	1,8
	25	40	37	10,8	2,7	0	0	24,3	2,7
P02	20	24	55	7,3	3,6	1,8	94,5	41,8	5,5
	25	40	17	11,8	5,9	5,9	88,2	23,5	0
N06	20	24	56	1,8	0	0	7,1	60,7	17,9
	25	40	13	0	0	0	15,4	84,6	15,4
N04	20	24	53	5,7	3,8	1,9	0	1,9	3,8
	25	40	25	28	16	16	8	4	0
GB3	20	24	49	4,1	2	2	4,1	6,1	0
	25	40	56	5,4	0	0	1,8	1,8	0
Sum			641						

Tab. 6: Cruise 377 RV 'Walther Herwig III', 28.08. – 17.09.2014:
Prevalence (%) of externally visible diseases and parasites in flounder (*Platichthys flesus*) from the Baltic Sea and North Sea

Area	N unt	Ly	Ulc Ak/Hei	Flo Ak/Hei	Skel Def	Cryp	Lepe
GB1	32	18,8	0,0	0,0	0,0	0,0	90,6
B01	54	27,8	1,9	0,0	0,0	68,5	42,6
B11	520	15,6	0,6	0,4	1,0	66,9	0,0
B09	5	0,0	40,0	0,0	0,0	60,0	0,0
B14	1	0,0	0,0	0,0	0,0	0,0	0,0
B10	487	15,8	1,0	0,0	0,6	64,5	0,0
Sum	1.099						

Tab. 7: Cruise 377 RV 'Walther Herwig III', 28.08. – 17.09.2014:
Prevalence (%) of liver anomalies in flounder (*Platichthys flesus*) from the North Sea (area GB1) and the Baltic Sea

Area	N unt	Liver nodules (mm)			Green livers	Nemato L	Acanthoceph
		≥ 2	≥ 5	≥ 10			
GB1	32	6,3	0,0	0,0	0,0	0,0	6,3
B01	54	0,0	0,0	0,0	0,0	0,0	1,9
B11	202	0,5	0,0	0,0	0,0	0,5	0,0
B09	5	0,0	0,0	0,0	0,0	20,0	40,0
B14	1	0,0	0,0	0,0	0,0	0,0	100,0
B10	284	0,0	0,0	0,0	0,0	0,7	4,9
Sum	578						

Tab. 8: Cruise 377 RV „Walther Herwig III“, 28.08. – 17.09.2014:
Prevalence (%) of externally visible diseases and parasites in cod (*Gadus morhua*) from the North Sea (area N04) and the Baltic Sea

GEBIET	N unt	Ulc Ak/Hei	Skel Def	PBT	Locera	Cryp	Loma	EpPap	N unt	Nemato BC
N04	9	0,0	0,0	0,0	0,0	0,0	66,7	11,1	0	0,0
B01	40	0,0	0,0	0,0	2,5	87,5	90,0	0,0	40	47,5
B11	49	10,2	2,0	0,0	0,0	16,3	48,9	0,0	49	6,1
BHB	1012	2,1	0,9	0,0	1,1	0,2	95,7	0,6	107	29,9
B09	754	3,8	2,1	0,0	0,0	0,0	94,5	0,0	109	28,4
B15	640	6,3	2,7	0,0	0,0	0,0	89,7	0,2	108	41,7
B14	138	2,2	2,2	0,0	0,0	0,0	89,8	0,0	106	49,1
B13	1066	2,9	1,6	0,0	0,5	0,3	97,4	3,6	107	40,2
B10	278	4,0	1,8	0,0	0,4	18,0	70,9	1,1	128	7,0
Sum	3.986								754	

Abbreviations:

N unt	: Number examined	Steph	: <i>Stephanostomum baccatum</i>
Ly	: Lymphocystis	Acanth	: <i>Acanthochondria cornuta</i>
Ep Hyp/Pap	: Epidermal hyperplasia/papilloma	Lepe	: <i>Lepeophtheirus pectoralis</i>
Ulc Ak/Hei	: Skin ulcerationen, acute/healing	Locera	: <i>Lernaocera branchialis</i>
Flo Ak/Hei	: Fin rot/erosion, acute/healing	Cryp	: <i>Cryptocotyle spp.</i>
KieHy	: Gill hyperplasia, x-cell disease	Loma	: <i>Loma sp.</i>
Hyp Pig	: Hyperpigmentation	Cryp	: <i>Cryptocotyle spp.</i>
Skel Def	: Skeletal deformities	Nemato BC	: Nematodes in the body cavity
PBT	: Pseudobranchial pseudotumour	Nemato L	: Nematodes on the liver
Acanthoceph	: Acanthocephaleans, liver		