Thünen Institute of Fisheries Ecology

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FRV Walther Herwig III
Cruise 387
28.08. – 17.09.2015

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 and internal 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 (BLMP) and international marine monitoring programmes (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 previous years, 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 the prevalence of externally visible diseases/parasites and macroscopic liver neoplasms;

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; relationship between prevalence of nematode infestation and mean condition factor; the highest prevalence of nematodes and the lowest mean condition factor were recorded in the main dumpsite for chemical warfare agents east of Bornholm; high prevalence of *Loma morhua* (= *branchialis*) in the gills.

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
Wolfgang Lindemann	Technician	TI-FI Hamburg
Nadine Dichte	Technician	TI-FI Hamburg
Pedro Nogueira	Scientist	TI-FI Hamburg
Horst Bahl	Scientist	TI-FI Hamburg
Lina Weirup	Student	University Hamburg
Liliana Lehmann	Student	University Berlin
Bianca Haas	Student	University Hamburg
Lisa Priebe	Student	University Oldenburg
Gabriele Dederer	Scientist	Datadiving

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);
6. Visual detection of drifting marine litter in the North Sea.

Dates of the Cruise

FRV Walther Herwig III left Bremerhaven at noon on 28.08. and passed Kiel Channel the following day. In the morning of 30.08., work started in the Baltic Sea in area B11. During the following days, studies and sampling were conducted in areas BHB, B13, B14, B15, B09 and B10. On 06.09., due to bad weather conditions, work had to be stopped in area B01. In the afternoon, Walther Herwig III arrived in Kiel and a member of the scientific staff was taken on board. The next day, work in area B01 was continued.

On 09.09., WHIII again passed Kiel Channel. In the period 09.-15.09., sampling was continued in six North Sea areas (P02, N04, GB4, N11, N01, GB1). 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 53 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, 5,800 dab (total length ≥10 cm) from one Baltic Sea and six North Sea areas were examined for the occurrence of externally visible diseases and parasites (Tab. 4) and 700 dab (total length ≥20 cm) for the occurrence of liver anomalies (Tab. 5).

The prevalence of externally visible diseases/parasites in the North Sea was comparable with those from previous cruises in 2014. The prevalence of lymphocystis was in range of 0.3-13.0 %, with the lowest value in the inner German Bight (area GB1) und the highest values in the northwestern part of the German EEZ (area GB4). The prevalence of epidermal hyperplasia/papilloma was in the range of 1.2 % (inner German Bight, area GB1) to 3.1 % (Dogger Bank, area N04). Marked regional variation was again recorded for hyperpigmentation, with values between 18.5 % (inner German Bight, area GB1) to 57.5 % (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 0.8 % (inner German Bight, area GB1) to 99.6 % (Ekofisk, area P02).

For the majority of diseases, there was a prevalence gradient – as during the previous cruises - 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) (Tab. 5) was low and comparable to values recorded during previous cruises. For dab of the size range 20-24 cm total length, the prevalence was in the range of 0.0 % (German Bight, area N01) to 9.6 % (Horns Reef, area N11), for dab of the size group ≥25 cm the prevalence ranged from 0.0 % (German Bight, area N01) to 33.3 % (Dogger Bank, area N04). Particularly interesting is the lack of liver nodules in

area N01 since this area had been characterised by a markedly elevated prevalence in the 1990s compared to other North Sea areas.

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, which is also true for liver tumours since some years.

2 Flounder (*Platichthys flesus*)

826 flounder from three Baltic Sea areas and one North Sea area (inner German Bight, area GB1) were examined for the occurrence of externally visible diseases and parasites (Tab. 6), 358 specimens thereof for the presence of liver nodules >2 mm (Tab. 7). As in summer 2014, the prevalence of lymphocystis in Kiel Bight (area B01) was high (29.1 %); in areas B10 and B11 in the Arkona Sea, the prevalence was – again as in the previous year - lower (16.7 % and 15.3 %, resp.). For *Lepeophtheirus pectoralis*, the marked regional pattern previously known was confirmed. A high prevalence occurred in the inner German Bight (90.2 %; area GB1, North Sea) and Kiel Bight (49.7 %; area B01, Baltic Sea), whereas flounder from all other areas were not affected.

3 Cod (*Gadus morhua*)

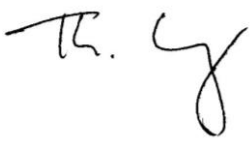
In total, 3,365 cod from eight Baltic Sea areas were examined for externally visible diseases and parasites and 694 specimens thereof for nematodes in the body cavity (Tab. 8). For the cod inspected for nematodes, also gutted weight and organ weights were measured for the calculation of condition factors and liversomatic as well as gonadosomatic indices. The disease prevalences were low in general. Acute/healing stages of skin ulcerations ranged from 0.0 % (Kiel Bight, area B01) to 4.3 % (Arkona Sea, area B11). Skeletal deformities were slightly more prevalent than in summer 2014, with a maximum value of 4.6 % (in area B09 off the Polish coast). The prevalence of the gill parasite *Loma morhua (= branchialis)* was generally high with values between 39.3 % (Arkona Sea, area B11) and 100 % (Gotland Deep, area B14). 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 (Fig. 3). A comparison of the prevalence of nematode infestation and the mean condition factors (CF) indicates a relationship: a strong infestation is coupled with low mean CF values (Fig. 4). A particularly high nematode prevalence and the lowest mean CF values of all areas were recorded in the main dumpsite for chemical warfare agents east of Bornholm (area B13).

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 Meier and his crew and to the scientific staff for constructive and hard work and a very good atmosphere on board.



Dr. Thomas Lang

(Scientist in Charge)

Annex: 8 Tables, 4 Figures

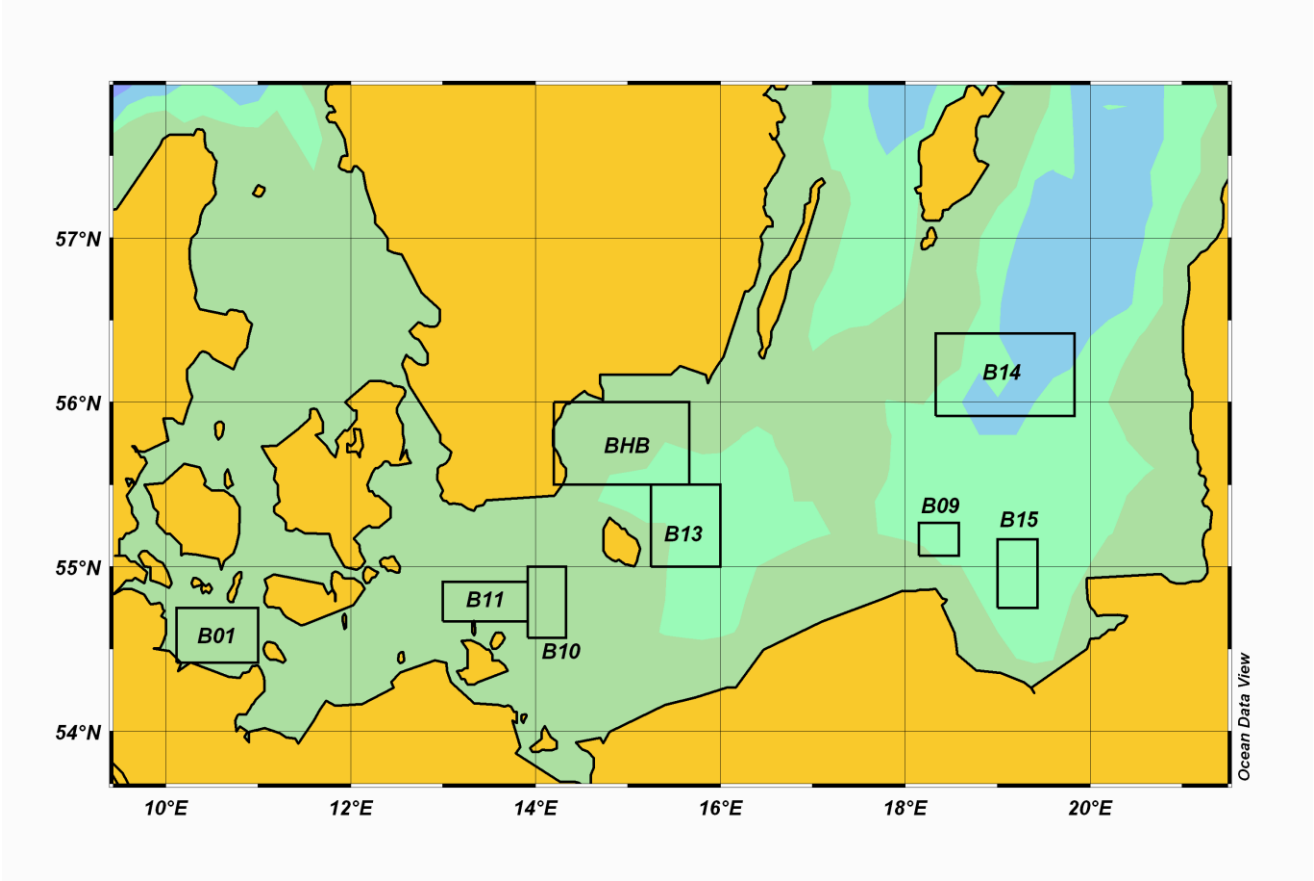


Fig. 1: *Cruise 387 RV 'Walther Herwig III', 28.08. – 17.09.2015:*
Location of sampling sites in the Baltic Sea

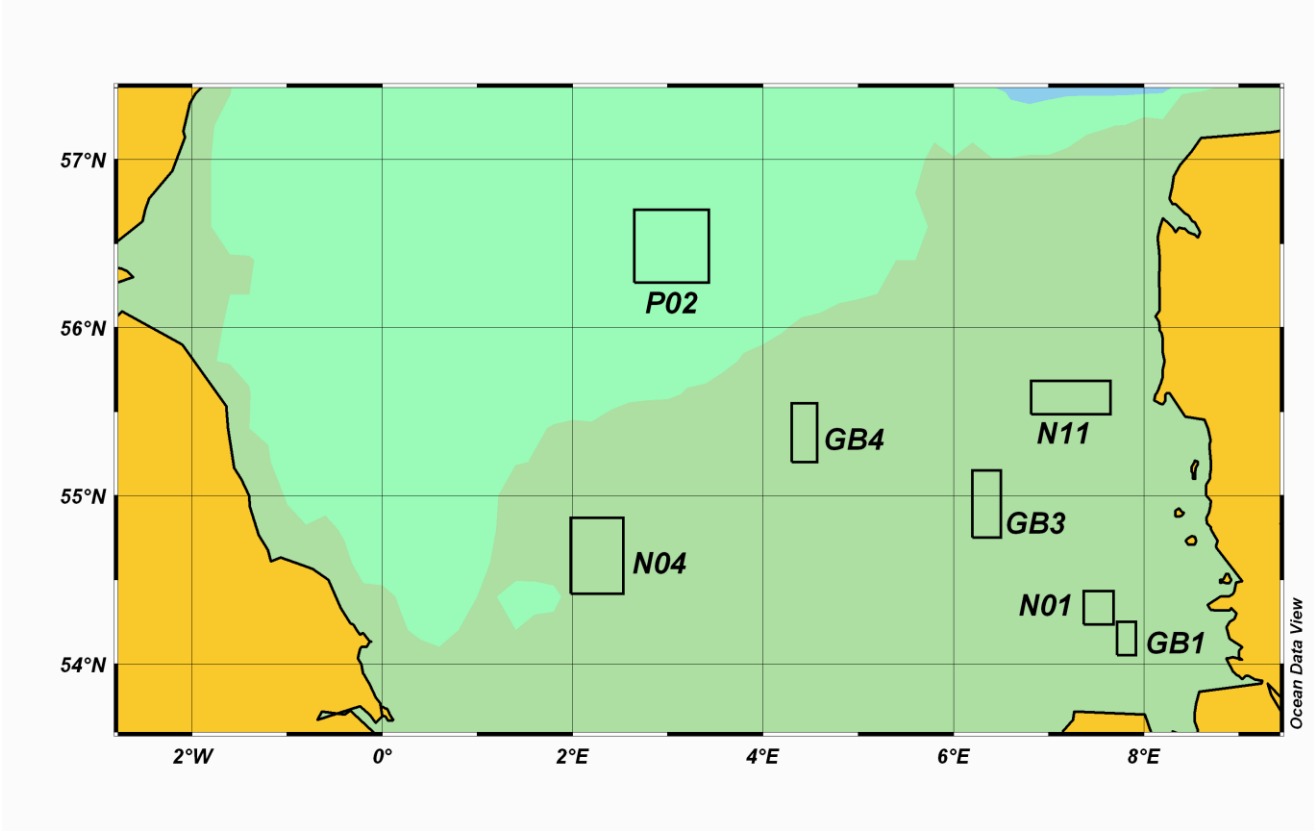


Fig. 2: *Cruise 387 RV 'Walther Herwig III', 28.08. – 17.09.2015:*
Location of sampling sites in the North Sea

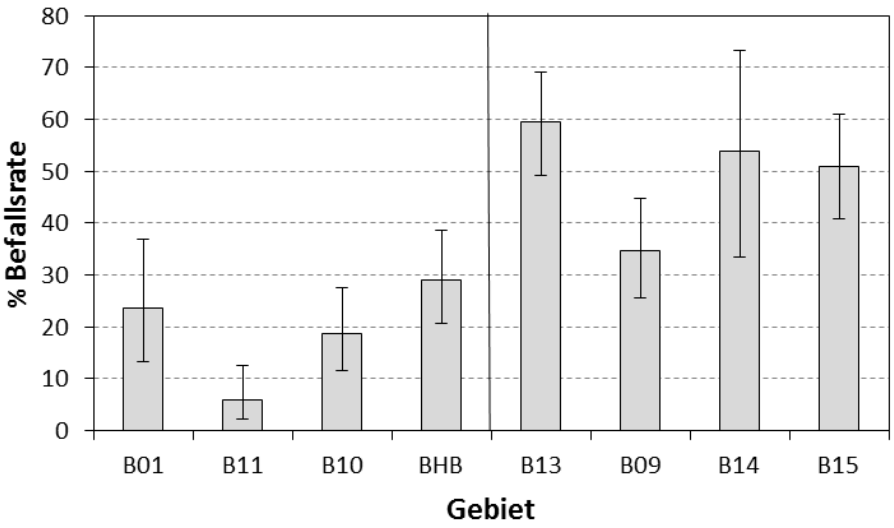


Fig. 3: Cruise *387 RV ‚Walther Herwig III', 28.08. – 17.09.2015:*
Mean prevalence of larval nematodes in the body cavity of Baltic cod (with 95 % confidence intervals)

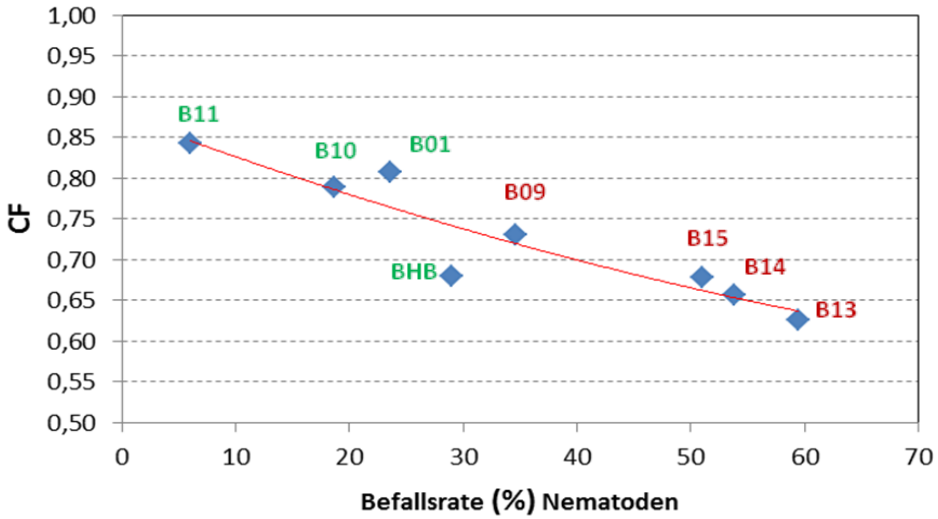


Fig. 4: Cruise *387 RV ‚Walther Herwig III', 28.08. – 17.09.2015:*
Relationship between prevalence of infestation with larval nematodes in the body cavity with mean condition factors (CF) (green: areas west of Bornholm red: areas east of Bornholm) (R^2= 0.8564)

Tab. 1: *Cruise 387 RV 'Walther Herwig III', 28.08. – 17.09.2015:*
Geographical coordinates of trawling stations in the Baltic Sea and North Sea

DATE	STATION	Area	ICES-RECTANGLE	Latitude	Longitude	Towing time	B: Bottom trawl P: Pelagic trawl
30.08.15	001	B11	38G3	54°47,71N	13°13,17E	59	B
30.08.15	002	B11	38G3	54°46,36N	13°37,88E	60	B
30.08.15	003	B11	38G3	54°43,51N	13°21,15E	60	B
30.08.15	004	B11	38G3	54°46,14N	13°20,55E	60	B
31.08.15	005	BHB	40G4	55°32,18N	14°50,09E	59	B
31.08.15	006	BHB	40G4	55°35,09N	14°57,23E	59	B
31.08.15	007	BHB	40G5	55°39,18N	15°08,88E	59	B
01.09.15	008	B13	39G5	55°21,01N	15°33,33E	60	P
01.09.15	009	B13	39G5	55°21,23N	15°40,78E	60	P
01.09.15	010	B13	39G5	55°18,76N	15°35,97E	60	P
01.09.15	011	B13	39G5	55°22,54N	15°34,79E	59	P
01.09.15	012	B13	39G5	55°19,54N	15°38,98E	30	P
02.09.15	013	B14	40G8	55°58,14N	18°51,46E	60	P
02.09.15	014	B14	40G8	55°59,03N	18°44,75E	60	P
02.09.15	015	B14	41G8	56°01,41N	18°51,53E	60	P
02.09.15	016	B14	41G8	56°01,27N	18°43,94E	59	P
03.09.15	017	B15	38G9	54°46,53N	19°13,21E	60	B
03.09.15	018	B15	38G9	54°50,22N	19°16,21E	60	B
03.09.15	019	B15	38G9	54°48,10N	19°10,40E	60	B
03.09.15	020	B15	38G9	54°46,03N	19°17,19E	60	B
04.09.15	021	B09	39G8	55°12,81N	18°31,04E	60	B
04.09.15	022	B09	39G8	55°05,32N	18°20,14E	59	B
04.09.15	023	B09	39G8	55°07,46N	18°11,12E	59	B
05.09.15	024	B10	38G4	54°52,52N	14°03,51E	60	B
05.09.15	025	B10	38G3	54°47,91N	13°58,51E	59	B
05.09.15	026	B10	38G3	54°44,84N	13°56,15E	29	B
06.09.15	027	B01	38G0	54°33,02N	10°47,64E	60	B
07.09.15	028	B01	38G0	54°31,22N	10°34,84E	60	B
07.09.15	029	B01	38G0	54°32,68N	10°31,93E	60	B
07.09.15	030	B01	38G0	54°33,54N	10°48,99E	60	B
09.09.15	031	GB3	38F6	54°56,22N	06°17,19E	59	B
09.09.15	032	GB3	38F6	54°58,62N	06°22,60E	60	B
09.09.15	033	GB3	38F6	54°55,86N	06°15,98E	60	B
09.09.15	034	GB3	38F6	54°58,66N	06°22,63E	59	B
10.09.15	035	P02	41F3	56°28,51N	03°23,82E	60	B
10.09.15	036	P02	42F3	56°36,65N	03°13,08E	60	B
10.09.15	037	P02	42F3	56°33,44N	03°03,16E	60	B
11.09.15	038	N04	38F2	54°48,06N	02°07,94E	60	B
11.09.15	039	N04	38F2	54°46,64N	02°01,88E	59	B
11.09.15	040	N04	38F2	54°45,74N	02°15,58E	58	B
11.09.15	041	N04	38F2	54°46,87N	02°21,12E	60	B
12.09.15	042	GB4	39F4	55°23,39N	04°32,17E	59	B

Tab. 1: cont.

DATE	STATION	Area	ICES-RECTANGLE	Latitude	Longitude	Towing time	B: Bottom trawl P: Pelagic trawl
12.09.15	043	GB4	39F4	55°23,66N	04°25,94E	30	B
13.09.15	044	N11	40F7	55°38,31N	07°01,90E	59	B
13.09.15	045	N11	40F7	55°34,51N	07°06,61E	28	B
13.09.15	046	N11	40F7	55°33,44N	07°07,83E	30	B
14.09.15	047	N01	37F7	54°20,79N	07°28,64E	59	B
14.09.15	048	N01	37F7	54°23,85N	07°34,96E	59	B
14.09.15	049	N01	37F7	54°16,20N	07°30,42E	36	B
14.09.15	050	N01	37F7	54°18,47N	07°27,02E	29	B
15.09.15	051	GB1	37F7	54°04,78N	07°52,69E	60	B
15.09.15	052	GB1	37F7	54°03,97N	07°53,54E	60	B
15.09.15	053	GB1	37F7	54°06,99N	07°46,68E	60	B

Tab. 1a: *Cruise 387 RV 'Walther Herwig III', 28.08. – 17.09.2015:*
Geographical coordinates of hydrography stations in the Baltic Sea and North Sea

DATE	STATION	FISHING STATION	AREA	ICES-RECTANGLE	LATITUDE	LONGITUDE
30.08.15	001	001	B11	38G3	54°48,19N	13°12,04E
30.08.15	002	002	B11	38G3	54°46,35N	13°36,70E
30.08.15	003	003	B11	38G3	54°43,30N	13°22,90E
30.08.15	004	004	B11	38G3	54°46,17N	13°19,63E
31.08.15	005	005	BHB	40G4	55°31,55N	14°49,07E
31.08.15	006	006	BHB	40G4	55°34,79N	14°55,60E
31.08.15	007	007	BHB	40G5	55°39,55N	15°10,03E
01.09.15	008	008	B13	39G5	55°20,98N	15°31,81E
01.09.15	009	009	B13	39G5	55°21,60N	15°41,92E
01.09.15	010	010	B13	39G5	55°17,76N	15°35,35E
01.09.15	011	011	B13	39G5	55°23,40N	15°33,79E
01.09.15	012	012	B13	39G5	55°22,16N	15°38,92E
02.09.15	013	013	B14	40G8	55°58,05N	18°52,65E
02.09.15	014	014	B14	41G8	56°01,40N	18°52,71E
02.09.15	015	015	B14	41G8	56°01,57N	18°43,64E
03.09.15	017	017	B15	38G9	54°45,95N	19°12,45E
03.09.15	018	018	B15	38G9	54°50,29N	19°17,41E
03.09.15	019	019	B15	38G9	54°48,66N	19°08,93E
03.09.15	020	020	B15	38G9	54°45,49N	19°09,39E
04.09.15	021	021	B09	39G8	55°13,61N	18°31,19E
04.09.15	022	022	B09	39G8	55°04,95N	18°21,47E
04.09.15	023	023	B09	39G8	55°06,68N	18°12,88E
05.09.15	024	024	B10	38G4	54°53,05N	14°04,37E
05.09.15	025	025	B10	38G3	54°48,63N	13°59,15E
05.09.15	026	026	B10	38G3	54°44,25N	13°56,38E
06.09.15	027	027	B01	38G0	54°32,96N	10°49,06E

Tab. 1a: cont.

DATE	STATION	FISHING STATION	AREA	ICES-RECTANGLE	LATITUDE	LONGITUDE
07.09.15	028	028	B01	38G0	54°31,02N	10°34,01E
07.09.15	029	029	B01	38G0	54°32,33N	10°32,46E
07.09.15	030	030	B01	38G0	54°33,64N	10°49,82E
09.09.15	031	031	GB3	38F6	54°55,56N	06°15,89E
09.09.15	032	032	GB3	38F6	54°59,05N	06°23,54E
09.09.15	033	033	GB3	38F6	54°55,41N	06°15,06E
09.09.15	034	034	GB3	38F6	54°59,12N	06°23,68E
10.09.15	035	035	P02	41F3	56°27,90N	03°25,04E
10.09.15	036	036	P02	42F3	56°35,97N	03°13,75E
10.09.15	037	037	P02	42F3	56°34,25N	03°03,82E
11.09.15	038	038	N04	38F2	54°48,23N	02°08,84E
11.09.15	039	039	N04	38F2	54°46,97N	02°01,23E
11.09.15	040	040	N04	38F2	54°45,41N	02°14,74E
11.09.15	041	041	N04	38F2	54°47,32N	02°20,90E
12.09.15	042	042	GB4	39F4	55°23,56N	04°33,43E
12.09.15	043	043	GB4	39F4	55°23,80N	04°24,83E
13.09.15	044	044	N11	40F7	55°36,13N	07°00,31E
13.09.15	045	045	N11	40F7	55°35,15N	07°06,42E
13.09.15	046	046	N11	40F7	55°33,91N	07°07,73E
14.09.15	047	047	N01	37F7	54°20,26N	07°27,95E
14.09.15	048	048	N01	37F7	54°23,86N	07°35,81E
14.09.15	049	049	N01	37F7	54°15,35N	07°30,50E
14.09.15	050	050	N01	37F7	54°18,88N	07°26,20E
15.09.15	051	051	GB1	37F7	54°04,59N	07°54,06E
15.09.15	052	052	GB1	37F7	54°03,66N	07°55,34E
15.09.15	053	053	GB1	37F7	54°07,29N	07°45,45E

Tab. 2: *Cruise 387 RV 'Walther Herwig III', 28.08. – 17.09.2015:*
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
B11	n	36	7		2091	8606	4	27	160	757
	kg	14	1		54	95	2	4	45	144
BHB	n	387	2		59	23			< 1	2
	kg	113	< 0,5		4	< 0,5			< 0,5	< 0,5
B13	n	96			2379	233				
	kg	27			111	3				
B14	n	6			1976	12024				
	kg	2			56	112				
B15	n	76			2023	381				< 1
	kg	31			110	4				< 0,5
B09	n	361			21	3			< 1	1
	kg	155			2	< 0,5			< 0,5	< 0,5
B10	n	268	123		521	282	1		25	335
	kg	164	41		34	3	1		6	68

Tab. 2: cont.

Area		Cod	Whiting	Haddock	Herring	Sprat	Mackerel	Dab	Plaice	Flounder
B01	n	13	33		228	494	22	1115	133	38
	kg	42	2		12	5	5	151	44	13
GB3	n	< 1	7570		1877	3684	31		127	1702
	kg	2	77		40	39	8		24	76
P02	n	< 1	29	9	85	458		1749	51	
	kg	< 0,5	2	2	4	7		120	16	
N04	n		87		16	163	103	803	13	
	kg		8		2	2	17	54	5	
GB4	n		292		60300	18039		1671	11	
	kg		12		2524	2127		152	3	
N11	n		11				6167	2283	50	
	kg		1				798	146	10	
N01	n		1758		33843	14792	189	864	4	
	kg		40		226	120	32	45	1	
GB1	n	2	6356		182	398		3523	26	13
	kg	3	165		6			97	1	3

Tab. 3: *Cruise 387 RV 'Walther Herwig III', 28.08. – 17.09.2015:* Water depth, temperature (T), salinity (S), O_2 in mg/l and O_2 saturation (%), Baltic Sea and North Sea

DATE	STATION	AREA	DEPTH (m)	S (PSU)	T (°C)	O_2 (mg/L)	O_2-SATURATION (%)
30.08.2015	001	B11	2	8,09	17,8	9,06	99.97
			34	9,03	14,3	6,77	69.90
30.08.2015	002	B11	2	8,12	17,6	9,09	99.98
			36	8,26	16,5	8,46	91.11
30.08.2015	003	B11	2	8,37	17,9	9,17	101.62
			26	8,39	16,6	8,82	95.10
30.08.2015	004	B11	2	8,08	17,8	9,28	102.46
			37	9,66	14,2	6,89	71.28
31.08.2015	005	BHB	3	7,72	17,8	9,13	100.67
			69	16,56	7,0	2,50	22.97
31.08.2015	006	BHB	2	7,59	17,7	9,14	100.45
			74	18,36	7,1	1,97	18.37
31.08.2015	007	BHB	2	7,75	17,8	9,15	100.89
			65	15,98	7,0	2,42	22.11
01.09.2015	008	B13	3	7,56	17,9	8,97	99.02
			89	19,47	7,0	1,06	9.90
01.09.2015	009	B13	2	7,55	18,1	8,98	99.39
			91	19,49	7,0	1,13	10.55
01.09.2015	010	B13	3	7,56	18,2	9,10	100.99
			88	19,46	7,0	1,19	11.17
01.09.2015	011	B13	3	7,59	18,1	9,12	101.03
			87	19,40	7,0	1,48	13.85
01.09.2015	012	B13	3	7,55	18,3	9,11	101.35
			89	19,49	7,0	1,16	10.83

Tab. 3: cont.

DATE	STATION	AREA	DEPTH (m)	S (PSU)	T (°C)	O_2 (mg/L)	O_2-SATURATION (%)
02.09.2015	013	B14	3	6,96	18,3	8,89	98.48
			112	12,22	6,0	3,10	26.98
02.09.2015	014	B14	2	7,03	18,3	8,85	98.06
			117	12,54	6,0	3,56	31.13
02.09.2015	015	B14	3	6,93	18,1	8,95	98.77
			113	11,90	6,1	1,52	13.26
02.09.2015	016	B14	3	6,94	18,1	8,98	99.15
			108	11,49	6,1	1,69	14.64
03.09.2015	017	B15	3	7,30	18,4	8,75	97.36
			96	13,66	7,3	0,23	2.05
03.09.2015	018	B15	2	7,29	18,3	8,73	96.82
			103	13,84	7,4	0,16	1.43
03.09.2015	019	B15	3	7,31	18,5	8,91	99.28
			96	13,75	7,4	0,16	1.43
03.09.2015	020	B15	2	7,31	18,9	8,93	100.31
			93	13,23	7,2	0,26	2.33
04.09.2015	021	B09	2	7,35	18,2	8,77	97.24
			78	10,59	5,8	6,50	55.64
04.09.2015	022	B09	2	7,34	18,5	8,87	98.96
			68	8,88	5,2	6,98	58.29
04.09.2015	023	B09	2	7,36	18,3	8,81	97.70
			65	8,51	5,5	7,59	63.71
05.09.2015	024	B10	4	7,85	17,6	8,86	97.38
			36	8,07	8,6	8,31	74.91
05.09.2015	025	B10	4	8,02	17,5	8,77	96.18
			37	10,57	10,0	4,26	40.50
05.09.2015	026	B10	3	7,95	17,5	8,68	95.25
			31	10,30	11,4	4,51	44.00
06.09.2015	027	B01	4	16,30	16,2	8,18	91.78
			17	19,43	15,2	7,15	80.22
07.09.2015	028	B01	3	13,35	16,5	8,58	95.34
			11	13,37	16,5	8,61	95.59
07.09.2015	029	B01	2	14,11	16,8	8,66	97.21
			15	14,16	16,8	8,59	96.37
07.09.2015	030	B01	2	13,45	16,7	8,71	97.13
			19	17,74	15,6	8,05	90.02
09.09.2015	031	GB3	2	34,46	17,0	7,72	98.30
			38	34,47	16,8	7,44	94.37
09.09.2015	032	GB3	2	34,43	16,7	7,62	96.45
			42	34,43	16,7	7,49	94.83
09.09.2015	033	GB3	3	34,47	17,0	7,74	98.54
			38	34,47	16,8	7,44	94.42
09.09.2015	034	GB3	3	34,45	17,2	7,86	100.43
			40	34,43	16,7	7,48	94.70

Tab. 3: cont.

DATE	STATION	AREA	DEPTH (m)	S (PSU)	T (°C)	O_2 (mg/L)	O_2-SATURATION (%)
10.09.2015	035	P02	3	34,85	14,4	8,12	98.44
			65	35,01	7,1	5,64	58.67
10.09.2015	036	P02	3	34,87	14,2	8,14	98.45
			66	35,00	7,4	5,60	58.55
10.09.2015	037	P02	3	34,85	14,5	8,17	99.46
			71	35,01	7,4	5,64	58.91
11.09.2015	038	N04	3	34,66	15,2	7,90	97.24
			20	34,66	15,2	7,90	97.29
11.09.2015	039	N04	2	34,64	15,2	7,85	96.65
			25	34,64	15,2	7,80	95.99
11.09.2015	040	N04	3	34,65	15,2	7,96	98.04
			18	34,64	15,2	7,93	97.67
11.09.2015	041	N04	3	34,66	15,3	7,93	97.83
			21	34,66	15,3	7,94	97.98
12.09.2015	042	GB4	4	34,83	15,2	7,88	97.11
			42	34,86	13,3	5,10	60.53
12.09.2015	043	GB4	3	34,82	15,2	7,79	96.04
			40	34,84	15,1	7,67	94.51
13.09.2015	044	N11	3	33,61	16,5	7,73	96.99
			29	33,89	16,6	7,56	95.22
13.09.2015	045	N11	3	33,40	16,6	7,83	98.25
			27	33,78	16,6	7,33	92.20
13.09.2015	046	N11	3	33,48	16,7	8,00	100.83
			28	33,74	16,6	7,35	92.50
14.09.2015	047	N01	3	33,56	17,1	7,56	96.07
			23	33,56	17,1	7,58	96.31
14.09.2015	048	N01	2	32,17	16,8	7,71	96.56
			24	32,20	16,8	7,67	96.07
14.09.2015	049	N01	2	33,59	17,4	7,58	96.74
			37	33,64	17,3	7,48	95.38
14.09.2015	050	N01	2	33,68	17,2	7,55	96.20
			35	33,68	17,2	7,52	95.78
14.09.2015	051	N01	4	32,88	17,1	7,06	89.28
			36	32,91	17,1	7,03	88.98
15.09.2015	052	GB1	3	32,81	17,0	7,28	91.80
			34	32,87	17,1	7,21	91.11
15.09.2015	053	GB1	4	33,23	17,2	7,35	93.28
			37	33,22	17,2	7,32	93.00

Tab. 4: *Cruise 387 RV 'Walther Herwig III', 28.08. – 17.09.2015:*
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*
B01	552	10,9	1,3	2,4	0,7	0,0	0,5	0,2	0,4	0,0	0,5
GB1	758	0,3	1,2	1,2	0,1	0,0	0,1	18,5	0,8	1,8	10,2
GB3	745	2,8	2,7	1,3	0,0	0,0	0,3	35,7	10,2	0,8	15,7
GB4	677	13,0	2,7	4,6	0,7	0,1	0,6	55,4	80,8	1,9	7,8
N01	816	1,8	2,3	2,2	0,5	0,0	0,7	30,4	2,7	1,7	13,1
N04	777	4,5	3,1	4,8	0,3	0,0	0,6	57,5	32,0	4,0	17,0
N11	720	2,2	2,1	2,8	0,8	0,1	0,4	40,1	7,8	1,8	15,1
P02	755	9,1	2,0	0,0	0,1	0,1	0,5	34,4	99,6	1,6	1,3
Sum	**5,800**										

Tab. 5: *Cruise 387 RV 'Walther Herwig III', 28.08. – 17.09.2015:*
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	Nematodel	Acanthoceph
			≥ 2	≥ 5	≥ 10			
B01	20-24	55	1,8	0,0	0,0	0,0	0,0	0,0
	25-40	51	13,7	5,9	2,0	2,0	0,0	0,0
GB1	20-24	55	1,8	0,0	0,0	3,6	1,8	0,0
	25-40	23	8,7	0,0	0,0	8,7	4,3	0,0
GB3	20-24	50	2,0	2,0	0,0	0,0	2,0	0,0
	25-40	52	3,8	0,0	0,0	0,0	11,5	3,8
GB4	20-24	56	7,1	1,8	1,8	3,6	1,8	1,8
	25-40	30	30,0	16,7	10,0	3,3	13,3	6,7
N01	20-24	60	0,0	0,0	0,0	1,7	0,0	0,0
	25-40	14	0,0	0,0	0,0	0,0	0,0	0,0
N04	20-24	26	0,0	0,0	0,0	19,2	15,4	0,0
	25-40	18	33,3	16,7	11,1	5,6	0,0	5,6
N11	20-24	52	9,6	7,7	5,8	0,0	0,0	0,0
	25-40	55	9,1	1,8	1,8	0,0	3,6	0,0
P02	20-24	78	9,0	0,0	0,0	66,7	30,8	3,8
	25-40	25	28,0	0,0	12,0	56,0	20,0	4,0
Sum		**700**						

Tab. 6: *Cruise 387 RV 'Walther Herwig III', 28.08. – 17.09.2015:*
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*
B01	175	29,1	0,6	1,1	0,0	72,0	49,7
B10	258	16,7	1,6	0,0	0,8	57,4	0,0
B11	352	15,3	1,4	0,9	0,3	62,2	0,0
GB1	41	7,3	0,0	0,0	0,0	0,0	90,2
Sum	**826**						

Tab. 7: *Cruise 387 RV 'Walther Herwig III', 28.08. – 17.09.2015:* 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			
B01	93	1,1	0,0	0,0	0,0	2,2	3,2
B10	101	1,0	0,0	0,0	0,0	1,0	10,9
B11	123	0,0	0,0	0,0	0,0	4,9	5,7
GB1	41	0,0	0,0	0,0	0,0	2,4	2,4
Sum	**358**						

Tab. 8: *Cruise 387 RV 'Walther Herwig III', 28.08. – 17.09.2015:* Prevalence (%) of externally visible diseases and parasites in cod (*Gadus morhua)* the Baltic Sea

GEBIET	N unt	Ulc Ak/Hei	Skel Def	PBT	Locera	Cryp	Loma	EpPap	N unt	Nemato BC
B01	57	0,0	1,8	0,0	3,5	64,9	89,5	0,0	55	23,6
B09	829	2,5	4,6	0,0	0,0	0,4	95,5	4,0	101	34,7
B10	578	2,6	2,9	0,5	6,1	5,5	91,2	4,0	102	18,6
B11	140	4,3	4,3	0,0	2,9	26,4	39,3	1,4	100	6,0
B13	420	1,7	2,6	0,0	4,8	1,0	98,8	2,4	101	59,4
B14	26	0,0	3,8	0,0	0,0	0,0	100,0	0,0	26	53,8
B15	305	3,6	3,9	0,0	0,0	4,6	96,7	2,0	102	51,0
BHB	1010	0,9	0,6	0,0	6,1	3,2	99,1	4,2	107	29,0
Sum	**3,365**								**694**	

Abbreviations:

N unt : Number examined
Ly : Lymphocystis
Ep Hyp/Pap : Epidermal hyperplasia/papilloma
Ulc Ak/Hei : Skin ulcerationen, acute/healing
Flo Ak/Hei : Fin rot/erosion, acute/healing
KieHy : Gill hyperplasia, x-cell disease
Hyp Pig : Hyperpigmentation
Skel Def : Skeletal deformities
PBT : Pseudobranchial pseudotumour
Acanthoceph : Acanthocephaleans, liver

Steph : *Stephanostomum baccatum*
Acanth : *Acanthochondria cornuta*
Lepe : *Lepeophtheirus pectoralis*
Locera : *Lernaeocera branchialis*
Cryp : *Cryptocotyle spp.*
Loma : *Loma sp.*
Cryp : *Cryptocotyle spp.*
Nemato BC : Nematodes in the body cavity
Nemato L Nematodes on the liver