

**FRV Walther Herwig III
Cruise 411
29.11. - 19.12.2017**

**Studies on Fish Diseases and Biological Effects of Contaminants
in the North Sea and Baltic Sea**

PlasM and DAIMON project

Scientist in Charge: Dr. Pedro Miguel Agostinho Nogueira

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 six Baltic Sea and six North Sea areas. In addition to the onboard examination of dab (*Limanda limanda*), flounder (*Platichthys flesus*) and cod (*Gadus morhua*) for macroscopically externally and internally visible diseases and parasites, a large range of fish samples were taken for a subsequent analysis of contaminants (incl. radioactive substances), their biological effects and the presence of plastic particles in the stomach and intestine of fish (PlasM project). As part of the DAIMON project, studies were carried out on the health status of fish in dumping areas for chemical munitions and in reference areas. Furthermore, sediment samples were taken and hydrographical measurements were carried out (water temperature, salinity, oxygen content, turbidity). A neuston net was operated to sample litter particles at the water surface, and macro litter particles in the bottom trawl were classified and quantified for each fishery haul. The following preliminary findings were noted:

Dab: generally decreasing prevalence of lymphocystis in the North Sea, comparatively high prevalence in the Baltic Sea, partly exceeding the values found in the North Sea; marked increase in prevalence of hyperpigmentation in the North Sea, continuously low values in the Baltic Sea; The ratio of diseased fish is increasing within the German North Sea EEZ in north-westerly direction from the inner German Bight to the Dogger Bank.

Baltic cod: Overall low prevalence of acute/healing skin ulcerations and skeletal deformities; nematodes in the body cavity (mainly on/in the liver) present in all Baltic Sea areas; once more generally high prevalence of the gill parasite *Loma morhua*.

Participants:

Name	Function	Institution
Dr. Pedro Nogueira	Scientist in Charge	TI FI Hamburg
Jennifer Ipse	Technician	TI FI Cuxhaven
Maike Siegmund	Technician	TI FI Cuxhaven
Nadine Dichte	Technician	TI FI Hamburg
Ivo Int-Veen	Scientist	TI FI Hamburg
Nadine Goldenstein	Scientist	TI FI Hamburg
Peggy Weist	Scientist	TI FI Hamburg
Dr. Klaus Wysujack	Scientist	TI FI Hamburg
Michał Józef Czub	Guest Scientist	IOPAS, Sopot
Jan Römer	Student	University Hamburg
Dimitri Schuschkow	Student	Westfälische Hochschule
Leonie Breidenbach	Student	University Bielefeld

Objectives of the Cruise

1. Studies on biological effects of contaminants;
2. Studies on the occurrence of fish diseases and parasites;
3. Sampling of fish for chemical analysis of contaminants (organic, inorganic, radionuclides);
4. Tissue sampling of livers and other organs for subsequent histological and biochemical analyses;
5. Studies and sampling for the PlasM project;
6. Sampling of the sea surface for micro plastic using a Neuston surface net;
7. Hydrographical measurements (salinity, temperature, oxygen, turbidity);
8. Hydroacoustic measurements;
9. Documentation of marine litter fished during bottom trawling;
10. Video and photos from marine litter on the Baltic and North Sea bottom;
11. Sediment sampling;
12. Collection of passive samplers;
13. Test of different trawl tracks.

Dates of the Cruise

Due to sickness of a Walther Herwig III crew member, departure from Bremerhaven was delayed to 1.12.2017 at 7 a.m., sailing towards our first study area in the German Bight (GB1). After this, we continued in direction Baltic Sea steaming along the Danish coast and through the Skagerrak.

On 3.12.2017 at 9 a.m., we arrived at our destination, the first sampling site in the Baltic Sea (B01). In parallel to our regular fishing activities, we deployed a Neuston Net for sampling of planktonic particles that will be used for shore-based analyses of microplastics at the sea surface in the areas visited during the cruise.

On 5.12.2017 we arrived at the deepest part of the Baltic Sea, the Gotland Basin, (GB14). Our goal in this area was to collect cod samples for genetic analyses. Additionally, we took the opportunity to collect sediment samples with three Van Veen grab casts.

On our return way to Kiel, we collected additional samples from areas B11 and B12 on 8.12.2017 and 9.12.2017. After a short stop in Kiel, our travel back to the North Sea started, on day 12.12, once again over the Skagerrak. The survey continued on 13.12 in the area P02, and was followed by the remaining interest areas in the North Sea (N11, N01, GB4, GB3 and GB1). Having achieved our goals, our travel ended on 18.12 in Bremerhaven, one day earlier than planned.

The location of the sampling areas and the cruise dates are shown in Fig. 1 and 2 and Tab. 1. In 12 sampling areas (Fig. 1), a total of 43 fishing hauls was performed (towing time 30–90 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), in the Baltic Sea sediment samples were taken using a van Veen grab (Tab 1b). Neuston trawl sampling was performed in the Baltic Sea and North Sea when the weather condition were favourable (geographical coordinates in Tab. 1C).

Preliminary Results

1 Dab (*Limanda limanda*)

In total, 3615 dab from two Baltic Sea area (B01, B12) and six North Sea areas (GB1, N01, N11, GB3, GB4, P02) were examined for the occurrence of externally visible diseases and parasites (Tab. 4) and 475 dab (≥ 20 cm) for the occurrence of liver anomalies (Tab. 5).

The prevalence of the diseases recorded largely corresponded to finding from previous surveys. The generally decreasing trend in lymphocystis prevalence of North Sea dab apparently continues (current values 2.4 %-16.2 %); In Baltic Sea dab an opposite trend is evident; presently Baltic Sea dab display a higher prevalence compared to some of the North Sea areas (current values 13.7 % in Kiel Bight (area B01) and even 20.3 % in Mecklenburg Bight (area B12)). In contrast, Baltic Sea dab display clearly lower prevalences of grossly visible parasites, and the phenomenon of hyperpigmentation occurs in the Baltic Sea only very rarely (see. Tab. 4).

In the four areas of the German North Sea EEZ, the marked spatial patterns in disease prevalence already identified during previous cruises were confirmed. Overall, the ratio of diseased fish is increasing in the German North Sea EEZ in north-westerly direction from the inner German Bight (area GB1) to the Dogger Bank (area GB4).

The prevalence of hyperpigmentation in North Sea dab has again increasing since some years and approaches partly the maximum values recorded during the 1990s. The highest prevalence was currently recorded in area N01 in the German Bight (57,3 %). The causes of this phenomenon are still unknown. Slightly increasing prevalences (over the past 10 years) were also noted for epidermal hyperplasia/papilloma and the skin parasite *Lepeophtheirus pectoralis*.

There were no major new findings regarding the prevalence of liver tumours, but the prevalence of macroscopic liver nodules >2 mm in large dab (≥ 25 cm) from Kiel Bight (area B01) was markedly increased (29.0 %) compared to previous cruises (Tab. 5). In this area, the increasing trend in prevalence has apparently continued.

2 Cod (*Gadus morhua*)

In total, 414 cod from four Baltic Sea areas were examined for externally visible diseases and parasites, out of which 195 specimens were inspected for nematodes in the body cavity (Tab. 6). The prevalence of externally visible diseases largely corresponded to previous cruises. The prevalence of acute/healing skin ulcerations was low and ranged from 0.0 % to 1.9 %. Skeletal deformities were rare, too, with values in the range of 0.0 % to 2.4 %.

Larval nematodes in the body cavity were recorded in cod from all sampling areas. A comparison to data from the 1980s/1990s reveals that the prevalence has clearly increased since then. The highest prevalence (61.9 %) occurred in cod from area B09 outside Gdansk

Bight. The majority of nematodes belong to the species *Contracaecum osculatum*, which mostly infests the livers of cod. The final hosts of this parasite are seals.

The gill parasite *Loma morhua* was again very prevalent in all areas, the highest prevalence of 100.0 % was recorded in cod from area B09 outside Gdansk Bight.

3 Flounder (*Platichthys flesus*)

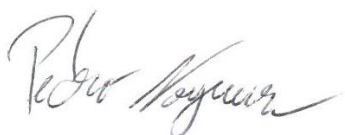
In total, 348 flounder from four Baltic Sea areas were examined for the presence of externally visible diseases and parasites. Lymphocystis still is the predominating disease (maximum prevalence 37.1 % in the Arkona Sea, area B11. The infestation with the trematode *Cryptocotyle* sp. Was also high (values in the range of 50.0 % - 77.5 %).

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



Dr. Pedro Miguel Agostinho Nogueira

(Scientist in Charge)

Annex

2 Figures, 7 Tables

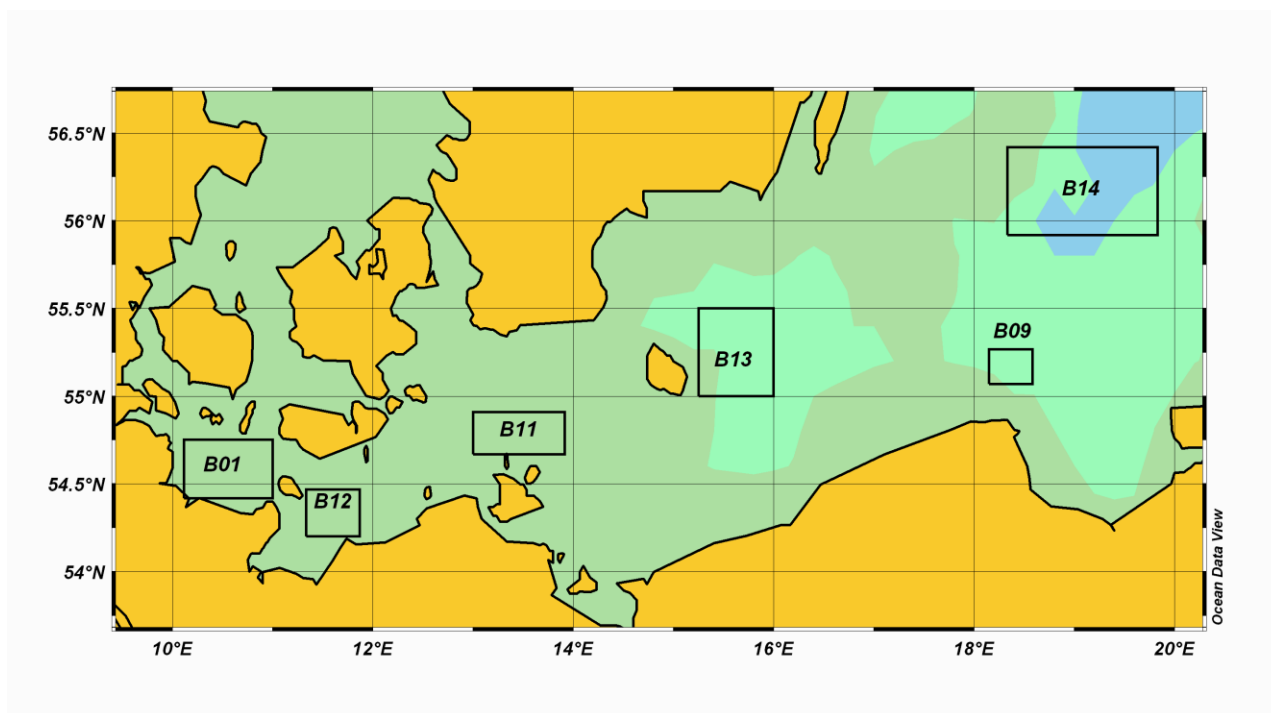


Fig. 1: Cruise 411 RV 'Walther Herwig III', 29.11. – 19.12.2017:
Location of sampling sites in the Baltic Sea

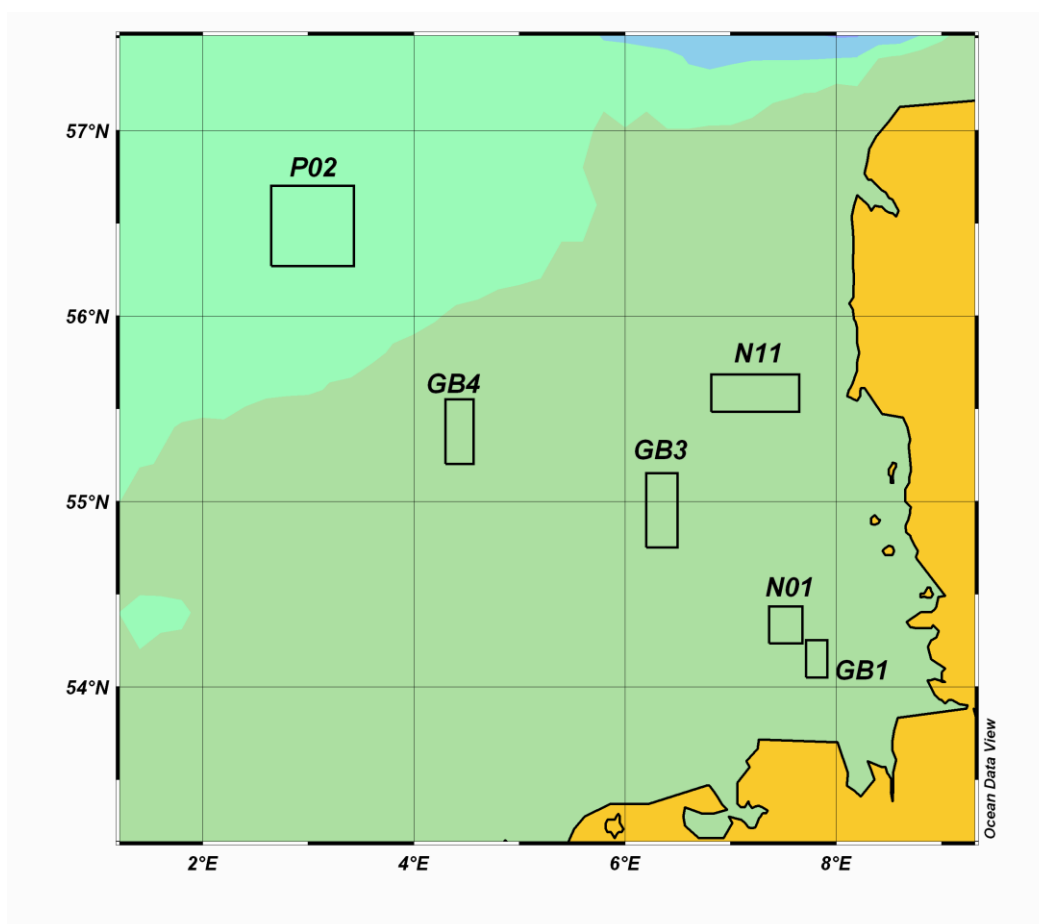


Fig. 2: Cruise 411 RV 'Walther Herwig III', 29.11. – 19.12.2017:
Location of sampling sites in the North Sea

Tab. 1: Cruise 411 RV 'Walther Herwig III', 29.11. – 19.12.2017:
Geographical coordinates of trawling stations in the Baltic Sea and North Sea

Date	LOG-Station	Station	Area	ICES-Rectangle	Latitude	Longitude
01.12.17	771	1	GB1	37F7	54°04,46N	07°52,19E
01.12.17	772	2	GB1	37F7	54°07,24N	07°45,29E
01.12.17	773	3	N01	37F7	54°15,78N	07°29,73E
03.12.17	774	4	B01	38G0	54°33,04N	10°47,82E
03.12.17	775	5	B01	38G0	54°33,93N	10°31,83E
03.12.17	776	6	B01	38G0	54°36,45N	10°23,48E
04.12.17	777	7	B13	39G5	55°23,94N	15°38,05E
04.12.17	778	8	B13	39G5	55°22,59N	15°47,75E
04.12.17	779	9	B13	39G5	55°21,08N	15°44,99E
04.12.17	780	10	B13	39G5	55°24,98N	15°34,93E
05.12.17	781	11	B14	41G8	56°04,14N	18°41,02E
05.12.17	782	12	B14	40G8	55°59,87N	18°49,46E
05.12.17	784	13	B14	41G8	56°00,50N	18°43,18E
06.12.17	790	14	B09	39G8	55°11,55N	18°29,55E
06.12.17	791	15	B09	39G8	55°12,86N	18°16,93E
06.12.17	792	16	B09	39G8	55°07,84N	18°15,07E
06.12.17	793	17	B09	39G8	55°08,13N	18°19,25E
06.12.17	794	18	B09	39G8	55°07,21N	18°10,90E
06.12.17	795	19	B09	39G8	55°10,54N	18°13,15E
07.12.17	796	20	B09	39G8	55°11,61N	18°28,77E
07.12.17	797	21	B09	39G8	55°08,22N	18°19,02E
07.12.17	798	22	B09	39G8	55°07,29N	18°15,74E
08.12.17	799	23	B11	38G3	54°46,63N	13°50,13E
08.12.17	800	24	B11	38G3	54°47,21N	13°48,93E
09.12.17	801	25	B12	37G1	54°13,70N	11°46,65E
09.12.17	802	26	B12	37G1	54°13,90N	11°46,98E
09.12.17	803	27	B12	37G1	54°20,33N	11°43,05E
13.12.17	804	28	P02	41F3	56°27,82N	03°24,46E
13.12.17	805	29	P02	42F3	56°36,55N	03°13,09E
13.12.17	806	30	P02	42F3	56°34,38N	03°04,24E
14.12.17	807	31	GB4	39F4	55°23,45N	04°32,94E
14.12.17	808	32	GB4	39F4	55°23,55N	04°26,11E
14.12.17	809	33	GB4	39F4	55°22,99N	04°32,61E
14.12.17	810	34	GB4	39F4	55°23,01N	04°26,10E
14.12.17	811	35	GB4	39F4	55°23,73N	04°26,32E
15.12.17	812	36	N11	40F7	55°31,10N	07°09,99E
15.12.17	814	37	GB3	38F6	54°58,75N	06°22,96E
16.12.17	815	38	GB3	38F6	54°56,25N	06°17,35E
16.12.17	816	39	GB3	38F6	54°58,46N	06°22,87E
16.12.17	817	40	N01	37F7	54°23,75N	07°27,78E
16.12.17	818	41	N01	37F7	54°22,85N	07°34,20E
17.12.17	819	42	GB1	37F7	54°04,33N	07°53,21E
17.12.17	820	43	GB1	37F7	54°06,76N	07°47,02E

Tab. 1a: Cruise 411 RV 'Walther Herwig III', 29.11. – 19.12.2017: Geographical coordinates of hydrography stations in the Baltic Sea and North Sea

Date	LOG Station	Trawling Station	Area	ICES-Rectangle	Latitude	Longitude
01.12.17	771	001	GB1	37F7	54°03,55N	07°52,77E
01.12.17	772	002	GB1	37F7	54°07,45N	07°44,43E
01.12.17	773	003	N01	37F7	54°19,60N	07°27,28E
03.12.17	774	004	B01	38G0	54°33,29N	10°48,70E
03.12.17	775	005	B01	38G0	54°33,86N	10°32,35E
03.12.17	776	006	B01	38G0	54°36,68N	10°22,32E
04.12.17	777	007	B13	39G5	55°24,60N	15°35,94E
04.12.17	778	008	B13	39G5	55°17,21N	15°55,20E
04.12.17	779	009	B13	39G5	55°20,54N	15°46,03E
04.12.17	780	010	B13	39G5	55°24,19N	15°35,03E
05.12.17	781	011	B14	41G8	56°04,79N	18°39,75E
05.12.17	782	012	B14	41G8	56°00,05N	18°51,27E
05.12.17	783		B14	40G8	55°59,87N	18°30,05E
05.12.17	784	013	B14	40G8	55°59,80N	18°39,57E
05.12.17	785		B14	41G8	56°00,59N	18°55,18E
05.12.17	786		B14	41G8	56°00,50N	18°47,54E
05.12.17	787		B14	41G8	56°04,84N	18°47,33E
05.12.17	788		B14	41G8	56°00,66N	18°39,44E
05.12.17	789		B14	40G8	55°56,12N	18°47,52E
06.12.17	790	014	B09	39G8	55°11,57N	18°30,87E
06.12.17	791	015	B09	39G8	55°12,68N	18°18,18E
06.12.17	792	016	B09	39G8	55°07,18N	18°15,67E
06.12.17	793	017	B09	39G8	55°08,16N	18°20,41E
06.12.17	794	018	B09	39G8	55°06,74N	18°11,45E
06.12.17	795	019	B09	39G8	55°10,21N	18°14,15E
07.12.17	796	020	B09	39G8	55°11,71N	18°30,00E
07.12.17	797	021	B09	39G8	55°08,43N	18°20,13E
07.12.17	798	022	B09	39G8	55°06,97N	18°16,39E
08.12.17	799	023	B11	38G3	54°47,03N	13°50,90E
08.12.17	800	024	B11	38G3	54°47,56N	13°49,69E
09.12.17	801	025	B12	37G1	54°13,88N	11°47,38E
09.12.17	802	026	B12	37G1	54°13,84N	11°47,92E
09.12.17	803	027	B12	37G1	54°20,71N	11°43,79E
13.12.17	804	028	P02	41F3	56°27,47N	03°25,61E
13.12.17	805	029	P02	42F3	56°35,87N	03°14,05E
13.12.17	806	030	P02	42F3	56°35,04N	03°04,82E
14.12.17	807	031	GB4	39F4	55°23,57N	04°33,90E
14.12.17	808	032	GB4	39F4	55°23,56N	04°25,45E
14.12.17	809	033	GB4	39F4	55°22,96N	04°33,74E
14.12.17	810	034	GB4	39F4	55°23,00N	04°25,02E
14.12.17	811		GB4	39F4	55°23,06N	04°33,92E
14.12.17	811.2	035	GB4	39F4	55°23,85N	04°25,12E

Tab. 1a: cont.

Date	LOG Station	Fishery Station	Area	ICES-Rectangle	Latitude	Longitude
15.12.17	812	036	N11	40F7	55°30,62N	07°10,33E
15.12.17	813		N11	40F7	55°35,41N	07°08,63E
15.12.17	814	037	GB3	38F6	54°59,14N	06°23,73E
16.12.17	815	038	GB3	38F6	54°55,77N	06°16,66E
16.12.17	816	039	GB3	38F6	54°59,05N	06°23,73E
16.12.17	817	040	N01	37F7	54°23,67N	07°26,91E
16.12.17	818	041	N01	37F7	54°23,34N	07°35,27E
17.12.17	819	042	GB1	37F7	54°04,26N	07°53,43E
17.12.17	820	043	GB1	37F7	54°07,27N	07°45,57E

Tab. 1b: Cruise 411 RV 'Walther Herwig III', 29.11. – 19.12.2017:
Geographical coordinates of sediment sampling stations in the Baltic Sea

Date	LOG-Station	GEBIET	RECTANGLE	GEOBREITE	GEOLAENGE
05.12.17	783	B14	40G8	55°59,79N	18°30,07E

Tab. 1c: Cruise 411 RV 'Walther Herwig III', 29.11. – 19.12.2017:
Geographical coordinates of Neuston trawl sampling stations in the Baltic Sea and North Sea

DATUM	LOG-Station	Fishery Station	GEBIET	GEOBREITE	GEOLAENGE	DAUER
03.12.2017	774	004	B01	54°32,85N	010°45,96E	15
03.12.2017	776	006	B01	54°36,14N	010°24,99E	15
04.12.2017	777	007	B13	54°23,92N	015°38,20E	15
04.12.2017	779	009	B13	54°21,10N	015°44,95E	15
05.12.2017	784	013	B14	54°00,46N	018°42,97E	15
08.12.2017	800	024	B11	54°47,16N	013°48,80E	15
15.12.2017	814	037	GB3	54°58,72N	006°22,89E	10
16.12.2017	817	040	N01	54°23,77N	007°28,01E	15

Tab. 2: Cruise 411 RV 'Walther Herwig III', 29.11. – 19.12.2017: 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	Herring	Sprat	Mackerel	Dab	Plaice	Flounder
GB1 n	1	26751	76	551		66	2	< 1
kg	1	1334	3	3		4	1	< 0,5
N01 n		33	15812	56909	1001	367	4	
kg		2	95	342	7	28	1	
B01 n	11	53	235	125		421	105	2
kg	6	6	5	2		83	38	2
B13 n	8	< 1	182	6124			13	5
kg	2	< 0,5	8	95			3	2
B14 n	12		96	1834			?	1
kg	5		4	13			?	< 0,5
B09 n	9		45	2		< 1		
kg	4		2	< 0,5		< 0,5		
B11 n	190	638	138	6198		< 1	6	60
kg	299	154	7	76		< 0,5	3	42
B12 n	40	168	122	27394		50	22	34
kg	62	39	4	384		18	7	18
P02 n	1	48	< 1	1		584	1	
kg	< 0,5	1	< 0,5	< 0,5		58	< 0,5	
GB4 n	2	12	4683	57059	6	411	9	
kg	1	1	91	449	< 0,5	34	1	
N11 n	1	20	2253	25045		1784	5	
kg	1	1	42	117		136	2	
GB3 n	2	47	923	3949		559	12	
kg	3	3	211	777		38	4	

Tab. 3: Cruise 411 RV 'Walther Herwig III', 29.11. – 19.12.2017: Water depth, temperature (T), salinity (S), O₂ in mg/l and O₂ saturation (%) in Baltic Sea and North Sea

DATE	STATION	AREA	DEPTH (m)	T (°C)	S (PSU)	O ₂ (mg/L)	O ₂ -SATURATION (%)
01.12.2017	1	GB1	2	9,182	32,906	5,92	90,88
			32	9,559	33,1305	5,86	90,8
01.12.2017	2	GB1	10	9,884	32,3422	5,81	90,15
			36	9,933	33,4858	5,77	90,4
01.12.2017	3	N01	3	10,338	32,8209	4,19	65,86
			30	10,381	32,8968	5,73	90,19
03.12.2017	4	B01	2	7,008	17,8304	7,03	93,08
			22	8,218	19,4723	6,21	85,48
03.12.2017	5	B01	3	7,647	19,2868	6,75	91,6
			14	7,649	19,2867	6,76	91,67
03.12.2017	6	B01	3	7,328	19,2887	6,96	93,64
			15	7,417	19,3527	6,88	92,92

Tab. 3: cont.

DATE	STATION	AREA	DEPTH (m)	T (°C)	S (PSU)	O2 (mg/L)	O2- SATURATION (%)
04.12.2017	7	B13	2 85	7,47 6,762	7,3323 17,0708	7,33 0,02	91,57 0,28
04.12.2017	8	B13	2 84	7,494 6,771	7,2992 17,1512	7,31 0,01	91,32 0,12
04.12.2017	9	B13	4 88	7,366 6,849	7,2546 17,4134	7,36 0	91,69 0,04
04.12.2017	10	B13	3 83	7,438 6,792	7,3272 17,0159	7,35 0,05	91,7 0,63
05.12.2017	11	B14	2 90	6,643 6,075	7,124 11,0385	7,48 0,16	91,47 1,97
05.12.2017	12	B14	3 110	7,265 6,4	7,2717 11,8009	7,34 0,22	91,18 2,7
05.12.2017		B14	3 95	6,675 6,268	7,1199 11,4517	7,49 0,46	91,71 5,71
05.12.2017	13	B14	3 104	6,778 6,386	7,1315 11,7387	7,45 0,62	91,45 7,82
05.12.2017		B14	3 110	7,293 6,413	7,2661 11,7722	7,34 0,27	91,26 3,36
05.12.2017		B14	2 105	6,947 6,328	7,1656 11,7	7,43 0,79	91,58 9,83
05.12.2017		B14	3 103	6,696 6,319	7,1233 11,5368	7,45 0,45	91,23 5,64
05.12.2017		B14	3 100	6,807 6,333	7,1462 11,586	7,45 0,59	91,48 7,42
05.12.2017		B14	2 102	6,969 6,343	7,2108 11,6942	7,42 0,72	91,51 8,98
06.12.2017	14	B09	3 76	6,825 6,199	7,2793 11,0786	7,44 0,64	91,45 7,93
06.12.2017	15	B09	3 62	7,061 5,975	7,3048 9,994	7,41 1,35	91,64 16,58
06.12.2017	16	B09	5 62	6,858 6,123	7,2549 10,4446	7,45 0,77	91,61 9,44
06.12.2017	17	B09	4 70	6,773 6,006	7,2837 10,5807	7,46 0,41	91,58 5
06.12.2017	18	B09	3 65	6,79 6,072	7,2462 10,0074	7,47 1,4	91,74 17,26
06.12.2017	19	B09	2 63	7,033 5,804	7,291 10,2208	7,39 0,48	91,34 5,88
07.12.2017	20	B09	3 75	7,099 6,276	7,3042 11,2187	7,4 0,8	91,58 9,9
07.12.2017	21	B09	5 71	7,027 5,994	7,2992 10,52	7,39 0,4	91,37 4,87
07.12.2017	22	B09	5 64	6,802 6,048	7,2254 9,9524	7,46 1,65	91,69 20,29

Tab. 3: cont.

DATE	STATION	AREA	DEPTH (m)	T (°C)	S (PSU)	O2 (mg/L)	O2- SATURATION (%)
08.12.2017	23	B11	2	7,208	7,6297	7,49	93,15
			34	9,121	9,9384	6,42	84,88
08.12.2017	24	B11	3	7,154	7,5505	7,5	93,09
			36	10,154	11,3308	6,09	83,15
09.12.2017	25	B12	2	6,513	14,7483	7,24	92,73
			23	6,621	15,7664	7,12	92,14
09.12.2017	26	B12	4	6,585	15,2203	7,15	92,03
			16	6,58	15,4797	7,14	92,15
09.12.2017	27	B12	4	6,707	15,5507	7,11	92,05
			20	6,808	16,0918	7,04	91,73
13.12.2017	28	P02	4	7,983	34,9084	6	90,89
			65	7,987	34,907	6,01	91,02
13.12.2017	29	P02	3	8,014	34,9305	6	90,94
			65	8,02	34,9295	5,98	90,63
13.12.2017	30	P02	3	8,074	34,9255	5,96	90,48
			65	8,081	34,9247	5,99	90,82
14.12.2017	31	GB4	3	7,983	34,8669	6,05	91,49
			40	8,001	34,8646	6,05	91,59
14.12.2017	32	GB4	4	8,035	34,8677	6,02	91,23
			39	8,038	34,8664	6,05	91,61
14.12.2017	33	GB4	3	8,024	34,8613	6,04	91,43
			42	8,027	34,861	6,04	91,54
14.12.2017	34	GB4	3	8,053	34,8661	6,03	91,37
			40	8,056	34,8654	6,04	91,56
14.12.2017	35	GB4	3	8,044	34,8603	6,03	91,35
			42	8,041	34,86	6,03	91,37
15.12.2017	36	N11	3	8,343	34,3028	5,95	90,45
			25	8,358	34,315	5,97	90,71
15.12.2017		N11	2	8,469	34,3331	5,93	90,37
			26	8,486	34,3468	5,94	90,6
15.12.2017	37	GB3	3	9,226	34,6015	5,84	90,7
			39	9,284	34,6072	5,84	90,89
16.12.2017	38	GB3	4	9,198	34,5246	5,85	90,81
			38	9,282	34,5516	5,86	91,05
16.12.2017	39	GB3	5	9,206	34,5673	5,84	90,67
			39	9,216	34,5685	5,85	90,89
16.12.2017	40	N01	3	7,976	33,5583	6,04	90,64
			22	8,007	33,5722	6,04	90,64
16.12.2017	41	N01	3	7,48	32,3871	6,17	90,8
			21	7,983	33,1952	6,05	90,63
17.12.2017	42	GB1	4	6,493	31,3828	6,37	91
			34	7,839	33,0298	6,01	89,59
17.12.2017	43	GB1	2	6,883	32,7218	6,23	90,73
			38	7,626	34,0778	6,06	90,44

Tab. 4: Cruise 411 RV 'Walther Herwig III', 29.11. – 19.12.2017: Prevalences (%) 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	502	13,7	1,6	0,6	0,2	0,2		1,0	0,8		0,4
B12	359	20,3	0,8	5,6	0,3		0,3	0,6			
GB1	291	2,4	3,1	2,4				41,2	6,9	3,4	11,0
GB3	515	9,7	4,7		0,6		0,2	45,8	33,6	4,7	8,7
GB4	569	16,2	1,9	0,5	0,5		0,7	48,5	85,9	2,8	8,6
N01	365	2,7	6,0		0,5	0,3	0,3	57,3	5,8	4,9	10,1
N11	510	5,9	4,7	0,6			0,4	38,6	7,8	3,9	11,0
P02	504	15,7	1,8	1,0	0,4		0,6	36,1	99,8	2,8	1,8
Sum	3615										

Tab. 5: Cruise 411 RV 'Walther Herwig III', 29.11. – 19.12.2017: Prevalences (%) of liver anomalies in dab (*Limanda limanda*) from the Baltic Sea and North Sea

GEBIET	Length (cm)		N unt	Liver nodules (mm)			Green Lebern	Nema-todes	Acantho-ceph.
	von	bis		≥ 2	≥ 5	≥ 10			
B01	20	24	48	2,1					
	25	40	62	29,0	22,6	19,4			
GB1	20	24	33	9,1	3,0		3,0		
	25	40	2						
GB3	20	24	56	5,4	1,8	1,8	1,8		
	25	40	13				7,7		7,7
GB4	20	24	52	7,7		5,8	11,5	1,9	
	25	40	20	10,0	10,0	10,0	5,0	10,0	
N01	20	24	54	20,4	11,1	3,7			3,7
	25	40	6	66,7	50,0	33,3			
N11	20	24	51	7,8		5,9			
	25	40	8	12,5				12,5	
P02	20	24	52	21,2	17,3	13,5	59,6	1,9	
	25	40	18	11,1	11,1	5,6	66,7	11,1	
Summe			475						

Tab. 6: Cruise 411 RV 'Walther Herwig III', 29.11. – 19.12.2017: Prevalences (%) of externally visible diseases and parasites in cod (*Gadus morhua*) from the Baltic Sea

Area	N unt	Ulc Ak/Hei	Skel Def	PBT	Locera	Cryp	Loma	N	Anis
B09	85		2,4			4,7	100,0	63	61,9
B11	254	1,6	0,4	0,4		15,0	89,8	101	15,8
B13	23					30,4	91,3		
B14	52	1,9	1,9			32,7	90,4	31	77,4
Sum	414							195	

Tab. 7: Cruise 411 RV 'Walther Herwig III', 29.11. – 19.12.2017:
Prevalences (%) of externally visible diseases and parasites in flounder
(*Platichthys flesus*) from the Baltic Sea

Area	N unt	Ly	Ulc Ak/Hei	Flo Ak/Hei	Skel Def	Cryp	Lepe
B11	251	37,1			0,4	64,5	
B12	71	25,4			1,4	77,5	2,8
B13	24	20,8	4,2			66,7	4,2
B14	2	100				50	
Summe	348						

Abbreviations:

N unt	: Number examined	Acanthoceph.	: Acanthocephaleans, liver
Ly	: Lymphocystis	Steph	: <i>Stephanostomum baccatum</i>
Ep Hyp/Pap	: Epidermal hyperplasia/papilloma	Acanth	: <i>Acanthochondria cornuta</i>
Ulc Ak/Hei	: Skin ulcerationen, acute/healing	Lepe	: <i>Lepeophtheirus pectoralis</i>
Flo Ak/Hei	: Fin rot/erosion, acute/healing	Locera	: <i>Lernaeocera branchialis</i>
KieHy	: Gill hyperplasia, x-cell disease	Clav	: <i>Clavella adunca</i>
Hyp Pig	: Hyperpigmentation	Cryp	: <i>Cryptocotyle spp.</i>
Skel Def	: Skeletal deformities	Loma	: <i>Loma sp.</i>
PBT	: Pseudobranchial pseudotumour	Nemato	: Nematodes in the body cavity
LK >2 mm	: Liver nodules > 2 mm in diameter	Cryp	: <i>Cryptocotyle spp.</i>