Federal Research Institute for Rural Areas, Forestry and Fisheries
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THÜNEN

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FRV Walther Herwig III
Cruise 419
21.08. - 09.09.2018

Integrated Monitoring of Contaminants and their Biological Effects (INMON)

Projects DAIMON and PlasM

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 four Baltic Sea and seven North Sea areas. In addition to the onboard examination of dab (*Limanda limanda*) and cod (*Gadus morhua*) for macroscopic externally and internally visible diseases and parasites, a large range of fish samples were taken for a subsequent analysis of contaminants (incl. radioactive substances) and their biological effects. As part of the DAIMON project, extensive studies were carried out on the health status of cod in a dumping area for chemical munitions in Bornholm Basin and in a reference area outside the Gulf of Gdansk. Furthermore, sediment samples were taken and, in the framework of the PlasM project, neuston samples from the water surface for investigations on plastic particles were collected. In addition, hydrographical measurements were carried out (water temperature, salinity, oxygen content, turbidity).

The following preliminary findings were noted:

Dab: generally low prevalence of "classical" infectious diseases (lymphocystis, epidermal hyperplasia/papilloma, skin ulcerations) in the North Sea; continuing increased prevalence of hyperpigmentation in the North Sea; increasing prevalence of liver nodules/tumours in Kiel Bight, Baltic Sea, and slightly elevated prevalence in the North Sea..

Baltic cod: slightly increased prevalence of skin ulcerations; continuing strong infestation with nematodes in the body cavity; once more generally high prevalence of the gill parasite *Loma morhua*.

Participants:

Name	Function	Institution
Dr. Thomas Lang	Scientist in Charge	TI Fishery Ecology
Dr. Klaus Wysujack	Scientist	TI Fishery Ecology
Katharina Straumer	Scientist	TI Fishery Ecology
Ivo Int-Veen	Scientist	TI Fishery Ecology
Nadine Dichte	Technician	TI Fishery Ecology
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Michal Czub	Guest scientist	IOPAS, Sopot
Marie-Kristin Blankenburg	Student	Braunschweig
Nora Salland	Student	Rostock
Jan Römer	Student	Bremerhaven

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;
4. Tissue sampling of livers and other organs for subsequent histological and biochemical analyses;
5. Studies and sampling for the DAIMON and PlasM projects;
6. Hydrographical measurements (salinity, temperature, oxygen, turbidity);
7. Sediment sampling;
8. Sea surface trawling for plastic particles using a Neuston net;

Dates of the Cruise

FRV Walther Herwig III left Bremerhaven in the morning of 21.08. heading for the Baltic Sea via the Skagerrak. In the morning of 23.08., the vessel berthed in Kiel where a guest scientist came on board. Practical work started on 24.08. in area B01 in Kiel Bight. During the following days, Baltic Sea areas B11, B09 and the munitions dumpsite B13 (the latter for two days) were visited. After the work in the Baltic Sea was finished, the vessel sailed through the Skagerrak (here one haul in area SK2) into the North Sea. Starting on 02.09., work was continued in North Sea areas P02, GB4, N11, GB3, N01 and GB1.The cruise ended on schedule in the morning of 09.09. in Bremerhaven.

The location of the sampling areas and the cruise dates are shown in Fig. 1 and 2 and Tab. 1. In 11 sampling areas (Fig. 1-3), a total of 32 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), in the Baltic Sea sediment samples were taken using a van Veen grab (Tab. 1b), a neuston sampler was used in both the Baltic Sea and the North Sea (Tab. 1c).

Preliminary Results

Dab (*Limanda limanda*)

In total, 3,659 dab from one Baltic Sea area (B01) and six North Sea areas (P02, GB4, N11, GB3, N01, GB1) were examined for the occurrence of externally visible diseases and parasites (Tab. 4) and, out of these, 554 dab (total length ≥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 has stabilised; current values were low, 0.2-10.1 %). Currently, Baltic Sea dab from Kiel Bight display a clearly higher prevalence (7.5 %) compared to most of the North Sea study areas. In contrast, the prevalence of grossly visible parasites is lower in the Baltic Sea, and the phenomenon of hyperpigmentation is currently lacking (see Tab. 4).

In the four areas of the German North Sea EEZ (GB1, N01, GB3, GB4), the marked spatial patterns in disease prevalence already identified during previous cruises were confirmed. Dab from the innermost area in the German Bight were healthiest, and the prevalence of lymphocystis, acute/healing skin ulcerations and fin rot/erosion and, in particular, of the parasite *Stephanostomum baccatum* (white cysts under the skin) increased in northwesterly direction, while the prevalence of the parasites *Acanthochondria cornuta* and *Lepeophtheirus pectoralis* (both copepods, crustaceans) apparently decreased.

The increasing prevalence of hyperpigmentation in North Sea dab was confirmed and approaches the maximum values recorded during the 1990s. The highest prevalence was recorded in areas N01 and GB4 (56.4 % in both areas). The causes of this phenomenon are still unknown.

There were no major new findings regarding the prevalence of liver tumours, but the prevalence of macroscopic liver nodules >2 mm in large dab (total length ≥25 cm) from Kiel Bight (area B01) was markedly increased (17.6 %); in this area, the increasing trend has continued. Also in the North Sea areas, more dab were affected compared to the previous year (Tab. 5).

Cod (*Gadus morhua*)

In total, 1,369 cod from three Baltic Sea areas (B11, B09, B13) were examined for externally visible diseases and parasites, out of which 406 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 slightly elevated compared to the previous year and ranged from 4.8 % to 8.5 %. Pre-stages of skin ulcerations (haemorrhagic stage) were more prevalent (15.7 %) in the munitions dumpsite (area B13) in Bornholm Basin compared to the other two areas B11 and B09 (3.3 % and 5.2 %, resp.). Skeletal deformities were rare, with values in the range of 0.9 % to 1.2 %.

Larval nematodes in the body cavity, in particular on the liver surface, were recorded in cod from all sampling areas. The highest prevalence of 54.4 % occurred in cod from the dumpsite of chemical munitions/warfare agents in Bornholm Basin (area B13). 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* (Microspora) was again very prevalent in all areas, the highest prevalence of 92.3 % was recorded in cod from the munitions dumpsite (area B13) in Bornholm Basin.

1 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.

Dr. Thomas Lang

(Scientist in Charge)

Annex

2 Figures, 7 Tables

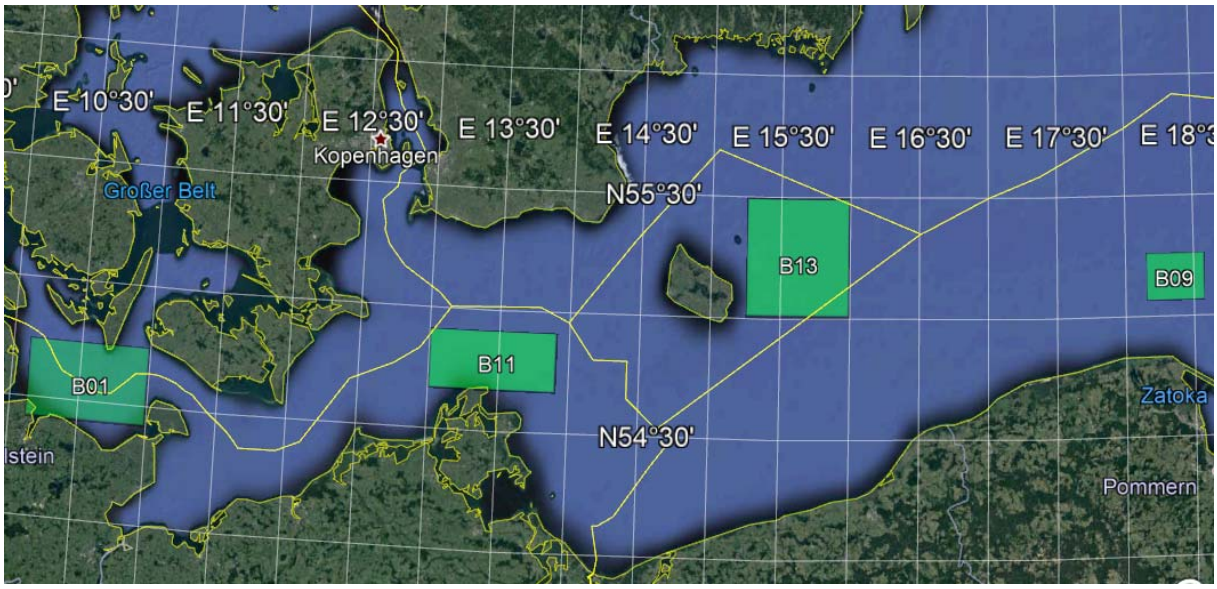

Fig. 1: Cruise 419 RV 'Walther Herwig III', 21.08. – 09.09.2018: Location of sampling sites in the Baltic Sea

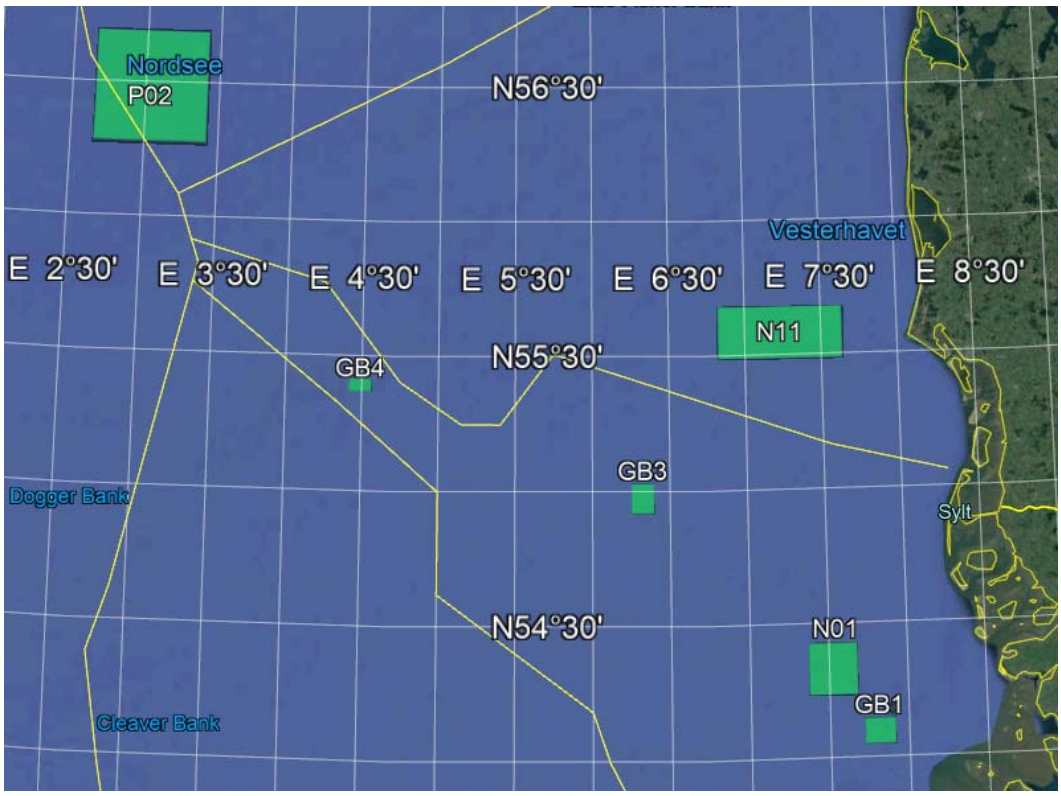

Fig. 2: Cruise 419 RV 'Walther Herwig III', 21.08. – 09.09.2018: Location of sampling sites in the North Sea

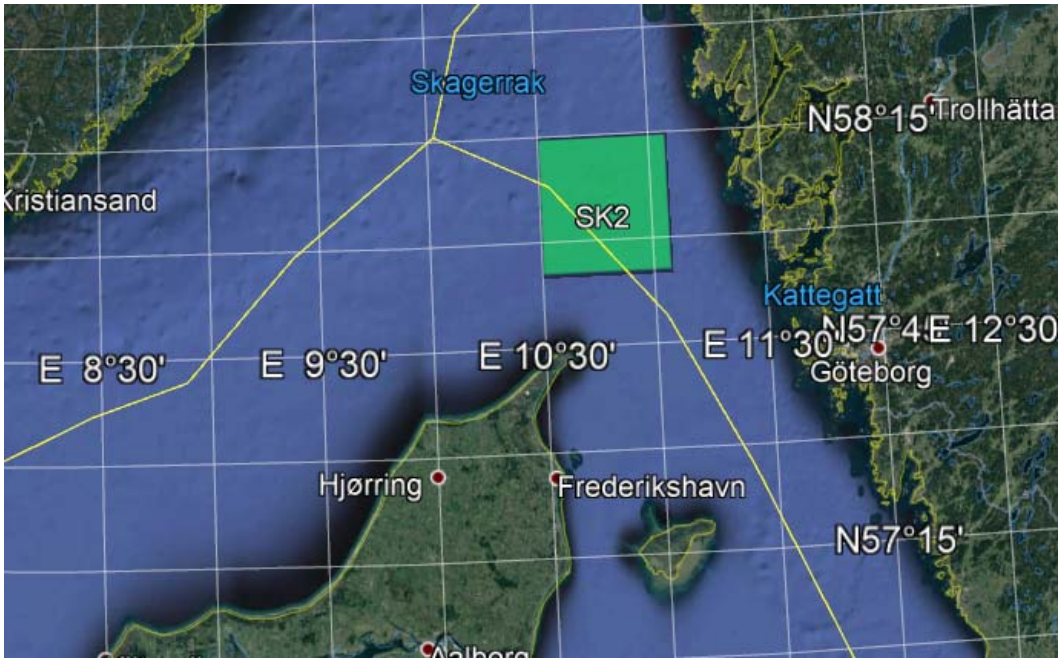

Fig. 2: Cruise 419 RV 'Walther Herwig III', 21.08. – 09.09.2018: Location of the sampling site in the Skagerrak

Tab. 1: Cruise 419 RV 'Walther Herwig III', 21.08. – 09.09.2018:
Geographical coordinates of trawling stations in the Baltic Sea and North Sea with trawling time and gear type

DATE	LOG STATION	STATION	Area	ICES RECT	LATITUDE	LONGITUDE	TIME (Min)	GEAR
24.08.18	400	001	B01	38G0	54°33,12N	10°47,76E	60	140er
24.08.18	401	002	B01	38G0	54°32,22N	10°40,11E	30	140er
26.08.18	402	003	B11	38G3	54°46,62N	13°16,03E	60	140er
26.08.18	403	004	B11	38G3	54°46,03N	13°20,84E	60	140er
26.08.18	404	005	B11	38G3	54°46,27N	13°39,41E	60	140er
26.08.18	405	006	B11	38G3	54°46,31N	13°48,99E	60	140er
27.08.18	406	007	B09	39G8	55°08,15N	18°11,18E	60	140er
27.08.18	408	008	B09	39G8	55°08,10N	18°19,03E	59	140er
28.08.18	410	009	B13	39G5	55°20,68N	15°35,32E	60	PSN
28.08.18	411	010	B13	39G5	55°19,83N	15°34,57E	74	PSN
28.08.18	412	011	B13	39G5	55°20,46N	15°35,07E	60	PSN
29.08.18	416	012	B13	39G5	55°18,73N	15°36,89E	60	PSN
29.08.18	417	013	B13	39G5	55°22,33N	15°34,52E	60	PSN
29.08.18	419	014	B13	39G5	55°19,85N	15°35,25E	61	PSN
01.09.18	424	015	SK2	45G0	58°11,10N	10°42,40E	60	PSN
02.09.18	426	016	P02	42F3	56°40,59N	03°12,08E	60	GOV
02.09.18	427	017	P02	41F3	56°28,84N	03°09,09E	59	GOV
03.09.18	428	018	GB4	39F4	55°23,55N	04°26,24E	60	GOV
03.09.18	429	019	GB4	39F4	55°23,08N	04°32,49E	60	GOV
03.09.18	431	020	GB4	39F4	55°22,82N	04°26,17E	60	GOV
04.09.18	432	021	N11	40F7	55°38,85N	07°01,59E	59	GOV
04.09.18	433	022	N11	40F7	55°35,25N	07°05,44E	59	GOV
04.09.18	435	023	N11	40F7	55°35,65N	07°05,73E	60	GOV
05.09.18	436	024	GB3	38F6	54°56,30N	06°17,14E	59	GOV
05.09.18	437	025	GB3	38F6	54°58,97N	06°23,09E	60	GOV
05.09.18	439	026	GB3	38F6	54°56,52N	06°16,74E	60	GOV
06.09.18	440	027	N01	37F7	54°15,76N	07°30,44E	59	GOV
06.09.18	441	028	N01	37F7	54°15,90N	07°29,70E	60	GOV
06.09.18	442	029	N01	37F7	54°15,88N	07°30,53E	60	GOV
07.09.18	444	030	GB1	37F7	54°04,42N	07°53,57E	59	GOV
07.09.18	446	031	GB1	37F7	54°06,84N	07°46,43E	60	GOV
07.09.18	447	032	GB1	37F7	54°04,71N	07°52,73E	60	GOV

Tab. 1a: Cruise 419 RV 'Walther Herwig III', 21.08. – 09.09.2018: Geographical coordinates of hydrography stations in the Baltic Sea and North Sea

DATE	LOG STATION	STATION	AREA	ICES RECT	LATITUDE	LONGITUDE
24.08.18	400	001	B01	38G0	54°33,00N	10°50,21E
24.08.18	401	002	B01	38G0	54°31,75N	10°38,13E
26.08.18	402	003	B11	38G3	54°46,00N	13°06,56E
26.08.18	403	004	B11	38G3	54°46,05N	13°19,80E
26.08.18	404	005	B11	38G3	54°46,23N	13°38,19E
26.08.18	405	006	B11	38G3	54°46,66N	13°49,54E
27.08.18	406	007	B09	39G8	55°07,79N	18°10,57E
27.08.18	408	008	B09	39G8	55°08,09N	18°20,26E
28.08.18	410	009	B13	39G5	55°18,99N	15°37,85E
28.08.18	411	000	B13	39G5	55°19,93N	15°33,23E
28.08.18	412	011	B13	39G5	55°20,31N	15°33,98E
29.08.18	416	012	B13	39G5	55°18,17N	15°36,02E
29.08.18	417	013	B13	39G5	55°22,94N	15°33,53E
29.08.18	418	014	B13	39G5	55°19,68N	15°33,45E
01.09.18	424	015	SK2	45G0	58°09,34N	10°42,37E
02.09.18	426	016	P02	42F3	56°40,78N	03°12,26E
02.09.18	427	017	P02	41F3	56°29,60N	03°09,23E
03.09.18	428	018	GB4	39F4	55°23,37N	04°26,35E
03.09.18	429	019	GB4	39F4	55°23,09N	04°32,95E
03.09.18	431	020	GB4	39F4	55°22,85N	04°25,42E
04.09.18	432	021	N11	40F7	55°39,33N	07°01,05E
04.09.18	433	022	N11	40F7	55°34,62N	07°05,99E
04.09.18	435	023	N11	40F7	55°36,19N	07°05,18E
05.09.18	436	024	GB3	38F6	54°55,68N	06°16,08E
05.09.18	437	025	GB3	38F6	54°59,83N	06°23,76E
05.09.18	439	026	GB3	38F6	54°56,17N	06°15,70E
06.09.18	440	027	N01	37F7	54°16,23N	07°30,95E
06.09.18	441	028	N01	37F7	54°15,16N	07°29,97E
06.09.18	442	029	N01	37F7	54°15,31N	07°29,90E
07.09.18	444	030	GB1	37F7	54°04,35N	07°53,59E
07.09.18	446	031	GB1	37F7	54°07,55N	07°46,18E
07.09.18	447	032	GB1	37F7	54°04,42N	07°53,16E

Tab. 1b: Cruise 419 RV 'Walther Herwig III', 21.08. – 09.09.2018:
Geographical coordinates of sediment sampling stations in the Baltic Sea

DATE	LOG STATION	STATION	AREA	ICES RECT	LATITUDE	LONGITUDE
27.08.18	407	001	B09	39G8	55°11,71N	18°29,76E
29.08.18	423	002	B13	39G5	55°16,99N	15°38,09E
01.09.18	425	003	SK2	45G0	58°15,24N	10°40,03E
03.09.18	430	004	GB4	39F4	55°22,86N	04°25,32E
04.09.18	434	005	N11	40F7	55°36,33N	07°05,30E
05.09.18	438	006	GB3	38F6	54°56,23N	06°16,49E
06.09.18	443	007	N01	37F7	54°17,39N	07°35,75E
27.08.18	408	001	B09	39G8	55°11,73N	18°30,58E
27.08.18	408	002	B09	39G8	55°11,69N	18°30,79E
27.08.18	408	003	B09	39G8	55°11,54N	18°30,87E
27.08.18	408	004	B09	39G8	55°11,45N	18°30,97E
28.08.18	413	005	B13	39G5	55°24,03N	15°37,13E
28.08.18	413	006	B13	39G5	55°24,08N	15°37,08E
28.08.18	414	007	B13	39G5	55°23,03N	15°41,11E
28.08.18	415	008	B13	39G5	55°20,69N	15°42,41E
29.08.18	420	009	B13	39G5	55°18,82N	15°40,86E
29.08.18	421	010	B13	39G5	55°17,32N	15°37,29E
29.08.18	422	011	B13	39G5	55°16,45N	15°37,63E

Tab. 1c: Cruise 419 RV 'Walther Herwig III', 21.08. – 09.09.2018:
Geographical coordinates of Neuston trawl sampling stations in the Baltic Sea and North Sea with duration of sampling

DATE	LOG STATION	STATION	AREA	ICES RECT	LATITUDE	LONGITUDE	TIME (Min.)
27.08.18	407	001	B09	39G8	55°11,71N	18°29,76E	14
29.08.18	423	002	B13	39G5	55°16,99N	15°38,09E	15
01.09.18	425	003	SK2	45G0	58°15,24N	10°40,03E	15
03.09.18	430	004	GB4	39F4	55°22,86N	04°25,32E	15
04.09.18	434	005	N11	40F7	55°36,33N	07°05,30E	15
05.09.18	438	006	GB3	38F6	54°56,23N	06°16,49E	14
06.09.18	443	007	N01	37F7	54°17,39N	07°35,75E	14

Tab. 2: Cruise 419 RV 'Walther Herwig III', 21.08. – 09.09.2018: 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
B01	n		585	4845	79894	96	17037	2670	
	kg		34	109	1367	24	1980	483	
B11	n	204	511	901	20604	67	33	1079	2022
	kg	82	92	21	141	65	18	244	449
B09	n	1032		111	52				69
	kg	360		6	1				14
B13	n	103		2554	5800				1
	kg	28		65	79				<0,5
SK2	n			2					
	kg			<0,5					
P02	n	<0,5	60				1834	6	
	kg	<0,5	4				129	2	
GB4	n	1	49	71	1	2	242	28	
	kg	1	<0,5	11	<0,5	<0,5	17	5	
N11	n		24	4		3723	2146	68	
	kg		1	<0,5		522	158	13	
GB3	n		822	25181	18989	43	1823	71	
	kg		17	132	27	7	116	17	
N01	n		5092	38540	43140	162	865	2	
	kg		114	134	151	25	54	<0,5	
GB1	n		6611	2145	3024	26	1088	13	47
	kg		140	6	10	4	41	X	10

Tab. 3: Cruise 419 RV 'Walther Herwig III', 21.08. – 09.09.2018: Water depth, temperature (T), salinity (S), O_2 in mg/l and O_2 saturation (%) in Baltic Sea and North Sea

DATE	STATION	AREA	DEPTH (m)	T (°C)	S (PSU)	O_2 (mL/L)	O_2 Sat (%)
24.08.2018	001	B01	7	18,92	19,02	5,17	89,02
			20	14,58	24,46	2,32	37,90
24.08.2018	002	B01	3	20,12	15,24	5,69	98,04
			17	17,90	21,44	4,83	82,75
26.08.2018	003	B11	2	19,57	8,17	5,69	93,08
			37	17,31	15,43	3,13	51,07
26.08.2018	004	B11	4	19,48	8,01	5,64	92,06
			38	16,56	15,74	3,02	48,67
26.08.2018	005	B11	3	19,46	7,82	5,72	93,13
			38	16,90	15,04	3,15	50,88
26.08.2018	006	B11	3	19,85	7,83	5,59	91,79
			40	16,28	15,18	2,63	42,03
27.08.2018	007	B09	2	19,79	6,59	4,63	75,26
			65	5,14	10,04	2,52	30,23
27.08.2018	008	B09	4	20,00	7,33	5,55	91,07
			76	5,48	10,65	2,07	25,11

Tab. 3: cont.

28.08.2018	009	B13	2	19,40	7,50	5,60	90,98
			91	6,96	16,79	0,25	3,23
28.08.2018	010	B13	5	18,87	7,50	5,66	90,84
			91	6,96	16,76	0,23	2,96
28.08.2018	011	B13	3	19,14	7,54	5,72	92,35
			90	6,96	16,77	0,25	3,32
29.08.2018	012	B13	2	19,01	7,48	5,65	91,02
			91	6,96	16,79	0,25	3,26
29.08.2018	013	B13	5	18,86	7,53	5,72	91,92
			89	6,97	16,75	0,26	3,40
29.08.2018	014	B13	2	18,91	7,54	5,75	92,43
			90	6,97	16,73	0,27	3,52
01.09.2018	015	SK2	5	16,73	31,99	5,26	93,82
			240	6,62	35,15	5,26	77,29
02.09.2018	016	P02	6	16,71	34,32	5,15	93,24
			68	5,71	34,98	4,95	71,12
02.09.2018	017	P02	3	16,88	34,44	5,15	93,55
			69	5,53	35,03	5,07	72,62
03.09.2018	018	GB4	2	17,02	34,76	5,19	94,70
			43	7,23	34,70	4,65	69,14
03.09.2018	019	GB4	5	16,86	34,79	5,18	94,30
			44	6,96	34,70	4,74	69,99
03.09.2018	020	GB4	2	17,06	34,79	5,26	96,00
			42	7,33	34,71	4,63	68,92
04.09.2018	021	N11	2	17,74	33,18	5,12	93,86
			29	13,98	33,76	3,68	62,91
04.09.2018	022	N11	4	18,14	32,79	5,15	94,82
			29	14,66	33,68	3,80	65,69
04.09.2018	023	N11	3	18,22	32,81	5,20	95,89
			28	14,45	33,69	3,65	62,84
05.09.2018	024	GB3	2	18,14	34,46	5,16	96,03
			40	16,67	34,46	3,82	69,18
05.09.2018	025	GB3	5	18,04	34,11	5,15	95,50
			41	15,00	34,37	3,24	56,69
05.09.2018	026	GB3	2	18,36	34,48	5,23	97,72
			39	16,68	34,46	3,87	69,97
06.09.2018	027	N01	2	18,12	33,26	5,02	92,69
			38	17,96	33,25	4,98	91,75
06.09.2018	028	N01	6	18,19	33,29	4,99	92,21
			39	18,13	33,29	4,85	89,56
06.09.2018	029	N01	2	18,28	33,28	5,12	94,84
			38	18,14	33,28	4,87	90,01
07.09.2018	030	GB1	2	18,82	32,87	4,76	88,89
			37	18,65	33,00	4,42	82,26
07.09.2018	031	GB1	6	18,42	32,98	4,80	88,92
			39	18,42	33,00	4,70	87,22

Tab. 3: cont.

07.09.2018	032	GB1	3	18,79	33,01	4,75	88,75
			36	18,73	33,02	4,49	83,74

Tab. 4: Cruise 419 RV 'Walther Herwig III', 21.08. – 09.09.2018: Prevalences (%) of externally visible diseases and parasites in dab (*Limanda limanda*) from the Baltic Sea and North Sea

Gebiet	N unt	Ly	Ep Hyp/Pap	Ulc Ak/Hei	Flo Ak/Hei	Kie Hyp	Skel Def	Hyp Pig	Steph	Acanth	Lepe
B01	440	7,5	0,5	2,0	0,2	0,0	0,9	0,0	0,0	0,0	1,8
GB1	549	0,2	1,8	1,6	0,7	0,2	0,2	14,8	0,2	4,0	15,1
GB3	499	1,0	4,6	2,2	0,4	0,0	0	45,5	4,2	1,4	20,8
GB4	569	9,7	2,6	3,2	1,4	0,0	0,9	56,4	85,4	4,9	3,7
N01	521	2,1	6,1	1,7	1,2	0,0	0,2	56,4	3,3	3,1	22,1
N11	528	1,1	2,7	9,8	1,3	0,0	0,6	42,4	5,1	3,4	18,0
P02	553	10,1	1,1	0,5	0,7	0,2	0,5	29,8	99,5	2,2	0,0
Summe	**3659**										

Tab. 5: Cruise 419 RV 'Walther Herwig III', 21.08. – 09.09.2018: Prevalences (%) of liver anomalies in dab (*Limanda limanda*) from the Baltic Sea and North Sea

Gebiet	Länge (cm)	N unt	Leberknoten			Nematoden	Kratzer	Grüne Lebern
			>2 mm	>5 mm	>10 mm			
B01	20 - 24	49	2,0	0,0	0,0	0,0	0,0	0,0
	25 - 40	51	17,6	2,0	0,0	0,0	0,0	0,0
GB1	20 - 24	49	4,1	4,1	4,1	0,0	2,0	0,0
	25 - 40	4	0,0	0,0	0,0	0,0	0,0	0,0
GB3	20 - 24	52	1,9	0,0	0,0	0,0	0,0	1,9
	25 - 40	53	9,4	5,7	3,8	9,4	0,0	0,0
GB4	20 - 24	52	9,6	5,8	3,8	5,8	3,8	9,6
	25 - 40	11	18,2	9,1	9,1	9,1	9,1	9,1
N01	20 - 24	53	0,0	0,0	0,0	0,0	1,9	0,0
	25 - 40	21	23,8	14,3	4,8	0,0	0,0	0,0
N11	20 - 24	52	3,8	1,9	0,0	0,0	1,9	0,0
	25 - 40	50	10,0	4,0	2,0	2,0	2,0	0,0
P02	20 - 24	51	5,9	0,0	0,0	13,7	5,9	86,3
	25 - 40	6	33,3	16,7	16,7	16,7	0,0	83,3
Summe		**554**						

Tab. 6: Cruise 419 RV 'Walther Herwig III', 21.08. – 09.09.2018: Prevalences (%) of externally visible diseases and parasites in cod (*Gadus morhua)* from the Baltic Sea

Gebiet	N unt	Ep Hyp/Pap	Ulc Ak/Hei	Ulc Hae	Flo Ak/Hei	Skel Def	PBT	Cryp	Locera	Loma		n Anis	Anis
B09	521	0,8	4,8	5,2	1,3	1,2	0,2	5,6	0	72,7		102	33,3
B11	211	0	8,5	3,3	0	1,9	0	11,4	0	18,0		179	7,3
B13	637	2,8	6,9	15,7	2,7	0,9	0	10,7	0,2	92,3		125	54,4
Summe	**1369**											**406**	

Abbreviations:

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