

**FRV Walther Herwig III
Cruise 429
14.08. - 03.09.2019**

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

Project DAIMON2

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 five 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 macroscopic externally and internally visible diseases and parasites, a large range of fish samples were taken for a subsequent analysis of contaminants (organic, inorganic and radioactive substances) and their biological effects. As part of the DAIMON2 project, extensive studies were carried out on the health status of cod in a dumping area for chemical munitions in Bornholm Basin and in Baltic Sea reference areas. Furthermore, hydrographical measurements were carried out (water temperature, salinity, oxygen content) and water samples were taken for measurement of radioactive substances.

The following preliminary findings were noted:

Dab: again, low prevalence of "classical" infectious diseases (lymphocystis, epidermal hyperplasia/papilloma, skin ulcerations) especially in the North Sea; continuing increased prevalence of hyperpigmentation in the North Sea; slightly elevated prevalence of liver nodules (tumours and pre-stages) in Kiel Bight, Baltic Sea (area B01), and in some North Sea areas (areas GB4, N04).

Baltic cod: again, low prevalence of skin ulcerations and skeletal deformities; infestation with nematodes in the body cavity has decreased in the Baltic Sea areas compared to last year's findings; once more generally high prevalence of the gill parasite *Loma morhua*.

Flounder: marked decrease in prevalence of lymphocystis in the Arkona Sea (area B11).

Participants:

Name	Function	Institution
Dr. Thomas Lang	Scientist in Charge	TI Fishery Ecology
Dr. Klaus Wysujack	Scientist	TI Fishery Ecology
Dr. Pedro Nogueira	Scientist	TI Fishery Ecology (North Sea)
Oguz Senmeyvacı	Technician	TI Fishery Ecology
Maike Siegmund	Technician	TI Fishery Ecology
Nadine Dichte	Technician	TI Fishery Ecology
Alexandra Poell	Technician	TI Fishery Ecology
Jason Isigkeit	Technician	TI Fishery Ecology
Lena Hemken	Technician	TI Fishery Ecology (Baltic Sea)
Felix Stäger	Guest scientist	Univ. Hannover
Ciara Baines	Guest scientist	Univ. Tartu, Estonia (Baltic Sea)
Dr. Randel Kreitsberg	Guest scientist	Univ. Tartu, Estonia (North Sea)
Wojciech Wilczynski	Guest scientist	Univ. Warszawa, Poland (Baltic Sea)
Stephan Hanisch	Student	Univ. Bayreuth
Klarea Regelsberger	Student	Univ. Wien, Austria (North Sea)
Jan Römer	Student	Univ. Hamburg

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. Sampling of fish and water for measurement of radioactive substances (collaboration with Univ. Hannover);
5. Tissue sampling of livers and other organs for subsequent histological and biochemical analyses (collaboration with Univ. Tartu);
6. Studies and sampling for the DAIMON2 project, including sampling of digestive tracts of cod for microbial studies (collaboration with Univ. Warszawa);
7. Hydrographical measurements (salinity, temperature, oxygen, turbidity).

Dates of the Cruise

FRV Walther Herwig III left Bremerhaven on 14.08. heading for the Baltic Sea via the Skagerrak. In the morning of 16.08., work started in area B01 in Kiel Bight. During the following days, Baltic Sea areas B11 (Arkona Sea), B09 (outside Bay of Gdansk), the munitions dumpsite B13 (for two days) and B12 (Mecklenburg Bight) were visited. In the afternoon of 21.08., The RV berthed in Kiel and an exchange of scientific staff took part. In the morning of 22.08., the vessel left Kiel and sailed through the Skagerrak into the North Sea. Starting on 24.08., work was continued in North Sea areas P02 (Ekofisk), N04 (central Dogger) GB4 (south-eastern Dogger), N11 (Horns Reef), GB3 (German Bight), GB1 (inner German Bight) and in the vicinity of area N01 (German Bight, former dumpsite for waste of the titanium dioxide production, area ID N01*). Fishing in area N01 was not possible because of commercial fishing activities. The cruise ended on schedule in the morning of 03.09. in Bremerhaven.

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, 2), a total of 38 fishing hauls was performed (towing time 30–75 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 (also successfully used in area B12 for test purposes) in the Baltic Sea, all with standard configuration. Hydrographical measurements were made at almost all fishery stations (geographical coordinates in Tab. 1a, results in Tab. 3).

Preliminary Results

Dab (*Limanda limanda*)

In total, 4528 dab (total length ≥ 10 cm) from Baltic Sea areas B01, B11 and B12 and seven North Sea areas (P02, N04, N11, GB4, GB3, GB1, N01) were examined for the occurrence of externally visible diseases and parasites (Tab. 4) and, out of these, 646 dab (total length ≥ 20 cm) for the occurrence of liver anomalies (Tab. 5).

The disease and their prevalence as well as the regional prevalence patterns largely corresponded to findings from previous surveys. The generally decreasing trend in lymphocystis prevalence of North Sea dab has continued; current values were low, 0.6-9.6 (%). Currently, Baltic Sea dab from Kiel Bight display a clearly higher prevalence (6.7-16.7 %) compared to most of the North Sea study areas. In contrast, the prevalence of grossly visible parasites is lower in the Baltic Sea, with the exception of the trematode *Cryptocotyle lingua*, 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. The prevalence of lymphocystis and, in particular, of the parasite *Stephanostomum baccatum* (white cysts under the skin) increased in north-westerly 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. The highest prevalence was again recorded in area and GB4 (57.8 %). 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 again markedly increased (12.5 %) compared to previous years, but not reach the highest values recorded in North Sea dab of the same size group (GB4: 16.6 %, N11: 15.0 %) (Tab. 5).

Cod (*Gadus morhua*)

In total, 920 cod from three Baltic Sea areas (B11, B09, B13) and three North Sea areas (P02, GB4, N04) were examined for externally visible diseases and parasites, out of which 247 specimens were inspected for the presence of larval 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 again low compared to the previous year and ranged from 2.2 % to 5.5 %. Pre-stages of skin ulcerations (haemorrhagic stage) were more prevalent (12.6 %) in the munitions dumpsite (area B13) in Bornholm Basin compared to the other two areas B11 and B09. Skeletal deformities were rare, with values in the range of 0.3 % to 2.6 %.

Larval nematodes in the body cavity, in particular on the liver surface, were recorded in cod from all sampling areas in the Baltic Sea. However, the prevalence was lower compared the previous year (maximum value in area B13: 2018 - 54.4 %; 2019 - 20.2 %), but compared to the 1980s and 1990s, the values are still markedly high. 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 prevalences of 84.5 % and 80.9 %, resp., were recorded recorded in cod from areas B09 and B13.

Flounder (*Platichthys flesus*)

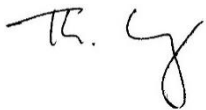
In total, 358 flounder from three Baltic Sea areas (B01, B11, B12) and one North Sea area (GB1) were examined for externally visible diseases and parasites. In the Baltic Sea, lymphocystis continued to be the predominant disease, but the prevalence in area B11 (Arkona Sea) has markedly decreased compared to previous years (2017: 32.8 %, 2019: 17.0 %). In the inner German Bight (area GB1, North Sea), a high prevalence of the parasite *Lepeophtheirus pectoralis* was recorded (9 out of 10 fish). In contrast, this parasite is rare in the Baltic Sea.

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 Arne Schwegmann and his crew and to the scientific staff for smooth, constructive and hard work and a very good atmosphere on board during my final survey!



Dr. Thomas Lang
(Scientist in Charge)

Annex

2 Figures, 7 Tables

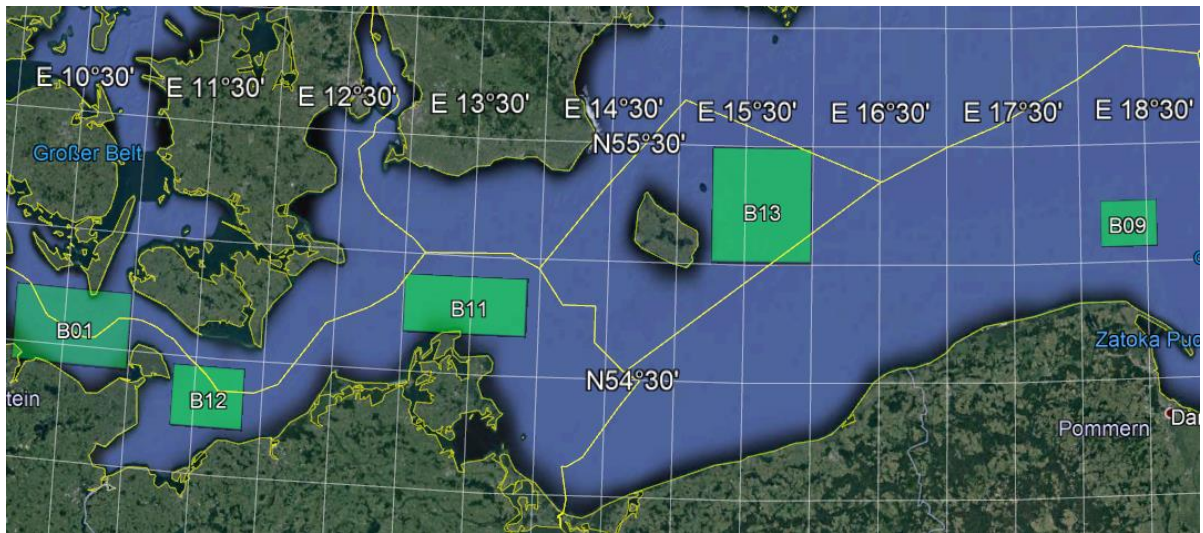


Fig. 1: Cruise 429 RV 'Walther Herwig III', 14.08. – 03.09.2019:
Location of sampling sites in the Baltic Sea

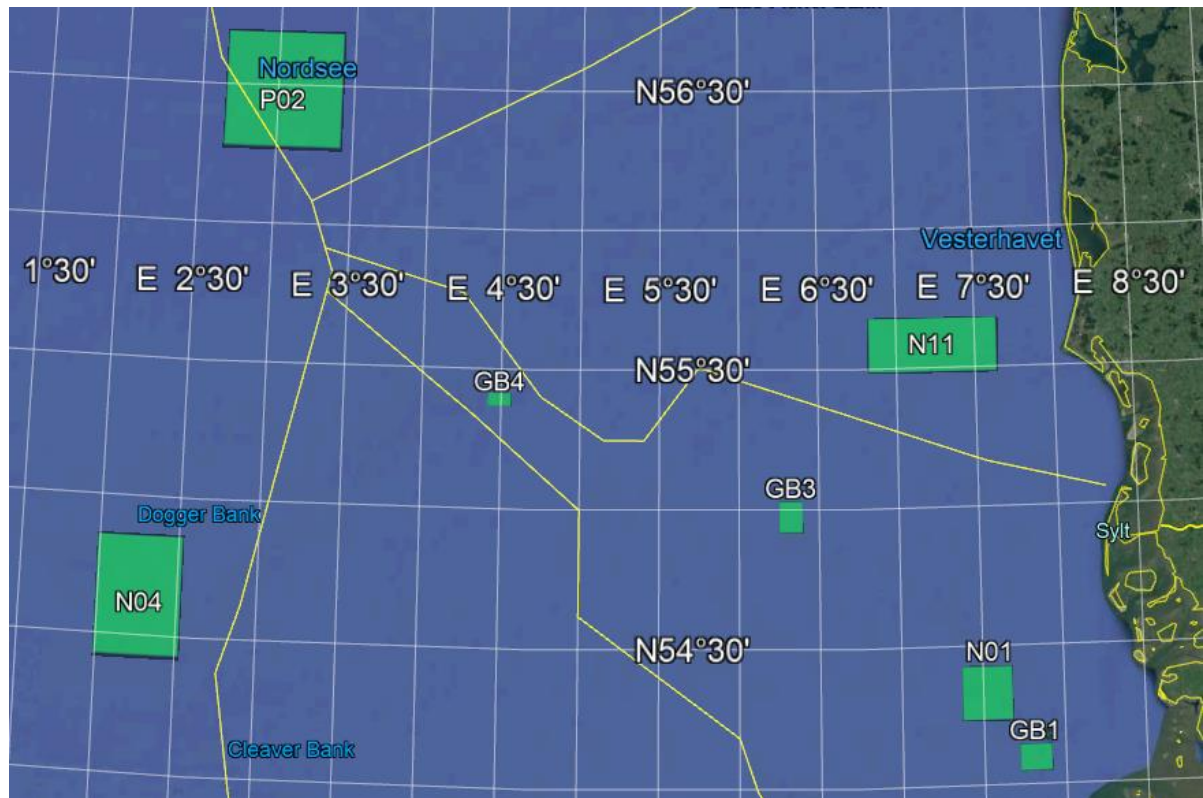


Fig. 2: Cruise 429 RV 'Walther Herwig III', 14.08. – 03.09.2019:
Location of sampling sites in the North Sea

Tab. 1: Cruise 429 RV 'Walther Herwig III', 14.08. – 03.09.2019:
Geographical coordinates of trawling stations in the Baltic Sea and North Sea
with trawling time and gear type

DATE	STATION	AREA	Latitude	Longitude	GEAR	Trawling (MIN.)
16.08.19	1	B01	54°32,743N	010°47,946E	140 Fuß-Netz	60
16.08.19	2	B01	54°32,264N	010°43,272E	140 Fuß-Netz	60
16.08.19	3	B01	54°44,135N	010°13,341E	140 Fuß-Netz	60
17.08.19	4	B11	54°45,395N	013°11,918E	140 Fuß-Netz	60
17.08.19	5	B11	54°47,822N	013°13,571E	140 Fuß-Netz	60
17.08.19	6	B11	54°44,002N	013°11,792E	140 Fuß-Netz	60
17.08.19	7	B11	54°43,498N	013°38,423E	140 Fuß-Netz	60
18.08.19	8	B09	55°06,938N	018°10,907E	140 Fuß-Netz	60
18.08.19	9	B09	55°12,612N	018°21,072E	140 Fuß-Netz	60
19.08.19	10	B13	55°18,665N	015°35,924E	PSN 205	60
19.08.19	11	B13	55°23,143N	015°37,160E	PSN 205	60
19.08.19	12	B13	55°18,949N	015°34,756E	PSN 205	60
19.08.19	13	B13	55°22,605N	015°34,809E	PSN 205	60
19.08.19	14	B13	55°18,390N	015°37,378E	PSN 205	60
20.08.19	15	B13	55°19,492N	015°41,641E	PSN 205	60
20.08.19	16	B13	55°21,960N	015°36,752E	PSN 205	60
20.08.19	17	B13	55°19,397N	015°40,034E	PSN 205	75
21.08.19	18	B12	54°14,876N	011°44,348E	GOV	60
21.08.19	19	B12	54°18,284N	011°27,462E	GOV	60
24.08.19	20	P02	56°40,979N	003°11,859E	GOV	60
24.08.19	21	P02	56°31,293N	003°18,987E	GOV	60
24.08.19	22	P02	56°30,407N	003°03,101E	GOV	60
26.08.19	23	N04	54°46,264N	002°02,239E	GOV	60
26.08.19	24	N04	54°41,153N	002°09,044E	GOV	60
26.08.19	25	N04	54°41,842N	002°13,409E	GOV	60
27.08.19	26	GB4	55°22,840N	004°26,735E	GOV	60
27.08.19	27	GB4	55°23,292N	004°32,441E	GOV	60
27.08.19	28	GB4	55°23,332N	004°26,157E	GOV	60
28.08.19	29	N11	55°39,214N	007°01,005E	GOV	60
28.08.19	30	N11	55°34,930N	007°06,096E	GOV	30
29.08.19	31	GB3	54°58,706N	006°22,933E	GOV	60
29.08.19	32	GB3	54°55,801N	006°16,699E	GOV	60
30.08.19	33	GB1	54°04,197N	007°53,049E	GOV	60
30.08.19	35	GB1	54°04,547N	007°53,712E	GOV	60
30.08.19	35	GB1	54°04,728N	007°52,428E	GOV	60
31.08.19	36	N01*	54°13,244N	007°27,696E	GOV	60
31.08.19	37	N01*	54°11,886N	007°38,978E	GOV	30
31.08.19	38	N01*	54°12,225N	007°34,758E	GOV	30

Tab. 1a: Cruise 429 RV 'Walther Herwig III', 14.08. – 03.09.2019: Geographical coordinates of hydrography stations in the Baltic Sea and North Sea

DATE	STATION	FISCHERY STATION	AREA	Latitude	Longitude
16.08.19	1	1	B01	54°32,954N	010°48,726E
16.08.19	2	2	B01	54°32,017N	010°44,982E
16.08.19	3	3	B01	54°44,638N	010°13,083E
17.08.19	4	4	B11	54°46,827N	013°13,060E
17.08.19	5	5	B11	54°48,390N	013°13,163E
17.08.19	6	6	B11	54°44,176N	013°10,987E
17.08.19	7	7	B11	54°43,625N	013°37,448E
18.08.19	8	8	B09	55°06,189N	018°11,541E
18.08.19	9	9	B09	55°12,845N	018°19,781E
19.08.19	10	10	B13	55°18,004N	015°35,438E
19.08.19	11	11	B13	55°24,079N	015°37,110E
19.08.19	12	12	B13	55°18,003N	015°34,358E
19.08.19	13	13	B13	55°23,339N	015°34,677E
19.08.19	14	14	B13	55°18,399N	015°35,456E
20.08.19	15	15	B13	55°19,106N	015°42,469E
20.08.19	16	16	B13	55°22,225N	015°35,326E
20.08.19	17	17	B13	55°19,456N	015°41,622E
21.08.19	18	18	B12	54°15,066N	011°45,820E
21.08.19	19	19	B12	54°17,797N	011°28,518E
24.08.19	20	20	P02	56°41,585N	003°11,082E
24.08.19	21	21	P02	56°32,081N	003°18,505E
24.08.19	22	22	P02	56°30,378N	003°04,439E
26.08.19	23	23	N04	54°46,623N	002°01,397E
26.08.19	24	24	N04	54°41,654N	002°08,407E
26.08.19	-	25	N04	-	-
27.08.19	26	26	GB4	55°22,904N	004°26,097E
27.08.19	27	27	GB4	55°23,300N	004°33,907E
27.08.19	28	28	GB4	55°23,328N	004°25,009E
28.08.19	29	29	N11	55°40,133N	007°00,436E
28.08.19	30	30	N11	55°35,527N	007°05,317E
29.08.19	31	31	GB3	54°58,825N	006°23,209E
29.08.19	32	32	GB3	54°55,362N	006°15,531E
30.08.19	33	33	GB1	54°03,960N	007°54,095E
30.08.19	34	34	GB1	54°04,264N	007°54,913E
30.08.19	35	35	GB1	54°04,513N	007°53,621E
31.08.19	36	36	N01*	54°13,245N	007°26,816E
31.08.19	37	37	N01*	54°11,940N	007°39,928E
31.08.19	38	38	N01*	54°12,411N	007°36,939E

Tab. 2: Cruise 429 RV 'Walther Herwig III', 14.08. – 03.09.2019: 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	Hadock	Herring	Sprat	Makerel	Dab	Plaice	Flounder
B01	n	1,7	55,0	0,0	317,7	1027,7	10,7	480,3	9,0	1,0
	kg	0,5	1,8	0,0	6,3	15,9	1,5	51,1	2,1	0,4
B11	n	10,3	24,0	0,0	8675,8	791,5	2,8	16,5	45,8	86,3
	kg	7,0	1,3	0,0	106,2	9,5	1,9	3,3	13,5	18,0
B09	n	312,0	0,0	0,0	32,5	2,0	0,0	0,0	3,5	68,5
	kg	93,7	0,0	0,0	1,6	0,1	0,0	0,0	0,9	11,7
B13	n	43,7	0,0	0,0	848,5	2346,0	0,0	0,0	0,0	0,0
	kg	10,0	0,0	0,0	26,8	24,9	0,0	0,0	0,0	0,0
B12	n	0,5	0,5	0,0	7976,5	41248,5	3,5	144,5	1,0	22,0
	kg	2,0	0,0	0,0	264,4	595,3	0,8	17,4	0,2	6,3
P02	n	1,3	3485,7	8318,7	22,3	0,0	0,0	1417,0	0,0	0,0
	kg	0,3	115,1	276,5	3,7	0,0	0,0	94,1	0,0	0,0
N04	n	0,3	4395,0	11,0	10,3	109,0	314,0	210,7	11,7	0,0
	kg	0,1	56,7	0,4	1,4	0,9	52,2	12,5	1,9	0,0
GB4	n	1,0	39,0	3,0	547,0	9562,3	0,0	1167,0	15,0	0,0
	kg	0,5	0,8	0,1	7,6	99,3	0,0	80,1	4,1	0,0
N11	n	0,0	1653,0	0,0	0,0	4,0	2821,0	2391,0	59,0	0,0
	kg	0,0	143,6	0,0	0,0	0,1	531,9	159,0	12,5	0,0
GB3	n	0,0	6987,5	0,0	2869,0	19133,0	0,0	1308,5	45,0	0,0
	kg	0,0	163,4	0,0	13,7	102,6	0,0	90,5	10,2	0,0
GB1	n	0,0	20811,7	0,0	1886,3	25924,3	13,3	303,7	0,0	2,0
	kg	0,0	531,5	0,0	15,5	140,6	3,0	15,7	0,0	2,5
N01*	n	0,0	37651,7	0,0	7999,3	97440,7	179,7	956,7	0,0	1,3
	kg	0,0	1074,2	0,0	43,1	523,7	33,4	55,2	0,0	0,5

Tab. 3: Cruise 429 RV 'Walther Herwig III', 14.08. – 03.09.2019:
Water depth, temperature (T), salinity (S), O₂ in mg/l and O₂ saturation (%)
in Baltic Sea and North Sea

STATION	Area	Water depth (m)	Sea Surface				Sea Bottom					
			Depth CTD (m)	T	S	O ₂ (mg/l)	O ₂ (%)	Depth CTD (m)	T	S	O ₂ (mg/l)	O ₂ (%)
1	B01	21	5	18.574	13.9994	5.83	96.75	18	15.216	22.2864	3.86	63.05
2	B01	20	4	18.717	13.2817	5.83	96.66	19	13.714	24.4731	2.92	46.85
4	B11	43	2	18.839	8.1799	6.27	101.00	40	14.379	14.9330	3.45	52.88
5	B11	42	2	18.670	8.3697	6.06	97.52	41	15.161	14.9806	3.33	51.97
6	B11	27	2	18.651	8.4108	6.10	98.02	25	16.548	11.6960	5.08	79.88
7	B11	39	10	18.769	7.7197	6.34	101.72	38	13.992	14.8781	2.51	38.12
8	B09	69	15	20.834	7.5676	6.30	85.27	68	5.920	10.3607	3.74	45.91
9	B09	75	12	19.191	7.3896	4.83	78.04	73	6.979	11.3243	4.37	55.36
10	B13	94	2	19.048	7.5664	5.91	95.30	92	8.613	17.0161	0.07	0.92
11	B13	89	28	14.208	7.6717	5.47	79.93	88	8.627	16.9947	0.03	0.41
12	B13	94	7	19.128	7.5393	5.95	96.04	92	8.616	17.0126	0.05	0.62
13	B13	91	70	8.271	16.1149	0.86	11.55	89	8.623	17.0140	0.11	1.52
14	B13	94	2	19.223	7.5321	6.06	98.09	92	8.614	17.0209	0.06	0.78
15	B13	95	7	19.265	7.5751	5.94	96.20	92	8.617	17.0276	0.05	0.72
16	B13	93	2	19.198	7.5595	5.93	96.00	91	8.624	17.0064	0.05	0.71
17	B13	93	40	6.568	7.9339	6.60	80.95	92	8.616	17.0126	0.08	1.07
18	B12	24	2	18.770	11.8246	6.15	101.25	23	12.490	22.4070	0.29	4.51
19	B12	22	3	18.616	12.3109	6.14	101.03	20	12.814	22.7825	1.25	19.43
20	P02	68	1	16.344	34.8043	5.44	97.94	67	8.001	34.9583	5.24	79.43
21	P02	68	2	16.458	34.7814	5.46	98.53	68	7.871	34.9545	5.15	77.82
22	P02	72	20	16.444	34.8033	5.42	97.87	71	7.718	34.9464	5.23	78.79
23	N04	27	2	17.667	34.5352	5.24	96.70	26	17.101	34.5351	5.20	94.86
24	N04	25	19	17.243	34.6005	5.43	99.36	24	17.237	34.5917	5.26	96.22
25	N04	25	4	18.290	34.6106	5.26	98.16	24	17.417	34.5931	5.25	96.44
26	GB4	44	13	16.927	34.8099	5.31	96.74	44	10.147	34.6532	5.56	88.06
27	GB4	45	5	17.520	34.8097	5.23	96.47	44	9.962	34.6496	5.69	89.87
28	GB4	44	3	18.184	34.7850	5.29	98.75	44	10.139	34.6498	5.50	87.23
29	N11	31	2	19.294	33.8769	5.52	104.50	30	17.385	33.9348	5.12	93.53
30	N11	30	24	17.661	33.9347	5.03	92.43	29	17.644	33.9063	5.01	92.07
31	GB3	43	3	19.722	34.4215	5.35	102.60	43	17.765	34.4865	4.62	85.46
32	GB3	42	1	20.104	34.4505	5.16	99.50	40	17.702	34.5295	4.84	89.31
33	GB1	37	2	19.486	32.9941	5.43	102.72	36	18.415	32.9557	4.55	84.30
34	GB1	39	2	19.437	33.0591	5.57	105.32	38	18.469	33.0034	4.54	84.18
35	GB1	40	3	19.462	33.0542	5.59	105.66	40	18.556	32.9972	4.56	84.77
36	N01*	38	2	19.013	33.2350	5.43	101.88	37	18.564	33.2154	4.96	92.43
37	N01*	40	1	19.136	33.2074	5.82	109.55	39	18.439	33.1851	5.02	93.19
38	N01*	39	3	19.530	33.2473	5.62	106.62	38	18.539	33.2082	5.06	94.23

Tab. 4: Cruise 429 RV 'Walther Herwig III', 14.08. – 03.09.2019: Prevalences (%) of externally visible diseases and parasites in dab (*Limanda limanda*) from the Baltic Sea and North Sea

AREA	N unt	Ly	Ep Pap/Hyp	Ulc Ak/Hei	FloF Ak/Hei	KieHy	HypPig	Skel	Steph	Acanth	Lepe	Cryp
B01	480	8.8	0.8	1.0	0.8	0.0	0.2	0.4	0.0	1.0	2.5	20.8
B11	6	16.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	66.7
B12	224	6.7	2.2	4.5	0.9	0.0	0.0	0.0	0.0	0.0	1.3	6.3
P02	539	9.6	1.3	0.2	0.0	0.0	37.3	1.1	99.3	2.2	0.0	0.0
N04	541	2.8	3.7	1.7	0.2	0.0	53.2	0.6	17.7	4.3	17.0	0.0
GB4	538	6.1	3.7	1.1	1.1	0.0	57.8	0.0	79.9	5.6	8.7	0.0
N11	540	4.8	1.1	13.3	2.6	0.0	55.2	0.2	4.3	3.0	13.1	1.3
GB3	612	2.5	3.1	2.9	2.5	0.0	51.0	0.0	5.7	2.6	19.1	2.0
GB1	529	0.6	2.8	2.6	1.3	0.0	29.5	0.2	0.4	3.6	13.6	0.4
N01*	519	0.8	3.9	3.9	1.2	0.0	54.3	0.2	1.2	5.6	19.5	0.2
SUM	4528											

Tab. 5: Cruise 429 RV 'Walther Herwig III', 14.08. – 03.09.2018: Prevalences (%) of liver anomalies in dab (*Limanda limanda*) from the Baltic Sea and North Sea

AREA	Length group (cm)	N unt	LK 2 - >10 mm	LK 2 - 5 mm	LK 6 - 9 mm	LK ≥10 mm	Grün	Nemato	Kratz
B01	20 bis 24	40	5.0	2.5	2.5	0.0	0.0	0.0	0.0
B01	25 bis 40	40	12.5	7.5	5.0	0.0	2.5	0.0	0.0
B11	20 bis 24	6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B11	25 bis 40	22	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B12	20 bis 24	27	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B12	25 bis 40	7	14.3	14.3	0.0	0.0	0.0	0.0	0.0
P02	20 bis 24	55	3.6	3.6	0.0	0.0	94.5	10.9	5.5
P02	25 bis 40	6	0.0	0.0	0.0	0.0	66.7	16.7	0.0
N04	20 bis 24	59	10.2	6.8	1.7	1.7	5.1	0.0	0.0
N04	25 bis 40	3	100.0	33.3	33.3	33.3	0.0	0.0	0.0
GB4	20 bis 24	51	13.7	9.8	0.0	3.9	9.8	0.0	0.0
GB4	25 bis 40	25	16.0	8.0	0.0	8.0	4.0	12.0	0.0
N11	20 bis 24	54	5.6	3.7	0.0	1.9	3.7	0.0	0.0
N11	25 bis 40	40	15.0	2.5	7.5	5.0	0.0	2.5	0.0
GB3	20 bis 24	50	6.0	4.0	2.0	0.0	0.0	0.0	0.0
GB3	25 bis 40	50	8.0	4.0	0.0	4.0	0.0	2.0	0.0
GB1	20 bis 24	51	5.9	3.9	2.0	0.0	2.0	0.0	2.0
GB1	25 bis 40	3	33.3	33.3	0.0	0.0	0.0	0.0	0.0
N01*	20 bis 24	52	5.8	1.9	1.9	1.9	0.0	1.9	1.9
N01*	25 bis 40	5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SUM		646							

Tab. 6: Cruise 429 RV 'Walther Herwig III', 14.08. – 03.09.2019:
Prevalences (%) of externally visible diseases and parasites in cod
(*Gadus morhua*) from the Baltic Sea and North Sea

Area	N unt	Ulc Ak/Hei	Ulc Hae	FloF Ak/Hei	Ep Pap/Hyp	Skel	PBT	Cryp	Locera	Loma	N unt (Anis)	Anis
B11	39	2.6	5.1	0.0	0.0	2.6	0.0	33.3	0.0	59.0	24	2.8
B09	507	5.5	6.3	3.6	1.4	1.4	0.0	0.6	0.0	84.4	111	12.1
B13	366	2.2	12.6	1.1	0.3	0.3	0.0	0.0	0.0	80.9	107	20.2
GB4	62	0.0	33.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3	0.0
N04	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1	0.0
P02	4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4	0.4
SUMME	920										247	

Tab. 7: Cruise 429 RV 'Walther Herwig III', 14.08. – 03.09.2019:
Prevalences (%) of externally visible diseases and parasites in flounder (*Platichthys flesus*) from the Baltic Sea and North Sea

AREA	N unt	Ly	Ulc Ak/Hei	FloF Ak/Hei	Skel	Lepe	Cryp
B11	235	17.0	0.4	0.4	0.4	0.0	32.8
B09	94	2.1	3.2	0.0	0.0	0.0	60.6
B12	19	0.0	5.3	0.0	0.0	5.3	15.8
GB1	10	0.0	0.0	0.0	0.0	90.0	0.0
SUM	358						

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 ulcerations, acute/healing	Locera	: <i>Lernaeocera branchialis</i>
Ulc Hae	: Skin ulcerations, haemorrhagic stage	Cryp	: <i>Cryptocotyle spp.</i>
Flo Ak/Hei	: Fin rot/erosion, acute/healing	Loma	: <i>Loma sp.</i>
Kie Hyp	: Gill hyperplasia, x-cell disease	Anis	: Nematodes in the body cavity
Hyp Pig	: Hyperpigmentation	LK	: Liver nodules > 2 mm in diameter
Skel Def	: Skeletal deformities	Nemato	: Nematodes on the liver
PBT	: Pseudobranchial pseudotumour	Grün	: green discolouration of the liver
		Kratz	: Acanthocephaleans on the liver