

Cruise Report

Cruise 303 RV 'Walther Herwig III'

23.08.-07.09.2007

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

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1 Abstract

As part of the long-term monitoring programme of the Institute of Fishery Ecology (FOE) on diseases and parasites of marine fish species, studies were conducted in 4 Baltic Sea and 8 North Sea areas. In addition to the examination of dab (*Limanda limanda*), Baltic cod (*Gadus morhua*) and Baltic flounder (*Platichthys flesus*) for macroscopically visible external and internal diseases and parasites, samples were taken for studies on histopathological alterations in liver and spleen, contaminant-induced changes in enzyme activity (EROD), concentrations of organic (organochlorines), inorganic (metals) contaminants and PAH metabolites in bile, age distribution, condition factors and organosomatic indices. Fish samples were frozen for the detection of radioactive substances in the framework of national legislation and international monitoring programmes. In addition, hydrographical measurements were carried out (water temperature, salinity, oxygen content).

The results of the examination of dab for macroscopic lesions largely confirmed last year's findings. The decrease in prevalence of lymphocystis in North Sea dab continued and, in the German Bight (area N01), the lowest prevalence ever was detected (0.4 %). Dab from offshore oil and gas exploitation areas P01 (Danfield) and P02 (Ekofisk) were characterised by elevated prevalences of lymphocystis (P01 and P02), acute/healing skin ulcers (P01), the parasite *Stephanostomum baccatum* (P02) and a green discolouration of the livers due to a parasitic infestation and blockage (= icterus) of the liver bile ducts (P02). In dab from the German Bight (area N01), the prevalence of hyperpigmentation this time was exceptionally low (3,5 %), while it had exceeded values of 50 % in the previous year. The prevalence of liver nodules (macroscopic liver tumours and pre-stages) continued to be low. In Baltic cod, the mean prevalence of acute/healing skin ulcerations and skeletal deformities were low and were comparable to previous years. Final results will be available after processing and analysing of all sample material brought back to the lab.

2 Objectives of the Cruise

1. Studies on the prevalence and spatial distribution of fish diseases and parasites;
2. Measurement of biological effects of contaminants;
3. Sampling of fish for chemical analysis of radioactive substances, organic and inorganic contaminants in the framework of national and international monitoring and research programmes;
4. Hydrographical measurements (salinity, temperature, oxygen);
5. Sampling of fish organs for subsequent histological and biochemical studies.

3 Dates of the Cruise

RV 'Walther Herwig III' left Bremerhaven on 23.08. heading for Kiel Channel and the Baltic Sea where work started in area B01 on 24.08., followed by sampling in 3 further Baltic Sea areas. After the passage of Kiel Channel on 28.08., 8 North Sea sampling areas were visited, beginning with area N11 off the Danish coast. The cruise ended according to time schedule on 07.09. in Bremerhaven.

The location of the sampling areas and the cruise dates are shown in Figure 1 and Tables 1a and 1b.

In 12 sampling areas (Fig. 1), a total of 53 fishing hauls were performed (towing time 1 h) (see Table 1a). In the North Sea, the GOV was used, in the Baltic Sea a 140 ft bottom trawl with rock hoppers. Hydrographical measurements were made at 25 stations (see Table 1b).

4 Preliminary Results

4.1 Dab (*Limanda limanda*)

In total, 5.657 dab were examined for the occurrence of externally visible diseases and parasites and 830 dab for the occurrence of macroscopic liver anomalies. Results are provided in Tables 4 and 5. The prevalence of lymphocystis continued to decrease in North Sea dab. The value of 0.4 % in the German Bight (area N01) was the lowest ever recorded in that region. Also the prevalence of hyperpigmentation (increased aggregation of green to black pigment spots in the skin) was exceptionally low in the German Bight (3.5 %). In December 2006, a much higher prevalence exceeding 50 % had been recorded in the same region. A possible explanation could be the fact the the dab sampled in summer 2007 were very small (it is known that both lymphocystis and hyperpigmentation are more prevalent in larger than in smaller fish).

In both sampling areas with oil and/or gas platforms (P01 and P02), the prevalence of lymphocystis was higher compared to the other areas. Also, acute/healing skin ulcers (area P01), the parasite *Stephanostomum baccatum* (area P02) and a green discolouration of the liver (caused by parasites blocking the liver bile ducts) (area P02) were more frequent.

The prevalence of liver nodules > 2 mm in diameter (macroscopic tumors and pre-stages) was highest in dab from the Dogger Bank (area N04); the increase in prevalence recorded in the previous year did not continue. A high percentage of dab from area N06 off the Scottish coast were affected by nematodes and acanthocephaleans on the liver. The green liver discolouration (see above) was most prevalent at stations in the northern North Sea (areas P02 and N10).

A large number of samples were taken for the analysis of contaminant levels and biological effects of contaminants.

4.2 Cod (*Gadus morhua*)

1.521 cod in total were examined for the occurrence of externally visible diseases and parasites, out of which 249 were collected from North Sea stations (see Table 6). The mean prevalence of acute/healing skin ulcerations in Baltic cod from the 4 sampling sites visited was comparatively low (4.9 %) whereas 43.3 % of cod from North Sea area P02 were afflicted with skin ulcers.

4.3 Flounder (*Platichthys flesus*)

455 flounder were examined for externally visible diseases (Tab. 7). The prevalence of lymphocystis was much higher in Baltic flounder compared to North Sea flounder but the prevalence in both areas was in the normal range. The prevalence of acute/healing skin ulcerations ranged from 1.4 % 5.1 % and was as low as in previous years.

5 Miscellaneous

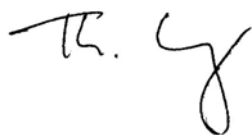
The mean catch data of the most frequent fish species are provided in Table 2; Table 3 gives results of the hydrographical measurements.

6 Participants

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7 Acknowledgements

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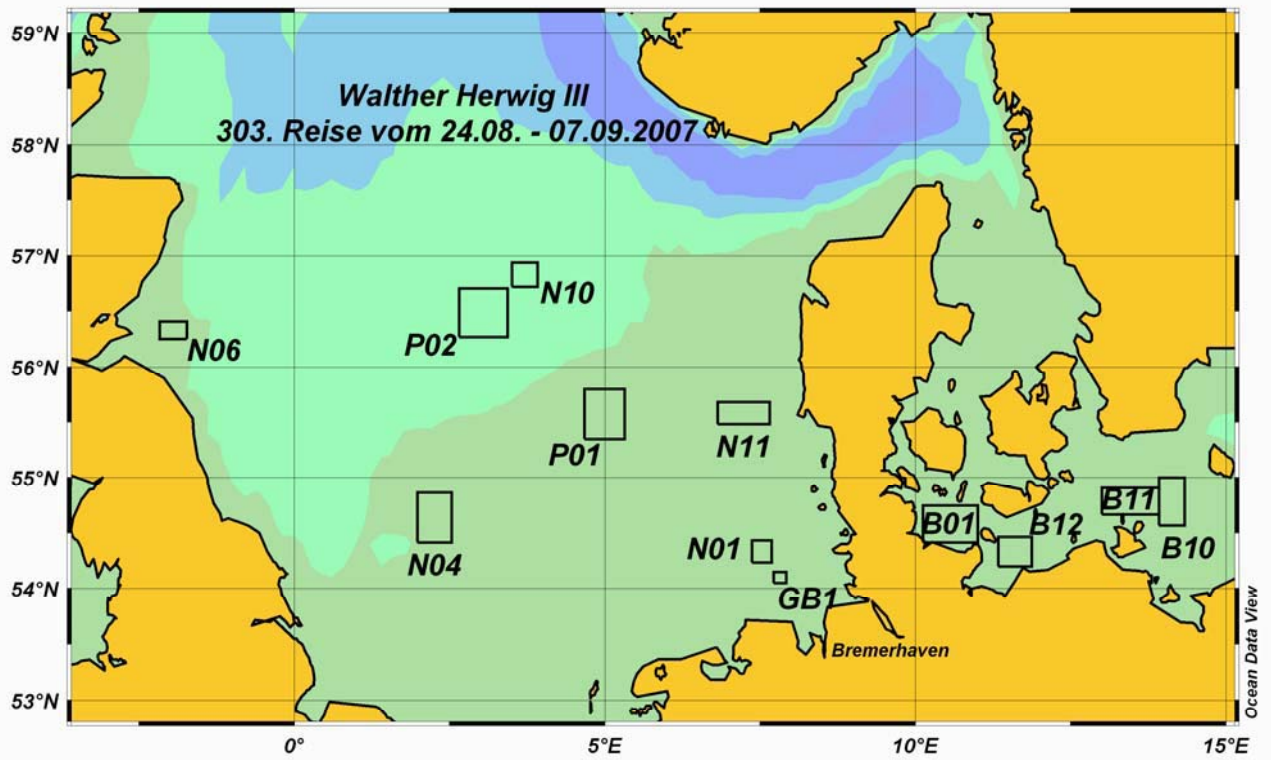


Dr. Thomas Lang
(Scientist in charge)

Annex

1 Figure, 7 Tables

Fig. 1: Cruise 303 RV 'Walther Herwig III', 23.08. – 07.09.2007:
Location of sampling sites



Tab. 1a: Cruise 303 RV 'Walther Herwig III', 23.08. – 07.09.2007:
Geographical coordinates of trawling sites

DATE	STATION	AREA	ICES- RECTANGLE	LATITUDE	LONGITUDE
BALTIC SEA					
24.08.07	001	B01	38G0	54°42'17N	10°18'06E
24.08.07	002	B01	38G0	54°36'14N	10°25'41E
24.08.07	003	B01	38G0	54°33'02N	10°40'40E
24.08.07	004	B01	38G0	54°33'73N	10°49'13E
24.08.07	005	B01	38G0	54°32'13N	10°37'24E
25.08.07	006	B10	38G3	54°44'50N	13°55'33E
25.08.07	007	B10	38G4	54°50'77N	14°02'61E
25.08.07	008	B10	38G3	54°48'16N	13°55'34E
25.08.07	009	B10	38G3	54°46'92N	13°59'15E
25.08.07	010	B10	38G4	54°47'29N	14°01'63E
26.08.07	011	B11	38G3	54°46'76N	13°47'11E
26.08.07	012	B11	38G3	54°48'46N	13°54'03E
26.08.07	013	B11	38G3	54°45'44N	13°46'84E
26.08.07	014	B11	38G3	54°45'71N	13°29'45E
26.08.07	015	B11	38G3	54°46'68N	13°12'94E
27.08.07	016	B12	37G1	54°27'05N	11°22'30E
27.08.07	017	B12	37G1	54°26'61N	11°23'01E
27.08.07	018	B12	37G1	54°17'68N	11°34'34E
27.08.07	019	B12	37G1	54°16'83N	11°41'92E

Tab. 1a: (cont.)

DATE	STATION	AREA	ICES-RECTANGLE	LATITUDE	LONGITUDE
NORTH SEA					
29.08.07	020	N11	40F7	55°31'89N	07°08'89E
29.08.07	021	N11	40F7	55°38'90N	07°01'48E
29.08.07	022	N11	40F7	55°32'95N	07°11'54E
29.08.07	023	N11	40F7	55°35'54N	07°01'01E
30.08.07	024	P01	39F5	55°20'56N	05°08'14E
30.08.07	025	P01	39F5	55°25'75N	05°13'61E
30.08.07	026	P01	39F5	55°27'61N	05°03'65E
30.08.07	027	P01	40F5	55°30'66N	05°06'53E
30.08.07	028	P01	40F5	55°41'31N	05°08'55E
31.08.07	029	N10	42F3	56°53'90N	03°30'35E
31.08.07	030	N10	42F3	56°49'62N	03°33'43E
31.08.07	031	N10	42F3	56°49'42N	03°40'86E
31.08.07	032	N10	42F3	56°47'18N	03°41'14E
01.09.07	033	P02	42F3	56°41'17N	03°11'72E
01.09.07	034	P02	42F3	56°31'54N	03°18'52E
01.09.07	035	P02	41F3	56°24'92N	03°08'44E
01.09.07	036	P02	42F3	56°34'22N	03°04'12E
02.09.07	037	N06	41E7	56°16'75N	02°04'58W
02.09.07	038	N06	41E7	56°18'24N	02°04'93W
02.09.07	039	N06	41E7	56°23'34N	02°08'87W
02.09.07	040	N06	41E7	56°17'19N	02°06'38W
03.09.07	041	N04	38F2	54°46'03N	02°02'68E
03.09.07	042	N04	38F2	54°47'97N	02°15'82E
03.09.07	043	N04	38F2	54°41'03N	02°09'56E
03.09.07	044	N04	38F2	54°34'50N	02°13'56E
05.09.07	045	N01	37F7	54°15'48N	07°30'22E
05.09.07	046	N01	37F7	54°21'06N	07°29'26E
05.09.07	047	N01	37F7	54°18'91N	07°31'06E
05.09.07	048	N01	37F7	54°15'93N	07°27'92E
05.09.07	049	N01	37F7	54°18'90N	07°26'19E
05.09.07	050	N01	37F7	54°15'54N	07°30'37E
06.09.07	051	GB1	37F7	54°04'50N	07°53'59E
06.09.07	052	GB1	37F7	54°06'57N	07°46'48E
06.09.07	053	GB1	37F7	54°04'52N	07°52'24E

Tab. 1b: Cruise 303 RV 'Walther Herwig III', 23.08. – 07.09.2007:
Geographical coordinates of hydrography stations

DATE	STATION	AREA	ICES- RECTANGLE	LATITUDE	LONGITUDE
BALTIC SEA					
24.08.07	001	B01	38G0	54°33'17N	10°31'39E
24.08.07	002	B01	38G0	54°32'07N	10°41'64E
25.08.07	003	B10	38G3	54°49'15N	13°55'60E
25.08.07	004	B10	38G4	54°42'72N	14°02'73E
26.08.07	005	B11	38G3	54°45'09N	13°48'45E
26.08.07	006	B11	38G3	54°45'70N	13°21'87E
27.08.07	007	B12	37G1	54°21'84N	11°24'44E
27.08.07	008	B12	37G1	54°12'47N	11°40'01E
NORTH SEA					
29.08.07	009	N11	40F7	55°34'06N	07°06'01E
29.08.07	010	N11	40F7	55°32'91N	07°07'11E
30.08.07	011	P01	40F5	55°30'10N	05°12'22E
30.08.07	012	P01	40F5	55°40'56N	05°00'51E
31.08.07	013	N10	42F3	56°49'29N	03°42'60E
31.08.07	014	N10	42F3	56°45'31N	03°49'10E
01.09.07	015	P02	41F3	56°27'86N	03°24'02E
01.09.07	016	P02	42F2	56°30'32N	02°59'73E
02.09.07	017	N06	41E7	56°22'70N	02°00'77W
02.09.07	018	N06	41E8	56°17'79N	01°58'72W
03.09.07	019	N04	38F2	54°44'52N	02°21'62E
03.09.07	020	N04	38F2	54°30'27N	02°16'16E
05.09.07	021	N01	37F7	54°23'69N	07°36'01E
05.09.07	022	N01	37F7	54°18'83N	07°22'66E
05.09.07	023	N01	37F7	54°17'78N	07°30'79E
06.09.07	024	GB1	37F7	54°04'44N	07°52'76E
06.09.07	025	GB1	37F7	54°06'51N	07°45'06E

Tab. 2: Cruise 303 RV 'Walther Herwig III', 23.08. – 07.09.2007:
Mean catches of selected abundant fish species
(n = number, kg = weight per 1 h trawling)

Area	Cod	Whiting	Haddock	Herring	Sprat	Mackerel	Dab	Plaice	Flounder
B01 n	1	33	-	50	4.326	3	820	-	4
kg	2,0	2,0	-	1'0	53,0	1,0	93,0	-	2,0
D n	179	147	-	704	4141	15	1	32	91
kg	54,0	42,0	-	13,0	52,0	6,0	< 0,5	7,0	31,0
B11 n	124	324	-	101	1605	3	5	15	92
kg	39,0	44,0	-	6,0	18,0	1,0	< 0,5	4,0	28,0
B12 n	1	11	-	16	1.074	-	192	2	3
kg	1,0	1,0	-	1,0	12,0	-	13,0	< 0,5	1,0
N11 n	2	315	-	-	-	1.559	1.249	107	-
kg	< 0,5	20,0	-	-	-	195,0	109,0	23,0	-
P01 n	18	248	19	20	-	202	169	31	-
kg	76,0	6,0	1,0	1,0	-	31,0	18,0	8,0	-
N10 n	30	810	448	2	-	18	2.794	3	-
kg	4,0	138,0	43,0	< 0,5	-	3,0	234,0	1,0	-
P02 n	3	68	76	1	-	284	1.012	-	-
kg	1,0	10,0	18,0	< 0,5	-	38,0	74,0	-	-
N06 n	-	160	470	82	-	6.947	392	20	-
kg	-	14,0	56,0	12,0	-	1671,0	21,0	1,0	-
N04 n	5	4	6	-	-	1.960	1.134	30	-
kg	2,0	1,0	< 0,5	-	-	270,0	78,0	9,0	-
N01 n	7	898	-	6.767	6	770	416	2	5
kg	2,0	39,0	-	47,0	< 0,5	114,0	10,0	< 0,5	2,0
GB1 n	4	14.220	-	81	17	4	161	8	81
kg	< 0,5	594,0	-	< 0,5	< 0,5	1,0	8,0	< 0,5	20,0

Tab. 3a: Cruise 303 RV 'Walther Herwig III', 23.08. – 07.09.2007:
Water depth, temperature (T), salinity (S) and O₂ saturation

DATE	STATION	AREA	DEPTH (m)	T (°C)	S (PSU)	O ₂ -SATURATION
BALTIC SEA						
24.08.2007	001	B01	2	18,26	13,61	94.57
			12	17,78	15,12	89.34
	002		2	18,95	13,68	98.59
			18	14,61	20,22	34.06
25.08.2007	003	B10	2	18,48	7,84	95.55
			37	13,32	11,39	56.33
	004		3	18,60	7,73	96.93
			21	9,73	8,14	72.17
26.08.2007	005	B11	2	17,47	7,59	93.70
			36	12,44	9,55	64.35
	006		3	17,56	7,84	96.65
			36	13,07	9,57	76.78
27.08.2007	007	B12	2	17,51	11,66	94.27
			21	14,51	20,67	60.28
	008		3	17,00	9,67	95.48
			21	13,77	21,59	29.33

Tab. 3b: Cruise 303 RV 'Walther Herwig III', 23.08. – 07.09.2007:
Water depth, temperature (T), salinity (S) and O₂ - saturation

DATE	STATION	AREA	DEPTH (m)	T (°C)	S (PSU)	O ₂ -SATURATION
NORTH SEA						
29.08.2007	009	N11	2	17,02	33,79	90.39
			26	17,01	33,79	90.25
	010		4	17,04	33,79	92.10
			27	17,02	33,80	91.29
30.08.2007	011	P01	3	16,04	35,02	93.90
			40	11,12	34,89	64.77
	012		3	15,89	35,06	92.69
			41	11,26	35,03	65.42
31.08.2007	013	N10	3	15,25	34,62	93.61
			58	7,88	35,12	68.62
	014		4	15,17	34,57	94.10
			53	8,03	35,12	69.98
	015		3	15,47	34,66	93.18
			67	8,04	35,11	72.24
01.09.2007	016	P02	4	15,46	34,82	93.70
			70	7,98	35,09	73.26
02.09.2007	017	N06	3	12,97	34,43	90.34
			51	12,96	34,43	90.22
	018		3	12,90	34,44	88.53
			46	12,61	34,44	83.48
03.09.2007	019	N04	3	16,24	34,72	92.65
			20	16,24	34,72	92.83
	020		3	16,64	34,81	92.38
			18	16,63	34,81	93.72
	021		4	16,96	32,03	86.87
			23	17,03	32,11	86.10
05.09.2007	022	N01	3	17,01	32,26	87.94
			42	17,17	32,74	84.43
	023		2	16,99	32,06	89.25
			37	17,16	32,43	83.71
06.09.2007	024	GB1	3	16,93	29,99	89.18
			37	17,76	31,94	71.52
	025		4	17,02	30,48	91.27
			36	17,59	32,12	79.25

Tab. 4: Cruise 303 RV 'Walther Herwig III', 23.08. – 07.09.2007:
Prevalences (%) of externally visible diseases and parasites of dab
(*Limanda limanda*) in the Baltic Sea and North Sea

AREA	N ex	Ly	Ep Hyp/Pap	Ulc Ak/Hei	Flo Ak/Hei	KieHy	Skel Def	Hyp Pig	Steph	Acanth	Lepe
B01	689	4,5	1,2	1,2	0,6	0,0	0,1	0,0	0,1	0,0	0,3
B12	211	2,8	1,9	0,0	0,0	0,0	0,5	0,0	0,0	0,0	0,9
N11	649	5,1	2,3	6,3	0,6	0,2	0,8	29,3	15,1	6,6	17,3
P01	441	20,2	2,7	7,9	0,7	1,1	0,0	9,8	91,2	3,4	4,5
N10	649	22,8	3,1	3,1	0,3	0,3	0,8	5,9	99,5	3,2	0,0
P02	619	21,0	2,3	3,1	0,6	1,0	0,2	6,0	100,0	2,3	0,0
N06	615	17,6	5,7	2,6	0,8	2,4	1,1	44,4	72,4	3,9	0,7
N04	684	7,2	3,4	2,5	0,9	0,0	1,9	36,1	33,3	4,8	18,0
N01	779	0,4	0,1	0,9	0,1	0,0	0,0	3,5	1,3	1,3	1,5
GB1	321	0,0	2,5	1,2	0,0	0,0	0,6	8,4	1,9	3,4	6,5

Tab. 5: Cruise 303 RV 'Walther Herwig III', 23.08. – 07.09.2007:
Prevalences (%) of liver anomalies in dab (*Limanda limanda*) from the Baltic Sea and
North Sea

Area	Length (cm)		N ex	Liver nodules (mm)			Green Livers	Nema- todes	Acantho- ceph.
	from	to		≥ 2	≥ 5	≥ 10			
B01	20	24	51	2,0	0,0	0,0	0,0	0,0	0,0
B01	25	40	52	0,0	0,0	0,0	1,9	0,0	0,0
B12	20	24	37	0,0	0,0	0,0	0,0	0,0	0,0
B12	25	40	33	0,0	0,0	0,0	0,0	0,0	0,0
N11	20	24	52	1,9	0,0	0,0	0,0	0,0	0,0
N11	25	40	52	5,8	3,8	1,9	0,0	0,0	0,0
P01	20	24	72	0,0	0,0	0,0	1,4	8,3	2,8
P01	25	40	31	9,7	3,2	3,2	0,0	3,2	6,5
N10	20	24	74	0,0	0,0	0,0	40,5	29,7	5,4
N10	25	40	48	4,2	2,1	2,1	14,6	33,3	8,3
P02	20	24	58	5,2	0,0	0,0	84,5	24,1	1,7
P02	25	40	11	9,1	9,1	9,1	90,9	18,2	9,1
N06	20	24	51	0,0	0,0	0,0	11,8	90,2	35,3
N06	25	40	6	0,0	0,0	0,0	0,0	83,3	16,7
N04	20	24	48	6,3	4,2	2,1	2,1	4,2	2,1
N04	25	40	51	19,6	9,8	7,8	0,0	17,6	0,0
N01	20	24	42	4,8	2,4	2,4	0,0	0,0	0,0
N01	25	40	6	0,0	0,0	0,0	0,0	0,0	0,0
GB1	20	24	50	2,0	0,0	0,0	0,0	0,0	0,0
GB1	25	40	5	20,0	0,0	0,0	0,0	0,0	0,0

Tab. 6: Cruise 303 RV 'Walther Herwig III', 23.08. – 07.09.2007:
Prevalences (%) of diseases and parasites of cod (*Gadus morhua*) in the Baltic Sea

GEBIET	N ex	Ulc Ak/Hei	Skel Def	PBT	NetzAb	Locera	Clav	Cryp
B01	4	25,0	0,0	0,0	0,0	0,0	0,0	50,0
B10	893	5,4	2,0	0,0	0,0	0,0	0,0	5,8
B11	622	4,2	2,4	0,0	0,0	0,6	0,0	10,9
B12	2	0,0	0,0	0,0	0,0	0,0	0,0	100,0
P01	90	43,3	3,3	0,0	0,0	7,8	50,0	20,0
N10	88	2,3	0,0	0,0	0,0	0,0	31,8	2,3
P02	12	0,0	0,0	0,0	0,0	0,0	83,3	0,0
N06	2	0,0	0,0	0,0	0,0	50,0	50,0	0,0
N04	18	0,0	0,0	0,0	0,0	0,0	22,2	0,0
N01	39	12,8	0,0	0,0	0,0	5,1	2,6	7,7

Tab. 7: Cruise 303 RV 'Walther Herwig III', 23.08. – 07.09.2007:
Prevalences (%) of diseases and parasites of flounder (*Platichthys flesus*)
from the Baltic Sea and North Sea

GEBIET	N ex	Ly	Ulc Ak/Hei	UlcAb	Skel Def	Hyp Pig	Cryp
B10	196	36,7	5,1	5,6	0,5	78,6	78,6
B11	188	37,2	2,7	4,8	0,5	83,5	79,8
GB1	71	4,2	1,4	1,4	1,4	29,6	14,1

Abbreviations:

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