

16/11/2005

**Cruise Report
Cruise 278 RV 'Walther Herwig III'
24.08. - 09.09.2005**

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

Chief Scientist: Dr. Thomas Lang

1 Abstract

As part of the regular activities of the Institute of Fishery Ecology of the Federal Research Centre for Fisheries on biological effects of contaminants in marine fish species, studies were conducted in 9 North Sea and 4 Baltic Sea areas. In addition to the examination of North Sea dab (*Limanda limanda*), Baltic cod (*Gadus morhua*) and Baltic flounder (*Platichthys flesus*) for macroscopically visible external and internal diseases and parasites, numerous samples were taken for studies on histopathological alterations in liver and spleen, contaminant-induced changes in enzyme activities (EROD), inorganic and organic contaminants and their metabolites (trace metals, organochlorines, PAH metabolites), age composition, condition factors, and organosomatic indices. In addition, hydrographical measurements were carried out (water temperature, salinity, oxygen content). Fish samples were frozen for the detection of radioactive substances and for measurements of contaminants in the framework of the OSPAR JAMP/CEMP and HELCOM BMP monitoring programmes.

The results of the examination of dab for macroscopic lesions largely confirmed last year's findings. The decreasing trend in prevalence of lymphocystis in dab from the North Sea has apparently continued. The values of 0.0 % and 2.3 % at stations in the German Bight were the lowest ever recorded in this region. Dab from the platform areas P01 (Danfield) and P02 (Ekofisk) were characterised by elevated prevalences of lymphocystis, skin ulcerations (only area P01), the parasite *Stephanostomum baccatum* and a green discolouration of the livers due to a parasitic infection of the bile ducts (only area P02). The prevalence of hyperpigmentation in area JMP of the German Bight was the highest ever recorded, indicating that the increasing trend in this area continued. The decrease in the prevalence of liver tumours in North Sea dab has continued. The prevalences of acute skin ulcerations in Baltic Sea cod varied between 0.0 % and 15.4 % and were thus increased compared to the previous year. More results will be available after subsequent lab analyses of samples.

2 Objectives of the Cruise

1. Studies on biological effects of contaminants in fish
2. Studies on the occurrence of fish diseases and parasites
3. Sampling of fish for chemical analysis of radioactive substances, trace metals and organic contaminants
4. Hydrographical measurements (salinity, temperature, oxygen)
5. Sampling of livers and other organs of fish for subsequent histological and biochemical studies

3 Dates of the Cruise

RV 'Walther Herwig III' left Bremerhaven on 24.08. and studies were started in the morning of 25.08. in area GB1 in the German Bight. Work in 8 other North Sea areas followed. On 03.09., RV 'Walther Herwig III' sailed into the Baltic Sea, after passing through the Kiel Channel. The work was continued on 04.09. in area B12 in the Mecklenburg Bight. After having finished the work in the Baltic Sea in 3 further areas, the RV returned to the North Sea and, according to plan, the cruise ended in the morning of 09.09.2005 in Bremerhaven.

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

In the 13 sampling areas (Fig. 1), a total of 54 fishing hauls was 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 conducted at 27 stations (see Table 1b).

4 Preliminary Results

4.1 Dab (*Limanda limanda*)

In total, 8.744 dab were examined for the occurrence of externally visible diseases and parasites and 981 dab for the occurrence of macroscopic liver anomalies. Results are given in Table 4 and 5. The decreasing trend in prevalence of lymphocystis in dab from the North Sea has apparently continued since the previous year. The values of 0.0 % and 2.3 %, resp., at the two stations in the German Bight (areas GB1 and JMP) were the lowest ever recorded in this area. Despite the higher prevalences in other areas (maximum values in areas P01, P02, N15), the general mean prevalence is low compared to previous years. The prevalence of acute stages of skin ulcerations was slightly increased compared to 2005, while the rest of the diseases/parasitoses recorded were similarly prevalent compared to previous years.

In accordance to previous cruises, generally high prevalences of skin hyperpigmentation (increased aggregation of green to black pigment spots) were noted in areas N06, JMP and N11. The prevalence in area JMP in the German Bight has further increased compared to previous years.

Dab from areas P01 and P02 (oil and gas platforms) showed elevated prevalences of lymphocystis, skin ulcerations (only in P01), *Stephanostomum baccatum* (parasite in the skin) and green discolouration of the livers (only in area P02).

Liver tumours in dab ≥ 25 cm total length were most prevalent at the Doggerbank (area N04: 12.0 %) and in the German Bight (area JMP: 9.0 %). However, prevalences were low in general and did no longer show distinct spatial patterns. Dab in area N06 off the Scottish coast again showed a pronounced liver parasitism with nematodes and acanthocephaleans.

A variety of samples were taken for subsequent chemical analysis of contaminants as well as for biological effects measurements. More comprehensive results will be available after all samples obtained have been processed.

4.2 Cod (*Gadus morhua*)

2.028 cod from the Baltic Sea were examined for the occurrence of externally visible diseases and parasites (see Table 6). The prevalences of acute/healing skin ulcerations were in the range of 0.0 % to 15.4 % and were thus higher than in 2005. Further studies will have to show if this can be regarded as a trend.

4.3 Flounder (*Platichthys flesus*)

153 Baltic flounder examined for externally visible diseases (Tab. 7). The prevalence of lymphocystis was high (compared to dab from the Baltic Sea and the North Sea) but in the normal range and acute/healing stages of skin ulcerations were absent in contrast to previous years.

5 Miscellaneous

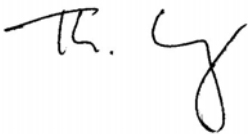
The mean catch data of the most frequent fish species are provided in Table 2; Table 3 gives results of the hydrographic measurements.

6 Participants

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7 Acknowledgements

Thanks are due to Captain Vandrei and his crew and to the scientific staff for constructive work, enormous enthusiasm and an excellent atmosphere on board.



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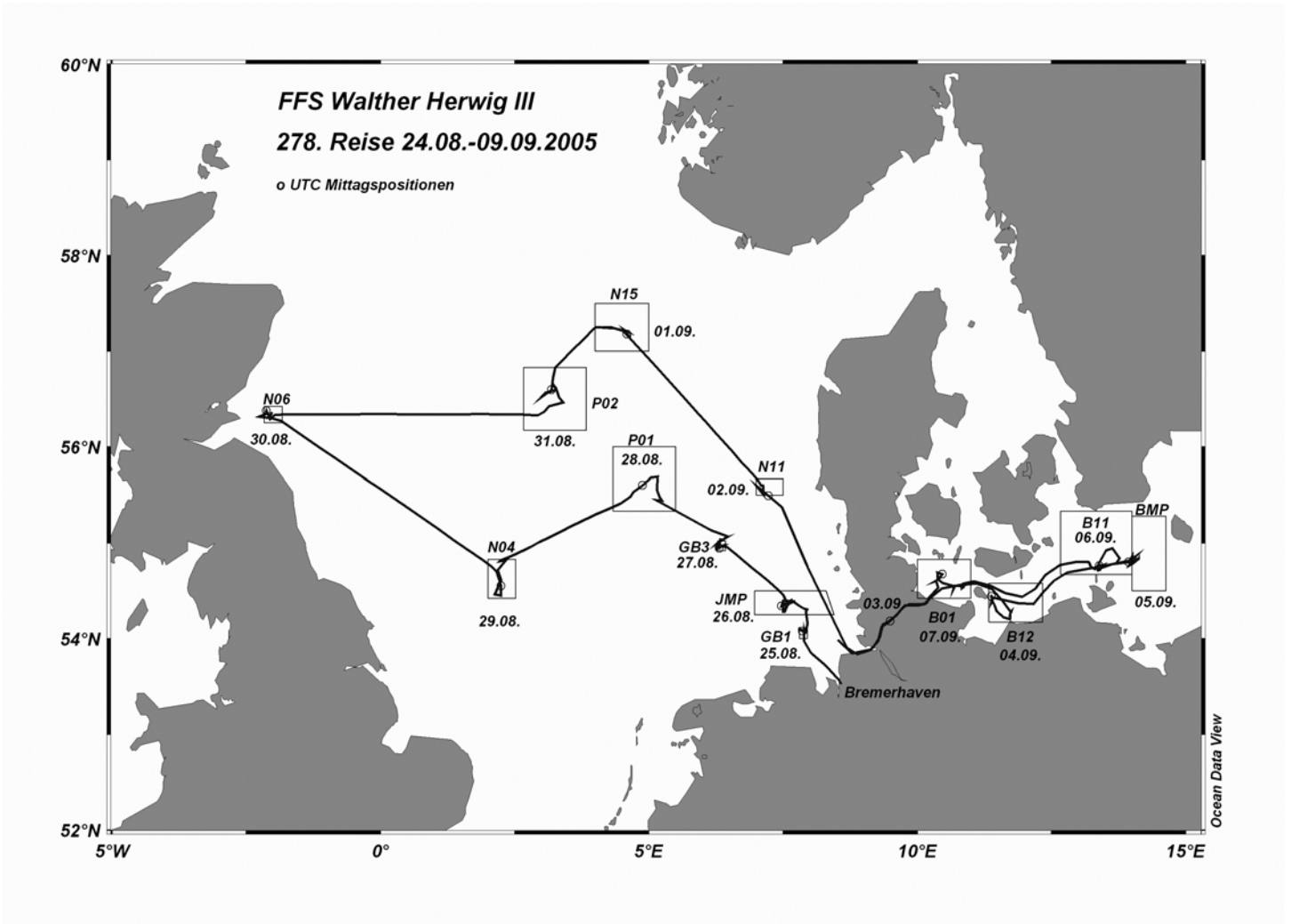
(Scientist in charge)

Annex

7 Tables

1 Figure

Fig. 1: Cruise 278 RV „Walther Herwig III“, 24.08.- 09.09.2005:
Location of sampling sites



Tab. 1a: Cruise 278 RV „Walther Herwig III“, 24.08. - 09.09.2005:
Geographical coordinates of trawling sites

DATE	STATION	Area	ICES- RECTANGLE	GEO LAT	GEO LONG
NORTH SEA					
25.08.05	001	GB1	37F7	54°04'41N	07°52'91E
25.08.05	002	GB1	37F7	54°06'20N	07°48'15E
26.08.05	003	JMP	37F7	54°24'17N	07°37'90E
26.08.05	004	JMP	37F7	54°19'27N	07°30'17E
26.08.05	005	JMP	37F7	54°23'87N	07°35'56E
26.08.05	006	JMP	37F7	54°20'75N	07°28'77E
27.08.05	007	GB3	38F6	54°58'26N	06°22'07E
27.08.05	008	GB3	38F6	54°56'81N	06°16'54E
27.08.05	009	GB3	38F6	54°58'09N	06°22'71E
27.08.05	010	GB3	38F6	54°57'89N	06°18'57E
28.08.05	011	P01	39F5	55°22'74N	05°08'04E
28.08.05	012	P01	39F5	55°27'12N	05°13'55E
28.08.05	013	P01	40F5	55°41'32N	05°08'31E
28.08.05	014	P01	40F4	55°32'91N	04°43'60E
29.08.05	015	N04	38F2	54°48'41N	02°12'45E
29.08.05	016	N04	38F2	54°41'14N	02°09'47E
29.08.05	017	N04	37F2	54°27'11N	02°09'27E
29.08.05	018	N04	38F2	54°42'10N	02°09'80E
30.08.05	019	N06	41E8	56°17'64N	01°56'46W
30.08.05	020	N06	41E7	56°21'96N	02°01'39W
30.08.05	021	N06	41E7	56°19'22N	02°08'47W
30.08.05	022	N06	41E7	56°17'29N	02°03'70W
31.08.05	023	P02	41F3	56°20'95N	03°01'75E
31.08.05	024	P02	41F3	56°28'24N	03°23'71E
31.08.05	025	P02	42F3	56°40'79N	03°11'78E
31.08.05	026	P02	42F2	56°31'02N	02°59'46E
01.09.05	027	N15	43F3	57°14'96N	03°59'88E
01.09.05	028	N15	43F4	57°14'40N	04°22'72E
01.09.05	029	N15	43F4	57°12'29N	04°36'39E
01.09.05	030	N15	43F4	57°08'40N	04°41'51E
02.09.05	031	N11	40F7	55°39'45N	07°01'30E
02.09.05	032	N11	40F7	55°34'97N	07°08'36E
02.09.05	033	N11	40F7	55°35'56N	07°01'06E

Tab. 1a: (Cont.)

DATE	STATION	AREA	ICES-RECTANGLE	GEO LAT	GEO LONG
BALTIC SEA					
04.09.05	034	B12	37G1	54°16'82N	11°43'85E
04.09.05	035	B12	37G1	54°13'58N	11°41'20E
04.09.05	036	B12	37G1	54°17'90N	11°27'70E
04.09.05	037	B12	37G1	54°22'67N	11°23'08E
04.09.05	038	B12	37G1	54°27'30N	11°22'29E
04.09.05	039	B12	37G1	54°22'08N	11°22'21E
05.09.05	040	BMP	38G4	54°49'93N	14°6'60E
05.09.05	041	BMP	38G3	54°46'09N	13°56'83E
05.09.05	042	BMP	38G4	54°51'80N	14°04'30E
05.09.09	043	BMP	38G4	54°48'16N	14°01'82E
05.09.05	044	BMP	38G4	54°51'84N	14°01'54E
06.09.05	045	B11	38G3	54°46'02N	13°28'88E
06.09.05	046	B11	38G3	54°55'51N	13°31'09E
06.09.05	047	B11	38G3	54°48'24N	13°46'69E
06.09.05	048	B11	38G3	54°45'94N	13°30'97E
06.09.05	049	B11	38G3	54°43'63N	13°21'02E
06.09.05	050	B11	38G3	54°46'10N	13°15'53E
07.09.05	051	B01	38G0	54°33'73N	10°48'66E
07.09.05	052	B01	37G0	54°29'51N	10°41'32E
07.09.05	053	B01	38G0	54°34'23N	10°29'91E
07.09.05	054	B01	38G0	54°41'80N	10°19'48E

Tab. 1b: Cruise 278 RV „Walther Herwig III“, 24.08. - 09.09.2005:
Geographical coordinates of hydrography stations

DATE	STATION	AREA	ICES-RECTANGLE	GEO LAT	GEO LONG
NORTH SEA					
25.08.05	001	GB1	37F7	54°04'41N	07°52'91E
25.08.05	002	GB1	37F7	54°06'20N	07°48'15E
26.08.05	003	JMP	37F7	54°19'27N	07°30'17E
26.08.05	004	JMP	37F7	54°20'75N	07°28'77E
27.08.05	005	GB3	38F6	54°56'81N	06°16'54E
27.08.05	006	GB3	38F6	54°57'89N	06°18'57E
28.08.05	007	P01	39F5	55°27'12N	05°13'55E
28.08.05	008	P01	40F4	55°32'91N	04°43'60E
29.08.05	009	N04	38F2	54°41'14N	02°09'47E
29.08.05	010	N04	38F2	54°42'10N	02°09'80E
30.08.05	011	N06	41E7	56°21'96N	02°01'39W
30.08.05	012	N06	41E7	56°17'29N	02°03'70W
31.08.05	013	P02	41F3	56°28'24N	03°23'71E
31.08.05	014	P02	42F2	56°31'02N	02°59'46E
01.09.05	015	N15	43F4	57°14'40N	04°22'72E
01.09.05	016	N15	43F4	57°08'40N	04°41'51E
02.09.05	017	N11	40F7	55°34'97N	07°08'36E
02.09.05	018	N11	40F7	55°35'56N	07°01'06E
BALTIC SEA					
04.09.05	019	B12	37G1	54°13'58N	11°41'20E
04.09.05	020	B12	37G1	54°22'67N	11°23'08E
04.09.05	021	B12	37G1	54°22'08N	11°22'21E
05.09.05	022	BMP	38G3	54°50'34N	13°59'97E
05.09.05	023	BMP	38G4	54°48'16N	14°01'82E
06.09.05	024	B11	38G3	54°55'51N	13°31'09E
06.09.05	025	B11	38G3	54°45'94N	13°30'97E
07.09.05	026	B01	37G0	54°29'51N	10°41'32E
07.09.05	027	B01	38G0	54°41'80N	10°19'48E

Tab. 2: Cruise 278 RV „Walther Herwig III“, 24.08. - 09.09.2005:
 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
GB1 n	8	956	-	4	808	96	156	42	148
kg	< 0,5	31,0	-	< 0,5	5,0	23,0	28,0	2,0	36,0
JMP n	2	68	-	10.457	11.155	1.078	492	42	-
kg	< 0,5	3,0	-	125,0	121,0	200,0	38,0	6,0	-
GB3 n	7	41	-	19.648	54.418	22	838	42	-
kg	< 0,5	2,0	-	224,0	518,0	6,0	49,0	6,0	-
P01 n	9	36	40	7.104	5.158	28	452	55	-
kg	7,0	2,0	1,0	242,0	67,0	5,0	39,0	14,0	-
N04 n	-	7	-	5	-	1.524	774	20	-
kg	-	1,0	-	1,0	-	238,0	58,0	8,0	-
N06 n	6	767	3.512	32	3	4.228	335	2	-
kg	< 0,5	37,0	82,0	6,0	< 0,5	676,0	21,0	< 0,5	-
P02 n	2	12	262	1	-	16	2.498	-	-
kg	1,0	< 0,5	28,0	< 0,5	-	3,0	155,0	-	-
N15 n	2	86	180	7	-	10	2.669	6	-
kg	< 0,5	1,0	10,0	1,0	-	2,0	216,0	3,0	-
N11 n	4	155	-	1.102	5.650	274	2.538	96	-
kg	2,0	13,0	-	30,0	96,0	92	193,0	13,0	-
B12 n	76	122	-	11	593	-	1.010	2	3
kg	141,0	1,0	-	< 0,5	7,0	-	101,0	< 0,5	1,0
BMP n	225	182	-	636	4.436	1	1	21	13
kg	81,0	59,0	-	16,0	57,0	1,0	< 0,5	3,0	5,0
B11 n	92	66	-	444	2.908	1	8	6	14
kg	50,0	17,0	-	23,0	42,0	< 0,5	2,0	1,0	4,0
B01 n	2	83	-	8	274	1	108	-	-
kg	2,0	< 0,5	-	< 0,5	4,0	< 0,5	9,0	-	-

Tab. 3a: Cruise 278 RV „Walther Herwig III“, 24.08. - 09.09.2005:
Water depth, temperature (T), salinity (S) und O₂ saturation, North Sea

DATE	STATION	AREA	DEPTH (m)	T (°C)	S (PSU)	O ₂ -SATURATION
25.08.2005	001	GB1	n.g.	n.g.	n.g.	n.g.
25.08.2005			n.g.	n.g.	n.g.	n.g.
25.08.2005	002		1	17,15	32,23	91,62
25.08.2005			37	17,06	32,33	86,55
26.08.2005	003	JMP	1	16,70	32,32	99,25
26.08.2005			37	16,77	32,60	95,64
26.08.2005	004		1	17,07	31,64	101,91
26.08.2005			23	17,10	31,67	100,88
27.08.2005	005	GB3	1	15,81	34,44	95,79
27.08.2005			41	15,74	34,46	97,37
27.08.2005	006		1	15,38	34,50	95,39
27.08.2005			42	15,22	34,52	93,65
28.08.2005	007	P01	1	15,24	34,96	102,10
28.08.2005			39	9,15	34,93	78,70
28.08.2005	008		1	14,65	35,00	99,17
28.08.2005			33	12,97	34,79	81,49
29.08.2005	009	N04	1	15,35	34,84	99,42
29.08.2005			21	15,34	34,84	99,66
29.08.2005	010		1	15,35	34,82	99,90
29.08.2005			27	15,31	34,82	98,85
30.08.2005	011	N06	n.g.	n.g.	n.g.	n.g.
30.08.2005			n.g.	n.g.	n.g.	n.g.
30.08.2005	012		1	12,99	34,54	102,56
30.08.2005			50	11,22	34,52	78,92
31.08.2005	013	P02	1	15,16	34,38	101,64
31.08.2005			66	6,80	35,15	70,70
31.08.2005	014		1	15,34	34,17	101,15
31.08.2005			68	6,84	35,14	72,42
01.09.2005	015	N15	1	14,84	33,38	101,25
01.09.2005			60	7,66	35,16	82,31
01.09.2005	016		1	15,06	33,24	101,46
01.09.2005			61	7,48	35,14	76,73
02.09.2005	017	N11	n.g.	n.g.	n.g.	n.g.
02.09.2005			n.g.	n.g.	n.g.	n.g.
02.09.2005	018		1	16,09	33,14	98,89
02.09.2005			26	16,02	33,25	101,67

Tab. 3b: Cruise 278 RV „Walther Herwig III“, 24.08. - 09.09.2005:
Water depth, temperature (T), salinity (S) und O₂ saturation, Baltic Sea

DATE	STATION	AREA	DEPTH (m)	T (°C)	S (PSU)	O ₂ SATURATION
04.09.2005	019	B12	1	17,15	12,81	106,36
04.09.2005			21	12,58	20,97	43,77
04.09.2005	020		1	15,78	9,41	78,17
04.09.2005			16	15,07	19,76	76,20
04.09.2005	021		1	15,86	9,58	92,05
04.09.2005			18	13,90	21,90	61,60
05.09.2005	022	BMP	1	17,97	7,60	85,15
05.09.2005			38	11,93	15,36	27,74
05.09.2005	023		1	18,43	7,59	103,91
05.09.2005			38	12,22	15,26	39,42
06.09.2005	024	B01	1	17,42	7,92	105,14
06.09.2005			43	10,92	16,44	36,11
06.09.2005	025		1	17,45	8,17	80,71
06.09.2005			37	12,03	14,73	40,62
07.09.2005	026	B01	1	17,47	14,54	105,52
07.09.2005			19	12,81	22,60	25,38
07.09.2005	027		1	18,04	14,42	108,20
07.09.2005			19	12,58	22,19	23,29

Tab. 4: Cruise 278 RV „Walther Herwig III“, 24.08. - 09.09.2005:
Prevalences (%) of externally visible diseases and parasites of dab (*Limanda limanda*) in the North Sea and Baltic Sea

GEBIET	N unt	Ly	Ep Hyp/Pap	Ulc Ak/Hei	Flo Aku/Hei	KieHy	Skel Def	HypPig	Steph	Acanth	Lepe
GB1	459	0,0	1,5	2,8	0,4	0,0	0,0	5,2	0,2	1,7	7,0
JMP	1003	2,3	2,1	10,6	1,6	0,0	1,1	35,2	3,0	5,1	22,8
GB3	1243	3,4	2,3	2,1	0,6	0,1	0,6	12,1	24,1	1,2	11,4
P01	809	14,8	3,1	11,5	1,6	1,0	1,4	10,0	81,6	4,4	3,3
N04	902	3,5	2,5	4,0	0,4	0,1	0,7	30,6	28,6	5,7	24,2
N06	800	12,6	4,9	12,7	1,1	8,2	2,7	39,6	60,7	4,1	1,2
P02	1004	15,8	0,9	0,8	0,3	0,3	0,4	3,2	99,0	2,4	0,2
N15	801	15,5	2,1	2,4	0,1	0,9	0,1	1,5	97,3	3,0	0,1
N11	723	7,5	1,9	7,6	1,1	0,0	0,6	31,8	11,6	3,2	13,0
B12	576	4,5	0,2	0,0	0,0	0,0	0,3	0,0	0,0	0,0	0,2
B01	424	3,1	0,2	0,5	0,7	0,0	0,0	0,0	0,0	0,0	0,2

Tab. 5: Cruise 278 RV „Walther Herwig III“, 24.08. - 09.09.2005:
Prevalences (%) of liver anomalies in dab (*Limanda limanda*) from the North Sea and Baltic Sea

Area	Length (cm)		N unt	Liver nodules (mm)			Green Livers	Nema- todes	Acantho- cephaleans
	min	max		> 2	> 5	>= 10			
GB1	20	24	48	6,3	4,2	2,1	0,0	2,1	0,0
GB1	25	40	9	0,0	0,0	0,0	11,1	0,0	0,0
JMP	20	24	54	1,9	1,9	0,0	0,0	0,0	0,0
JMP	25	40	67	9,0	6,0	6,0	1,5	0,0	0,0
GB3	20	24	52	3,8	1,9	0,0	0,0	1,9	0,0
GB3	25	40	50	0,0	0,0	0,0	0,0	4,0	0,0
P01	20	24	52	5,8	5,8	5,8	1,9	11,5	0,0
P01	25	40	50	4,0	2,0	2,0	4,0	12,0	0,0
N04	20	24	51	5,9	5,9	3,9	7,8	9,8	0,0
N04	25	40	50	12,0	6,0	0,0	2,0	16,0	0,0
N06	20	24	52	1,9	0,0	0,0	9,6	82,7	28,8
N06	25	40	48	4,2	2,1	2,1	12,5	87,5	31,3
P02	20	24	51	3,9	2,0	0,0	70,6	23,5	9,8
P02	25	40	43	7,0	2,3	0,0	93,0	48,8	0,0
N15	20	24	51	2,0	0,0	0,0	15,7	25,5	2,0
N15	25	40	51	3,9	0,0	0,0	29,4	39,2	0,0
N11	20	24	54	7,4	3,7	1,9	0,0	3,7	0,0
N11	25	40	51	5,9	3,9	2,0	0,0	2,0	0,0
B01	20	24	51	0,0	0,0	0,0	0,0	0,0	0,0
B01	25	40	46	4,3	0,0	0,0	2,2	0,0	0,0

Tab. 6: Cruise 278 RV „Walther Herwig III“, 24.08.- 09.09.2005:
Prevalences (%) of diseases and parasites of cod (*Gadus morhua*) in the Baltic Sea

Area	N unt	Ulc Ak/Hei	Skel Def	PBT	NetzAb	Locera	Clav	Cryp
P01	12	0,0	0,0	0,0	0,0	0,0	0,0	0,0
N11	3	0,0	0,0	0,0	0,0	0,0	0,0	33,3
B12	393	5,3	6,1	0,3	0,0	3,1	0,0	76,1
BMP	909	15,4	5,1	0,0	0,0	1,0	0,0	9,9
B11	719	8,3	4,7	0,1	0,0	1,7	0,0	15,0
B01	7	0,0	0,0	0,0	0,0	14,3	0,0	71,4

Tab. 7: Cruise 278 RV „Walther Herwig III“, 24.08.- 09.09.2005:
Prevalences (%) of diseases and parasites of flounder (*Platichthys flesus*) in the Baltic Sea

Area	N unt	Ly	Ulc Ak/Hei	UlcAb	Skel Def	Hyp Pig	Flo Ak/Hei	Cryp
B12	19	21,1	0,0	0,0	0,0	0,0	5,3	57,9
BMP	51	27,5	0,0	2,0	0,0	0,0	7,8	68,6
B11	83	26,5	0,0	0,0	0,0	0,0	1,2	61,4

Abbreviations:

N unt	: Number examined	PBT	: Pseudobranchial pseudotumour
Ly	: Lymphocystis	Netz Ab	: Net injury, healed
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	Clav	: <i>Clavella adunca</i>
Skel Def	: Skeletal deformities	Cryp	: <i>Cryptocotyle lingua</i>