

## RV Walther Herwig III Cruise 360

10.12. – 20.12.2012

### Fish diseases and biological effects of contaminants in the Baltic Sea, CHEMSEA Project

Scientist in Charge: Dr. Thomas Lang

#### Summary

As part of the long-term monitoring programme of the Thünen Institute of Fisheries Ecology on diseases and parasites of marine fish species and in the framework of the EU-funded CHEMSEA project (Chemical Munitions - Search and Assessment), studies were conducted in 6 Baltic Sea areas. Due to technical problems, the start of the cruise had to be postponed from 01.12. to 10.12., and therefore not all sampling sites in the Baltic Sea could be visited and the North Sea sampling was completely cancelled.

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, extensive samples for the CHEMSEA project were taken for measurements on dumped chemical weapons and their biological effects. In particular, cod samples were taken for the CHEMSEA project in areas B14 (Gotland Basin), B13 (Bornholm Basin) and B01 (close to dumpsites in the Little Belt). In addition, fish samples were frozen for the detection of contaminants (incl. radioactive substances) in the framework of national legislation (BLMP) and international monitoring programmes (HELCOM). Hydrographical measurements were carried out (water temperature, salinity, oxygen content, turbidity). The following preliminary findings were noted:

*Dab*: Disease prevalences in the normal range;

*Flounder*: Prevalences in the normal range;

*Baltic cod*: Comparatively high prevalences of skin ulcers and skeletal deformities in the Baltic Sea sampling area B14 in the Gotland Basin.

#### Participants

Name	Function	Institution
Dr. Thomas Lang	Scientist in Charge	FI, Cuxhaven
Nicolai Fricke	Scientist	FI, Cuxhaven
Thomas Tepperies	Technician	FI, Cuxhaven
Jennifer Ipse	Technician	FI, Cuxhaven
Dr. Marc-Oliver Aust	Scientist	FI, Hamburg
Dr. Matthias Brenner	Guest Scientist	AWI, Bremerhaven
Dr. Virmantas Stunzenas	Guest Scientist	Nature Research Centre, Lithuania
Marc Faber	Student	University Berlin
Friederike Engel	Student	University Kiel
Wiebke Schmidt	Volunteer	University of Galway, Ireland
Marc Fabian	Volunteer	Veterinary University Hannover
Michael Klein	Volunteer	Switzerland

## Objectives of the Cruise

1. Studies on biological effects of contaminants and diseases and parasites in fish;
2. Sampling of fish for the analysis of radioactive substances;
3. Sampling of livers and other organs of fish for subsequent histological and biochemical studies;
4. Studies and sampling for the project CHEMSEA (CHEMical Munitions SEArch and Assessment)
5. Hydrographical measurements (salinity, temperature, oxygen, turbidity);

## Dates of the Cruise

RV Walther Herwig III left Bremerhaven in the morning of 10.12. After the passage of the Kiel Channel, work started in the morning of 12.12. in the first sampling area B09. In the following days sampling was conducted in the areas of B14, B13, B11, B12 and B01. On 17.12. RV WH III arrived in Kiel, where two scientists disembarked. After passing Kiel Channel on 18.12., WH III arrived in Bremerhaven on schedule in the early morning of 20.12.

The location of the sampling areas and the cruise dates are shown in Figure 1 and Table 1. In 6 sampling areas (Fig. 1), a total of 24 fishing hauls was performed (towing time 30-120 min each) (see Table 1). A 140 ft bottom trawl and pelagic PSN 205 net were used, both with standard configuration. Hydrographical CTD measurements were made at stations related to bottom and fish samplings (see Tables 1b and 3).

## Preliminary Results

### 1 Dab (*Limanda limanda*)

In total, 1.015 dab were examined for the occurrence of externally visible diseases and parasites in two Baltic Sea areas (B12 and B01, results are provided in Tab. 4). The disease prevalences were low in general compared to previous years.

### 2 Flounder (*Platichthys flesus*)

720 flounder were inspected for externally visible diseases in four Baltic Sea areas (results see Tab. 5) and 14 flounder for liver anomalies (results see Tab. 6). All prevalences were within the normal range.

### 3 Cod (*Gadus morhua*)

1.397 Baltic cod from 6 sampling areas were examined for the occurrence of externally visible diseases and parasites (results see Table 7). The prevalence of acute/healing skin ulcers was again comparatively high with a maximum value of 21.2 % in area B14 (dumping area for chemical warfare agents after WW II). Cod from this area were also affected by skeletal deformities at a high prevalence (12, 1 %).

## Miscellaneous

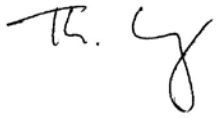
An extended sampling of cod was carried out for CHEMSEA project (CHEMical Munitions SEArch and Assessment) in area B14 (Gotland Basin), B13 (Bornholm Basin) and B01 (Kiel Bight, close to the munitions dumpsite in the Little Belt). Samples for contaminant and biological effects of chemical warfare agents, resp., were taken from the following organs: musculature, liver, spleen, bile, head kidney, kidney and blood (see Table ).

Oxygen levels in the bottom layers were, with the exception of deep sampling areas (partly > 100 m) east of Bornholm (B13) and in the Gotland Basin (B14), non-critical and exceeded the threshold of 2 mg/l. This situation is typical for the Baltic Sea due to a halocline in the depths of 60 m that prevents the exchange between upper and lower water layers.

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

## Acknowledgements

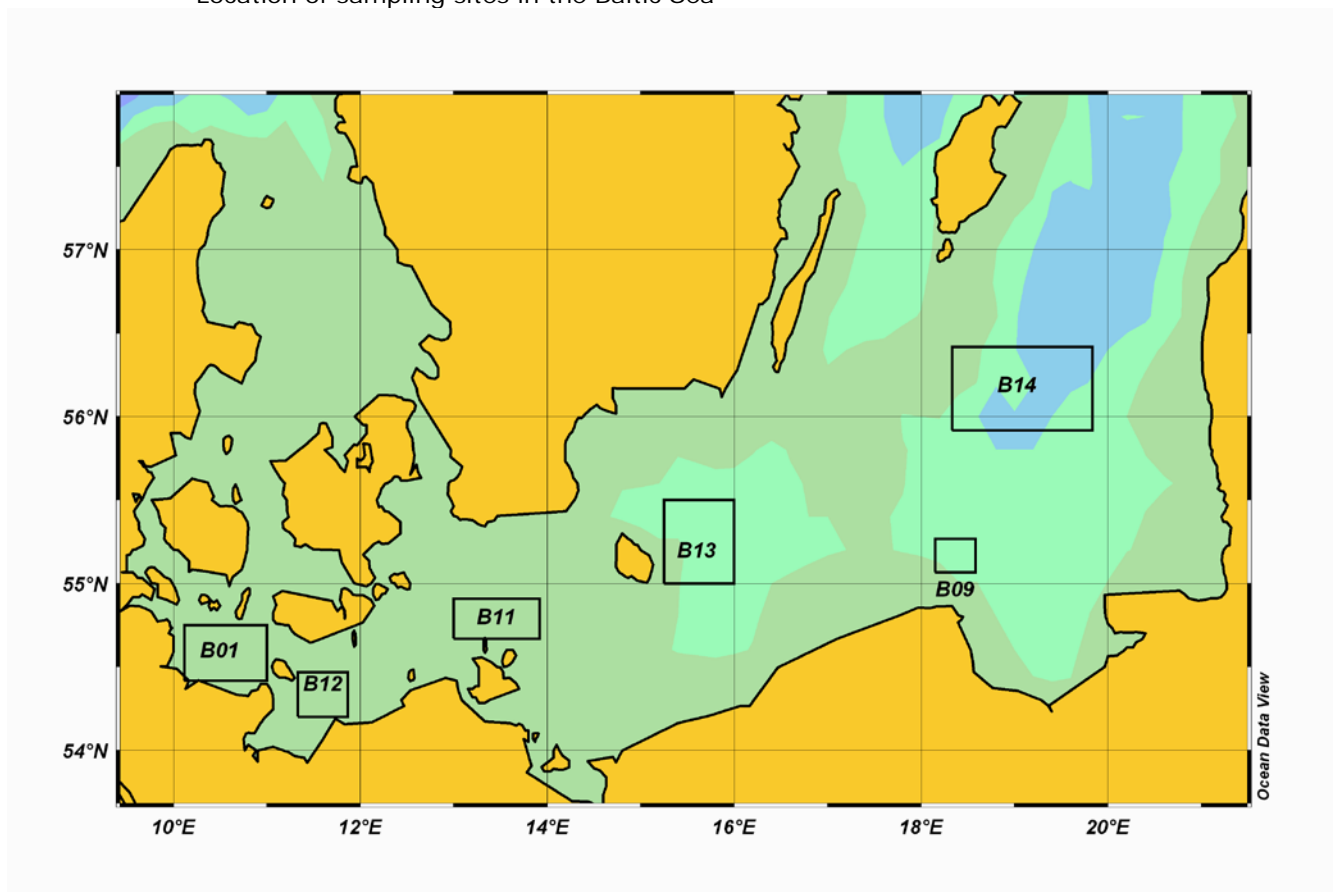
Thanks are due to Captain Janßen and his crew and to the scientific staff for a successful cruise, constructive and hard work and a good atmosphere on board.



Dr. Thomas Lang  
(Scientist in Charge)

**Annex:** 8 Tables, 2 Figures

**Fig. 1:** *Cruise 360 RV „Walther Herwig III“, 10.12. – 20.12.2012:*  
Location of sampling sites in the Baltic Sea



**Tab. 1a:** *Cruise 360 RV „Walther Herwig III“, 10.12. – 20.12.2012:*  
Geographical coordinates of trawling sites, Baltic Sea

DATE	FISHING-STATION	Area	ICES-RECTANGLE	LATITUDE	LONGITUDE	B: Bottom trawl P: Pelagic trawl
12.12.12	001	B09	39G8	55°13,99N	18°10,47E	G
12.12.12	002	B09	39G8	55°08,05N	18°18,84E	G
12.12.12	003	B09	39G8	55°07,17N	18°10,79E	G
12.12.12	004	B09	39G8	55°12,27N	18°21,68E	G
13.12.12	005	B14	41G8	56°09,09N	18°26,22E	G
13.12.12	006	B14	40G8	55°57,17N	18°49,92E	G
13.12.12	007	B14	41G8	56°00,72N	18°44,11E	G
13.12.12	008	B14	41G8	56°02,97N	18°41,23E	G
14.12.12	009	B13	39G5	55°22,89N	15°35,70E	G
14.12.12	010	B13	39G5	55°19,30N	15°40,16E	G
14.12.12	011	B13	39G5	55°22,41N	15°33,89E	G
14.12.12	012	B13	39G5	55°22,57N	15°39,17E	G
14.12.12	013	B13	39G5	55°19,22N	15°34,05E	G
15.12.12	014	B11	38G3	54°47,17N	13°50,96E	G
15.12.12	015	B11	38G3	54°46,87N	13°47,13E	G
15.12.12	016	B11	38G3	54°45,70N	13°29,86E	G
16.12.12	017	B12	37G1	54°13,85N	11°46,91E	G
16.12.12	018	B12	37G1	54°20,40N	11°43,14E	G
16.12.12	019	B12	37G1	54°17,82N	11°35,32E	G
16.12.12	020	B12	37G1	54°18,00N	11°28,59E	G
17.12.12	021	B01	38G0	54°40,32N	10°15,96E	G
17.12.12	022	B01	38G0	54°44,04N	10°13,37E	G
17.12.12	023	B01	38G0	54°36,32N	10°25,05E	G
17.12.12	024	B01	38G0	54°34,37N	10°29,91E	G

**Tab. 1b:** *Cruise 360 RV „Walther Herwig III“, 10.12. – 20.12.2012:*  
Geographical coordinates of hydrography CTD stations

DATE	HYDRO-STATION	Related to FISHING (F) STATION	Area	ICES-RECTANGLE	LATITUDE	LONGITUDE
12.12.12	001	001	B09	39G8	55°14,24N	18°10,87E
12.12.12	002	002	B09	39G8	55°08,05N	18°18,87E
12.12.12	003	003	B09	39G8	55°06,82N	18°10,48E
12.12.12	004	004	B09	39G8	55°12,44N	18°20,26E
13.12.12	005	005	B14	41G8	56°09,97N	18°24,56E
13.12.12	006	006	B14	40G8	55°56,26N	18°51,40E
13.12.12	007	007	B14	41G8	56°03,64N	18°39,48E
13.12.12	008	008	B14	40G8	55°59,84N	18°55,00E
14.12.12	009	009	B13	39G5	55°21,97N	15°35,85E
14.12.12	010	010	B13	39G5	55°23,36N	15°37,97E
14.12.12	011	011	B13	39G5	55°22,40N	15°41,22E
14.12.12	012	012	B13	39G5	55°18,44N	15°35,12E

14.12.12	013	013	B13	39G5	55°23,05N	15°33,48E
15.12.12	014	014	B11	38G3	54°44,87N	13°43,78E
15.12.12	015	015	B11	38G3	54°46,39N	13°38,90E
15.12.12	016	016	B11	38G3	54°46,00N	13°21,69E
16.12.12	017	017	B12	37G1	54°15,16N	11°38,58E
16.12.12	018	018	B12	37G1	54°17,89N	11°36,07E
16.12.12	019	019	B12	37G1	54°19,91N	11°42,39E
16.12.12	020	020	B12	37G1	54°22,35N	11°25,95E
17.12.12	021	021	B01	38G0	54°44,47N	10°13,08E
17.12.12	022	022	B01	38G0	54°39,92N	10°16,82E
17.12.12	023	023	B01	38G0	54°34,27N	10°31,35E
17.12.12	024	024	B01	38G0	54°36,69N	10°22,62E

**Tab. 2:** *Cruise 360 RV „Walther Herwig III“, 10.12. – 20.12.2012:*  
Mean catches of selected abundant fish species  
(n = number, kg = weight per 1 h trawling)

Area	Cod	Whiting	Plaice	Herring	Sprat	Mackerel	Dab	Flounder
B09 n	235	-	2	60	12	< 0,5	-	10
kg	92,0	-	< 0,1	4,0	< 0,1	< 0,1	-	4,0
B14 n	8	-	-	96	20.481	-	-	< 0,5
kg	3,0	-	-	6,0	149,0	-	-	< 0,1
B13 n	23	< 0,5	3	323	1.070	-	-	< 0,5
kg	9,0	< 0,1	1,0	18,0	12,0	-	-	< 0,1
B11 n	278	23	12	104	17.498	-	1	334
kg	268,0	3,0	2,0	9,0	141,0	-	< 0,1	71,0
B12 n	12	42	32	1.946	2.048	-	532	68
kg	16,0	1,0	9,0	32,0	17,0	-	91,0	15,0
B01 n	47	272	194	43	25	-	406	6
kg	58,0	11,0	64	1,0	8,0	-	88	3,0

**Tab. 3:** *Cruise 360 RV „Walther Herwig III“, 10.12. – 20.12.2012:*  
Water depth, temperature (T), salinity (S), O<sub>2</sub> saturation and O<sub>2</sub> in mg/l, Baltic Sea

DATE	STATION	AREA	DEPTH(m)	T (°C)	S (PSU)	O <sub>2</sub> -Saturation (%)	O <sub>2</sub> (mg/l)
12.12.2012	1	B09	1	5.498	7.1068	10.91	90.71
			66	5.021	8.7440	6.83	56.70
	2		1	5.733	7.2961	11.05	92.54
			73	5.726	8.0128	8.57	72.11
	3		2	5.698	7.2669	11.23	93.97
			64	5.674	8.8775	7.10	60.02
	4		1	5.556	7.1706	11.19	93.19
			72	5.042	9.1259	6.32	52.61

13.12.2012	5	B14	2	5.845	7.0307	11.12	93.20
			72	4.282	8.7775	3.82	31.16
	6		1	5.835	7.0974	11.26	94.40
			113	5.364	10.8781	0.50	4.21
	7		1	5.840	7.1618	11.21	94.04
			97	5.138	10.4165	0.45	3.80
	8		2	5.696	7.0901	11.20	93.54
			8	115	5.385	10.9115	0.38
14.12.2012	9	B13	2	5.128	7.2885	11.19	92.28
			89	6.420	15.4227	0.23	2.08
	10		2	5.589	7.5169	10.93	91.35
			88	6.354	15.2697	0.25	2.23
	11		1	5.513	7.5063	10.80	90.05
			88	6.356	15.2342	0.23	2.05
	12		2	5.276	7.2616	11.29	93.41
			90	6.434	15.4434	0.22	1.98
13	1	6.097	7.6835	11.02	93.33		
	88	6.351	15.1391	0.26	2.32		
15.12.2012	14	B11	2	5.333	8.2235	11.20	93.46
			37	5.639	8.4156	10.86	91.44
	15		2	5.327	8.4776	11.25	94.02
			39	6.645	9.1972	10.39	90.06
	16		2	5.611	8.2224	11.23	94.36
37		8.272	10.2663	8.43	76.61		
16.12.2012	17	B12	1	3.812	9.3946	11.59	93.75
			21	8.177	17.3962	8.87	84.24
	18		1	4.037	9.6586	11.61	94.58
			20	7.911	17.1067	8.97	84.46
	19		1	4.320	8.5981	11.64	94.86
			21	8.214	17.5191	8.74	83.15
20	1	3.987	9.7811	11.79	96.06		
	20	7.090	16.8108	9.51	87.65		
17.12.2012	21	B01	1	3.402	13.6293	11.70	96.35
			21	6.212	18.4092	9.41	85.82
	22		1	4.211	15.3000	11.29	95.98
			15	7.419	19.0177	9.34	87.78
	23		1	3.879	12.9051	11.59	96.16
			14	4.156	16.3817	11.02	94.24
	24		1	4.268	15.4589	11.28	96.15
18		7.982	19.3117	8.15	77.99		

**Tab. 4:** *Cruise 360 RV „Walther Herwig III“, 10.12. – 20.12.2012:*  
Prevalences (%) of externally visible diseases and parasites of dab (*Limanda limanda*) in the Baltic Sea

Area	N unt	Ly	Ep Hyp/Pap	Ulc Ak/Hei	Flo Ak/Hei	KieHy	Skel Def	Hyp Pig	Steph	Acanth	Lepe
B12	500	13,4	0,8	3,6	1,2	0,0	0,4	0,0	0,2	0,0	0,2
B01	515	10,9	1,7	0,4	0,4	0,0	0,0	0,0	0,0	0,0	0,8
<b>Summe</b>	<b>1.015</b>										

**Tab. 5:** *Cruise 360 RV „Walther Herwig III“, 10.12. – 20.12.2012:*  
Prevalences (%) of diseases and parasites of flounder (*Platichthys flesus*) from the Baltic Sea

Area	N unt	Ly	Ulc Ak/Hei	Flo Ak/Hei	Skel Def	Hyp Pig	Cryp	Lepe
B09	10	30,0	0,0	0,0	0,0	0,0	60,0	0,0
B11	468	10,0	0,6	0,0	1,1	0,0	47,9	0,0
B12	233	10,3	0,9	0,4	1,3	0,0	42,1	0,9
B01	9	66,7	11,1	0,0	0,0	0,0	77,8	22,2
<b>Summe</b>	<b>720</b>							

**Tab. 6:** *Cruise 360 RV „Walther Herwig III“, 10.12. – 20.12.2012:*  
Prevalences (%) of liver anomalies in flounder (*Platichthys flesus*) from the Baltic Sea and North Sea

Area	N unt	Liver nodules (mm)			Green Livers	Nema-todes	Acantho-ceph.
		≥ 2	≥ 5	≥ 10			
B01	14	0,0	0,0	0,0	7,1	0,0	14,3
<b>Summe</b>	<b>14</b>						

**Tab. 7:** *Cruise 360 RV „Walther Herwig III“, 10.12. – 20.12.2012:*  
Prevalences (%) of diseases and parasites of cod (*Gadus morhua*) in the Baltic Sea

Area	N unt	Ulc Ak/Hei	Skel Def	PBT	Locera	Clav	Cryp	Loma
B09	565	12,9	2,3	1,9	0,0	0,0	1,6	50,1
B14	33	21,2	12,1	0,0	0,0	0,0	0,0	39,4
B13	106	7,5	1,9	2,8	0,0	0,0	0,0	49,1
B11	510	6,9	3,3	1,6	0,0	0,0	6,3	6,9
B12	46	2,2	6,5	4,3	2,2	0,0	71,7	23,9
B01	137	1,5	0,0	0,0	6,6	0,0	65,0	35,8
<b>Summe</b>	<b>1.397</b>							

**Tab. 8:** Cruise 360 RV „Walther Herwig III“, 10.12. – 20.12.2012:  
Cod tissue samples collected and distributed to CHEMSEA project partners

Sampling area	Number of fish	Project Partner	Cod tissue	Analysis
B14	22	IOPAS (PP1)	Muscle, liver, kidney	Organochlorines, PAH, metals
B14	22	VERIFIN (PP6)	Muscle, liver, kidney, urine	Chemical warfare agents and metabolites
B14	22	SYKE (PP7)	Muscle, liver	Oxidative stress enzymes, neurotoxicity biomarkers
B01	48	TI (PP8)	Blood smears, liver, spleen	Differential blood cell counts, histopathology
B13	43			
B15	22			
B09	50			
B01	48	AWI (PP9)	Liver, kidney, head kidney, blood smears	Histopathology, lysosomal membrane stability, blood cell counts
B13	43			
B14	22			
B09	50			
B01	22	LEPA (PP10), Sub-contractor NRC-IEVU	Blood smears	Micronucleus assay, genotoxicity biomarkers
B13	39			
B15	42			
B09	13			

**Abbreviations:**

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