

**FRV Walther Herwig III
Cruise 390
04.12. - 19.12.2015**

**Studies on fish diseases and biological effects of contaminants in the
western Baltic Sea**

NATO project MODUM

Scientist in Charge: Dr. Marc-Oliver Aust

Summary

As part of the monitoring programme of the Thünen Institute of Fisheries Ecology (FI) on the health status of fish in the North and the Baltic Sea and as part of the NATO-funded project MODUM, research was carried out in five areas of the Baltic Sea. The second part of the cruise planned in the North Sea was cancelled due to technical problems with the research vessel and due to heavy weather conditions. Besides the examination for macroscopic externally and internally visible fish diseases and parasites of dab (*Limanda limanda*) and cod (*Gadus morhua*) on board, samples for a subsequent analysis of contaminants and their biological effects were taken.

Furthermore inspections on the health status of cod were carried out in dumpsites of chemical warfare agents and reference sites in the framework of the MODUM-Project (2013-2016). Additionally, hydrographical measurements were carried out (water temperature, salinity, oxygen content, turbidity). Preliminary results were as follows:

Dab: Only one site was sampled (B01, Kiel Bight); no abnormalities compared to earlier cruises detected

Baltic Sea Cod stock: Low infection rates of skin ulcers and skeletal deformities; nematodes in the body cavity at all Baltic Sea sites, especially abundant in the eastern sites B13 (Bornholm Basin) and B09 (near Gdansk Bay). Comparable infection rates of the gill parasite *Lernaeocera branchialis* at sites in the Arkona Sea and of the skin parasite *Cryptocotyle lingua* in Kiel Bight; generally high infection rates with the gill parasite *Loma branchialis*.

Participants:

Name	Function	Institution
Dr. Marc-Oliver Aust	Scientist in Charge	TI-FI Hamburg
Jennifer Ipse	Technician	TI-FI Cuxhaven
Maike Siegmund	Technician	TI-FI Cuxhaven
Nadine Dichte	Technician	TI-FI Hamburg
Dr. Bernhard Allner	Scientist	GOBIO-GmbH
Thomas Schmidt	Scientist	GOBIO-GmbH
Sandra Bisenius	Scientist	LAVES Cuxhaven
Johannes Höhn	Student	University of Rostock
Fabian Deister	Student	University of Oldenburg
Jan Römer	Student	University of Hamburg
Hendrik Stolz	Student	University of Rostock

Objectives of the cruise

1. Studies on fish diseases and parasites in the North and the Baltic Sea;
2. Studies on biological effects of contaminants;
3. Sampling of fish for contaminant analyses;
4. Use of CTD and water sampling for hydrographical measurements (salinity, temperature, oxygen and turbidity).

Dates of the cruise

FRV Walther Herwig III left Bremerhaven in the morning of 04.12.2015 with a delay of three days due to necessary maintenance work. A part of the scientific crew was already on board since 30.11.2015. The vessel was on target for Helgoland where it took shelter from heavy storms. Afterwards, it transited through the Kiel Canal on 07.12.15. The vessel proceeded to the first research site in the Baltic Sea close to the Island of Rügen (B11), where the work started in the morning of 08.12.15. Sampling continued at sites B13, B09, B10 und B01 (13./14.12.) during the following days. FRV Walther Herwig III entered Kiel port on 14.12., where the scientists S. Bisenius and Dr. B. Allner left the scientific crew.

The vessel could not pass Kiel Canal (as planned) due to technical problems with the primary engine, which could only be provisionally repaired. Therefore, on 16.12. Walther Herwig III started the return to the North Sea via Skagen. The North Sea part of the cruise had to be cancelled because of the bad shape of the vessel and poor weather forecast. As a result, Walther Herwig III arrived at Bremerhaven in the morning of 19.12., where the cruise ended two days ahead of schedule.

The location of the sampling areas and exact cruise dates are shown in Fig. 1 and in Tab.1. A total of 16 fishing hauls (trawling time 48 to 60 minutes) were performed using the 140ft bottom trawl and the pelagic PSN 205 in five sampling areas (Fig. 1; see Tab. 1 for coordinates and Tab. 2 for catch composition). Hydrographical measurements were carried out at each fishery station (see Tab. 1a for geographical coordinates and Tab. 3 for results).

Preliminary Results

1 Dab (*Limanda limanda*)

In total, 684 dab (total length ≥ 10 cm) from one sampling area were examined for the occurrence of externally and internally visible diseases and parasites (Tab. 4) and 100 dab for the occurrence of liver anomalies (Tab. 5). The results were similar to earlier cruises. As stated above, no sampling was possible in the North Sea.

2 Flounder (*Platichthys flesus*)

A total of 562 flounder from four Baltic Sea areas were examined for the occurrence of externally and internally visible diseases and parasites (Tab. 6). The infection rates with Lymphocystis ranged from 30,9 % (Kiel Bight, site B01) to 42,9 % (Arkona Basin, site B10). Infection rates of acute/healing skin ulcers were as low as observed during previous cruises. The only exception was site B09, where an increased value of 12,5 % was determined like already found in December 2014; only eight flounder were examined here.

3 Cod (*Gadus morhua*)

In total, 862 cod from five Baltic Sea areas were examined for the occurrence of externally and internally visible diseases and parasites, thereof 392 for nematodes in the body cavity (Tab. 7). Infection rates for acute/healing skin ulcers ranged from 0,0 % in Kiel Bight (site B01) to 8,0 % at Gdansk Bay (site B09). This means that infection rates at sites in Gdansk Bay and Arkona Basin (B09, B10 and B11) were slightly higher compared to cruises in Dec. 2014 and Aug./Sept. 2015. Skeletal deformities were only rarely detected, the maximum percentage was 2,8 % (Arkona Basin, site B10). Larval nematodes in the body cavity were recorded in cod from all Baltic Sea areas, with the highest prevalence in the easternmost areas B13 (Bornholm Basin; 60,0 %) and B09 (Gdansk Bay; 40,5 %). The increased occurrence of the gill parasite *Lernaocera branchialis* in cod of the Arkona Basin (sites B10: 9,4 % and B11: 12,0 %) was a striking result. Furthermore, the frequency of determination of

the parasite *Cryptocotyle lingua* (black spot trematode inside the skin) was again high in Kiel Bight (Site B01, at 51,1 %). The gill parasite *Loma morhua* (Microspora) was detected in all areas at high prevalence (93,3 % - 100,0 %).

4 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 as well as to the scientific staff for constructive and hard work and a very good atmosphere on board under bad surrounding conditions.

A handwritten signature in blue ink that reads "Marc-Oliver Aust". The signature is cursive and includes a long horizontal stroke at the end.

Dr. Marc-Oliver Aust
(Scientist in Charge)

Annex: 8 Tables and 1 Figure

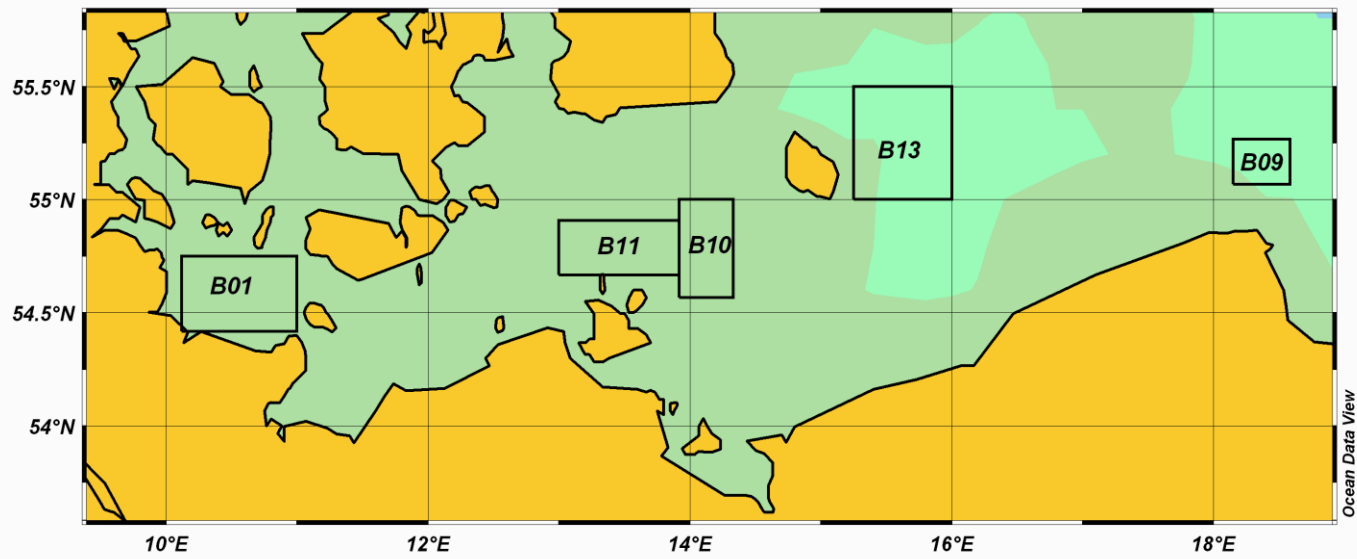


Abb. 1: Cruise 390 of FRV „Walther Herwig III“, 04.12. – 19.12.2015:
Location of sampling sites in the Baltic Sea

Tab. 1: Cruise 390 of FRV „Walther Herwig III“, 04.12. – 19.12.2015:
Geographical coordinates of fishing stations in the Baltic Sea

Date	Station	Area	Rectangle	Latitude	Longitude	Towing time	B: Bottom trawl P: pelagic trawl
08.12.15	001	B11	38G3	54°47,42N	13°12,78E	59	B
08.12.15	002	B11	38G3	54°46,37N	13°17,56E	60	B
09.12.15	003	B13	39G5	55°19,93N	15°35,21E	60	P
09.12.15	004	B13	39G5	55°19,37N	15°35,00E	59	P
09.12.15	005	B13	39G5	55°19,78N	15°34,19E	60	P
10.12.15	006	B09	39G8	55°14,18N	18°10,46E	58	B
10.12.15	007	B09	39G8	55°08,06N	18°11,64E	60	B
10.12.15	008	B09	39G8	55°14,17N	18°10,18E	60	B
12.12.15	009	B10	38G3	54°49,45N	13°56,41E	58	B
12.12.15	010	B10	38G3	54°49,80N	13°55,97E	60	B
12.12.15	011	B10	38G3	54°47,12N	13°57,40E	59	B
13.12.15	012	B01	38G0	54°32,17N	10°36,97E	60	B
13.12.15	013	B01	38G0	54°32,19N	10°36,89E	60	B
13.12.15	014	B01	38G0	54°31,92N	10°36,56E	60	B
13.12.15	015	B01	38G0	54°31,91N	10°36,82E	48	B
14.12.15	016	B01	38G0	54°31,87N	10°36,30E	60	B

Tab. 1a: *Cruise 390 of FRV „Walther Herwig III“, 04.12. – 19.12.2015:*
Geographical coordinates of hydrography stations in the Baltic Sea

DATE	STATION	CORRESP. FISHING STATION	AREA	ICES-RECTANGLE	LATITUDE	LONGITUDE
08.12.15	001	001	B11	38G3	54°47,38N	13°12,28E
08.12.15	002	002	B11	38G3	54°46,67N	13°16,40E
09.12.15	003	003	B13	39G5	55°20,12N	15°36,25E
09.12.15	004	004	B13	39G5	55°18,63N	15°34,20E
09.12.15	005	005	B13	39G5	55°19,60N	15°33,53E
10.12.15	006	006	B09	39G8	55°14,34N	18°10,30E
10.12.15	007	007	B09	39G8	55°07,77N	18°10,90E
10.12.15	008	008	B09	39G8	55°13,84N	18°09,97E
12.12.15	009	009	B10	38G3	54°48,82N	13°55,83E
12.12.15	010	010	B10	38G3	54°49,70N	13°55,68E
12.12.15	011	011	B10	38G3	54°46,20N	13°56,05E
13.12.15	012	012	B01	38G0	54°31,81N	10°36,78E
13.12.15	013	013	B01	38G0	54°32,12N	10°36,31E
13.12.15	014	014	B01	38G0	54°31,79N	10°36,35E
13.12.15	015	015	B01	38G0	54°31,98N	10°36,17E
14.12.15	016	016	B01	38G0	54°31,94N	10°36,98E

Tab. 2: *Cruise 390 of FRV „Walther Herwig III“, 04.12. – 19.12.2015:*
Mean catches of selected abundant fish species in the Baltic Sea (n = numberl, kg = Catch weight per 1 h of trawling)

Area		cod	whiting	herring	sprat	mackerel	dab	plaice	flounder
B11	n	346	184	126	9.060	-	-	16	337
	kg	224	53	8	98	-	-	10	114
B13	n	5	-	647	7.848	1	-	4	-
	kg	2	-	30	102	< 0,5	-	1	-
B09	n	112	-	38	39	-	-	-	7
	kg	51	-	2	< 0,5	-	-	-	1
B10	n	152	58	65	2.433	-	-	21	1.066
	kg	56	16	6	12	-	-	4	281
B01	n	10	45	55	135	-	1.238	196	16
	kg	26	5	1	2	-	130	63	5

Tab. 3: Cruise 390 of FRV „Walther Herwig III“, 04.- 19.12.2015: : Water depth, temperature (T), salinity (S), O₂ in mg/l and O₂ saturation (%), Baltic Sea

DATE	STATION	AREA	DEPTH (m)	S (PSU)	T (°C)	O ₂ (mg/L)	O ₂ -SATURATION (%)
08.12.2015	001	B11	2	8,44	8,3	7,49	96,22
			37	19,99	10,3	5,43	78,84
	002		3	8,44	8,3	7,50	96,27
			37	21,63	10,9	4,80	71,25
09.12.2015	003	B13	4	7,75	8,2	7,42	94,82
			93	19,00	7,2	0,88	11,82
	004		3	7,71	8,1	7,43	94,74
			93	18,93	7,2	0,98	13,11
	005		4	7,71	8,1	7,44	94,85
			90	18,96	7,2	0,95	12,78
10.12.2015	006	B09	5	7,52	7,8	7,64	96,51
			57	9,66	5,7	3,49	42,38
	007		5	7,53	7,7	7,65	96,45
			64	10,61	5,9	2,66	32,73
12.12.2015	008	B10	4	8,62	7,8	7,60	96,56
			56	9,63	5,7	4,14	50,31
	009		5	8,62	7,8	7,60	96,58
			38	21,06	10,8	4,81	71,03
	010		3	8,01	8,0	7,56	96,33
			38	20,73	10,8	4,93	72,65
	011		3	22,93	7,3	7,06	97,36
			35	20,70	10,9	4,99	73,53
13.12.2015	012	B01	4	22,93	7,3	7,06	97,36
			11	23,03	7,3	7,04	97,25
	013		3	22,93	7,3	7,13	98,32
			14	23,02	7,3	7,03	97,17
	014		3	22,95	7,3	7,15	98,64
			13	22,94	7,3	7,13	98,26
	015		2	23,06	7,2	7,09	97,80
			13	22,95	7,3	7,13	98,35
14.12.2015	016	B01	3	23,08	7,2	7,08	97,62
			13	23,53	7,4	7,02	97,44

Tab. 4: Cruise 390 of FRV „Walther Herwig III“, 04.12. – 19.12.2015: Prevalence (%) 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	KieHy	Skel Def	Hyp Pig	Steph	Acanth	Lepe
B01	684	7,9	1,8	0,7	0,3	0,0	0,1	0,0	0,6	0,0	1,0
Summe	684										

Tab. 5: Cruise 390 of FRV „Walther Herwig III“, 04.12. – 19.12.2015: Prevalence (%) of liver anomalies in dab (*Limanda limanda*) from the Baltic Sea and North Sea

Area	Length (cm)		N unt	Liver nodules (mm)			Green Livers	Nematodes	Acanthoceph
	min	max		≥ 2	≥ 5	≥ 10			
B01	20	24	51	2,0	0,0	0,0	0,0	0,0	0,0
	25	40	49	8,2	8,2	4,1	2,0	0,0	0,0
Summe			100						

Tab. 6: Cruise 390 of FRV „Walther Herwig III“, 04.12. – 19.12.2015: Prevalence (%) of externally visible diseases and parasites in flounder (*Platichthys flesus*) from the Baltic Sea

GEBIET	N unt	Ly	Ulc Ak/Hei	Flo Ak/Hei	Skel Def	Cryp	Lepe
B01	55	30,9	0,0	0,0	1,8	80,0	47,3
B09	8	37,5	12,5	0,0	0,0	100,0	0,0
B10	252	42,9	1,6	0,8	0,8	54,0	0,0
B11	247	37,7	0,4	0,4	0,4	54,7	0,0
Summe	562						

Tab. 7: Cruise 390 of FRV „Walther Herwig III“, 04.12. – 19.12.2015: Prevalence (%) of externally visible diseases and parasites in cod (*Gadus morhua*) of the Baltic Sea

GEBIET	N unt	Ulc Ak/Hei	Skel Def	PBT	Locera	Cryp	Loma	N	Anis
B01	45	0,0	0,0	0,0	6,7	51,1	97,8	44	38,6
B09	301	8,0	0,7	0,0	0,0	0,3	96,3	111	40,5
B10	254	3,5	2,8	3,9	9,4	0,8	98,8	102	39,2
B11	251	4,8	0,8	2,4	12,0	7,2	98,0	125	37,6
B13	11	0,0	0,0	0,0	0,0	0,0	100,0	10	60,0
Summe	862							392	

Legende:

N unt	: Number of examined animals	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	: Acute/healing skin ulcers	Locera	: <i>Lernaeocera branchialis</i>
Flo Ak/Hei	: Fin rot/erosion, acute/healing	Clav	: <i>Clavella adunca</i>
KieHy	: Gill hyperplasia, x-cell disease	Cryp	: <i>Cryptocotyle spp.</i>
HypPig	: Hyperpigmentation	Loma	: <i>Loma sp.</i>
Skel Def	: Skeletal deformities	Nemato	: <i>Nematodes in the body cavity</i>
PBT	: Pseudobranchial pseudotumour		
LK >2 mm	: Liver nodules > 2 mm		