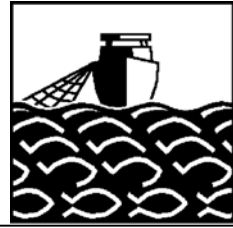# Federal Research Centre for Fisheries

Institute for Fishery Ecology

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Report

of the 289. Cruise of FRV „Walther Herwig III"
13.06.-10.07.2006

Chief Scientist: Hans-Jürgen Kellermann

Sampling to study the pollutant state in fish, water and sediment as well as quality tests with fish in the Barents Sea.

1. Summary

Within cruise No. 289 on several fishing grounds extensive samples of fillet from the target fish species cod , large volume seawater samples and sediment cores were collected for radioactivity analysis later on in the laboratory.
Ice-storage experiments were carried out for studying various parameters influencing quality. The change of quality was simultaneously measured with micro waves (EU-Project SEQUID 8970/4000). Various fish samples were collected for analysis for fatty acids and cholesterol, organic and inorganic contaminants, and for the data bank for species identification.
State of health, especially of cod, was determined in all study areas.

2. Tasks

The Institute for Fishery Ecology (IFÖ) fishing strategy was to sample fillet from cod of selected length groups to determine the length dependent concentration of radionuclides in fillet. Before filleting most of these fishes were examined for diseases. Large water samples as well as sediment cores were given to the Marine Environmental Laboratory (Monaco) of the International Atomic Energy Agency (MEL, IAEA) for further treatment and following analysis on radioactivity.
The Group of the Department for Seafood Quality (BFEL) made sensory, physical, chemical and microbiological investigations and sampled fish for organic and inorganic trace analysis, analysis on cholesterol and fatty acid composition, and sampling for completion of the DNA-data bank.

3. Cruiseplan

14.06.06 Departure Bremerhaven 06^{00}
18.06.06 Arrival Tromsø 10^{30}
19.06.06 Departure Tromsø 08^{00}
19.06.06 Arrival west of Tromsø
19.06.06 Departure west of Tromsø
20.06.06 Arrival North cap bank
22.06.06 Departure North cap bank (3 days working)
23.06.06 Arrival Central bank
25.06.06 Departure Central bank (3 days working)
25.06.06 Arrival Hope Island
25.06.06 Departure Hope Island
26.06.06 Arrival Spitzbergen
27.09.06 Arrival Ny Ålesund 17^{00}
28.09.06 Departure Ny Ålesund 08^{00}
28.06.06 Departure Spitzbergen (3 days working)
30.06.06 Arrival Bear Island
02.07.06 Departure Bear Island (3 days working)
03.07.06 Arrival Tromsø 11^{30}
03.07.06 Departure Tromsø 18^{00}
07.07.06 Arrival Bremerhaven 20^{00}
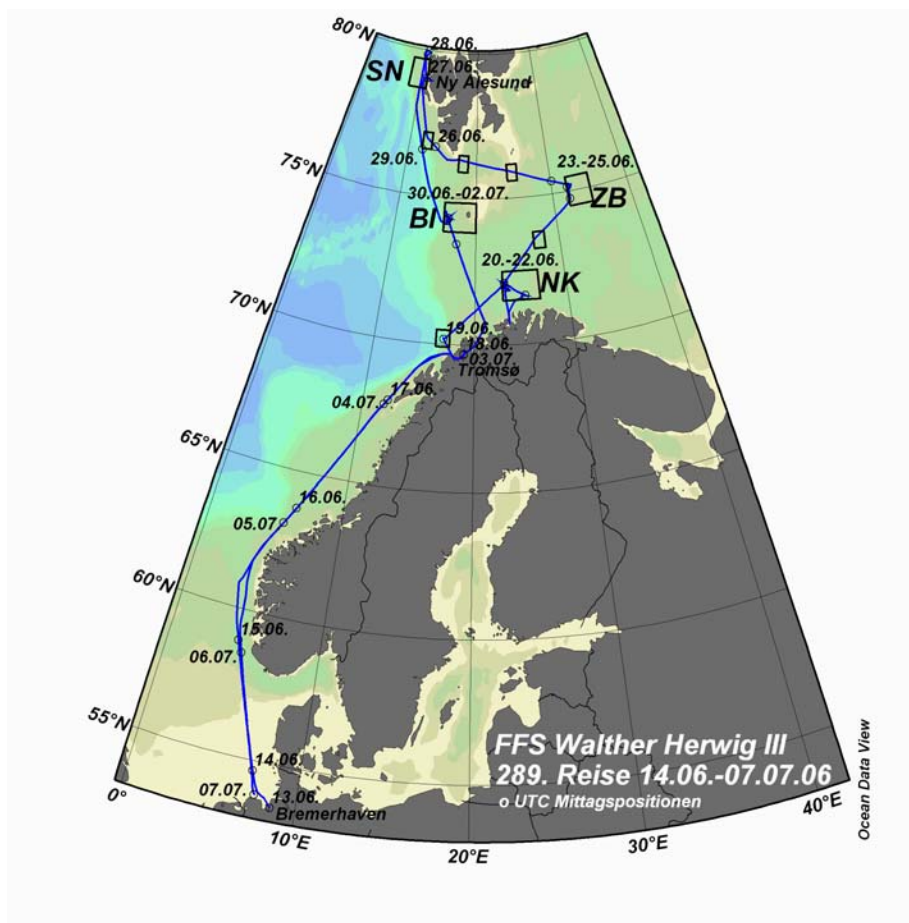
Map of cruise no. 289 FRV "Walther Herwig III" june/july 2006

4. Sampling summary

Due to good weather conditions altogether 78 stations could be finished. A differentiated summary is given below. (NR: Norwegian Coast, NB: North Cape bank, CB: Central bank, BI: Bear Island, SB: Spitzbergen)

Device summary

Device	Number	NR	NB	CB	BI	SB
Ships pump	10	1	2	1	1	5
Water sampler	20	6	3	3	5	3
CTD-Probe	20	2	4	4	5	5
Bottom-Trawl	21	0	7	6	7	1
Twin-Corer	7	0	1	1	1	4
Totalling	**78**	**9**	**17**	**15**	**19**	**18**

5. First Results

5.1 Radioactivity

The chemical processing of the sampling material and the following radiation measurement of extreme low level material is very time-consuming and requires clean laboratories. Hence this job cannot be done aboard. To obtain the results for alpha-, beta- and gamma-radiation takes round about 2-3 years. Scientific fillet samples with a total weight of approximately 330 kg were collected for later analysis at land. Furthermore 27 preprocessed water samples (400 l each) and 10 sediment cores with length up to 35 cm were taken to the laboratories.

5.2 Examination for externally visible diseases and parasites

In total, 1241 cod and 464 long rough dab from three areas (North Cape bank, Central bank, Bear Island) were examined for the presence of diseases and parasites. Procedures applied were according to standard ICES protocols. The results are provided in Tables 1 and 2.

Table 1: Prevalence of externally visible diseases/parasites in cod (*Gadus morhua*) from the Barents Sea

Area	N ex	Prevalence (%)						
		Ulc Aku/Hei	SkelDef	PBT	Locera	Clav	Cal	Cryp
North Cape bank	125	3,2	0,0	0,0	3,2	77,6	0,8	5,6
Central bank	725	0,7	0,0	0,1	0,1	48,7	2,2	0,1
Bear Island	391	1,0	0,5	0,3	0,3	71,1	3,6	1,0

In cod, infestation with parasites (especially with the parasitic copepod *Clavella adunca*) were dominating, whilst the prevalence of acute or healing stages of skin ulcerations and skeletal deformities were low, compared to data from studies in Baltic Sea cod.

Table 2: Prevalence of externally visible diseases/parasites in long rough dab (*Gadus morhua*) from the Barents Sea

Area	N ex.	Prevalence (%)						
		Ly	EpPap	Ulc Aku/Hei	FloFäu	SkelDef	HypPig	Acanth
Central bank	100	0,0	0,0	0,0	0,0	11,0	0,0	2,0
Bear Island	364	0,0	0,0	0,0	0,0	16,5	0,3	0,0

Long rough dab were only rarely affected by diseases or parasites. The highest prevalence was found for deformities of the head skeleton, possibly in association with an infestation with a yet unknown parasite in the head/gill region. Diseases such as lymphocystis, epidermal hyperplasia/papilloma or skin ulcerations, commonly found in e.g. North Sea dab, were not recorded.

Additional sampling

A maximum of 25 cod of the size group 30-60 cm total length were sampled in each of the three areas for a Master Thesis on a comparison of the parasitic fauna of cod in the Barents Sea, Baltic Sea and waters off Greenland prepared at Rostock University. Cod selected were deep-frozen at – 30 °C after blood samples for the study of blood parasites had been taken.

Bile from 20 further cod were taken in each area for a subsequent analysis of metabolites of polycyclic aromatic hydrocarbons (PAHs). Bile samples were deep-frozen at -80 °C.

Abbreviations:
N ex: number of fish examined
Ulc Aku/Hei: acute or healing skin ulcers
Skel Def: skeletal deformities
PBT: pseudobranchial pseudotumour (x-cell disease)
Locera: *Lernaeocera branchialis*
Clav: *Clavella adunca*
Cal: *Caligus* sp.
Cryp: *Cryptocotyle lingua*
Ly: Lymphocystis
EpPap: epidermal hyperplasia/papilloma
FloFäu: fin rot/erosion
HypPig: hyperpigmentation
Acanth: *Acanthochondria cornuta*

5.3 Seafood Quality

The Group of the Department for Seafood Quality of the Federal Research Centre for Nutrition and Food made an extensive sampling for different working groups of the department. Samples were taken for:
Analysis for toxic trace elements as cadmium and lead,
Analysis for taurine an essential amino acid being present in marine fish in high amounts,
Analysis for cholesterol for filling gaps in food composition tables,
Analysis of pharmaceuticals in shrimp (for comparison),
Aquatic species identification and authenticity by molecular biological methods,
Training and education of sensory panel.
Three iced storage experiments were conducted to assess the length and weight losses during storage. It seems that the losses are very much specimen and catching ground dependent and that a general statement is not possible based on the results obtained so far.
Cfu were determined in different organs of freshly killed fish.
Samples for an international comparison test on fat determination using less toxic solvents were prepared.

5.4 Quality examinations of fish fillets by pattern recognition

In many examinations the correlation between variations of surface patterns of fish fillets and quality loss during storage time could be proved for many fish species. The identification of species from surface patterns for a separation of raw material during processing was the aim of this cruise. An inspection window of 10 [mm] x 10 [mm] for the pattern recognition process was used on the lateral line on the the same position on the skinside of fillets. From special interest were the patterns from redfish species *Sebastes marinus* and *Sebastes mentella*. By image spectroscopy patterns from samples were recorded over a period of 14 days. As a test for the method the prediction of storage time from data was used. Sample data from *Sebastes marinus* and *Sebastes mentella* were first separated and in a following step mixed for the prediction calculations. As a result the strong correlation between the used pattern recognition method and different species was proved and gave a link for the separation of species by contactless measurements. While only unsatisfactory results could be achieved from mixed data (Coefficient of determination < 60%), the storage time for separated data could be predicted with a coefficient of determination of more than 85%.

The figures demonstrate the coherence of model data and storage time for *Sebastes marinus* (left) and for *Sebastes mentella* (right):
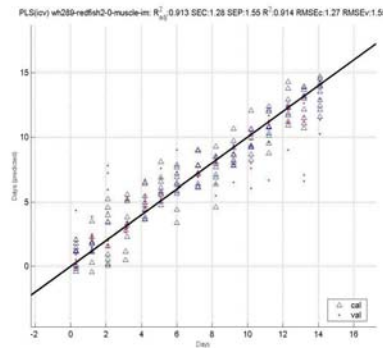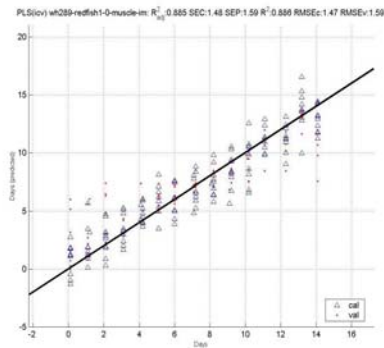
6. Scientific crew

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Beniamino Oregioni, MEL
Vol. Karin Schiefenhövel, Uni Hamburg
Vol. Paul Kotterba, Uni Hamburg
Vol. Helga Rittmann

7. Acknowledgement

All planed activities could be carried out successfully. Thanks to captain Janßen and his crew for excellent assistance with our research equipment. In the same way thanks to the scientific staff for engaged and successful help.

Hamburg, 07.09.2006

Hans-Jürgen Kellermann