

Cruise Report
FRV Walther Herwig III, WH 397
07/21 to 08/18/2016

IBTS and GSBTS

Cruise Leader: Dr. Anne Sell

Summary

Cruise WH 397 covered fisheries research representing the German contribution to the International Bottom Trawl Survey (IBTS) in quarter III, as well as one component of the two-ship operation in the German Small-scale Bottom Trawl Survey (GSBTS). Both surveys use the same principle fishing methods but at different spatial scales, applying a GOV otter board trawl. A large subset of the fishing hauls was accompanied by hydrographic measurements and investigations of benthic epifauna, infauna and sediments. By-catch of marine litter in the GOV is reported.

During the sampling for the IBTS Q3, an experiment on the effect of haul duration on the catch composition was extended as decided during the ICES-IBTS Working Group meeting earlier in 2016. Overall, the cruise WH397 was severely impacted by multiple technical failures aboard the 'Walther Herwig III' and the necessity of returning to port. This shortened the time at sea from 30 to 19 days, and reduced the effective ship time even more. As a consequence, the programme of GSBTS had to be reduced to a degree which causes almost complete breaks in the time series within the six standard areas of investigation sampled by this vessel.

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*Cruise acronym:

03.02.2016, 21.07.-19.08.2016, Jnr. 16/1588

Number of stations sampled during WH 397

	Hauls GOV	CTD casts (total)	Hauls 2-m beam trawl	Van Veen sediment grab**
IBTS*	33	33	33	93
Box A	9	7	5	10
Box B	-	-	-	-
Box C	4	3	1	4
Box D'	2	1	1	2
Box L	5	3	2	4
Box M	7	5	3	6
total	54	46	39	107

*) IBTS: Includes 29 stations in the wider German Bight, and 1 each in "Boxes" C, D, L, and M; see map.

***) Sediment samples from all stations in this column, infauna for selected areas.

Instead of the original Box D, which was obstructed during the sampling time, the nearby Box D' was sampled. This replacement box was first sampled in 2015 (then in comparison to Box D) and hosts similar habitats.

Methods

1. Groundfish (Thünen Institute of Sea Fisheries, TI-SF)

The qualitative and quantitative composition of the bottom fish fauna was analysed from a total of 54 GOV hauls for the IBTS and the GSBTS, respectively (cruise track, see Fig. 1). Larger invertebrates of commercial interest were quantified as specified in the IBTS manual. In addition, other benthic macro-invertebrates from the by-catch of the GOV otter board trawl were analysed from IBTS stations, and from selected additional GSBTS stations. During all hauls, the GOV was equipped with Scanmar sensors to monitor net geometry as required for the IBTS and GSBTS. Data from the IBTS hauls taken in the wider German Bight are to be combined with international data covering the entire North Sea for the assessment of groundfish stocks and for analyses on the non-commercial fish species. IBTS data have been uploaded to the ICES DATRAS system.

The sampling for the IBTS was arranged to expand an experiment started in Q3 2015, where the effect of haul duration on catch composition was tested. The IBTS Q3 coordinator had designed the pattern of allocation of 15- and 30-min hauls to the international partners in order to aim at covering each IBTS rectangle with one haul of each type, and at achieving a certain portion of additional hauls in less sampled areas. The allocation for the hauls conducted with the Walther Herwig is presented in Figure 2. One 30-min haul and three of the 15-min hauls originally assigned to Germany were taken over by Scotland and Norway, respectively.

2. Hydrography (TI-SF)

A total of 46 hydrographic casts were performed with a Seabird CTD to record vertical profiles of temperature, salinity and oxygen concentration at the fishing stations. For a subset of stations, water samples for calibration of the oxygen probe were processed aboard through Winkler titration, and another subset of samples was taken to shore for calibration of the salinity probe.

3. Epibenthos (Senckenberg Research Institute)

Epibenthos was sampled within ICES rectangles of the wider German Bight (24 rectangles of the regular German IBTS + 35F2-F4), as well as in the Boxes A, C, D', L and M, applying a 2m-beam trawl. Samples were sieved over 5-mm and 2-mm mesh. The 5-mm fraction was analysed aboard, the 2-mm fraction was preserved in 4-% formaldehyde for analysis in the laboratory ashore. Length-frequency measurements of the solenette *Buglossidium luteum*, the goby *Pomatoschistus minutus* and the starfish *Asterias rubens* were taken in Box A and in all rectangles whenever sample size was $n > 70$.

4. Sediments, benthic infauna (Senckenberg Research Institute)

Investigations of epibenthos were accompanied by sampling of sediments using a 0.1-m² Van Veen grab. The same grab was used to sample benthic infauna in all Boxes (1 to 5 replicates per Box) as well as in the ICES Rectangles (1 replicate per rectangle).

5. Marine litter (TI-SF)

Marine litter by-catch from the GOV hauls was reported according to the ICES standards on all fishing stations.

Cruise schedule

After two days delay due to repairs of acute technical failures, the FRV 'Walther Herwig' departed on July 21st from Bremerhaven, Germany. On the 22nd, the scientific program started with sampling for the IBTS, which continued as planned – despite a multitude of necessary repairs underway - until the afternoon of July 29, when apart from the central fishing winch, the cooling system of the engine failed. The ship returned to port in Bremerhaven on July 30.

Repairs could be finished on August 9th, and the ship sailed again the next day, steaming to the investigation area of 'Box A', where two IBTS/GSBTS hauls could be conducted in the afternoon. After another day of GSBTS sampling in Box A, the cruise continued with a combination of IBTS- and GSBTS-hauls, in which priority was given to the international programme. With the help of the vessels from Norway and Scotland, which undertook the sampling on four stations assigned to Germany, the IBTS sampling could be completed, at the expense of the GSBTS.

On August 16th after the second haul of the day, new technical failures occurred and the ship returned to port, where it arrived on August 18th.

Preliminary Results

Groundfish (Thünen Institute of Sea Fisheries)

IBTS samples

38 fish species were recorded in the IBTS hauls in the southern North Sea. The five most abundant species were dab, sprat, whiting, herring and grey gurnard, with mean standardized catches of 54, 52, 19, 18, and 13 kg/30-min haul, respectively.

Sampling for the IBTS was reported to the Q3 survey coordinator almost daily during of the cruise, which helped significantly to arrange for other vessels to take over stations, which the Walther Herwig was not able to reach. After the cruise, the IBTS data set has been quality-checked, supplemented with age readings, and uploaded to the ICES database DATRAS.

GSBTS samples

Due to the much reduced number of fishing hauls, the 2016 data unfortunately are only a very weak addition to the GSBTS time series. Sampling in the area of 'Box B' had to be completely omitted.

Box A (German Bight)

Mean catch biomass in Box A was slightly below the long-term average. Exceptionally, dab and whiting together dominated the biomass of the catches, with an average of 220 kg dab per 30-min haul, amounting to its highest biomass in the time series since 1987. Whiting biomass (on average 174 kg/haul) was similar as in 2014, and in the range of the years before 1993, when large catches of whiting occurred. Yet, the 2016 abundance was the highest ever recorded in Box A since 1987, due to the strongest zero-age group with on average ca. 10000 ind/ 30-min haul (Fig. 3, top).

Box C (Central North Sea)

Similarly as in Box A in the German Bight, whiting was abundant in Box C (n= 4 hauls; Fig. 3, bottom). Its biomass, on average 16.5 kg/ 30-min haul, was higher than in any of the years since 1993, and amounted to about 1700 ind/ haul due to the very abundant zero-age fish.

Dab dominated the groundfish biomass (55 kg/ haul) and remained comparable to previous years, as it generally shows little variation throughout the time series since 1987. Biomass of long rough dab (*Hippoglossoides platessoides*, 12 kg/ haul) was higher than in preceding years, but close to the long-term average. Among flatfish, lemon sole (*Microstomus kitt*) reached the highest biomass since 1987, yet staying in the same order of magnitude as usual, with an average of 36 individuals, or 5.6 kg/ 30-min haul. Biomass of grey gurnard (*Eutrigla gurnardus*) was about double of the long-term average, but stayed in the range seen also in individual other years since 1998.

Box L (Northern North Sea)

Total average biomass in Box L was in the typical range (n = 5 hauls). As in Box C in the central North Sea, grey gurnard was unusually abundant, amounting to 9.5 kg/ haul, the highest value since the start of the time series in Box L in 1999. Whiting, with a biomass of 35 kg/ haul, was also much more abundant than in the long-term average from 1999-2015 (14 kg/haul). Horse mackerel (*Trachurus trachurus*), typically occurring only in single individuals in this box, appeared in all five hauls, with an average of 11 kg/haul. In contrast, the biomass of Norway pout (*Trisopterus esmarki*) was lowest within the time span since 1999 (3 kg/haul versus 32 kg/haul).

Box M (Northern North Sea)

Total biomass in Box M remained with 298 kg/ haul close to the long-term average since 1999. Haddock with 63 kg/haul was one of the species, which had kept their typical abundance, whereas saithe (*Pollachius virens*; 72 kg/haul) occurred with an unusually high biomass. Hake (*Merluccius merluccius*) continued to occur in high numbers as in the preceding five years.

As in other boxes, grey gurnard was very abundant, with the highest record in the time series (21 kg/ haul). Another value above 10 kg/haul was only seen in 2014. Horse mackerel was not as abundant as in 2015 (161 kg/haul then), but with 32 kg/ haul stayed way above the typical records of only single individuals.

Box D (Western North Sea)

Due to obstruction with marine infrastructure and operating vessels, the original Box D could not be sampled. Instead, two fishing hauls were conducted in the nearby Box D', which had first in 2015 been used as a replacement for Box D. Depth and sediment composition are similar in both boxes. Yet, because of the limitation to two hauls, the value of interpretations is limited, here.

Herring biomass was slightly above the long-term average (710 versus 665 kg/ 30-min haul). Grey gurnard was with 5.5 kg/haul more abundant than before, about twice the long-term average. Most other species recorded did not differ clearly from the records of previous years, except for haddock (*Melanogrammus aeglefinus*) with only 87 kg/haul, while values of several hundred kg/haul were typical of the last two decades.

Box B (Western North Sea)

Not sampled in 2016.

Epibenthos (Senckenberg Research Institute)

IBTS rectangles

Generally, abundance and biomass of species was high at the coast and decreased towards offshore areas. Three invertebrate species were found in almost all rectangles: The starfish *Asterias rubens*, the swimming crab *Liocarcinus holsatus* and the hermit crab *Pagurus bernhardus*. Abundance of all three species decreased in the area compared to previous years. Common fishes were the goby *Pomatoschistus minutus*, the dab *Limanda limanda* and the solenette *Buglossidium luteum*. Goby and solenette revealed the highest abundances since 2011. The rectangles 35F2, 35F3 and 35F4 were sampled for the first time in 2016. The solenette *Buglossidium luteum* was frequently found in all three rectangles. Additionally, the sea urchin *Echinocardium cordatum* was very abundant in 35F2 and the brittle stars *Ophiura ophiura* and *Ophiura albida* in 35F3 and 35F4.

GSBTS samples

Conclusions on the development of groundfish diversity in the GSBTS boxes are not reliable for the 2016 data, because all boxes were sampled with much fewer hauls than typical. The overall conspicuous developments in the more abundant species are described below.

Box A

Five samples were taken in Box A in 2016. Epifauna assemblages in 2016 were dominated by the goby *Pomatoschistus minutus*, the starfish *Asterias rubens*, the shrimp *Crangon allmanni* and the solenette *Buglossidium luteum*. Exceptional low abundances were found for the brittle stars *Ophiura ophiura* and *O. albida*, which were both very abundant species in previous years. Abundances of the shrimp *Crangon allmanni* and the goby *Pomatoschistus minutus* had increased remarkably in 2016 after low abundances in 2015.

Box C

One sample was taken in Box C in 2016, where the epibenthic community was characterized by the starfishes *Astropecten irregularis* and *Asterias rubens* as well as the sea urchin *Brissopsis lyrifera* and the snail *Buccinum undatum*. Abundance of *B. lyrifera* was the highest since 2009 and numbers of *A. irregularis* had increased remarkably after low abundances in 2014 and 2015. In contrast, abundances of the hermit crab *Pagurus bernhardus* and the snail *Turritella communis* were the lowest recorded in Box C since 2006. It should be noted however, that because the 2016 values are based on a single sample, interpretations of the related inter-annual variability should be interpreted with caution.

Box L

Three samples were taken in Box L in 2016. Box L was characterized by exceptional high numbers of the sea urchin *Gracilechinus acutus* accompanied by high numbers of the shrimp *Crangon allmanni* and the starfish *Astropecten irregularis*. Additionally, many sessile species such as *Verruca stroemia*, *Hydroides norvegica* and *Heteranomia squamula* occurred in Box L. Generally, species composition, abundance and biomass were similar to the preceding years. However, abundance of the shrimp *Crangon allmanni* was very high since 2014 and had increased again in 2016. Additionally, high numbers of the shrimp *Pandalus montagui* were found in Box L this year.

Box M

The three samples taken in Box M in 2016 revealed a species composition, which was slightly different in comparison to preceding years. Common species in 2016 were the hermit crabs *Anapagurus*

laevis and *Pagurus prideaux* as well as the shrimps *Spirontocaris liljeborgi* and *Crangon allmanni*. Abundance of *S. liljeborgi* was continuously increasing in previous years and revealed in 2016 the highest numbers since beginning of sampling in Box M. Additionally, abundance of the polychaet *Thelepus cincinnatus* and the sea squirt *Ascidella scabra* had increased while numbers of the sea urchin *Spatangus purpureus* had decreased in Box M.

Box D'

Only one sample was taken in Box D' in 2016. It was characterized by high numbers of the shrimp *Crangon allmanni*. The snail *Turritella communis* and the long rough dab *Hippoglossoides plattessoides* were also abundant. Benthic invertebrates in Box D' were sampled for the second time in 2016. The species composition was similar to the one observed in 2015 whereas abundances of almost all species were elevated in 2016. Due to low sample numbers in Box D' so far, interpretations need to be treated with caution.

Box B

Not sampled in 2016.

Cruise participants

Name	Institution	Tasks
Dr. Anne Sell	Thünen Institute, TI-SF	Cruise leader; fisheries biology, hydrography
Dr. Hermann Neumann	Senckenberg	Benthos
Stephan Durst	Senckenberg	Benthos
Finn Werner	TI-SF	Fisheries biology
Paul Haffke	TI-SF	Fisheries biology /data management
Annika Elsheimer ⁽¹⁾	TI-SF	Fisheries biology
Marcellus Rödiger ⁽¹⁾	TI-SF	Fisheries biology /data management
Marcel Bächtiger	TI-SF, student	Fisheries biology
Sandra Rybicki	TI-SF, student	Fisheries biology
Simon Wieser	TI-SF, student	Fisheries biology
Erik Sulanke	TI-SF, student	Fisheries biology
Stefanie Haase ⁽²⁾	TI-SF, student	Fisheries biology
Kora Thomsen ⁽²⁾	TI-SF, student	Fisheries biology

⁽¹⁾ Leg 1, on board until July 30

⁽²⁾ Leg 2, on board from August 9

Acknowledgements

We are grateful to Captain Jürgen Vandrei and to the vessel's crew for doing their best to keep the boat afloat.

A. Sell

(Dr. Anne Sell, Cruise leader)

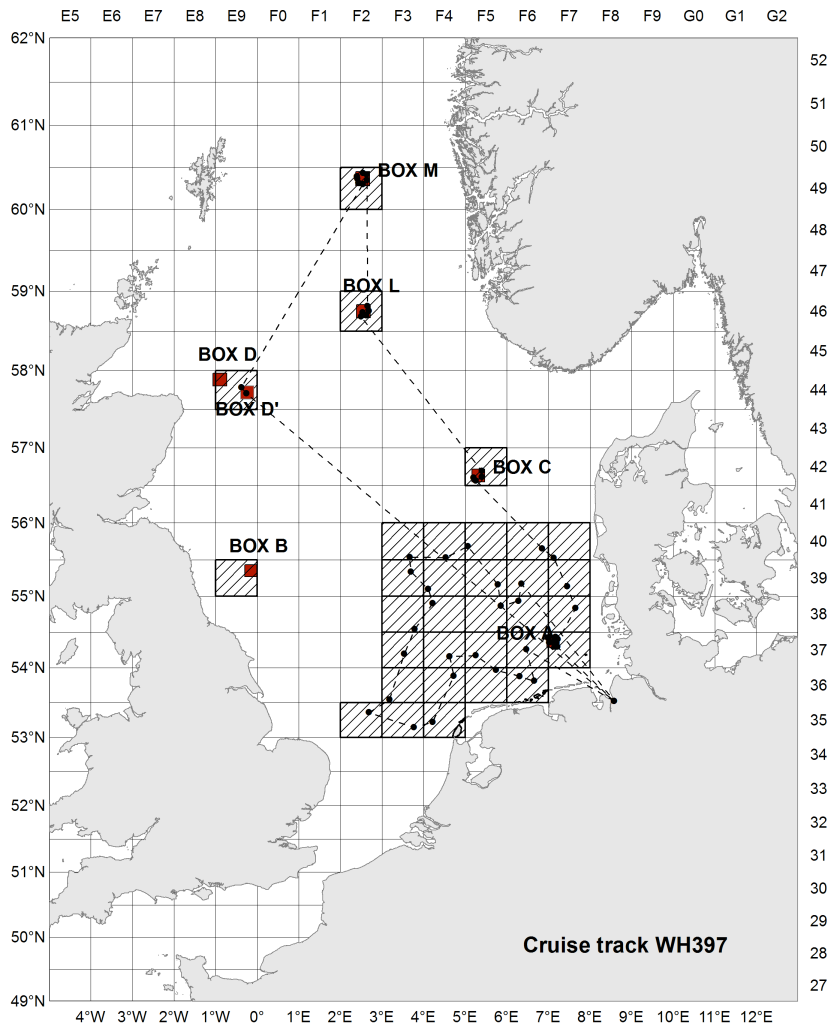


Fig. 1: Cruise track of WH 397, GSBTS and IBTS, 07/21-08/18/2016 (dashed line). Hatched areas: ICES rectangles to be sampled for the IBTS, red: areas of investigation (Boxes) within the GSBTS. [Box D, Box B and rectangle 39E9 planned, but not sampled during WH397].

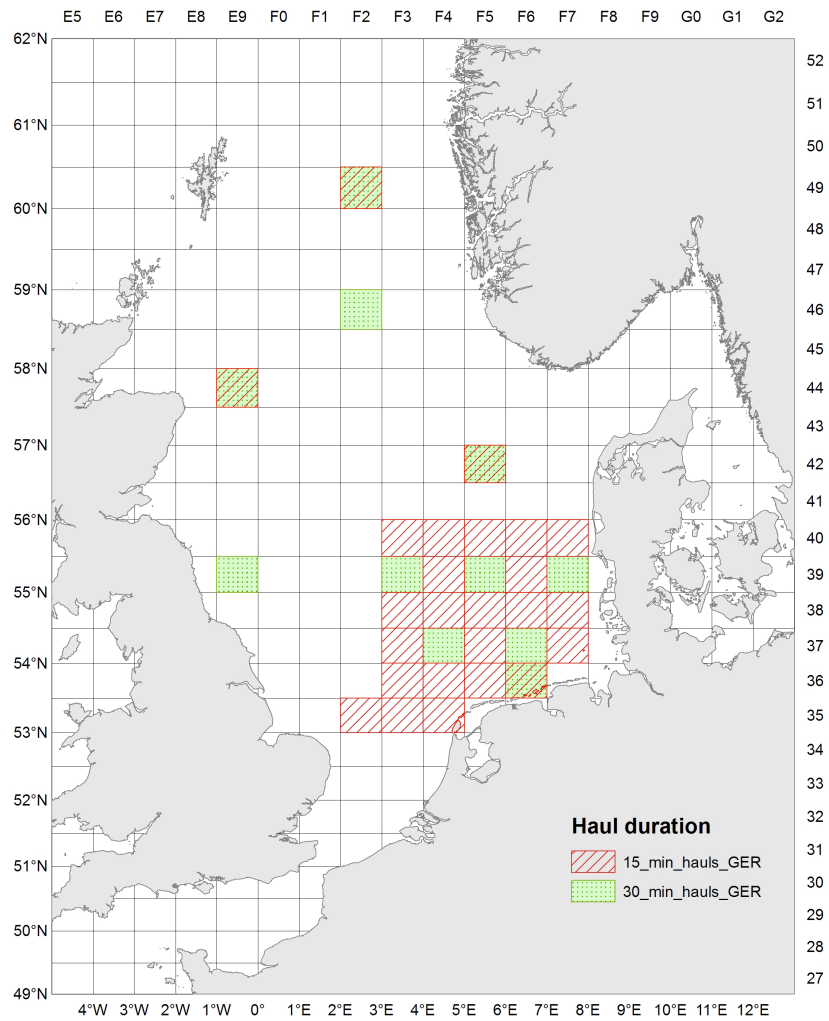


Fig. 2: Planned allocation of 15- and 30-min hauls during cruise WH 397. Deviations from this plan: Rectangle 39E9 was taken over by Scotland, and in 44E9, only the 30-min haul was conducted by Germany (15-min by Scotland). The 15-min tows in 42F5 and 49F2 were taken over by Norway. The 'Walther Herwig' conducted an additional 30-min tow in 37F7.

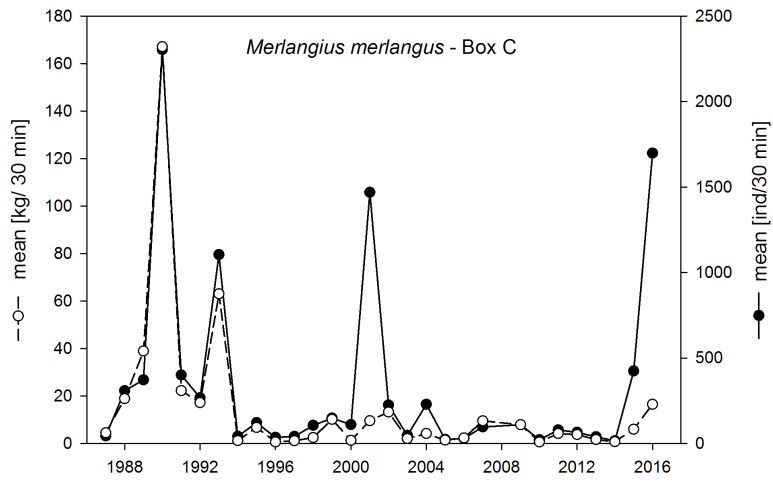
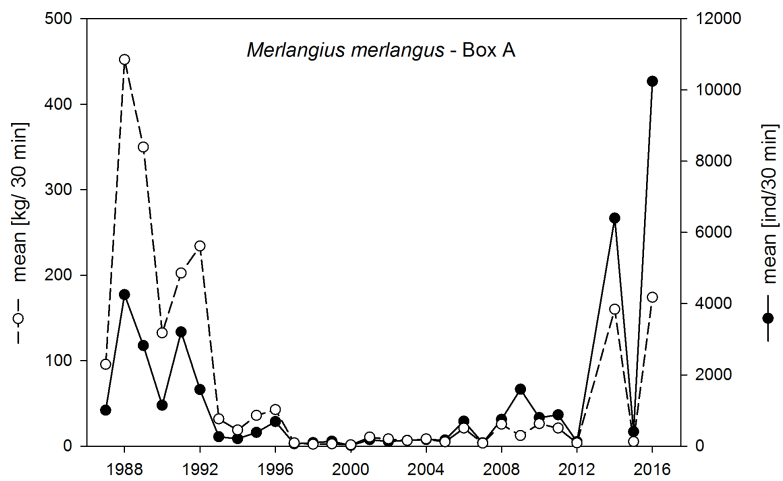


Fig. 3: Time series of whiting abundance and biomass in Box A (top panel) and Box C (lower panel). Large numbers of age-zero group fish occurred in 2016 in both boxes.