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Cruise Report
FRV Walther Herwig III, WH 366
07/26 to 08/20/2013

IBTS and GSBTS

Cruise Leader: Dr. Anne Sell

Summary

This cruise 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 bottom trawl, accompanied by hydrographic measurements, investigations of benthic epifauna, infauna and sediments.

A total of 99 stations were sampled in the North Sea. Besides the regular survey tasks, sampling was performed for stomach analyses of demersal fish species for an international "Stomach Tender" investigating feeding behaviour, and for several other national and international research projects. Specific fish and cephalopod specimens were collected in order to contribute to a genetic bar-coding project at Senckenberg Research Institute.

Unfortunately, due to a major winch failure, the cruise had to be interrupted on the evening of August 14th off the English coast, and the ship steamed back to Bremerhaven. The winch could not be repaired before the scheduled end of the cruise on August 22nd, and the 12 remaining ICES rectangles in the wider German Bight and the GSBTS "Box A" remained un-sampled when the cruise was terminated on August 20th.

Number of stations sampled during WH 366

	Hauls GOV	CTD casts (total)	CTD casts with nutrient samples	Hauls 2-m beam trawl	Van Veen sediment grab**
IBTS	17*	18	18	17*	46
Box A	0	0	0	0	0
Box B	11	8	4	4	8
Box C	20	15	9	9	18
Box D	19	15	9	9	18
Box L	14	10	6	6	12
Box M	21	15	9	9	18
total	**97**	**76**	**50**	**49**	**110**

*) IBTS: Includes 12 hauls in rectangles in the wider German Bight, and 1 each in "Boxes" B, C, D, L , and M.
**) Sediment samples from all stations, infauna for selected areas.

Methods

1. Groundfish (TI-SF)

(Institute of Sea Fisheries, Johann Heinrich von Thünen-Institute, TI-SF)

The qualitative and quantitative composition of the bottom fish fauna was analysed from a total of 97 GOV hauls for the IBTS and the GSBTS, respectively. 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 for IBTS stations, and for selected additional GSBTS stations. During all hauls, the GOV was equipped with Scanmar sensors for net geometry as required for the IBTS and GSBTS surveys. A bottom contact sensor was used in a trial setup (with only manual recording). Data from the IBTS hauls taken in the wider German Bight will be combined with international data covering the entire North Sea for the assessment of groundfish stocks and for analyses on the non-commercial species. Data are uploaded to ICES DATRAS system.

Due to a winch failure, only 17 of the 29 ICES rectangles allocated for IBTS sampling during WH 366 could be covered (1 GOV haul and accompanying investigations, each), reducing the German contribution to the international survey. Within the national GSBTS, one of the six areas of investigation ('Boxes') - Box A - could not be sampled, for the first time in the now 27-year time series. The numbers of hauls conducted within each of the boxes were reduced over those in previous years to account for the limitations given by the scheduled shorter cruise time in 2013. Intentionally, the reduction of haul numbers occurred somewhat unevenly, with the goal of conducting in each box yet enough hauls to likely catch 95% of the maximum total species number observed within one survey year of the time series. Only in Box B, where hauls were cancelled due to winch problems, the number of hauls was equivalent to only 90% of the respective species number. Hauls for each Box were completed within two or three consecutive days (Fig. 1).

Additional sampling: From IBTS hauls, fish stomach samples were taken for analyses of feeding behaviour in the international "Stomach Tender" for the species *Eutrigla gurnardus* (grey gurnard), *Scomber scombrus* (mackerel), and *Merluccius merluccius* (hake). At GSBTS stations in Boxes D, L and M Boxes, stomach samples of various sizes of *Pollachius virens* (saithe) and hake were taken for a project at the French institute IFREMER. At suitable GSBTS stations, specimens of various cephalopod species and a few yet missing fish species were collected to expand the genetic database of a bar-coding project at Senckenberg Research Institute. Additional fish samples were provided to the project "AutoMAt (UFO)" at the Thünen Institute of Sea Fisheries, and to an ecotoxicology project at the Max Rubner Institute.

2. Hydrography (TI-SF)

A total of 76 hydrographic casts were performed with a Seabird CTD to record vertical profiles of temperature, salinity and oxygen concentration within the Boxes. At 50 of these stations, water samples for nutrient analyses were taken. Samples for calibration of the oxygen probe were taken and processed through Winkler titration for a subset of stations.

3. Epibenthos (Senckenberg Research Institute)

Epibenthos was sampled within ICES rectangles of the wider German Bight (IBTS stations), as well as in the Boxes B, C, D, L and M, applying a 2m-beamtrawl. Samples were sieved over 5mm 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. Selected species were taken from the beam-trawl hauls and for further genetic analysis (barcoding). During sampling in the ICES rectangles the beam-trawl was equipped with a Hero 3 gopro camera for underwater video analysis of fauna and sediment surface structure.

4. Sediments, benthic infauna (Senckenberg Res. Inst.)

Investigations of epibenthos were accompanied by sampling of sediments using a 0.1 m^2 van Veen grab. The same grab was used to sample benthic infauna from stations in the Boxes B, C, D, L and M (6 to 9 replicates per Box) as well as the ICES Rectangles (1 replicate per rectangle).

5. Seabirds (Research and Technology Centre, FTZ)

Investigations on seabirds were conducted during the fishing operations and also while the ship was steaming, using three different methods: During the fishing hauls, maxima in the numbers of ship-following birds were recorded. Secondly, discard feeding experiments were performed to document which fish species would be taken by which bird species, and at which size of prey fish. Experiments were performed at 35 stations, typically three times per day. For these feeding trials, measured individual fish from a representative subsample of a preceding GOV catch were fed while another fishing haul was being conducted. Feeding behaviour of the responding seabird species was reported. Finally, during steaming transects and at sufficient ship speed, standardized counts of ship-independent seabirds were obtained for the international Seabirds at Sea (SAS) monitoring program, which records species occurrence, as well as behavioural observations.

6. Marine litter (TI-SF)

Occurrence of marine litter as by-catch in the fishing hauls was documented at all stations, following the IBTS manual.

Cruise schedule

On July 26, 2013, the *FRV Walther Herwig* departed for cruise WH 366 from Bremerhaven, Germany. On the 27th, the scientific program started with the first haul in ICES rectangle 38F7 and continued sampling for the IBTS until July 30 with 3-4 hauls per day. The following eight days were used to sample the boxes C, L and M (Fig. 1). During a port stop in Lerwick (Shetland Islands) on August 8/9, one member of the scientific crew was exchanged, before the survey continued with stations in the ICES Rectangles 44E9, 39E9, and the Boxes D and B (3 and 2 days, respectively). Technical problems with the ship's winches occurred repeatedly, and with increasing frequency during this part of the cruise, and lead to a final interruption of the cruise in the afternoon of August 14th. Arrangements for repairs by the manufacturer were immediately initiated, and the ship returned to Bremerhaven in the morning of August 16 to allow for the necessary repairs. On August 19th, it was definite that the ship could not sail again before the scheduled end of the survey on the 22nd, the cruise had to be terminated and the scientific crew disembarked on August 20th.

Preliminary Results

Groundfish (TI_SF)

<u>IBTS samples (ICES rectangles in the wider German Bight)</u>

Preliminary data from the IBTS stations have transmitted to the Q3 survey coordinator directly after termination of the cruise. The full IBTS data set, including age readings, has been submitted to ICES in September of 2013 and is available via the ICES database DATRAS.

GSBTS samples

Data from the German Small-scale bottom Trawl survey GSBTS extend the existing time series of annual data. Unfortunately, the now existing > 25-year time series for Box A had to be interrupted in 2013.

Box A (German Bight)

No sampling possible in 2013, due to winch failure.

Box C (Central North Sea)

Mean total catches in Box C were 69 kg/30-min haul, about half the average amount over the entire time series since 1987 (Fig. 2b). Again, a rather typical amount of dab (41 kg/ haul) was caught, dominating the groundfish assemblage. Herring occurred in exceptionally low abundance (equivalent to an average of 0.6 kg/30-min haul), and cod also remained almost absent.

Box M (Northern North Sea)

Total biomass in Box M was similar as during most of the previous decade (mean of 141 kg/ haul; Fig. 2 c). Saithe (*Pollachius virens*) dominated with a contribution of 50% of the biomass; hake (*Merluccius merluccius*) and haddock (*Melanogrammus aeglefinus*) followed with about 19 and 12 % of the total biomass, respectively. As for the pelagic species, mackerel occurred at exceptionally low biomass, and also herring was present in low numbers only.

Box L (Northern North Sea)

Total biomass in Box L was with 274 kg/ 30-min haul less than average (Fig. 2 d). Norway pout (*Trisopterus esmarki*) and haddock each amounted to about 1/3 of the total biomass; herring to about 1/6.

Box D (Western North Sea)

Total average catch rates (~ 1200 kg/ 30-min haul; Fig. 2 e) were almost identical with the long-term mean since 1987, in which the first decade was generally characterized by lower catches than the later years. Herring had the greatest share in the biomass overall, with on average 737 kg/ haul. Haddock and then Norway pout followed in biomass (240 and 81 kg/ haul, respectively).

Box B (Western North Sea)

Catches in Box B were with on average 140 kg/ 30-min haul considerably lower as the long-term mean (708 kg/ haul; Fig. 2 f). Herring (54 kg/ haul) and whiting (42 kg/ haul) were the dominant species, followed by haddock (28 kg/ haul).

Epibenthos (Senckenberg Res. Inst.)

IBTS rectangles

Only 12 of the planned 24 ICES rectangles were sampled for epibenthos. The sampled area included the North Frisian coast and the Dogger Bank. The species composition varied between the ICES rectangles. Highest abundances and species numbers were found in the rectangles 38F6, 38F7 and 39F7. Common species in most of the sampled rectangles were the starfishes *Asterias rubens* and *Astropecten irregularis,* the brittle star *Ophiura ophiura* as well as the solenette *Buglossidium luteum.* Some rectangles were characterized by exceptional species composition and species abundances. For example, high abundances of *Ammodytes marinus* were found in rectangle 39F4, which were never

found before in this rectangle. Furthermore, the ascidian *Ascidiella scabra* was characteristic for 38F7 and the snail *Turritella communis* and the *sea urchin Echinocardium cordatum* dominated the epibenthic community in rectangle 38F6. As in previous years the swimming crab *Liocarcinus holsatus* was less abundant in the sampled area after very high abundances from 2003 to 2007. In all rectangles the underwater video device was applied, which worked very well. Most characteristic species could be seen on the videos as well as characteristic sediment structures such as distinctive sand ripples in rectangles 39F7.

GSBTS samples

Box B

Box B near the British coast has low numbers and diversity of benthic species. However, the hermit crab *Pagurus bernhardus,* the sea star *Asterias rubens,* the polychaetes *Thelepus cincinnatus* and the shrimp *Crangon allmanni* occurred regularly in Box B. Sessile species such as Hydrozoa, Bryozoa and Anthozoa were also relatively common. Abundance and biomass of species were lower than in previous years in this Box. The previously common hermit crab *Anapagurus laevis* was not found this year.

Box D

Box D near the Scottish coast was characterized by the regular occurrence of the shrimp *Crangon allmanni* as well as the hermit crabs *Pagurus bernhardus* and *Anapagurus laevis*. Sessile species such as Hydrozoa, Bryozoa and Anthozoa were also relatively common. Abundance of hermit crabs was lower than in previous years. The bobtail squid *Sepiola atlantica* – a characteristic species in Box D – was not found this year. In contrast, unusually high numbers of the ascidian *Molgula occulta* were found this year in Box D.

Box C

The assemblages in Box C were dominated by the starfish *Astropecten irregularis*, the hermit crab *Pagurus bernhardus* and the gastropod *Turritella communis.* Abundance of *T. communis* and the sea urchin *Brissopsis lyrifera* slightly increased in 2013 compared to the previous year where extreme low abundances of both species were found. This year abundance of the starfish *Luidia sarsi* was comparatively low.

Box L

In Box L, very high abundance of the sea urchin *Gracilechinus acutus* was found, accompanied by larger numbers of the starfish *Astropecten irregularis*, the shrimp *Pandalus montagui* and the hermit crab *Anapagurus laevis*. Additionally, many sessile species occurred in Box L such as *Verruca stroemia*, *Hydroides norwegica* and *Heteranomia squamula*. Generally, species composition, abundance and biomass in Box L were very similar to the last years. However, numbers of the shrimp *Crangon allmanni* were very high since 2011.

Box M

Common species in Box M were the hermit crabs *Anapagurus laevis, Pagurus pubescens and P. prideaux,* although a decreasing trend in abundance is obvious during the last years. *P. prideaux* was found together with the symbiotic sea anemone *Adamsia carcinopados*. Furthermore, the sea urchin *Spartangus purpureus* and the polycheata *Thelepus cincinnatus* were frequently found in Box M. As in Box L the sessile species *Verruca stroemia*, *Hydroides norwegica* and *Heteranomia squamula* were very common. Abundance of the squat lobster *Galathea dispersa* and the sea squirt *Ascidiella scabra* increased in the last years in Box M.

Seabirds (FTZ Büsum)

Highest numbers of ship-following seabirds accompanying fisheries activities were observed in Box M with e.g. 1100 individuals of Northern Fulmar. For the SAS programme, transects with a total distance of 1390 km and an area of 417 km² were covered (Fig. 3).

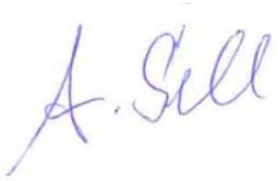
Cruise participants

Name	Institution	Tasks
Dr. Anne Sell	Thünen Institute, TI-SF	Cruise leader, fisheries biology
Dr. Ingrid Kröncke	Senckenberg	Benthos
Dr. Hermann Neumann	Senckenberg	Benthos
Andriy Martynenko	Thünen Institute, TI-SF	Hydrography, water chemistry
Sakis Kroupis	Thünen Institute, TI-SF	Fisheries biology
Christina Fromm	Thünen Institute, TI-SF	Fisheries biology
Jens Edinger	Thünen Institute, TI-SF	Fisheries biology
Inken Rottgardt	Thünen Institute, TI-SF	Fisheries biology
Florian Krau	Thünen Institute, TI-SF	Fisheries biology
Johannes Baltzer	Thünen Institute, TI-SF	Fisheries biology
Hendrik Lörper	FTZ Büsum	Seabird ecology
Frieder Schwarz (1) / Stefan Weiel (2)	FTZ Büsum	Seabird ecology

(1) First cruise leg, (2) second leg.

Acknowledgements

We are grateful to Captain Jürgen Vandrei and to the ship's crew for trying everything possible to continue the cruise as long as possible despite recurring technical problems.



(Dr. Anne Sell, Cruise leader)

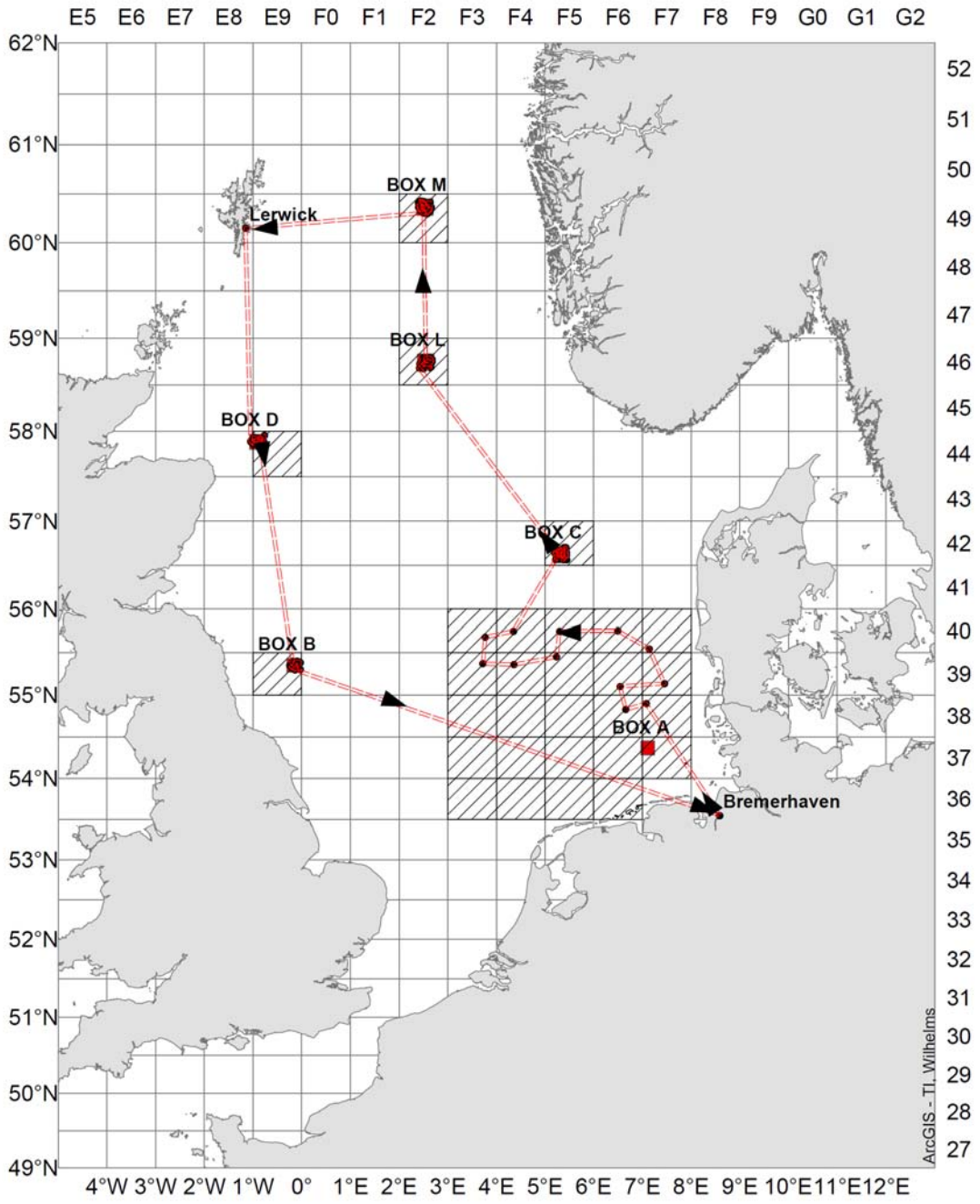


Fig. 1: Cruise track of WH 366, GSBTS and IBTS, 07/26-08/20/2013. Hatched area: ICES rectangles sampled within the IBTS, letters: areas of investigation (Boxes) within the GSBTS.

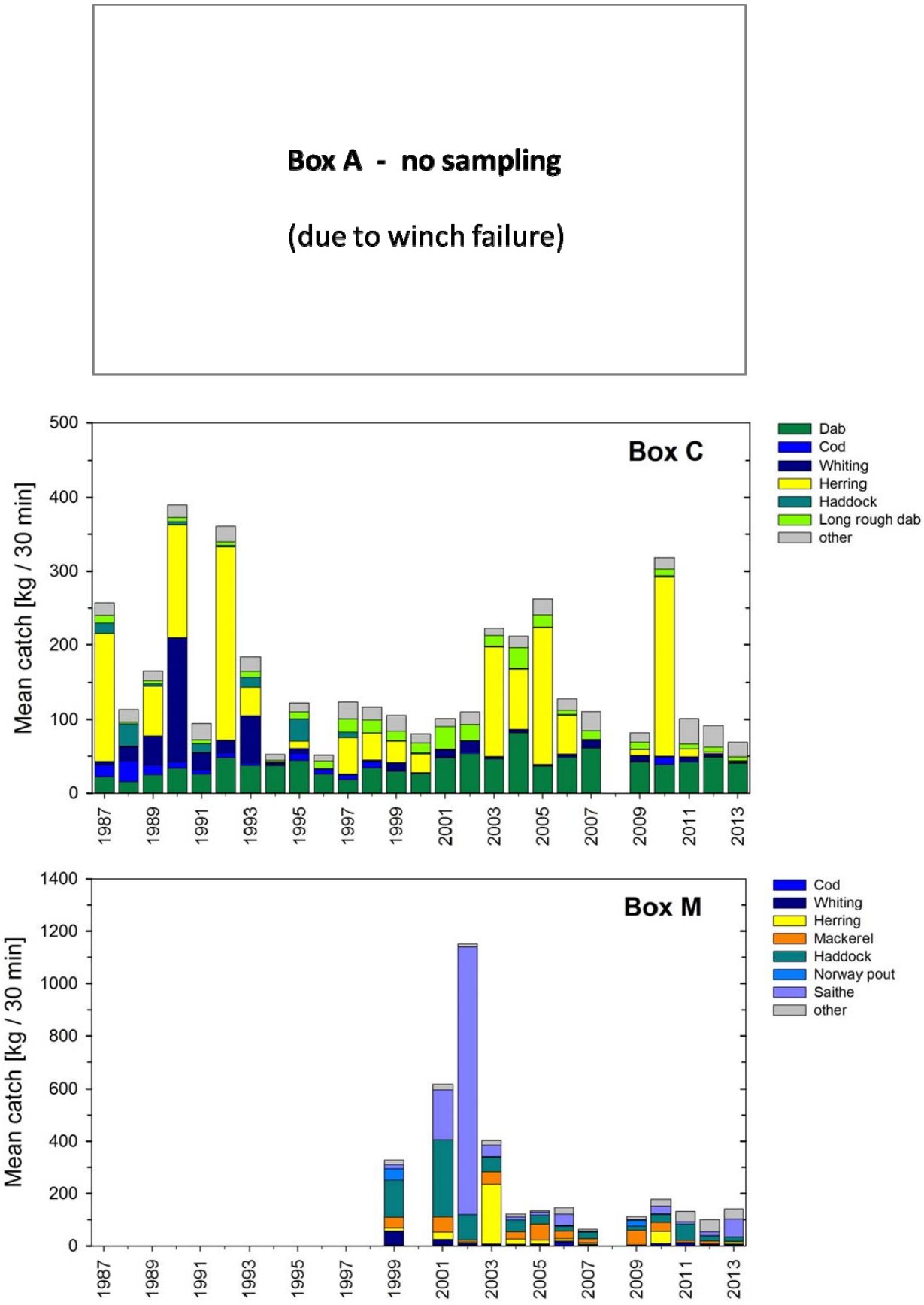


Fig. 2 (a-c), Boxes A, C and M: mean catch in GOV hauls during cruise WH 366 (2013) and preceding years since the beginning of the GSBTS.

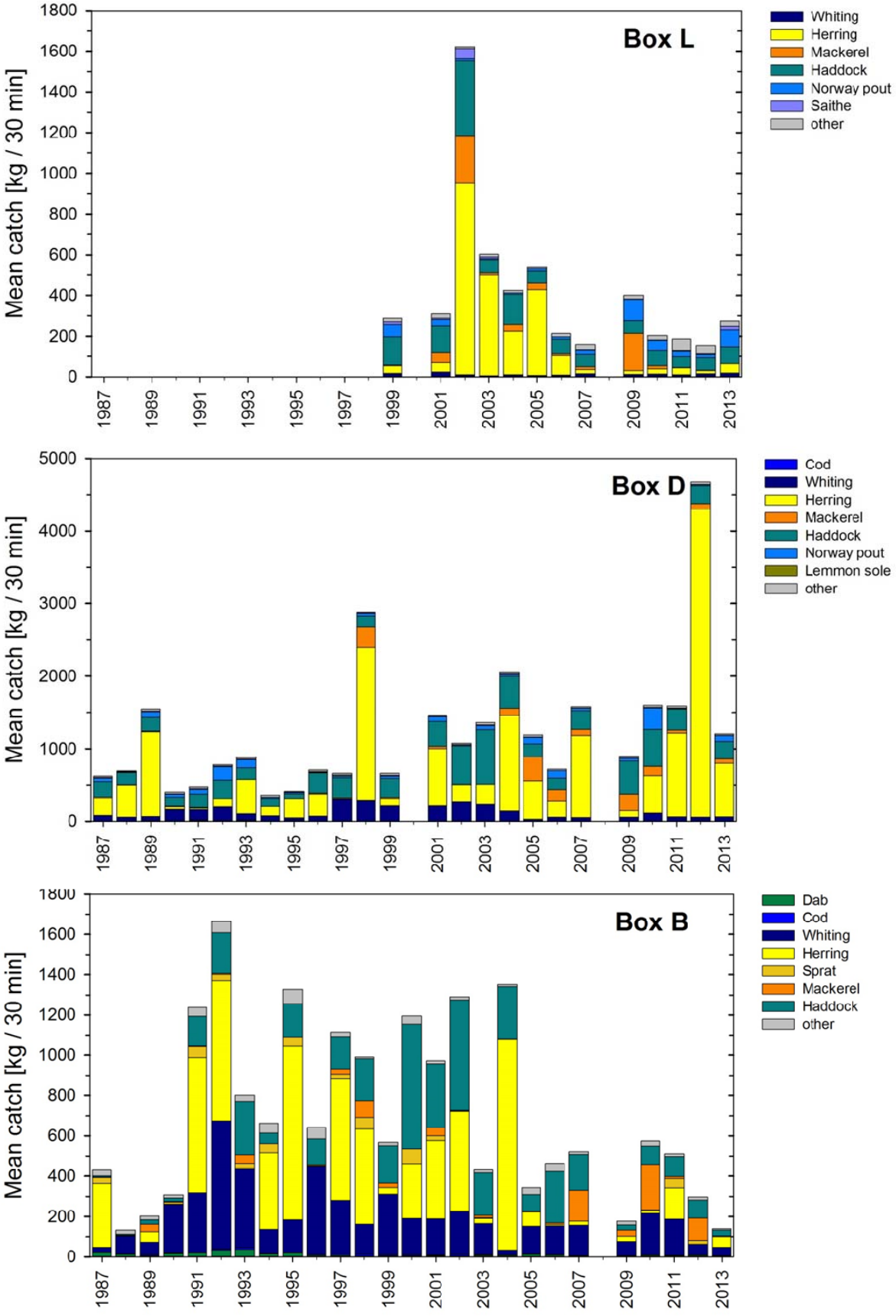


Fig. 2 (d-f), Boxes L, D and B: mean catch in GOV hauls during cruise WH 366 (2013) and preceding years since the beginning of the GSBTS.

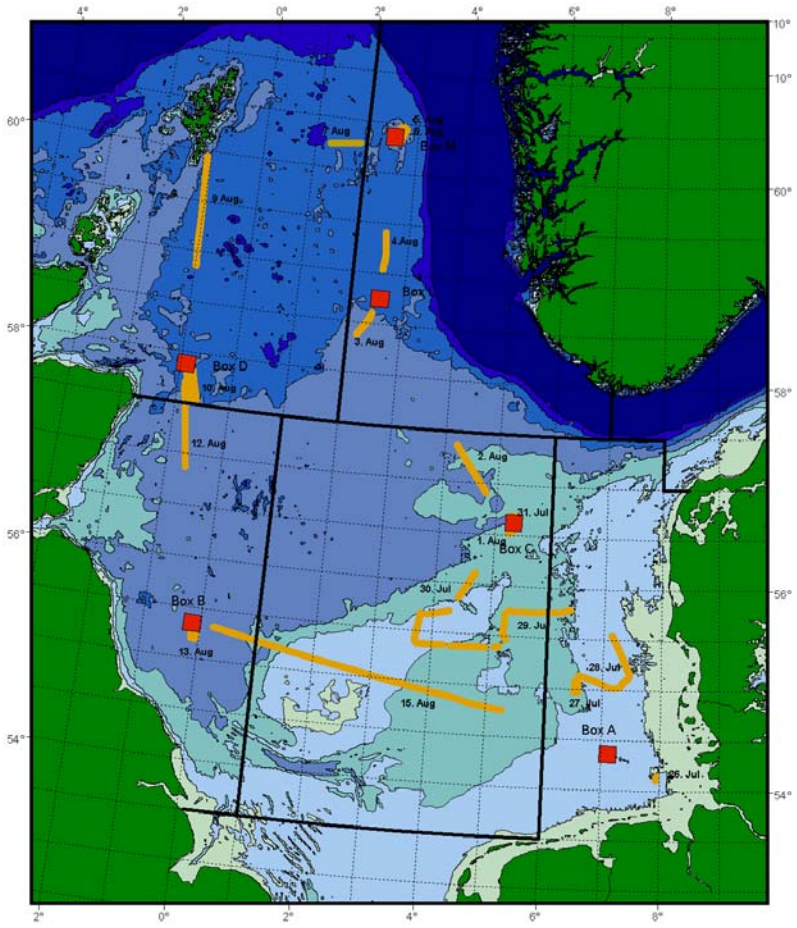


Fig. 3: Transects of seabird observations during WH 366 for the Seabirds at Sea Programme (SAS).