

Cruise Report
FRV Walther Herwig III, WH 407
07/20 to 08/16/2017

IBTS and GSBTS

Cruise Leaders: Dr. Anne Sell / Dr. Matthias Bernreuther

Summary

Cruise WH 407 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. Bycatch of marine litter in the GOV is reported.

As a special task for the ICES IBTS Working Group, a few "zero-minute hauls" were conducted, in order to investigate which amount of fish may be caught outside the official haul duration. The duration of individual steps during shooting and hauling activities was also recorded.

The GSBTS is a national program to monitor small-scale variability as well as long term changes in demersal fish assemblages in relation to physical and biological habitat characteristics. In order to fully cover the international IBTS programme, the GSBTS component of the cruise had to be reduced due to weather conditions and technical constraints.

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TI - Seefischerei

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BMEL, Ref. 614

BMEL, Ref. 613

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Directorate of Fisheries, Norway*

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*Cruise acronym:

08.02.2017, 19.07.-17.08.2017, Jnr. 17/2421

Number of stations sampled during WH 407

	Hauls GOV	CTD casts (total)	Hauls 2-m beam trawl	Van Veen sediment grab***
IBTS*	32	32	32	32
IBTS zero-minute hauls**	3			
Box A	21	15	9	9
Box B	7	7	6	6
Box C	12	9	5	5
Box D'	8	7	5	5
Box L	19	14	9	9
Box M	14	10	6	6
total	107 + 3**	88	88	88

*) IBTS: Includes 27 stations in the wider German Bight, and 1 each in "Boxes" B, C, D', L, and M; see map.
 **) Zero-minute hauls for analysis of catch outside official haul duration; for IBTS Working Group. Kept separate, not uploaded to the ICES database DATRAS.
 ***) Sediment samples from all stations in this column, infauna for selected areas.

Instead of the original Box D, which is now largely obstructed by offshore infrastructure, 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 107 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 for IBTS stations, and for 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 surveys. 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.

As agreed in the ICES IBTS Working Group, the German contribution to the 2017 Q3-IBTS was expanded by three rectangles in the southern North Sea (35F2 to 35F4; same extension as in 2016). This addition supports an initiative of all survey partners to optimize the overall distribution of hauls over the area of the North Sea, but required 1 additional day of shiptime, which was allocated at the expense of the GSBTS.

As a special task for the IBTSWG, a few "zero-minute hauls" were conducted, during which the net was hauled back directly after deployment, as soon as it reached the stable geometry which typically is defined as the start of the haul duration. The purpose of this experiment was to look into the amount of fish, which may be caught outside the official haul duration. This portion of the catch would become more relevant if shorter haul durations would be chosen in future (compare experiments on haul duration in Q3 2015 and 2016). As additional parameters useful for the interpretation of such zero-haul data, the duration of individual steps during shooting and hauling activities were recorded.

2. Hydrography (TI-SF)

A total of 88 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' (replacement for Box 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 all sampled IBTS rectangles.

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 as in the ICES Rectangles.

5. Marine litter (TI-SF)

Marine litter bycatch from the GOV hauls was reported according to the ICES standards on all fishing stations. Data have been prepared for uploading to the ICES database.

Cruise schedule

After one day delay due to repairs of acute technical failures, the FRV 'Walther Herwig' departed on July 20st from Bremerhaven, Germany. On the 21st, the scientific program started with sampling for the IBTS, which continued as planned until the 27th, followed by three days in GSBTS Box A, interrupted due to weather conditions after the first day of sampling. A partial crew exchange was conducted on August 1st at the island of Helgoland via the tender. The programme was resumed on August 2nd, had to be suspended due to storms on August 5 and 11. On August 15th after completion of four hauls, the ship steamed towards Bremerhaven, where it arrived in the evening of August 17th. The scientific crew disembarked on August 18th.

Preliminary Results

Groundfish (Thünen Institute of Sea Fisheries)

IBTS samples

32 fish species were recorded in the IBTS hauls in the southern North Sea, of which the five most abundant ones were sprat, herring, whiting, dab, and mackerel. After the cruise, the IBTS data set has been quality-checked, supplemented with age readings, and uploaded to the ICES database DATRAS.

GSBTS samples

Overall, the number of hauls in GSBTS boxes had to be reduced due to technical constraints and weather conditions in several cases, affecting particularly the sampling effort in Boxes B and D', but also in Box C.

Box A (German Bight)

Mean catch biomass in Box A (256 kg/ 30 min haul) was less than half of the long-term average (640 kg/ 30 min), and was dominated by dab (111 kg/ 30 min) and mackerel (85 kg/ 30 min), followed by whiting (32 kg/ 30 min; Fig. 2a). After the exceptionally high abundances of zero-group whiting observed in Box A in 2016, whiting abundance in 2017 (on average 966 ind/30 min) had returned to values close to the long-term average of 30 years, with outliers removed (Fig. 3). Herring occurred in low numbers, resulting in an average of 0.84 kg/ 30 min. Biomass of grey gurnard was the highest in the time series since 1987 (14.9 kg/ 30 min).

Box C (Central North Sea)

Catches in Box C contained with a mean of 184 kg close to the long-term average biomass (171 kg/ 30 min haul; Fig. 2b). The largest portion was added by herring (109 kg) and dab (44 kg), the latter also close to the long-term mean. Similarly as in Box A in the German Bight, whiting abundance had in 2017 returned to rather typical values of abundance (mean of 115 ind/ 30 min) and biomass (4.6 kg/ 30 min; Fig. 3). In contrast to 2016, biomass of grey gurnard (*Eutrigla gurnardus*; 5.2 kg/ 30 min) had also returned to average levels. Lemon sole (*Microstomus kitt*) on the other hand, remained at a similarly high biomass (also 5.2 kg/ 30 min) as in 2016, the year of its maximum (5.6 kg/ 30 min haul).

Box L (Northern North Sea)

Total biomass in Box L (511 kg/ 30-min haul) was higher than average, about 50% of it consisted of herring (Fig. 2c). Other abundant species were mackerel, haddock and saithe, the latter (40.6 kg/ 30 min) with the second to highest biomass since 1999. Cod remained at comparably high biomass (18 kg/ 30 min), and as in the preceding year, grey gurnard remained at high levels (8.8 kg/ 30 min).

Box M (Northern North Sea)

Total biomass in Box M remained with 327 kg/ haul close to the long-term average since 1999 (Fig. 2d). Saithe (*Pollachius virens*) contributed one third of the biomass. Mackerel (85 kg/ 30 min) reached the highest biomass within the time series, and co-occurred with also abundant horse mackerel (*Trachurus trachurus*, 64 kg / 30 min).

Box D' (Western North Sea)

Due to obstruction with marine infrastructure, the original Box D cannot be sampled for the GSBTS any longer has been replaced by the nearby Box D', first fished in 2015. Depth and sediments composition are similar in both boxes. In 2017, haul duration for all hauls except 1 (also reported as IBTS-haul) had to be shortened to towing times between 8-15 minutes, due to high abundance of herring. This needs to be taken into account when comparing the data between years / boxes.

2017 catches in Box D' were large due to very high abundance of herring. The one fully completed 30-min haul contained 2846 kg of *Clupea harengus* (Fig. 2e). Most of the remaining biomass was made up of whiting (68 kg) and haddock (61 kg), the share of *Trisopterus esmarkii* was comparably low (23.6 kg/ 30 min).

Box B (Western North Sea)

Box B was sampled with 7 hauls only, limiting the validity of conclusions from comparisons with previous years for this box. Yet, none of the catches were unusual (Fig. 2f). Average biomass (404 kg/ 30 min haul) was less than 2/3 of the long-term average (680 kg/ 30 min), and was dominated by haddock, whiting and mackerel (140, 131 and 77 kg/ 30 min, respectively).

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*. Common fishes were the goby *Pomatoschistus minutus*, the dab *Limanda limanda* and the solenette *Buglossidium luteum*. The solenette increased remarkably in northern offshore areas (rectangles 40F5, 40F6 and 39F3) in the last years. In contrast, numbers of brittle stars such as *Ophiura ophiura* and *Ophiura albida* decreased in coastal areas after very high abundances in 2014 and 2015. Very high numbers of juvenile swimming crabs (*Liocarcinus holsatus*) and small gobies (*Pomatoschistus minutus*) were found in rectangle 38F7 (2430 and 985 ind/ 500 m², respectively). Additionally, the sea star *Astropecten irregularis* was very abundant in rectangle 37F5 (788 ind/ 500 m²) and *Asterias rubens* in rectangle 36F5 (442 ind/ 500 m²).

GSBTS samples

Box A

Nine replicates were taken in Box A in 2017. Epifauna assemblages were dominated by the goby *Pomatoschistus minutus*, the brittle star *Ophiura albida* and the starfish *Asterias rubens*. Exceptional high abundances were found for the sea star *Astropecten irregularis*. Abundances of the shrimp *Crangon allmanni* decreased remarkably in 2017 after high abundances in 2016. Length-frequency distributions of the sea star *Asterias rubens* revealed that the main cohort of the sea star was larger than ever before since start of the measurements in 2009.

Box C

Five samples were taken in Box C. The epibenthic community in 2017 was characterized by the starfishes *Astropecten irregularis* and *Asterias rubens* as well as the hermit crab *Pagurus bernhardus*. Numbers of *Astropecten irregularis* and *Asterias rubens* were remarkably low in 2017. Abundance of sea urchin *Brissopsis lyrifera* decreased after exceptional high numbers in 2016.

Box L

Nine replicates were taken in Box L in 2017. 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 snail *Aporrhais pespelecani*. Mass occurrence of the polychaete *Ampharete falcata* was found in the northeastern part of Box L accompanied by high abundances of juvenile individuals of e.g. *A. pespelecani* or the sea stars *Asterias rubens*, *Astropecten irregularis* and *Luidia sarsi*. Abundance of the shrimp *Pandalus montagui* and the hermit crab *Anapagurus laevis* increased compared to previous years.

Box M

Six replicates were taken in Box M in 2017. The hermit crabs *Anapagurus laevis*, *Pagurus pubescens* and *P. prideaux* as well as the sea urchin *Gracilechinus acutus* and the shrimp *Crangon allmanni* were frequently found in Box M. Abundance of the polychaete *Thelepus cincinnatus* and the sea squirt

Ascidella scabra decreased while numbers of the brittle star *Ophiura albida* increased compared to preceding years.

Box D'

Five samples were taken in Box D' in 2017 (replacement for the original Box D). Box D' was characterized by high numbers of the shrimp *Crangon allmanni* and the sea urchin *Gracilechinus acutus*. However, *G. acutus* was very patchily distributed in Box D' and high numbers only occurred in two samples. The bobtail squid *Sepiolo atlantica* revealed the highest abundance since the beginning of sampling in Box D and D'.

Box B

Six replicates were taken in Box B in 2017. Generally, Box B is characterized by very low abundances and biomasses of epibenthic species, but by high epibenthic diversity due to high numbers of sessile species (Hydrozoa, Bryozoa and Anthozoa). The sea star *Luidia sarsi* and the shrimp *Crangon allmanni* were the most frequently found species in Box B. Most individuals of *Luidia sarsi* were small juveniles, which were never found before in high numbers in Box B. It is also notable, that the edible sea urchin *Echinus esculentus* – a common species in Box B - was not found in 2017.

Cruise participants

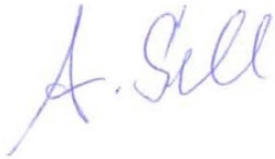
Name	Institution	Tasks
Dr. Anne Sell ⁽¹⁾	Thünen Institute, TI-SF	Cruise leader; fisheries biology, hydrography
Dr. Matthias Bernreuther ⁽²⁾	Thünen Institute, TI-SF	Cruise leader; fisheries biology
Marcellus Rödiger ⁽¹⁾	TI-SF	Fisheries biology /data management
Dr. Ismael Núñez-Riboni ⁽²⁾	TI-SF	Hydrography
Paul Haffke	TI-SF	Fisheries biology
Gertrud Delfs	TI-SF	Fisheries biology
Timo Meißner	TI-SF	Fisheries biology
Marcel Bächtiger	TI-SF, student	Fisheries biology
Gregor Boerner	TI-SF, student	Fisheries biology
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Dr. Hermann Neumann	Senckenberg	Benthos
Lara Beckmann	Senckenberg	Benthos

⁽¹⁾ Leg 1, until August 1

⁽²⁾ Leg 2, from August 1

Acknowledgements

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(Dr. Anne Sell, Cruise Leader, leg 1)



(Dr. Matthias Bernreuther, Cruise Leader, leg 2)

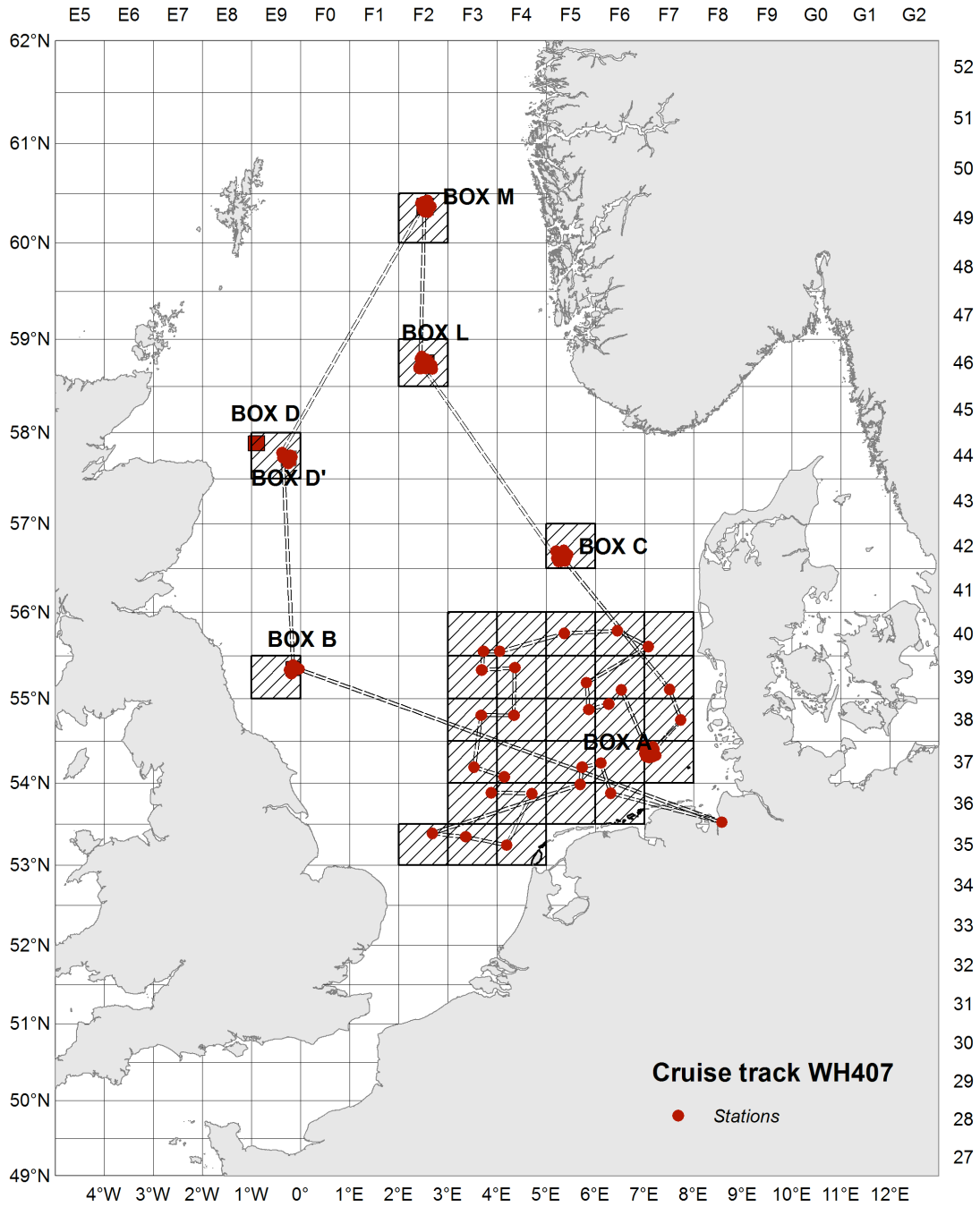


Fig. 1: Cruise track of WH 407, GSBTS and IBTS, 07/20-08/16/2017 (dashed line). Hatched areas: ICES rectangles to be sampled for the IBTS, red: areas of investigation (Boxes) within the GSBTS.

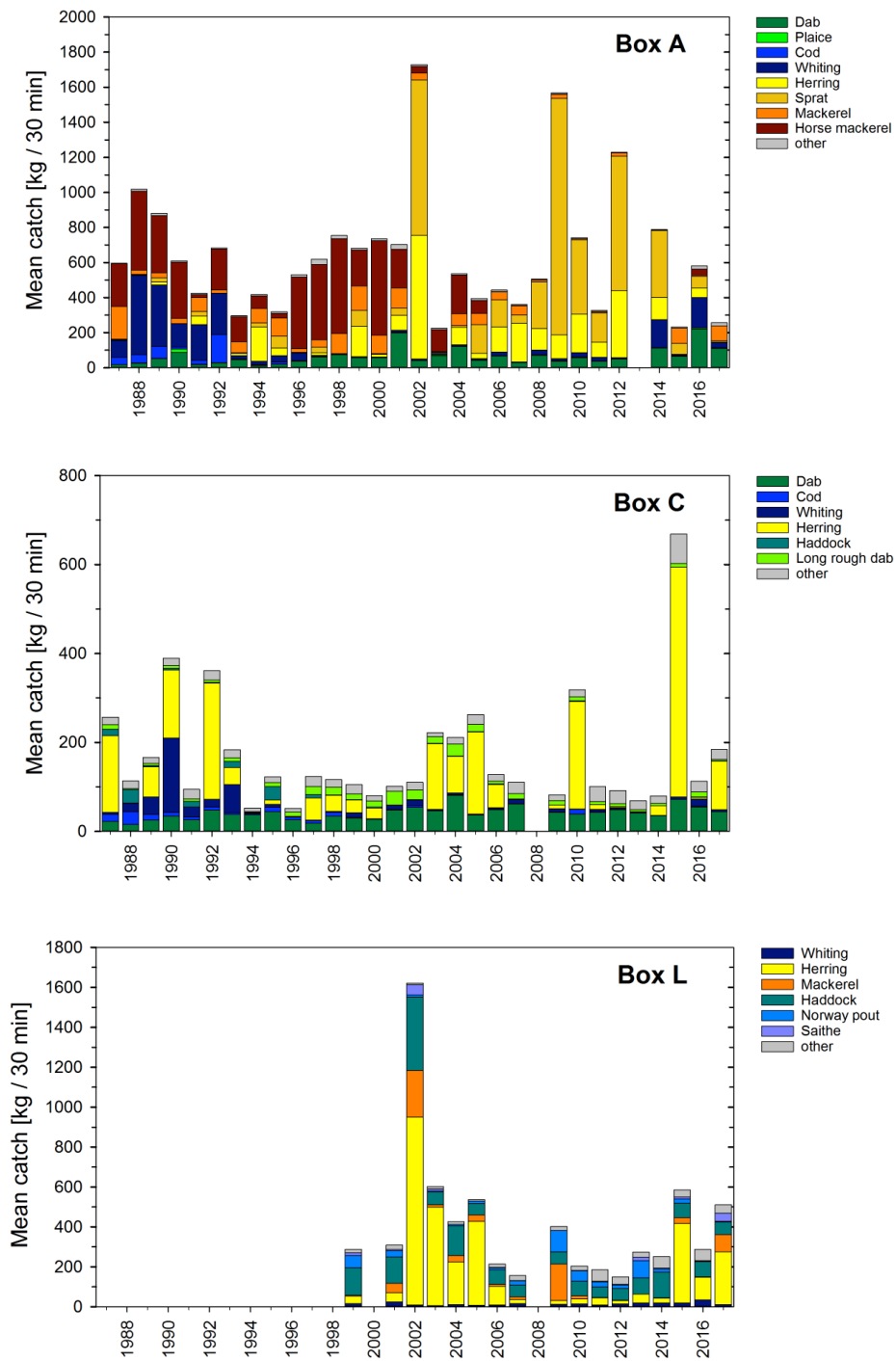


Fig. 2 (a-c), Boxes A, C and L: mean catch in GOV hauls during cruise WH 407 (2017) and preceding years since the beginning of the GSBTS.

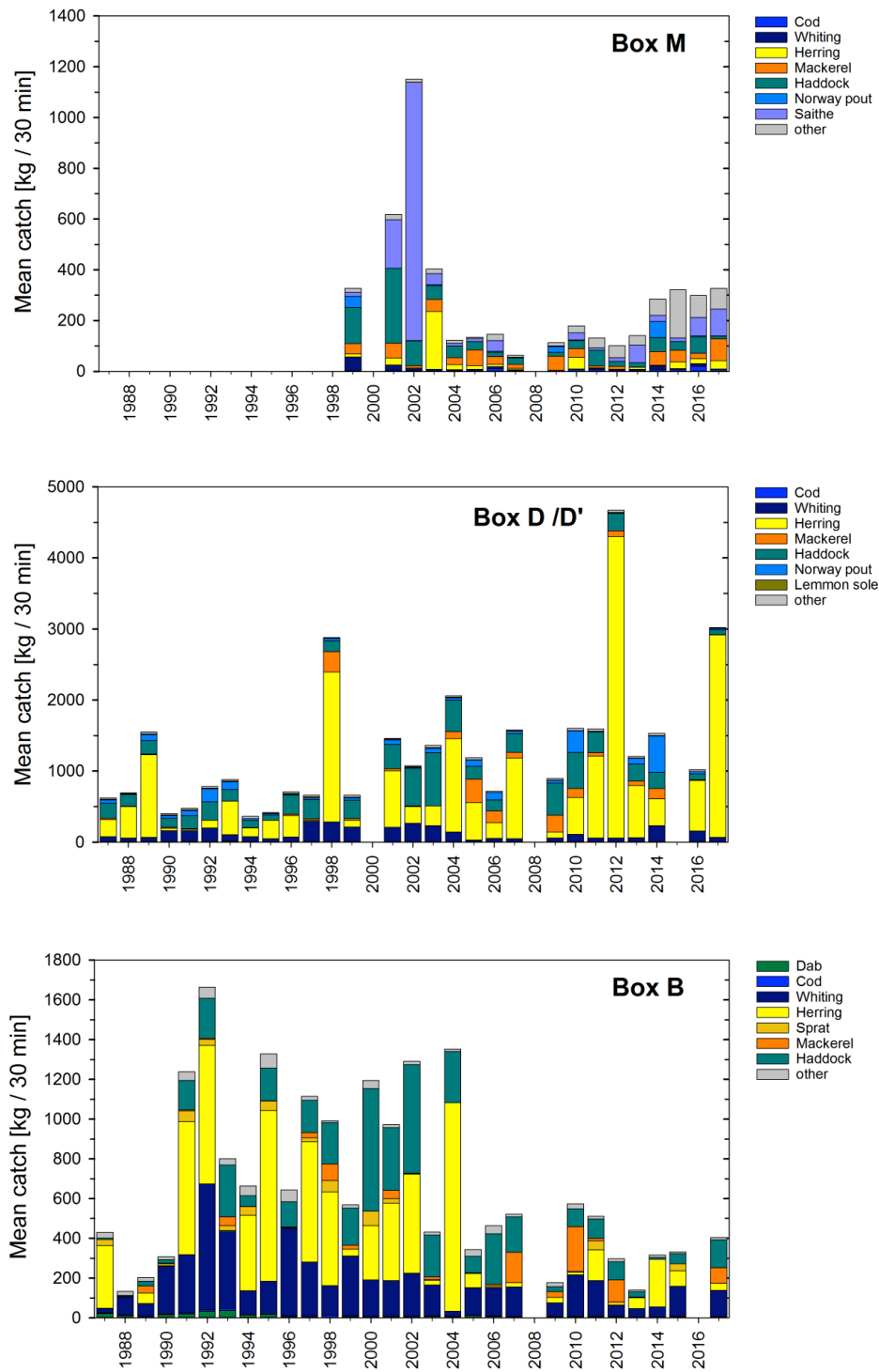


Fig. 2 (d-f), Boxes M, D' and B: mean catch in GOV hauls during cruise WH 407 (2017) and preceding years since the beginning of the GSBTS. (Box D': only 1 30-min haul in 2017).

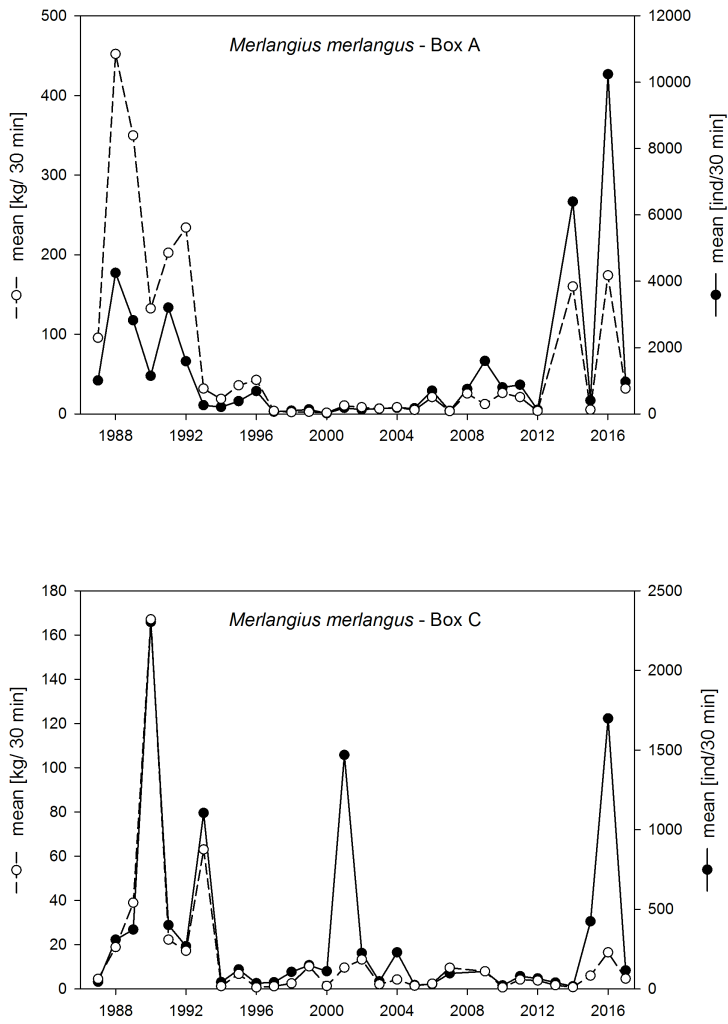


Fig. 3: Time series of whiting abundance and biomass in Box A (top panel) and Box C (lower panel).