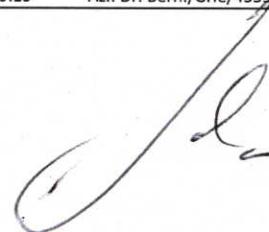


Survey Report
FRV Walther Herwig III, WH 428
08 July to 03 August 2019

IBTS and GSBTS

Chief scientist: Dr. Matthias Bernreuther



Summary

Survey WH 428 covered fisheries research representing the German contribution to the International Bottom Trawl Survey (IBTS) in quarter 3, 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 is accompanied by hydrographic measurements and investigations of benthic epifauna, infauna and sediments. Bycatch of marine litter in the GOV is reported.

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 survey (boxes B and D') had to be reduced due to time constraints.

The survey started on 08 July 2019 in Bremerhaven, starting with the IBTS on 09 July. Due to technical problems, 'Walther Herwig III' returned to Bremerhaven on 20 July. After resolving these problems, the survey continued on 23 July and the remaining program was successfully completed on 02 August. The 'Walther Herwig III' returned to Bremerhaven on 03 August 2019.

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***Cruise acronym:**

31.01.2018, 19.07.-15.08.2018, Jnr. 18/1927

Number of stations sampled during WH 428

	Hauls GOV	CTD casts (total)	Hauls 2-m beam trawl	Van Veen sediment grab**
IBTS	31*	31	30	85
Box A	21	17	10	21
Box C	19	16	9	20
Box L	19	18	8	18
Box M	24	16	9	18
total	110	93	66	162

*) Includes 28 hauls in the wider German Bight, and 1 each in "Boxes" A, C, L, and M; see map.

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

Box B and Box D/D' were not sampled in 2019, due to time constraints.

Methods

1. Bottom Trawl Survey (Thünen Institute of Sea Fisheries, TI-SF)

The qualitative and quantitative composition of the fish fauna caught in demersal hauls was analysed from a total of 110 GOV hauls for the IBTS and the GSBTS, respectively (survey 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 commercially important fish 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 2019 Q3-IBTS was expanded by three rectangles in the southern North Sea (35F2 to 35F4; same extension since 2016). This addition supports an initiative of all survey partners to optimize the overall distribution of hauls over the area of the North Sea.

2. Hydrography (TI-SF)

A total of 93 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 the laboratory in Bremerhaven for calibration of the salinity probe. Water samples from 33 casts were taken for the FishGenome-Project.

3. Epibenthos (Senckenberg Research Institute)

Epibenthos was sampled within ICES rectangles of the wider German Bight (27 rectangles of the regular German IBTS + 35F2-F4), as well as in the Boxes A, C, 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 starfish *Asterias rubens* were taken in Box A.

4. Sediments, benthic infauna (Senckenberg Research Institute)

Investigations of epibenthos were accompanied by sampling of sediments using a 0.1-m² Van Veen grab. Additional grabs were taken to sample benthic infauna in the Boxes as well as in the ICES rectangles.

5. EU project FishGenome-Project (TI-FI, TI-SF)

During the WH428 survey samples were collected for the EU project FishGenome. Besides Spanish institutes, the Thünen Institutes of Sea Fisheries and Fisheries Ecology are involved in this project.

A total of 33 water and 33 sediment samples were taken from IBTS and GSBTS stations. Out of these samples so called environmental DNA (eDNA) will be extracted. With high-throughput sequencing and quantitative PCR methods the different fish species and – if possible – their relative abundance in the respective sampling areas will be determined by researchers of the Thünen Institute.

In addition, up to four tissue types of 275 cod and 109 hake were sampled. Extracted DNA from these tissues will be supplied to other partners of the FishGenome project and tested with further molecular genetic methods (Close-Kin Mark-Recapture and Epigenetic Age Determination).

By comparison with the net catches carried out in parallel, it will be tested whether it is possible, with the aid of the molecular genetic methods mentioned above, to supplement data collected by conventional fish surveys in terms of informative power. This analysis includes the evaluation of ship time as well as time and expertise or manpower needed for obtaining and processing the samples aboard.

During WH 428, the sampling of water and sediments could be conducted without additional ship time, because DNA samples could be obtained from routine samples. Fish sampling was conducted partly on regular IBTS or GSBTS stations (without additional ship time) and partly on five dedicated stations for genetic analyses. The latter amounted to a total of ca. 5 hours additional ship time. Processing of water samples aboard required one additional scientist, and support from a second person for the days of the dedicated trial stations for genetics.

Additional scientist and technician time required for the processing of fish samples was significant and turned out to involve two persons. Processing times per fish were between 5 and 10 minutes, depending on the number of different tissues sampled.

6. 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.

Survey schedule

The FRV 'Walther Herwig III' departed as planned on 08 July 2019 from Bremerhaven, Germany. On 09 July, the scientific program started with sampling for the IBTS, which continued until 16 July when the vessel sailed to the island of Helgoland for a planned exchange of two ship's crew members. The

survey continued with three days of GSBTS sampling in Box A. On 20 July the 'Walther Herwig III' had to return to port due to technical problems. The problems were successfully solved and the vessel departed again on 23 July after repairs and a partial scientific crew exchange, which was originally planned to be conducted via tender from Helgoland. The remaining GSBTS hauls in Box A were conducted on 23 July. Fishing continued in the GSBTS Box C from 24 – 26 July. During the remaining survey time, Boxes L and M were sampled. The sampling in Box L was separated to take place on one day before (27 July) and two days after (01+02 August) the sampling in Box M (28 to 31 July), in order to allow for short enough steaming times between boxes to be conducted over night. After completion of the third day of fishing in Box L on 2 August, the vessel sailed towards Bremerhaven, where it arrived in the evening of 3 August.

Preliminary Results

Fish fauna in bottom trawls (Thünen Institute of Sea Fisheries)

IBTS samples

39 fish species were recorded in the IBTS hauls in the southern North Sea, of which the five most abundant ones were sprat, dab, horse mackerel, whiting and mackerel. After the survey, 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 A, C, L and M was sufficient. Due to time constraints, sampling of Boxes B and D' in the western North Sea was not possible.

Box A (German Bight)

Mean catch biomass in Box A (226 kg/ 30 min haul) was slightly higher compared to last year's lowest ever observed biomass of 166 kg/ 30 min haul in the time series since 1987 (for 1987-2018: mean = 625 kg/ 30 min; range: 225-1728 kg/ 30 min). The catches were dominated by sprat (116 kg/ 30 min) and mackerel (48 kg/ 30 min), followed by herring (25 kg/ 30 min) and dab (20 kg/ 30 min; Fig. 2a).

Box C (Central North Sea)

Mean catch biomass in Box C of 382 kg/ 30 min haul were almost 7 fold higher compared to last year's very low mean of 55 kg which was close to the minimum of the long-term time series (mean until 2018 168 kg/ 30 min haul; Fig. 2b). The catches were dominated by herring (208 kg/ 30 min haul), followed by highest observed sprat and haddock catches in the time series (sprat: 57 and haddock: 54 kg/ 30 min haul), dab (26 kg/ 30 min haul) and whiting (13 kg/30 min haul; Fig. 2b).

Box L (Northern North Sea)

Mean catch biomass in Box L (181 kg/ 30-min haul) was higher compared to last year's lowest observed biomass since the start of the Box L time series in 1999 (2018: 120 kg/ 30 min haul), but still low compared to the mean of the time series (mean until 2018 396 kg/ 30 min). The most abundant species were Norway pout (56 kg/ 30 min), haddock (43 kg/ 30 min) and whiting (32 kg/ 30 min) (Fig. 2c). Herring catch biomass of 2 kg/ 30 min was the lowest observed since the start of the time series (mean until 2018 179 kg/ 30 min; Fig. 2c).

Box M (Northern North Sea)

Total biomass in Box M (280 kg/ haul) was lower compared to last year's (2018) high biomass of 473 kg/ 30 min but still close to the average catch biomass of 297 kg/ 30 min from the start of the time series in 1999 to 2018. The most abundant species was mackerel (90 kg/ 30 min), followed by herring (55 kg/ 30 min), saithe (36 kg/ 30 min) and Norway pout (22 kg/ 30 min; Fig. 2d).

Box B and D' (Western North Sea)

Not sampled in 2019, due to lack in ship time.

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*. No exceptional changes compared to recent years have been noted for these dominant species.

GSBTS samples**Box A**

Nine replicates were taken in Box A in 2019. Epifauna assemblages were dominated by the solenette *Buglossidium luteum* and the starfishes *Asterias rubens* and *Astropecten irregularis*. The abundance of the latter has been steadily increasing since 2015. In contrast, abundance of the goby *Pomatoschistus minutus* is still low compared to the high abundance in 2017.

Box C

Six samples were taken in Box C in 2019. The epibenthic community in 2019 was characterized by the starfishes *Astropecten irregularis* and the hermit crab *Pagurus bernhardus*. Abundance of the starfishes *Astropecten irregularis* and *Asterias rubens* has increased remarkably since 2016. As usual, a high diversity of gastropods was found in Box C.

Box L

Eight replicates were taken in Box L in 2019. Box L was characterized by exceptional high numbers of the sea urchin *Gracilechinus acutus* accompanied by high numbers of the shrimps *Pandalus montagui* and *Crangon allmanni*. Abundance of *P. montagui* in 2019 was high, similar to 2018.

Box M

Six replicates were taken in Box M in 2019. The shrimp *Pandalus montagui* as well as the hermit crab *Anapagurus laevis* and the sea urchin *Gracilechinus acutus* were frequently found in Box M. High abundances of the hermit crabs *Pagurus pubescens*, *Pagurus prideaux* and the echinoid *Spatangus purpureus* were found.

Box B and D' (Western North Sea)

Not sampled in 2019, due to lack in ship time.

Survey participants

<i>Name</i>	<i>Institution</i>	<i>Aufgabenbereich</i>
Dr. Matthias Bernreuther	Thünen Institute, TI-SF	Fisheries biology/Hydrography/Chief scientist
Gertrud Delfs	TI-SF	Fisheries biology /Data processing
Timo Meißner	TI-SF	Fisheries biology
Samira Kadhim	TI-SF	Fisheries biology
Silvia Malagoli ⁽¹⁾	TI-SF	Fisheries biology
Dr. Erik Eschbach	TI-FI	Hydrography /FishGenome
Marcellus Rödiger ⁽²⁾	TI-SF	Fisheries biology /Electronic Measuring board
Benita Möckel ⁽¹⁾	TI-FI	Fisheries biology /FishGenome
Tina Blancke ⁽²⁾	TI-FI	Fisheries biology /FishGenome
Judith Freyer	TI-SF	Fisheries biology
Raphael Koll	TI-SF	Fisheries biology
Theresa Reismann	TI-SF	Fisheries biology
Prof. Dr. Ingrid Kröncke	Senckenberg am Meer	Benthos
Lara Beckmann	Senckenberg am Meer	Benthos

⁽¹⁾ Leg 1, until 20 July

⁽²⁾ Leg 2, from 22 July

Acknowledgements

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Dr. Matthias Bernreuther, Chief scientist

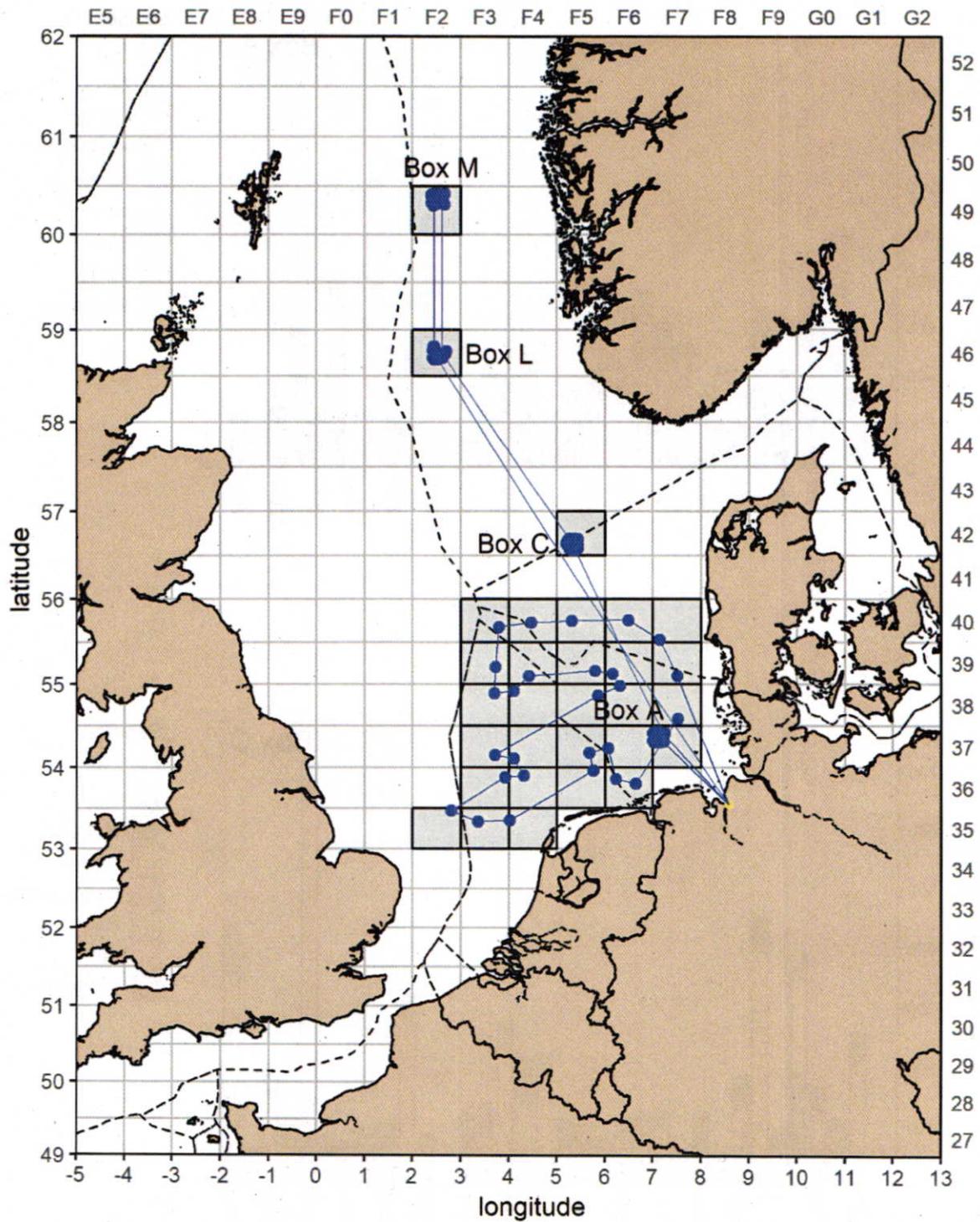
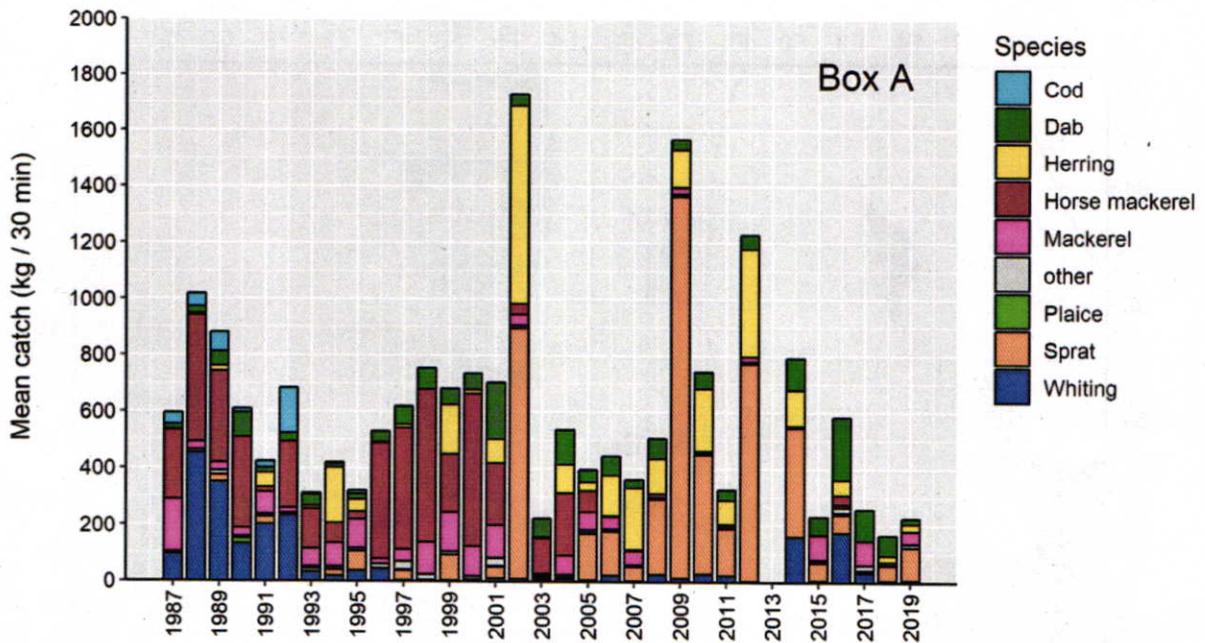


Fig. 1: Survey track of WH 428, IBTS and GSBTS, 08 July to 03 August 2019 (line). Blue points: Fishing hauls for IBTS and GSBTS; Grey areas: ICES rectangles sampled for the IBTS.

(a)



(b)

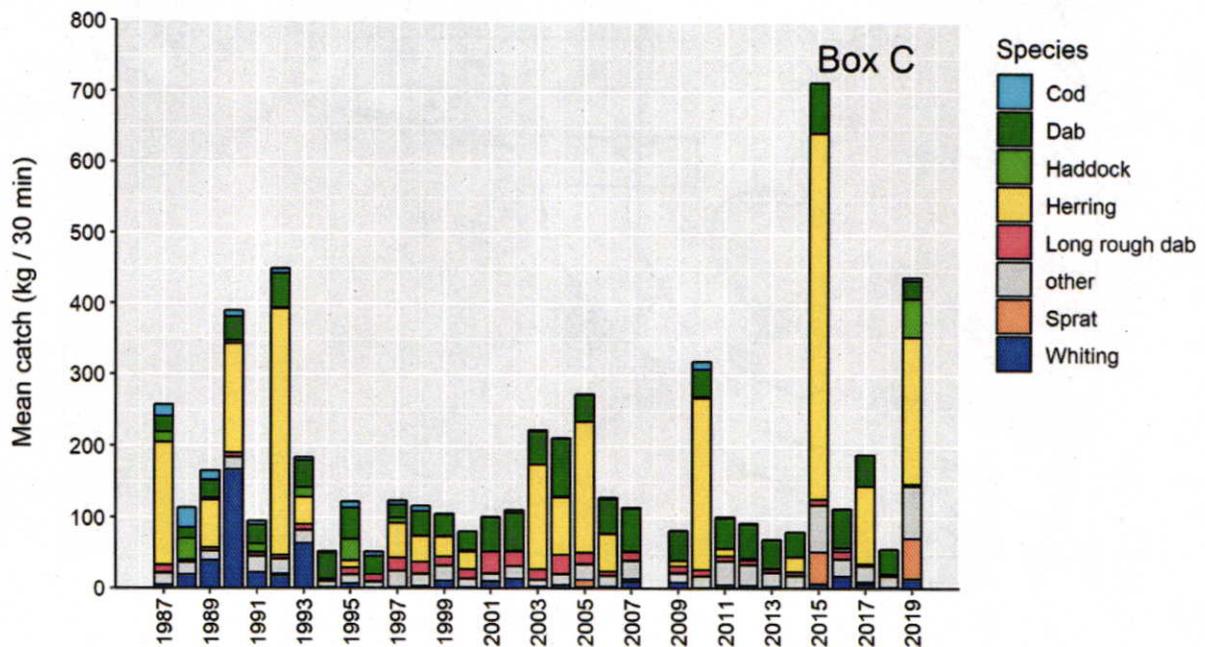
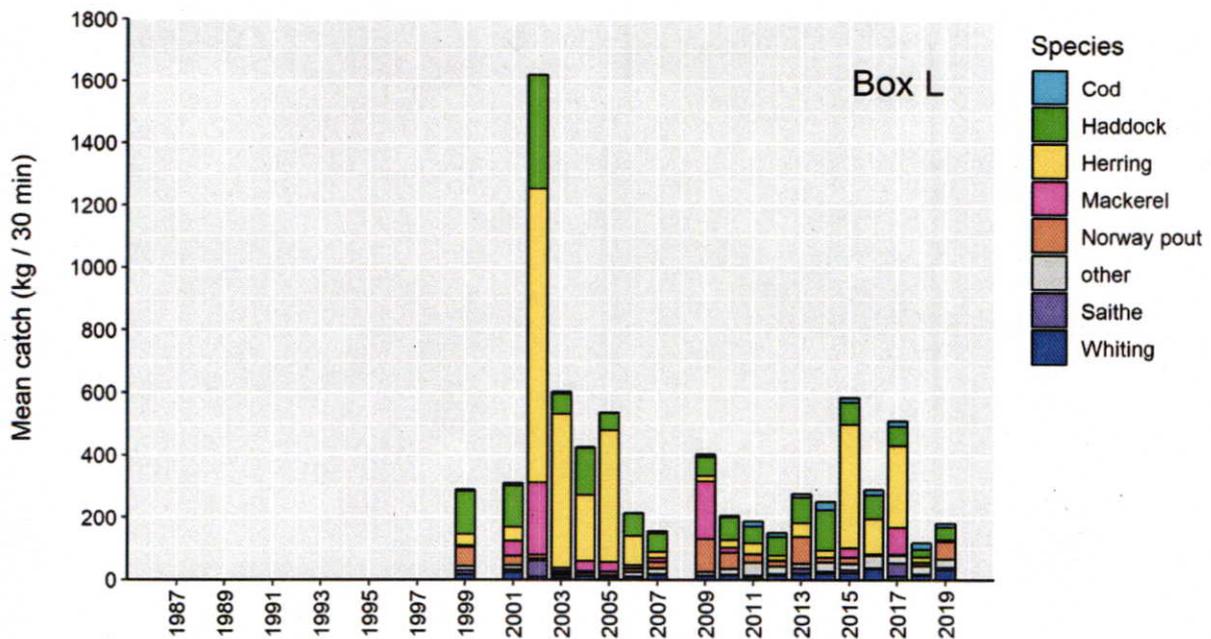


Fig. 2 (a, b), Boxes A and C: mean biomass caught in standardized GOV hauls during survey WH 428 (2019), and during preceding years since the beginning of the GSBTS.

(c)



(d)

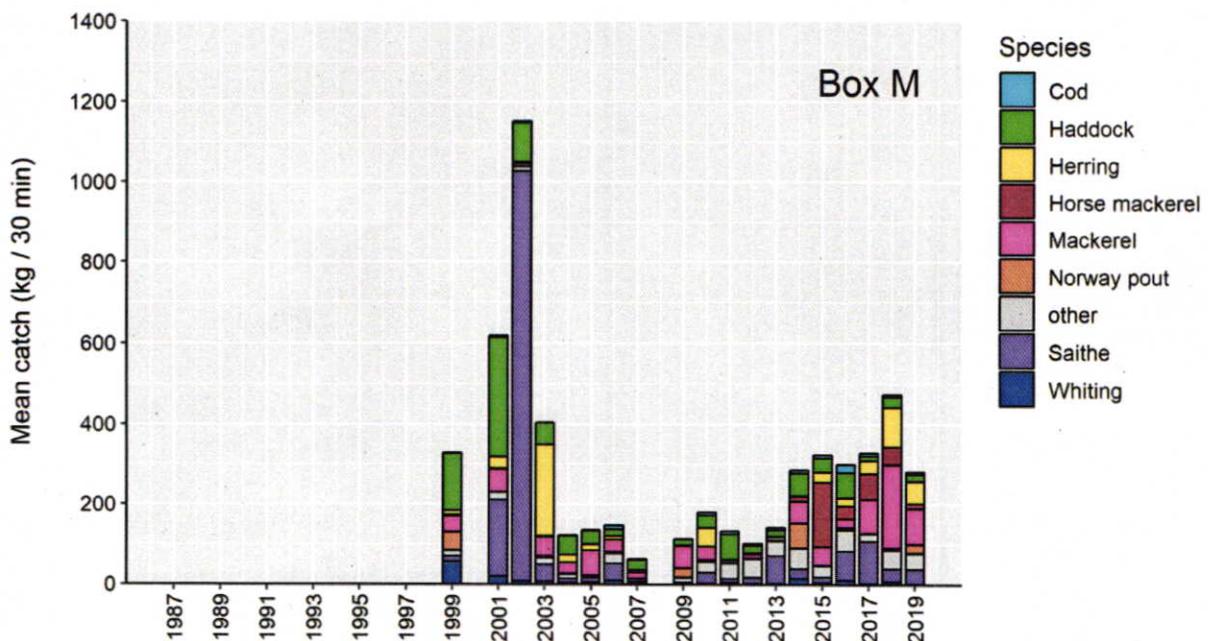


Fig. 2 (c, d), Boxes L and M: mean biomass caught in standardized GOV hauls during survey WH 428 (2019), and during preceding years since the beginning of the time series within the GSBTS.