

## „SOLEA" Cruise 691 REPORT

18.07. – 06.08.2014

### Personnel

Name	Role	Affiliation
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Antje Gimpel	Fisheries biology	TI - SF
Henrike Seidel	Fisheries biology	TI - SF
Svenja Zakrzewski	Fisheries biology	TI - SF

### Objectives

1. To participate in the German Small-Scale Bottom Trawl Survey (GSBTS) to monitor the fish fauna in 6 out of 12 small areas (boxes).
2. To investigate the hydrographical conditions within the boxes (vertical distribution of temperature, salinity and turbidity).
3. To calibrate the low-light stereo cameras used in the UFO-Project with the RAMSES-ACC-VIS (Hyperspectral UV-VIS Irradiance Sensor - 320 - 950 nm).

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**Narrative :**

On the 18<sup>th</sup> of July 2014 Solea left Cuxhaven and started the following day in Box K (German Bight) the scientific program. In general, the scientific program comprised three days with 7 hauls a day per box together with three CTD measurements and three measurements with RAMSES. The spectral radiometer was borrowed from the working group of Prof Martin Wahl (GEOMAR, Kiel). The incoming solar radiation [W/m<sup>2</sup>nm] between wavelengths of 320nm and 950nm was measured at all hydrographic stations up to a maximum water depth of approximately 25 m. The calculated (with the SAS Software) depth profiles will be used to calibrated the low light stereo cameras used in the UFO-Project (TP1 of AutoMAT, TI-SF).

On Monday the 21<sup>st</sup> Solea had to stop in Esbjerg due to some technical problems. The scientific program continued from the 22<sup>nd</sup> of July until the 28<sup>th</sup> of July. On the 29<sup>th</sup> of July three members of the scientific crew have been exchanged in Esbjerg. The program continued from the following Wednesday 30<sup>th</sup> of July.

Figure 1 shows the actual sequences of sampled boxes: Box K (Danish EEZ; 3 days), Box P (German EEZ; 3 days), Box H (British EEZ; 3 days), Box N (German Bight; 2 days), Box F (British EEZ; 3 days) and Box E (Dutch EEZ; 3 days). The program ended on the 5<sup>th</sup> of August at 6 pm and the Solea docked in Cuxhaven the following day. A summary of the activities during SB691 within each box is given in Tab. 1 and a summary of the total sampling effort by box and year is presented in Tab.2.

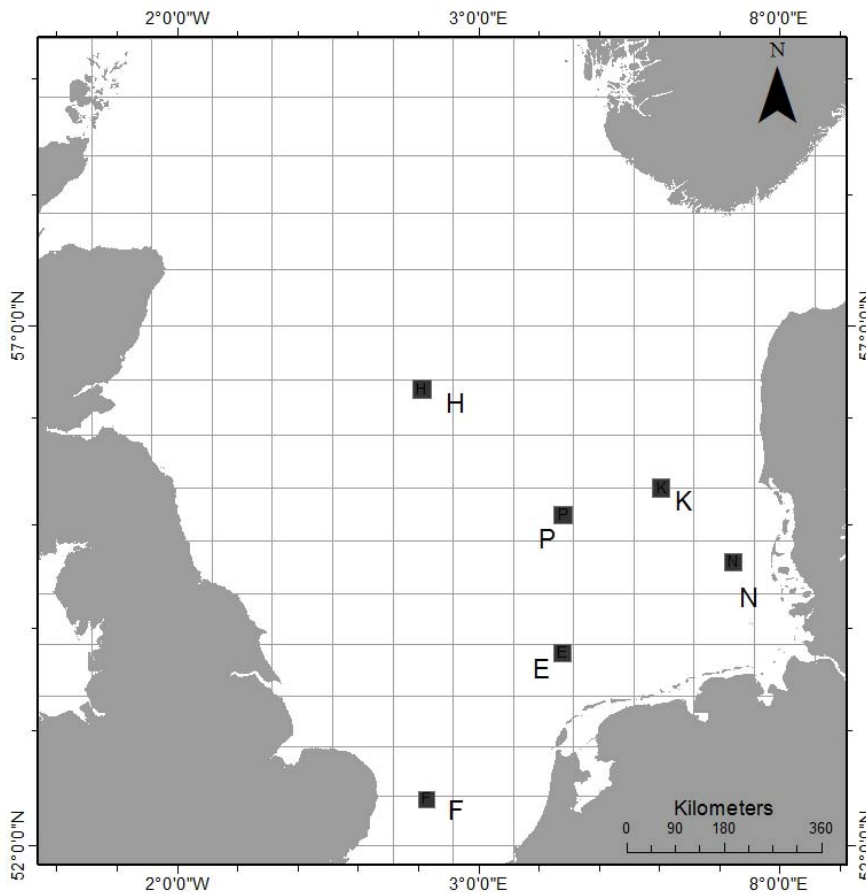


Fig. 1: Positions of German small scale bottom trawl survey “boxes” (10 x 10 nm) monitored by the research vessel „Solea” during cruise no. 691. With ICES rectangles (30 x 30 nm).

**Tab. 1: Activities (stations) during the cruise SB 691**

area	KJH hauls	CTD	RAMSES
Box N	17	6	6
Box K	18	8	8
Box H	23	9	9
Box P	24	9	9
Box F	21	9	9
Box E	21	9	9
<b>total</b>	<b>124</b>	<b>50</b>	<b>50</b>

**Tab. 2: Total sampling effort (hauls) by the research vessels SA and SB for each box and survey year.**

Year	BOX E	BOX F	BOX H	BOX K	BOX N	BOX P	Total
1990	8	28	-	-	-	-	36
1991	28	28	27	24	-	-	107
1992	28	21	23	19	-	-	91
1993	27	23	25	27	-	-	102
1995	21	25	26	24	-	-	96
1996	28	26	17	28	-	-	99
1997	6	18	25	26	-	-	75
1998	17	20	25	23	-	-	85
1999	10	27	17	30	-	-	84
2000	-	-	-	-	8	-	8
2002	15	17	17	9	-	-	58
2003	15	24	23	24	-	24	110
2004	19	17	23	17	15	16	107
2005	14	16	20	14	20	14	98
2006	-	-	16	24	19	-	59
2007	23	22	24	12	21	16	118
2008	21	22	21	18	21	18	121
2009	24	22	21	15	22	16	120
2010	21	21	21	16	21	14	114
2011	10	-	21	7	21	21	80
2012	21	-	21	7	21	18	88
2013	21	21	21	21	23	18	125
2014	21	21	23	18	17	24	124
<b>Total</b>	<b>398</b>	<b>419</b>	<b>457</b>	<b>403</b>	<b>229</b>	<b>199</b>	<b>2105</b>

## Results

A total of 124 valid 30-min hauls were conducted using the cod hopper trawl equipped with the standard ground gear (20cm rubber discs in the ground rope) to monitor changes in species compositions of the 6 boxes. In addition to fishing, in each box a maximum of 9 stations were sampled with CTD and the RAMSES device was deployed.

Fig. 1 shows the area of investigation. Examples of a depth profile and an intensity-wavelength-plot measured with RAMSES-ACC-VIS - Hyperspectral UV-VIS Irradiance Sensor - 320 - 950 nm are presented below (Fig. 2 and Fig. 3).

The mean species compositions of each box and the variability within the time period are shown in Figs. 4 to 9. In Figure 10 the temporal trend in the mean diversity of a 30 min haul is shown for each box. The Shannon-Weaver-Index was calculated on the bases of annual mean cpue (kg/ 30min); (excluding crustaceans, squids and invertebrates) per box. Noticeable is the increased occurrence of spiny spurdog (*Squalus acanthias*) in box H (Fig. 11). 2008 was the last time spurdog was caught in this box and the species was only caught in very low numbers in the years before.



Dr. V. Stelzenmüller

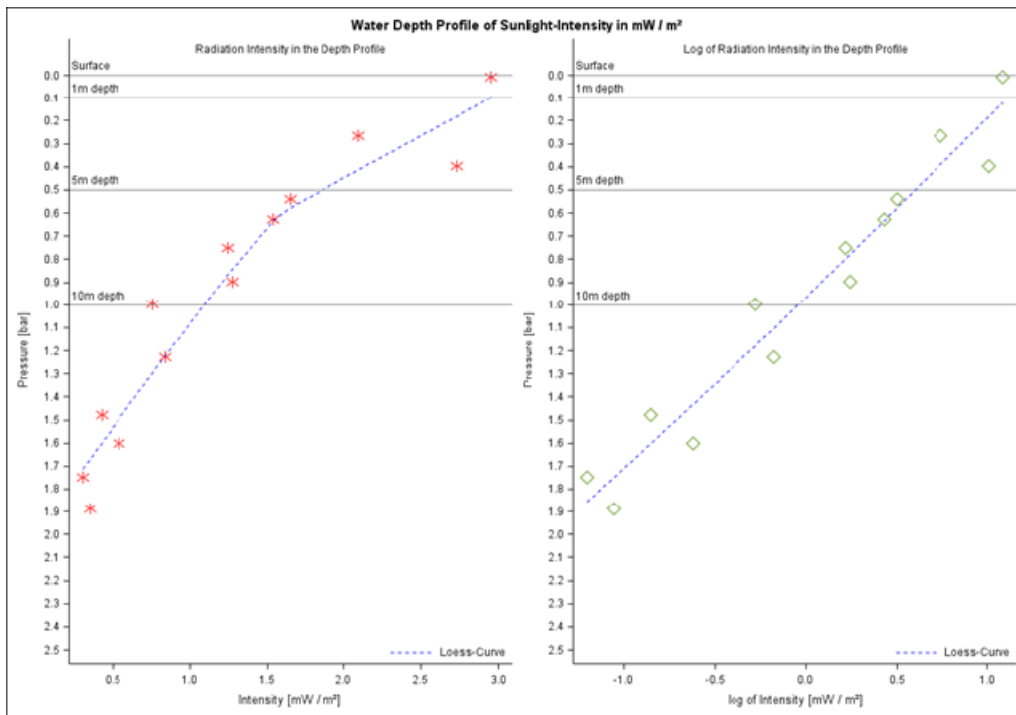


Fig.2: Depth Profile of intensity of solar radiation in  $\text{mW} / \text{m}^2$  (left) and the log-normalized intensity (right) measured with the RAMSES-ACC-VIS at Box F

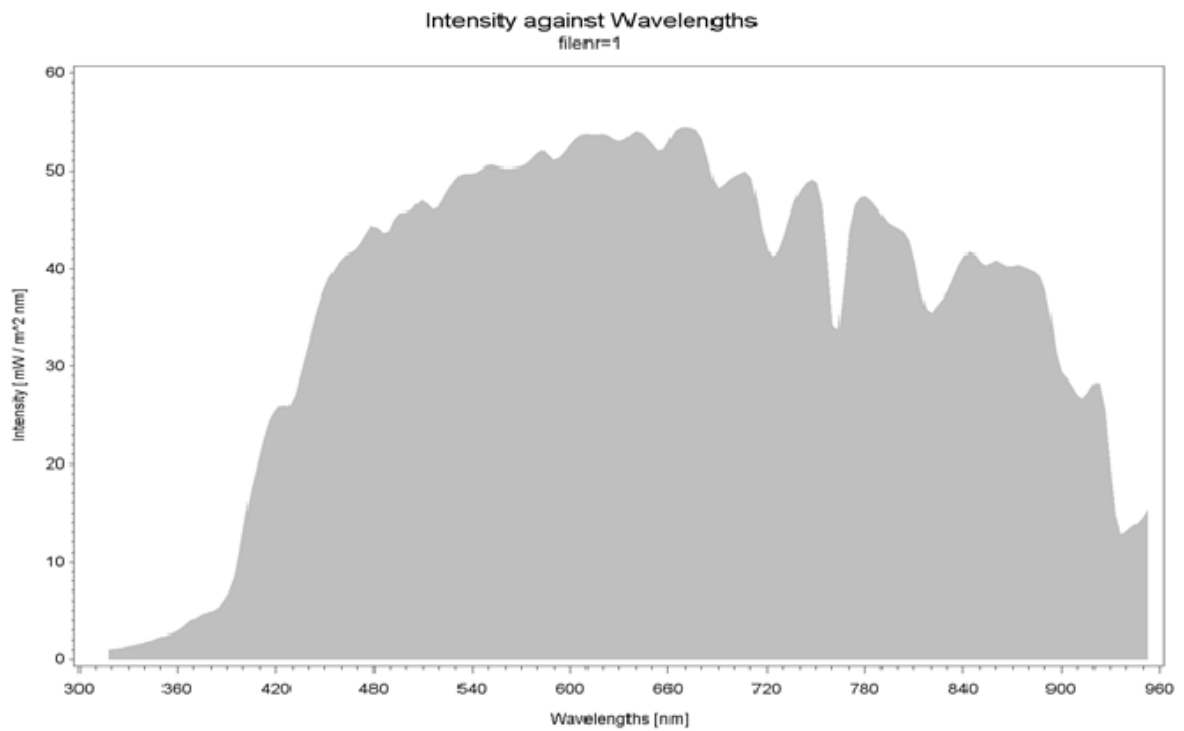


Fig. 3: Intensity Profile over the measured wavelengths at 0.5m depth measured with the RAMSES-ACC-VIS at Box F

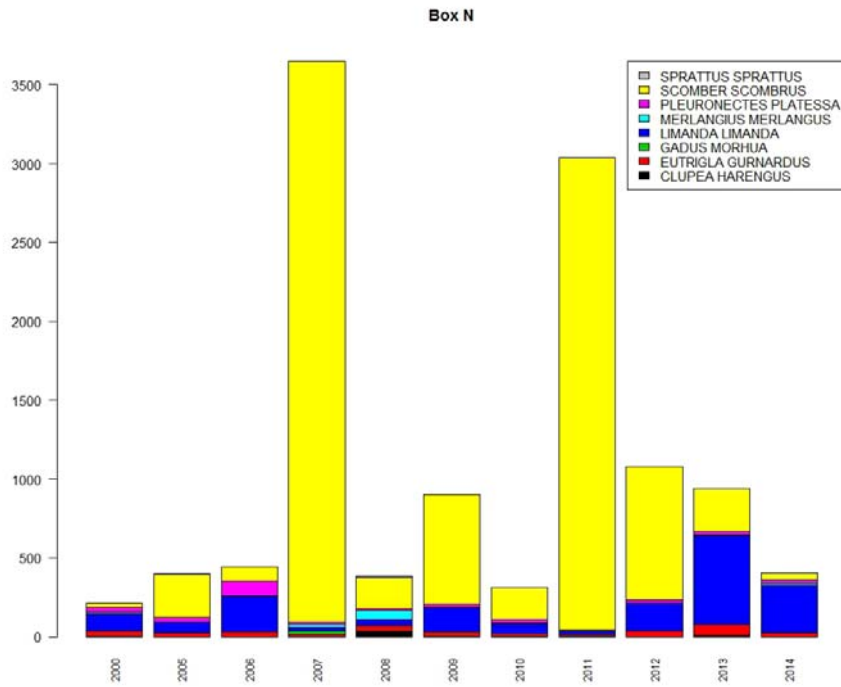


Fig. 4: Total cpue (kg/30 min) of main species from 2000 to 2014 (summer) in Box N (German Bight).

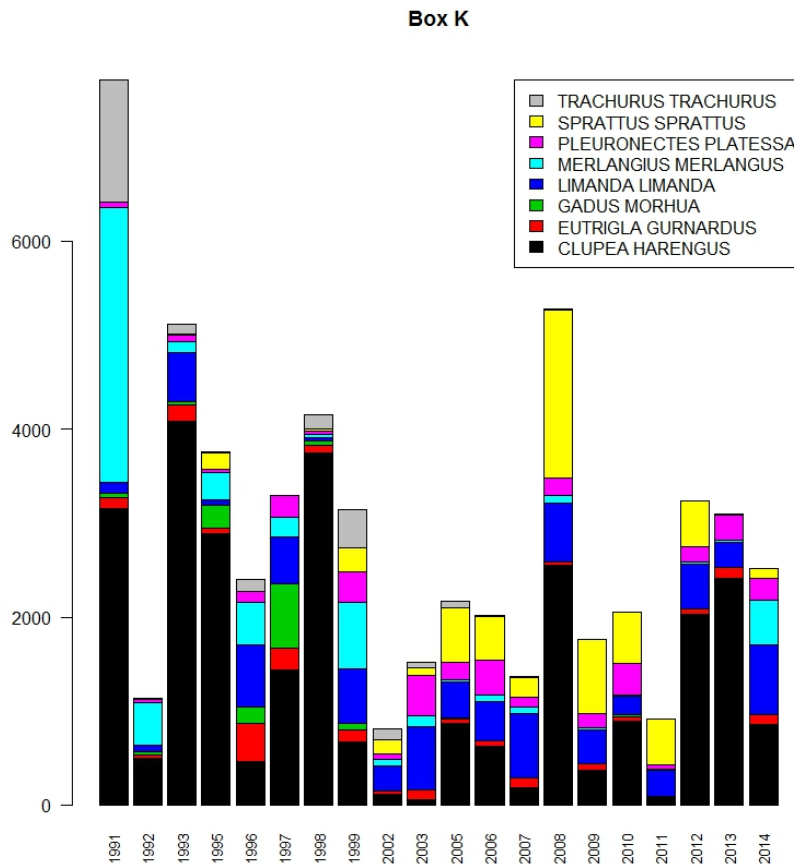


Fig. 5: Total cpue (kg/30 min) of main species from 1991 to 2014 (summer) in Box K (Danish EEZ).

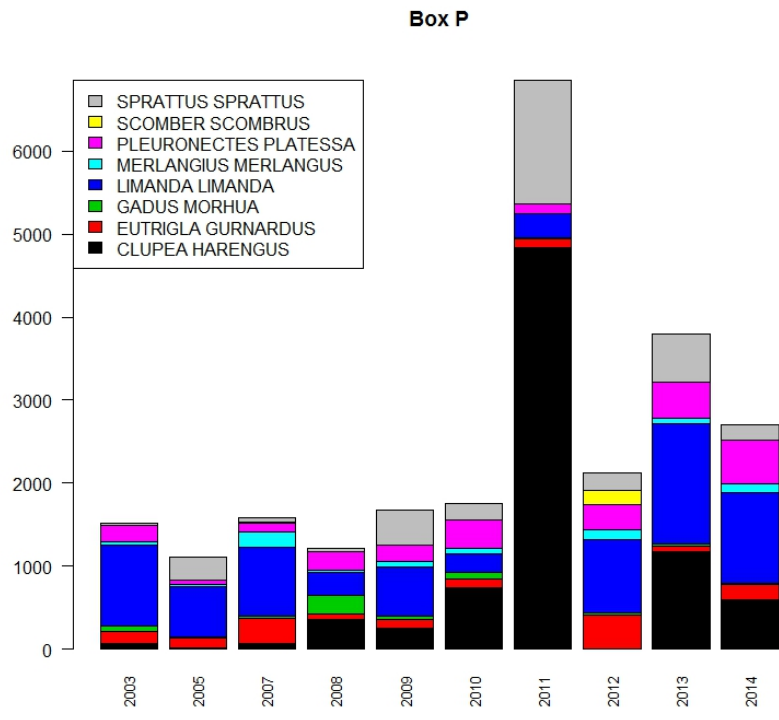


Fig. 6: Total cpue (kg/30 min) of main species from 2003 to 2014 (summer) in Box P (German EEZ).

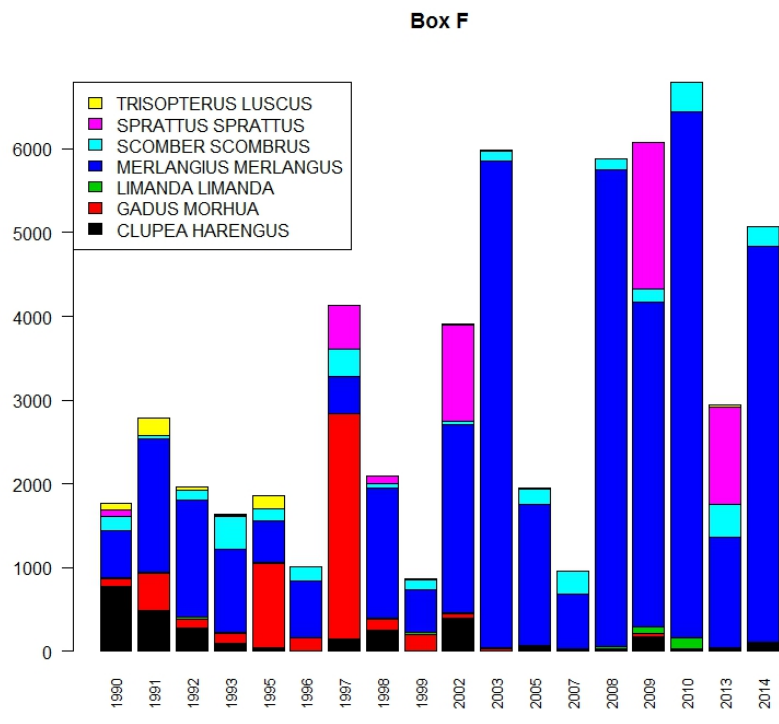


Fig. 7: Total cpue (kg/30 min) of main species from 1990 to 2014 (summer) in Box F (British EEZ; English Channel).

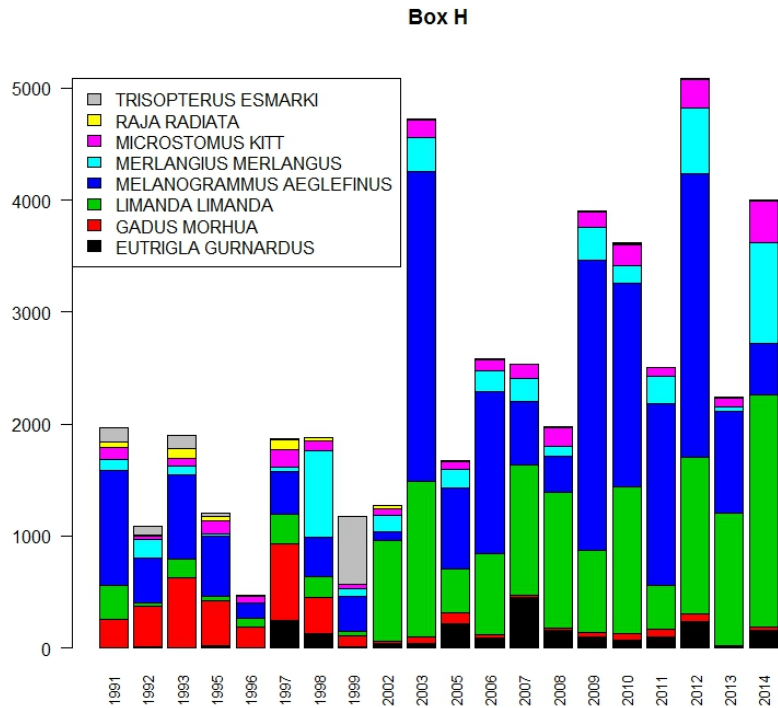


Fig. 8: Total cpue (kg/30 min) of main species from 1991 to 2014 (summer) in Box H (British EZ; central North Sea).

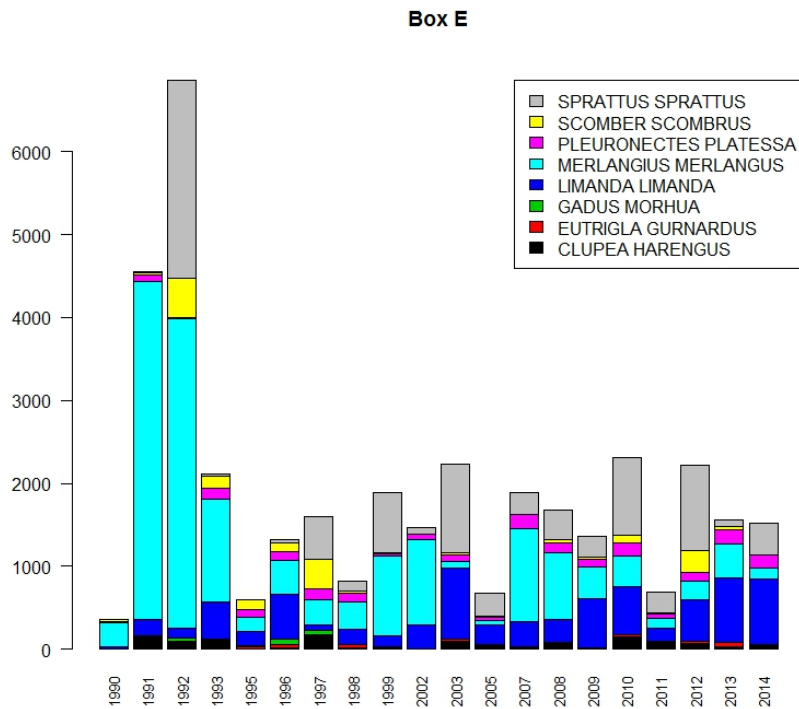


Fig. 9: Total cpue (kg/30 min) of main species from 1990 to 2014 (summer) in Box E (Dutch EEZ).



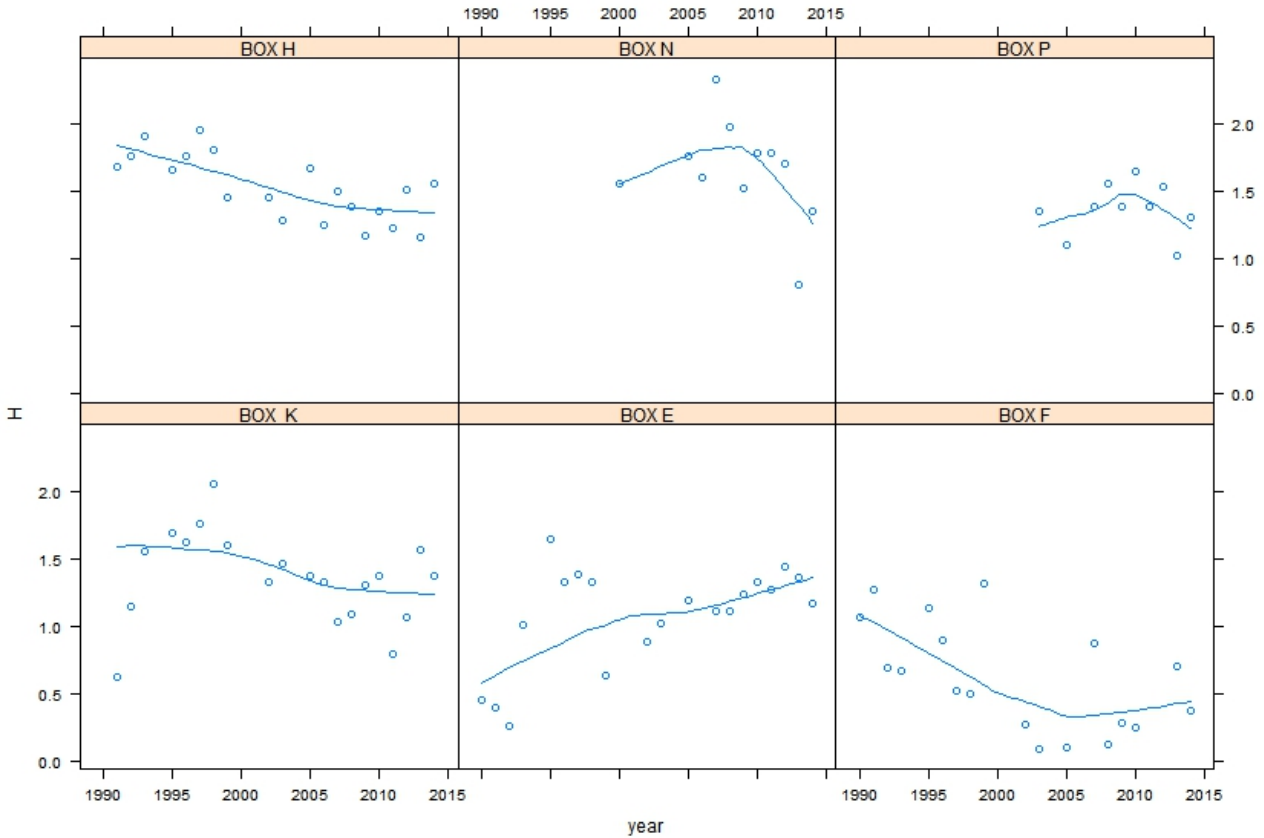


Fig 10: Temporal trends of the Shannon-Weaver-Index of biodiversity calculated on the basis of mean catch (kg/30 min) per species (excluding crustaceans, squids and invertebrates) for each sampling year and GSBTS box.

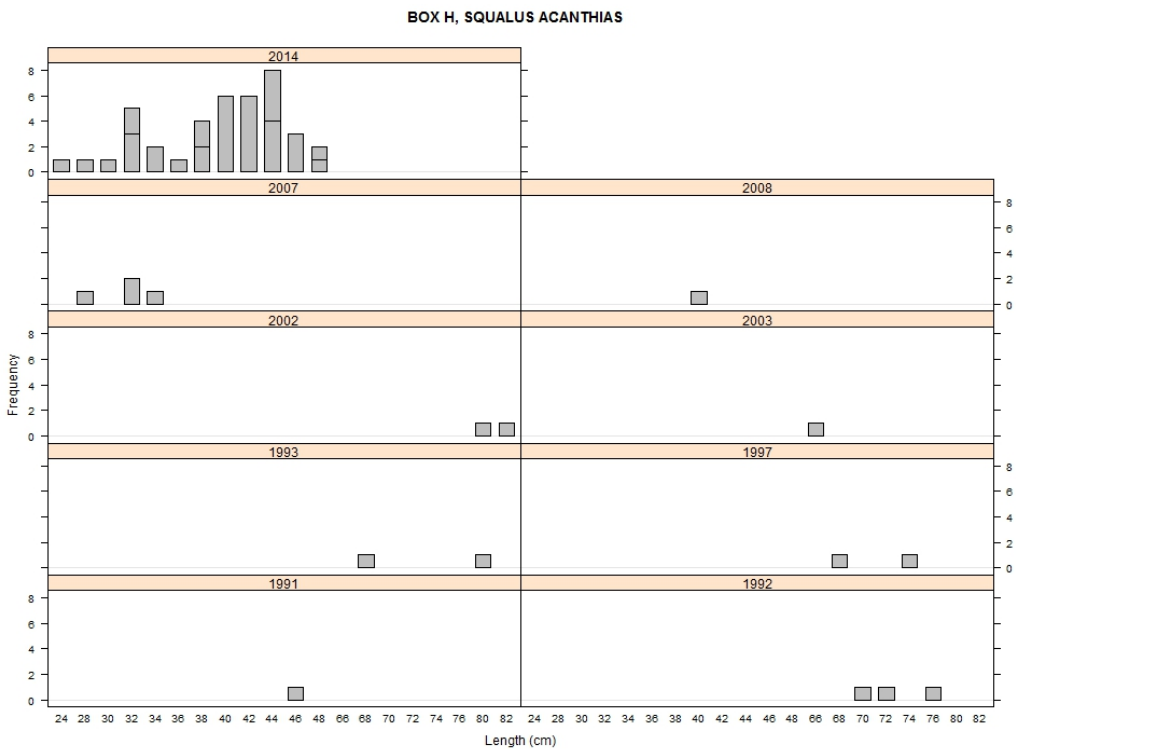


Fig. 11 Length distributions of spurdog (*Squalus acanthias*) in box H 1992 -2014