

9 DEMERSAL *SEBASTES MENTELLA* ON THE CONTINENTAL SHELF

Demersal *S. mentella* on the continental shelves and slopes around the Faeroe Islands, Iceland, and East Greenland is treated as one stock unit and separated from the stock fished in the Irminger Sea (pelagic *S. mentella*, see Chapter 10). It is believed to have a common area of larval extrusion southwest of Iceland, a drift of the pelagic fry towards the nursery areas on relatively shallow waters off East Greenland, and feeding and copulation areas on the shelves and banks around the Faeroe Islands, Iceland, and East-Greenland. The main fishing grounds are in Icelandic waters.

9.1 Landings and Trends in the Fisheries

The total annual landings of demersal *S. mentella* from Divisions Va and Vb, and Sub-areas VI and XIV varied between 20 000 and 84 000 t in 1978-1994 (Table 9.1.1 and Figure 9.1.1). Since 1994, landings gradually decreased and in 2001 and 2002 annual landings were 24 000 t. Landings in 2003 increased by about 7 000 t from 2002 and was mainly due to increased landings from Va. Landings in 2004 were 22 000 t, which was the lowest landings recorded since 1978.

In Division Va, annual landings gradually decreased from a record high of 57 000 t in 1994 to 17 000 t and 19 000 t in 2001 and 2002 respectively. Landings in 2003 increased by an amount of 10 000 t and to 28 500 t, but decreased again in 2004 to 18 000 t (Table 9.1.1 and Figure 9.1.1). Most of the catches are taken by bottom trawlers along the shelf west, southwest, and southeast of Iceland at depths between 500 and 800 m (Figure 9.1.2). The fraction of demersal *S. mentella* catches taken by pelagic trawls has been varying since 1993, ranging between 0% in 2004 and 23% in 1994 (average 12%). The catches in the third and fourth quarter of the year decreased considerable in 2001 and 2002 compared with earlier years (Figure 9.1.3). The reason for this decrease seems to be associated with decreased effort at that time of the year. The catch pattern by month changed considerably in 2003. The catches peaked in July, which was unusual compared with other years (Figure 9.1.3). This pattern is probably associated with the pelagic *S. mentella* fishery within the Icelandic EEZ (see Figure 10.1.3). The pelagic *S. mentella* fishery has in recent years moved more northwards, and in 2003 it merged with the demersal *S. mentella* fishery on the redfish line in July (Figure 10.1.4). When the pelagic *S. mentella* crossed the redfish line it was recorded as demersal *S. mentella* and caught with bottom trawls resulting in increased landings in 2003 (Figures 10.1.5 and 10.1.6). The catches in the third and fourth quarter of 2004 are similar as in 2001 and 2002. Length distributions of demersal *S. mentella* from the bottom trawl fishery show an increase in the number of small fish in the catch 1994-2003 compared to 1989-1993 (Figure 9.1.4). A peak of about 32 cm in 1994 can be followed by approximately 1 cm annual growth in 1996-2002. The fish caught in 2004 peaked around 37 cm and are on average bigger than in 2003.

In Division Vb, landings of demersal *S. mentella* were 4 000 t in 2004, which is a considerable increase compared to 2002 and 2003 (Table 9.1.1 and Figure 9.1.1). The record high was reported in 1986 as 15 000 t. Length distributions from the landings in 2001-2003 indicate that the fish caught are on average larger than 40 cm (Figure 9.1.5).

In Subarea VI, the annual landings varied between 200 t and 1 100 t in 1978-2000 (Table 9.1.1 and Figure 9.1.1). The landings from VI in 2004 were negligible and only 6 t were landed, which is the lowest recorded since 1978.

In Subarea XIV, the annual demersal *S. mentella* landings have decreased drastically. In 1980-1994, landings varied between 2 000 and 19 000 with the lowest landings in 1989 and the

highest in 1994 (Table 9.1.1 and Figure 9.1.1). In the following three years, the annual landings were less than 1 000 t and the redfish was mainly caught as bycatch in the shrimp fishery. In 1998, Germany started a directed fishery for redfish with annual landings around 1 000 t in 1998-2001, but landings increased to 1 900 t in 2002. Samples taken from the German fleet indicated that substantial quantities of the redfish caught, especially in 2002, were juveniles, i.e. fish less than 30 cm (Figure 9.1.6). There was very little demersal *S. mentella* fishery in XIV in 2003 and 2004, and 348 t and 38 t were landed from that area, respectively.

The table below shows the 2004 biological sampling from the catch and landings of demersal *S. mentella* from the continental selves divided by ICES Division and nation. No biological samples were taken in sub-area XIV in 2004.

AREA	NATION	LANDINGS	NOS. SAMPLES	NOS. FISH MEASURED
Va	Iceland	17,883	110	18,687
Vb	Faeroe Islands	3,931	16	3,166

9.2 Assessment

9.2.1 CPUE indices

Data used to estimate CPUE for demersal *S. mentella* in Division Va 1986-2004 were obtained from log-books of the Icelandic trawl fleet. Only bottom trawl tows taken below 500 m depth were used and where *S. mentella* composed at least 50% of the total catch in each tow. Indices of CPUE were estimated from this data set using a GLM multiplicative model (generalized linear models). This model takes into account changes in vessels over time as well as difference in vessel size, area (ICES statistical square), and month and year effects.

From 1986 to 1989 CPUE in Division Va was relatively stable, but gradually decreased from 1989 to a record low in 1994 (Figure 9.1.7). From 1995 to 2000, CPUE slightly increased annually, but has since then been fairly stable. From 1991 to 1994, when CPUE decreased, the fishing effort increased drastically. From 1995 effort decreased between 10% and 20% each year to 2001. Since 2001 the effort has varied. ICES recommended 25% annual reduction in fishing effort during the same time period. Effort increased by about 12% between 2001 and 2002, by about 40% between 2002 and 2003, but decreased by about 35% between 2003 and 2004.

Non-standardized CPUE indices in Division Vb for demersal *S. mentella* were obtained from the Faeroese otterboard (OB) trawlers > 1000 HP towing deeper than 450 m and where demersal *S. mentella* composed at least 70% of the total catch in each tow. The OB trawlers have in recent years landed about 50% of the total demersal *S. mentella* landings from Vb. CPUE for the OB trawlers decreased from 500 kg/hour in 1991 to of 300 kg/hour in 1993 and has, since then, been at this level (Figure 9.1.8). Fishing effort decreased between 2001 and 2003, but increased in 2004.

Non-standardized CPUE data from Division XIV were available from 1998 to 2002 when the German fleet fished for *S. mentella* by Germany along the continental slope of East Greenland. CPUE decreased between 1998 and 1999, but increased since then annually. No CPUE and effort data were available from sub-area XIV in 2003 and 2004, as there was no effort exerted by the German fleet.

9.2.2 Survey indices

The German survey conducted on the continental shelf of West and East Greenland since 1985 cover only the distribution of juvenile demersal *S. mentella* (recruits). The results indicate that juveniles are most abundant off East Greenland, while a negligible part of juveniles is distributed off West Greenland (Figure 9.2.1). Figure 9.2.1 shows that the abundance was dominated

by a single strong year class recorded for the first time in 1987 at a mean length of 20 cm. Annual growth of this cohort was about 2 cm and fully recruited to the survey gear in 1997 at a length of about 27 cm, when abundance and biomass reached its maximum (total abundance estimated 7 billion individuals and biomass 1.5 million tons). This year class seems to have left the survey area in the following years. The abundance and biomass in 2003 and 2004 further recruiting year-classes (Figures 9.2.2 and 9.2.3). The juveniles observed at East and West Greenland will probably recruit to some extent to the demersal stock on the shelves of Greenland, Iceland and Faeroes Islands and partly to the pelagic stock as well (Stransky 2000). Juvenile demersal *S. mentella* are not observed in the spring and autumn surveys in Icelandic waters and in the surveys conducted in Faeroese waters.

The Greenland halibut survey conducted on the continental shelf and slope of East Greenland 1998-2004 covers depths from 400 m down to 1 500 m (WD 11). Although relatively short survey series the trends in abundance and biomass have varied with the highest estimates in 1999 and lowest in 2002 (Figure 9.2.4). The highest densities are at depth stratum 401-600 m with the remaining densities at depth stratum 600-800 m. The length distribution in 2002-2004 are dominated by 20-25 cm fish (Figure 9.2.4) and length increases both by depth and from north to south.

The Icelandic autumn survey on the continental shelf and slope in Va 2000-2004, covering depths down to 1200 m, shows that the fishable biomass index of demersal *S. mentella* increased between 2000 and 2001, but since then there has been a considerable decrease (Figure 9.2.5). Note the large measurement error in 2001. This large measurement error is caused by one tow accounting for a large part of the total amount caught. The biomass index in 2003 was the lowest measured, but the index increased in 2004 and was similar as it was in 2002. Because there may high variance in the estimates and because the time series of the survey is short, it may be difficult use such data to explain any trend in biomass in the short term. The length of the demersal *S. mentella* in the autumn survey is between 30 and 47 cm with a modes ranging between 36-39 cm (Figure 9.2.6).

The Faeroes summer survey in Division Vb shows up to five-fold decrease in the catch rate from 1996 to 2004 or from about 10 kg/hour to about 2 kg/h (except in 1999 when the catches were over 10 kg/h) (Figure 9.2.7). The spring survey in the same area has varied more between 1994 and 2005 ranging between 2 kg/h and 6 kg/h (Figure 9.2.7). However, the surveys are mainly designed for species inhabiting depths down to 500 m and do not cover the entire vertical distribution of demersal *S. mentella*.

9.3 State of the stock

The Group concludes that the state of the stock is stable on a low level. With information at hand, current exploitation rates can not be evaluated for the demersal *S. mentella* sub-areas V and XIV.

The fishable biomass index of *S. mentella* in Va from the Icelandic autumn survey shows that the biomass index for 2002-2004 has been relatively stable on a lower level than in earlier years. In Division Vb, there is no reliable survey information available on fishable biomass. In sub-area XIV, the Greenlandic survey designed for Greenland halibut suggests stable demersal *S. mentella* biomass in survey period 1998-2004. Standardised CPUE indices in Division Va show a reduction from highs in the late 1980s, but there is an indication that the stock has started a slow recovery since the middle of 1990s, when CPUE was close to 50% of the maximum. The CPUE index has been increasing since 1995. In Division Vb development in CPUE resembles that in Division Va, i.e., the CPUE have stabilised close to the 50% of the maximum in the time series.

Recently, good recruitment has been observed on the East Greenland shelf (growth of about 2cm/yr) which is assumed to contribute to both the demersal and pelagic stock at unknown shares.

9.4 Biological reference points

There are no biological reference points for the species. Previous reference points established were based upon commercial CPUE indices, but are now considered to be unreliable indicators of stock size. ICES has withdrawn these reference points.

9.5 Management considerations

S. mentella is a slow growing, late maturing deep-sea species and is therefore considered vulnerable to overexploitation and advice has to be conservative.

The CPUE has been stable on a low level during recent years. It is, however, not known to what extent CPUE series reflect change in stock status of demersal *S. mentella*. The fishery is focusing on aggregations.

The landings decreased in Division Va between 2003 and 2004 by about 10 000 t and were considerable lower than the set quota of 22 000 t. The likely explanation for this decrease in the demersal *S. mentella* fishery and not fishing out the set quota is due to decreased effort. .

It should be noted that Icelandic authorities give a joint quota for *S. marinus* and *S. mentella*. The working group reiterates its recommendation that the TAC of *S. marinus* **should be given separately**. There is a strong indication that *S. mentella* and *S. marinus* in Va are spatially separated and therefore, separate quotas for these species can be given.

Bycatches of juvenile demersal *S. mentella* in the shrimp fishery off East Greenland can not be quantified at present but are assumed to be considerably high (see chapter 7.3). The Working Group recommends, however, a maximum protection of the juveniles in Division XIV.

Table 9.1.1 Nominal landings (tonnes) of demersal *S. mentella* on the continental shelf and slopes 1978-2004, divided by ICES Division.

Year	ICES DIVISION					Total
	Va	Vb	VI	XII	XIV	
1978	3 902	7 767	18	0	5 403	17 090
1979	7 694	7 869	819	0	5 131	21 513
1980	10 197	5 119	1 109	0	10 406	26 831
1981	19 689	4 607	1 008	0	19 391	44 695
1982	18 492	7 631	626	0	12 140	38 889
1983	37 115	5 990	396	0	15 207	58 708
1984	24 493	7 704	609	0	9 126	41 932
1985	24 768	10 560	247	0	9 376	44 951
1986	18 898	15 176	242	0	12 138	46 454
1987	19 293	11 395	478	0	6 407	37 573
1988	14 290	10 488	590	0	6 065	31 433
1989	40 269	10 928	424	0	2 284	53 905
1990	28 429	9 330	348	0	6 097	44 204
1991	47 651	12 897	273	0	7 057	67 879
1992	43 414	12 533	134	0	7 022	63 103
1993	51 221	7 801	346	0	14 828	74 196
1994	56 720	6 899	642	0	19 305	83 566
1995	48 708	5 670	536	0	819	55 733
1996	34 741	5 337	1 048	0	730	41 856
1997	37 876	4 558	419	0	199	43 051
1998	33 125	4 089	298	3	1 376	38 890
1999	28 590	5 294	243	0	865	34 992
2000	31 393	4 841	885	0	986	38 105
2001	17 230	4 696	36	0	927	23 889
2002	19 045	2 552	20	0	1 903	23 520
2003	28 478	2 114	197	0	348	31 137
2004 ¹⁾	17,584	3 931	6	0	38	21 559

1) Provisional

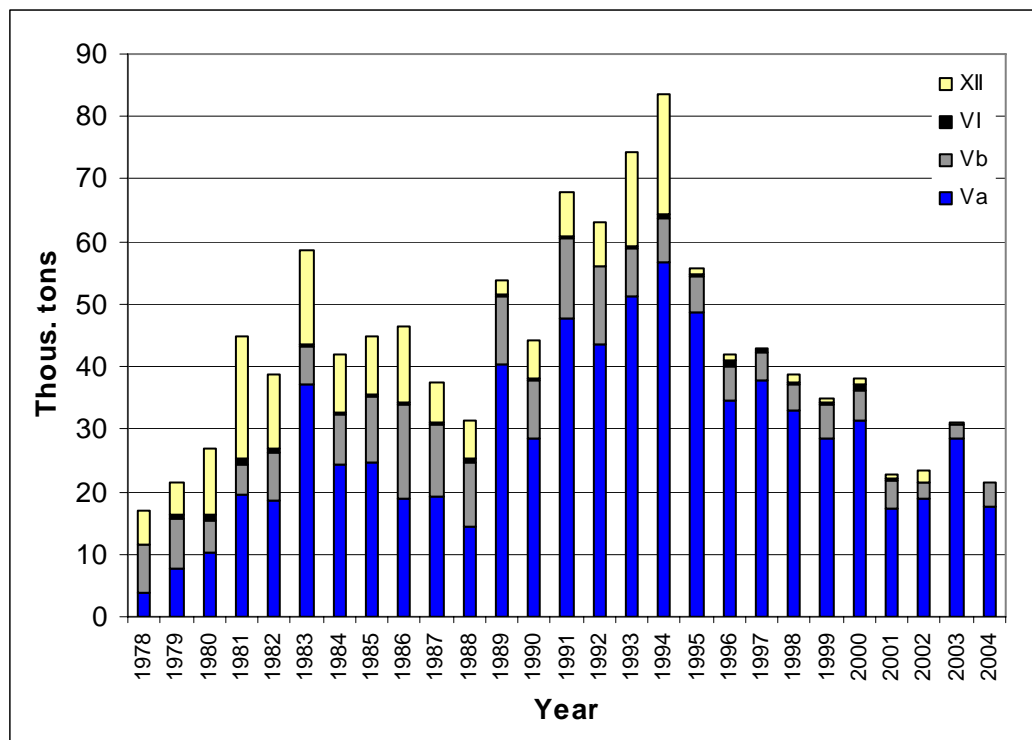


Figure 9.1.1 Nominal landings of demersal *S. mentella* (in tonnes) from ICES Divisions Va, Vb, VI and XII 1978-2004.

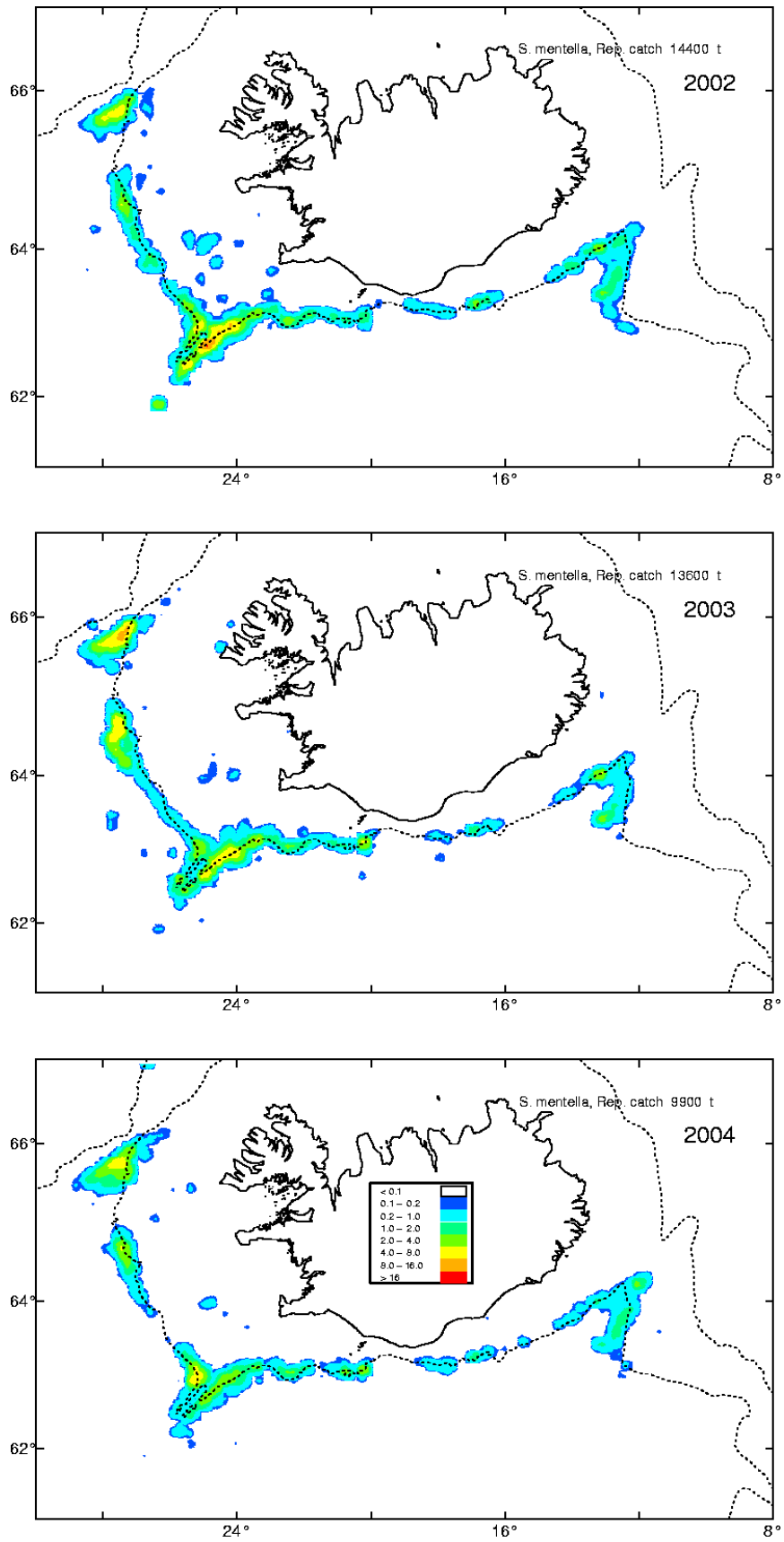


Figure 9.1.2 Geographical location of the demersal *S. mentella* catches in Icelandic waters 2002-2004 as reported in log-books of the Icelandic bottom trawl fleet. The dotted line represents the 1000 m isobaths.

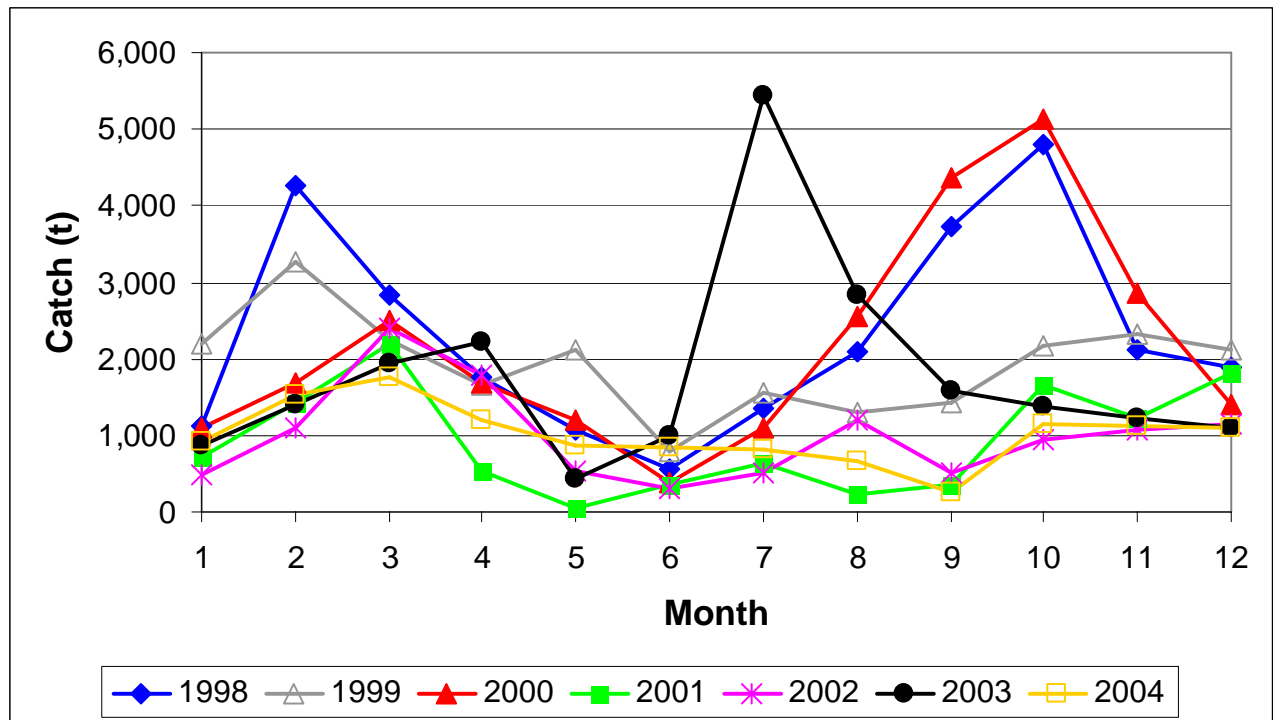


Figure 9.1.3 Nominal landings of demersal *S. mentella* (in tonnes) in Icelandic waters (ICES Division Va) of the Icelandic bottom trawl fleet 1998-2004, divided by month.

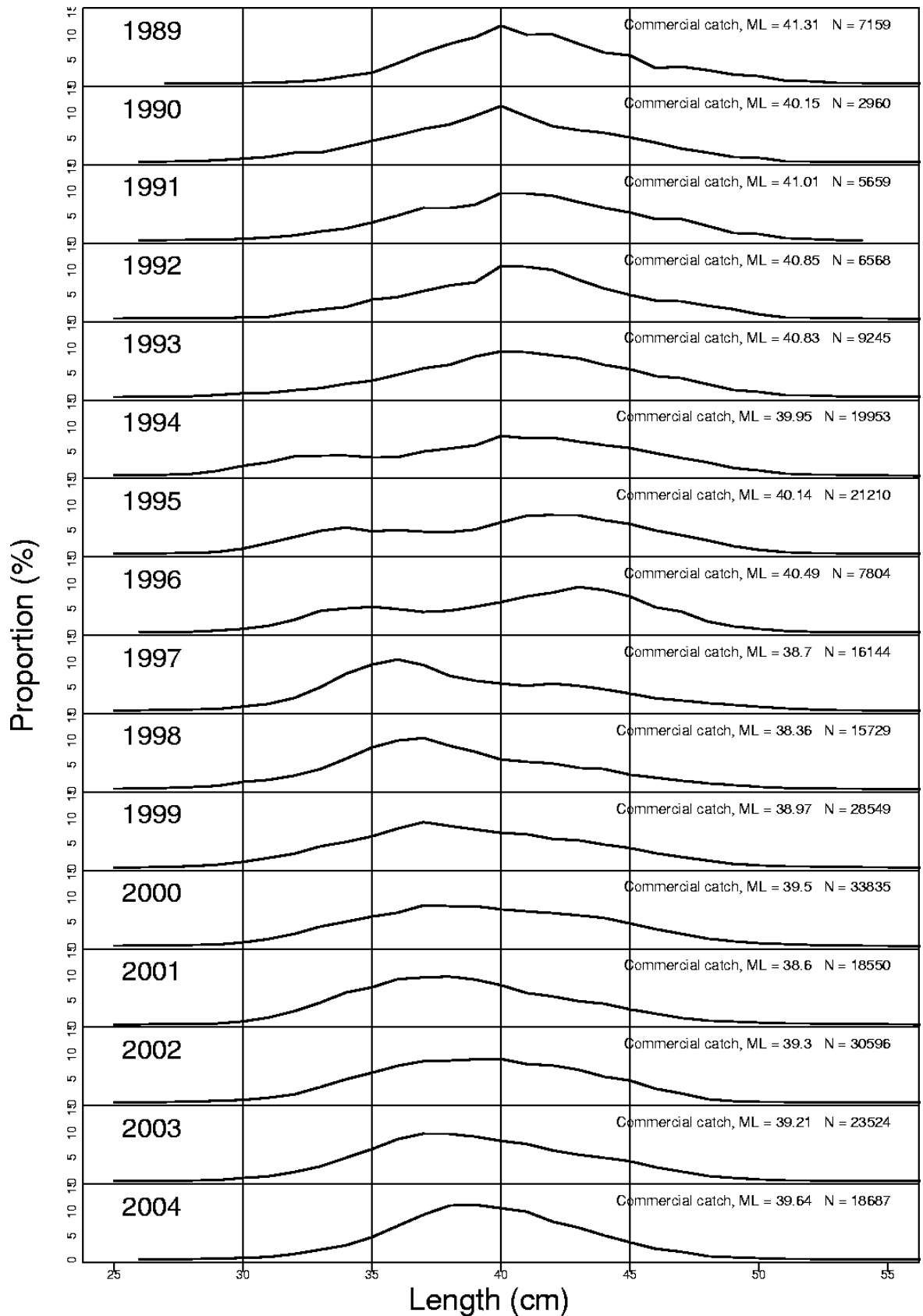


Figure 9.1.4 Length distributions of demersal *S. mentella* from the Icelandic bottom trawl catch and landings in Division Va 1989-2004.

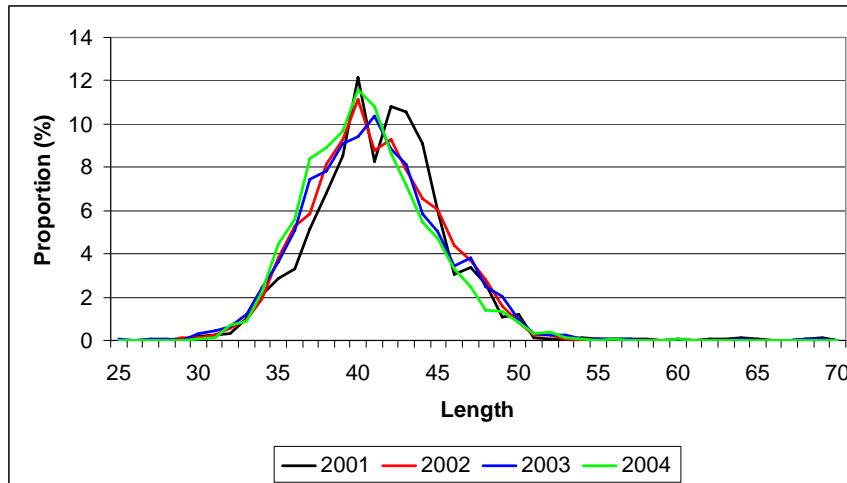


Figure 9.1.5 Length distribution of demersal *S. mentella* from landings of the Faeroese fleet in Division Vb 2001-2004.

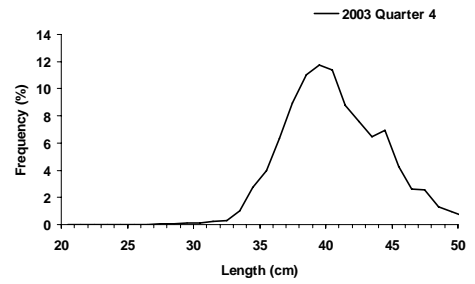
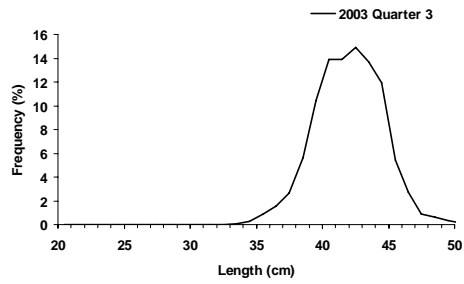
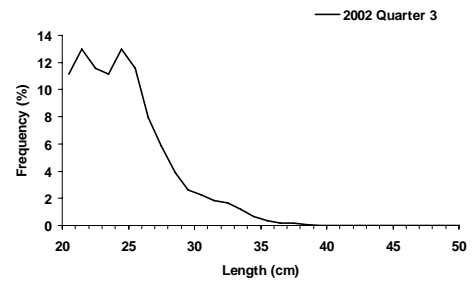
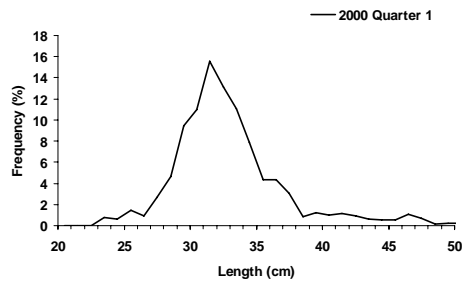
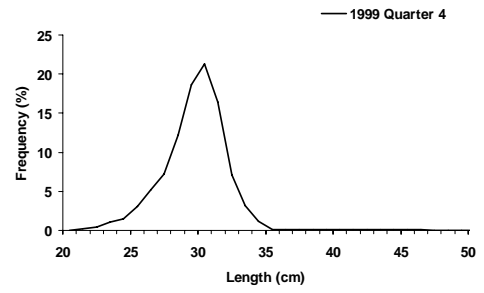
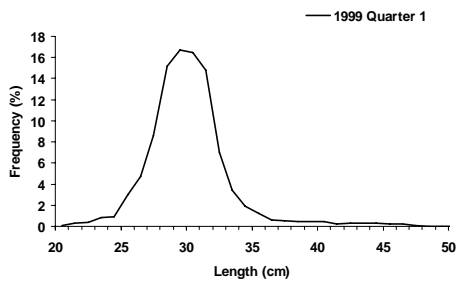


Figure 9.1.6 Length distribution of demersal *S. mentella* of the German commercial landings in Division XIV 1999-2003, divided by quarters.

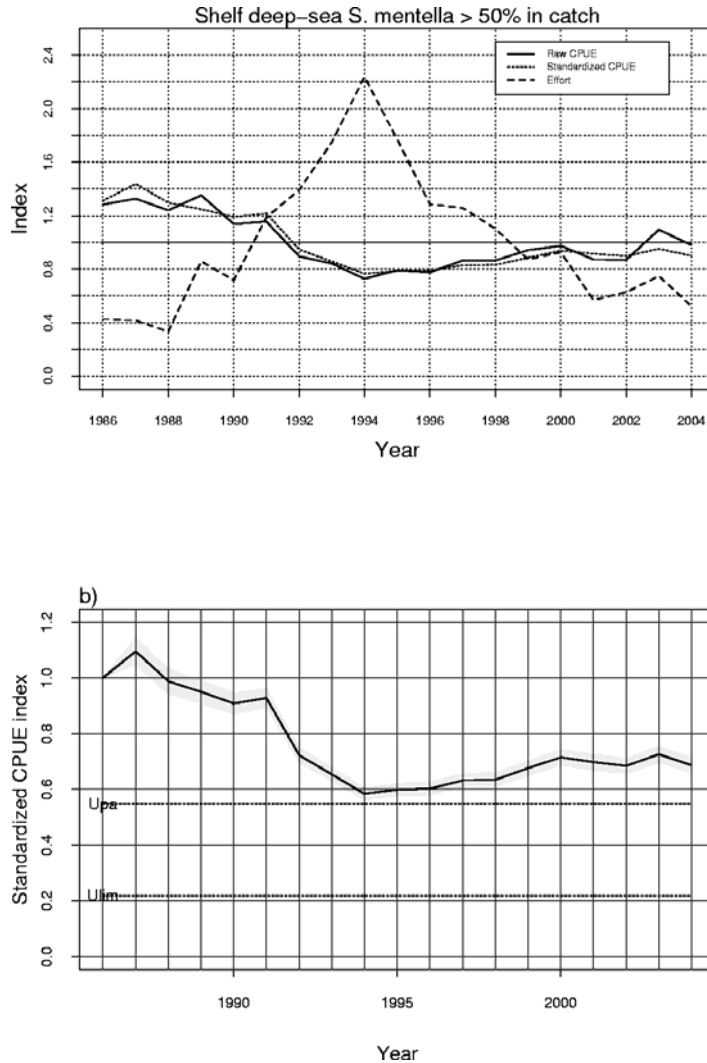


Figure 9.1.7 CPUE indices, relative to 1986, of demersal *S. mentella* from the Icelandic bottom trawl fishery in Division Va. The CPUE indices are based on a GLM model, based on data from log-books and where at least 50% of the total catch in each tow was demersal *S. mentella*. Also shown is the fishing effort.

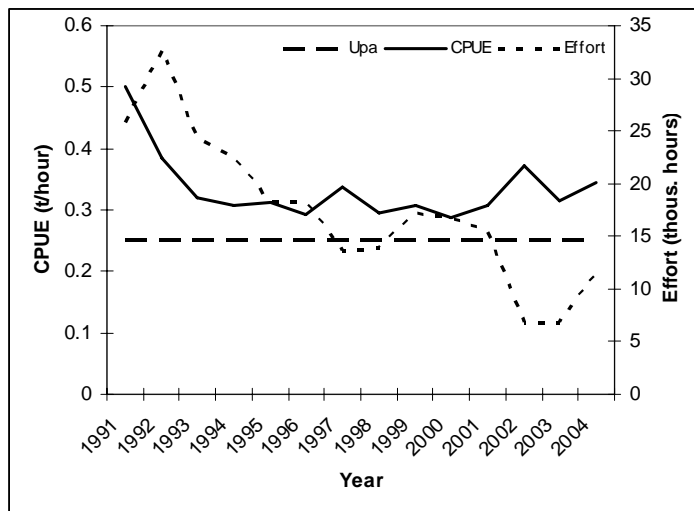


Figure 9.1.8 Demersal *S. mentella*. CPUE (t/hour) and fishing effort (in thousands hours) from the Faeroese CUBA fleet 1991-2004 and where 70% of the total catch was demersal *S. mentella*.

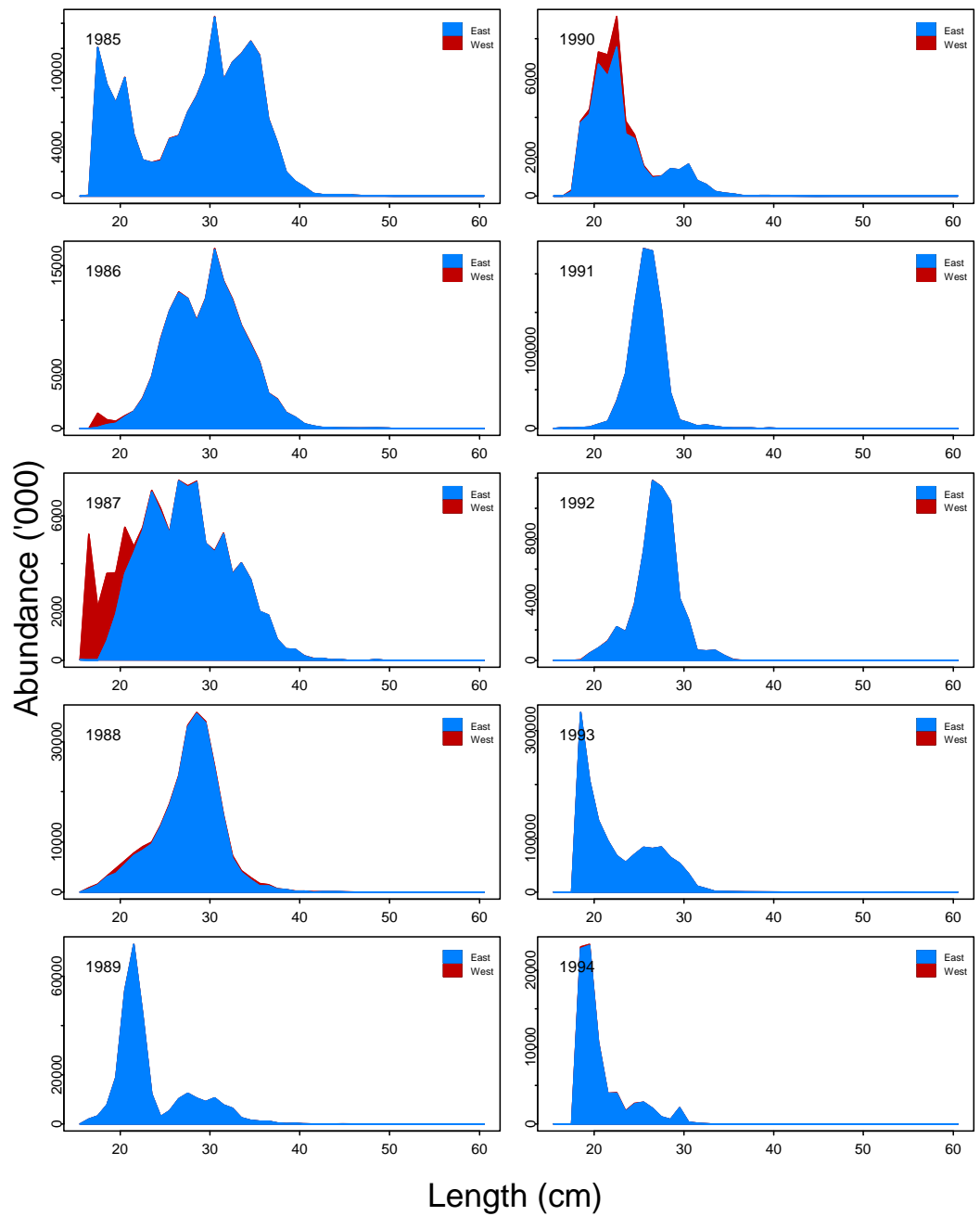


Figure 9.2.1 Demersal *S. mentella* (15-35 cm) on the continental shelves off West- and East-Greenland. Length composition off Greenland is derived from the German and groundfish survey 1985-2004. Note different scale on y-axis.

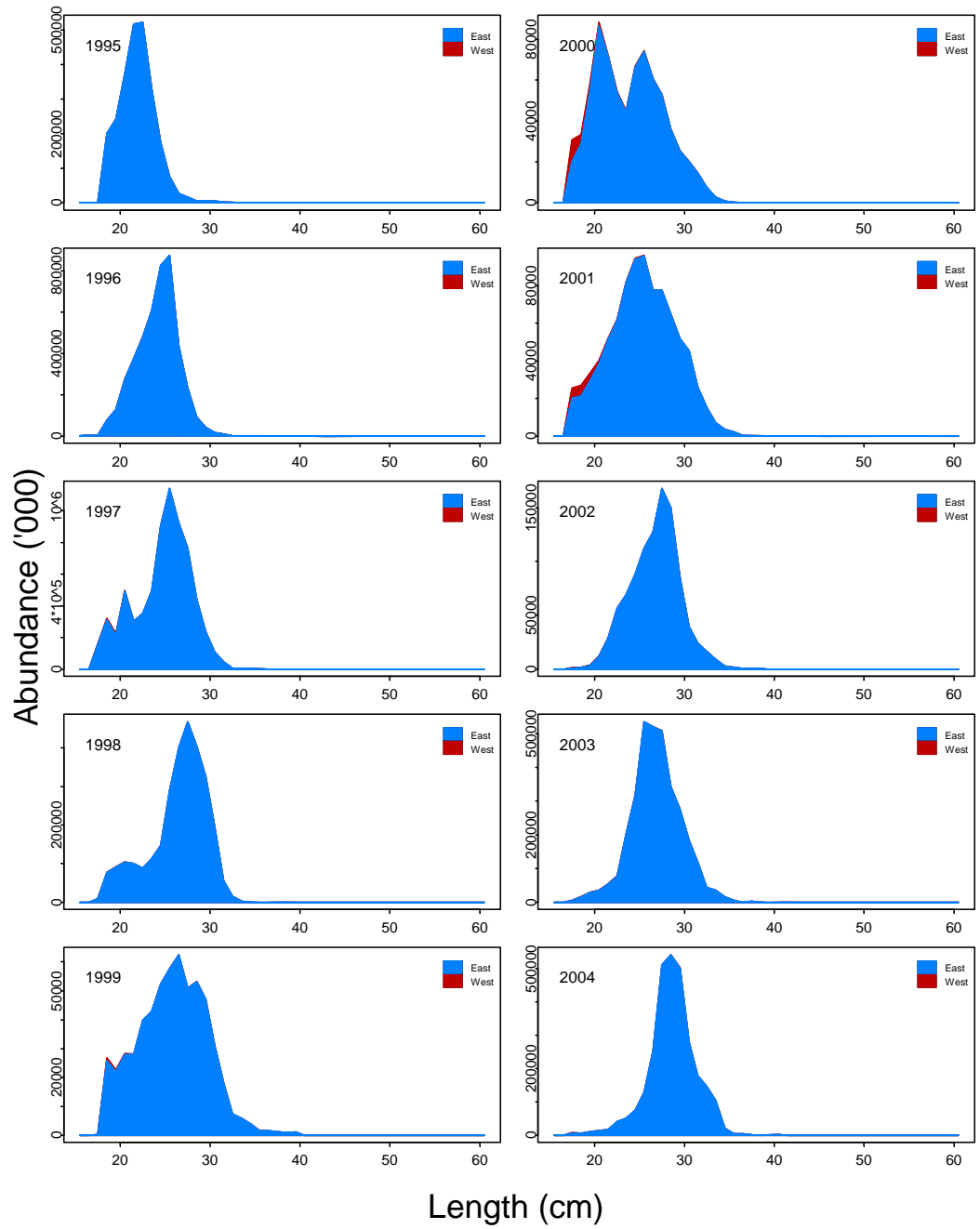


Figure 9.2.1 Continued.

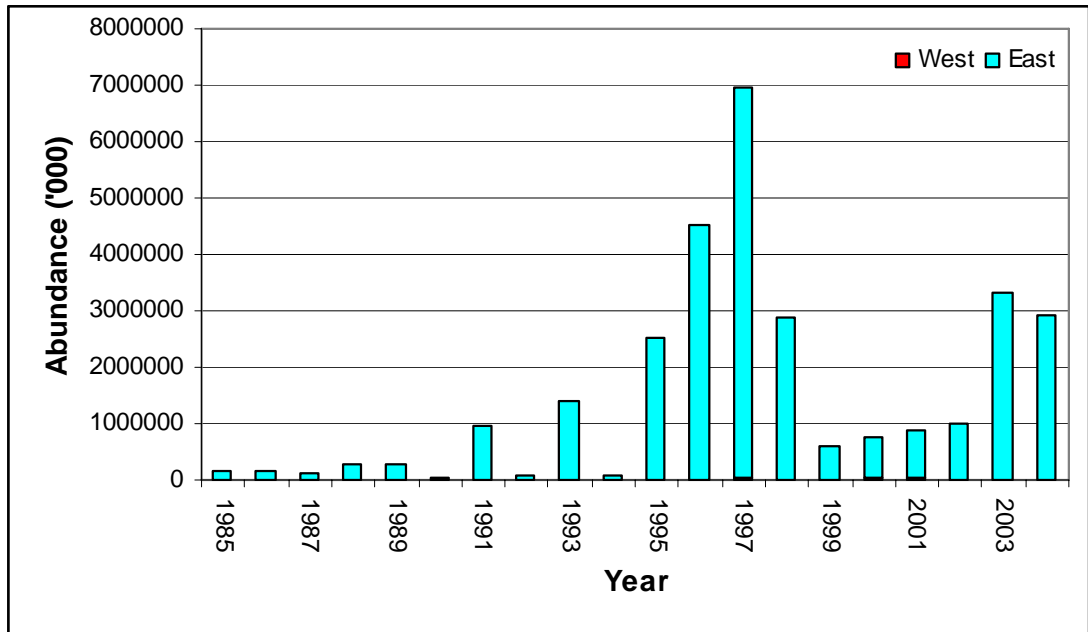


Figure 9.2.2 Demersal *S. mentella* (≥ 17 cm) on the continental shelf. Survey abundance indices for East and West Greenland derived from the German groundfish survey 1985–2004.

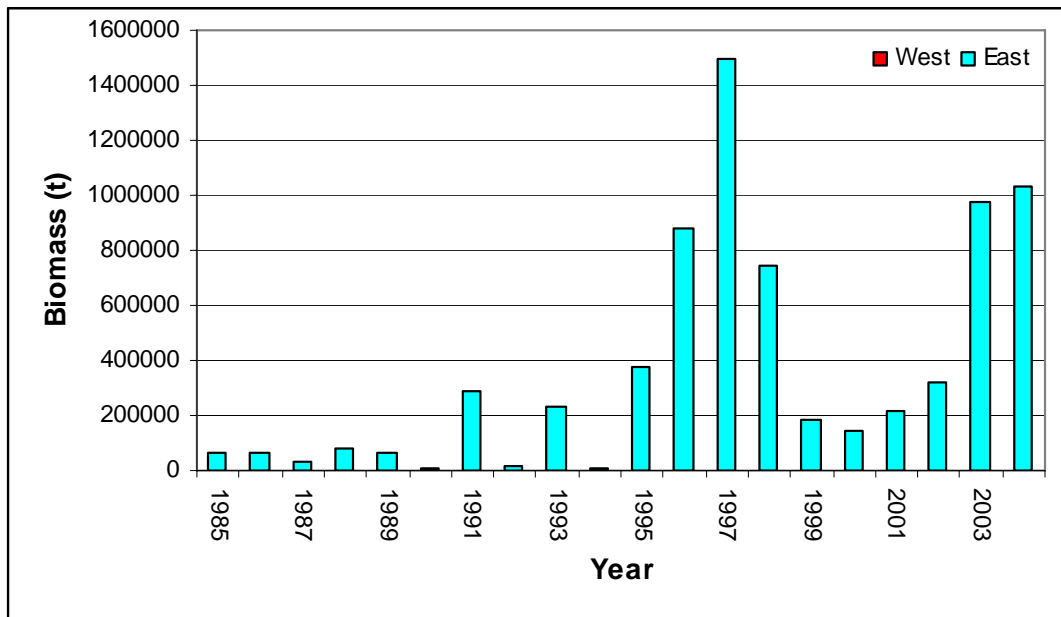


Figure 9.2.3 Demersal *S. mentella* (≥ 17 cm) on the continental shelf. Survey biomass indices for East and West Greenland from the German groundfish surveys 1985-2004.

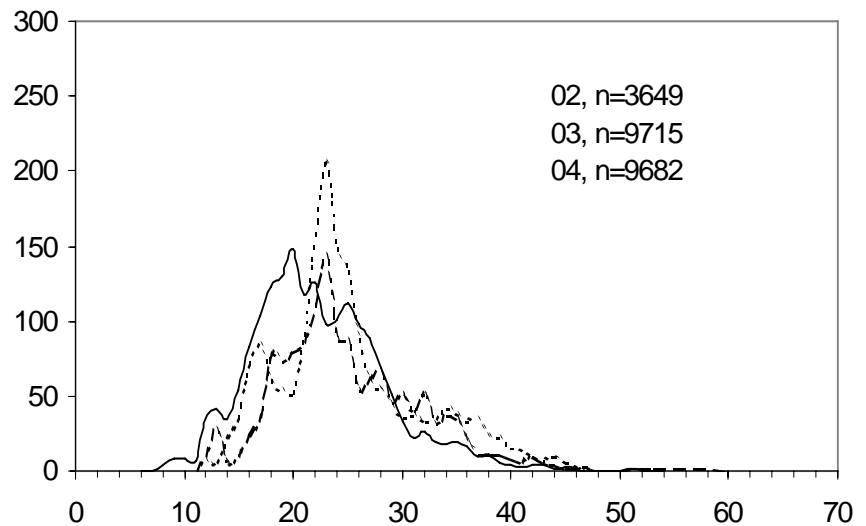
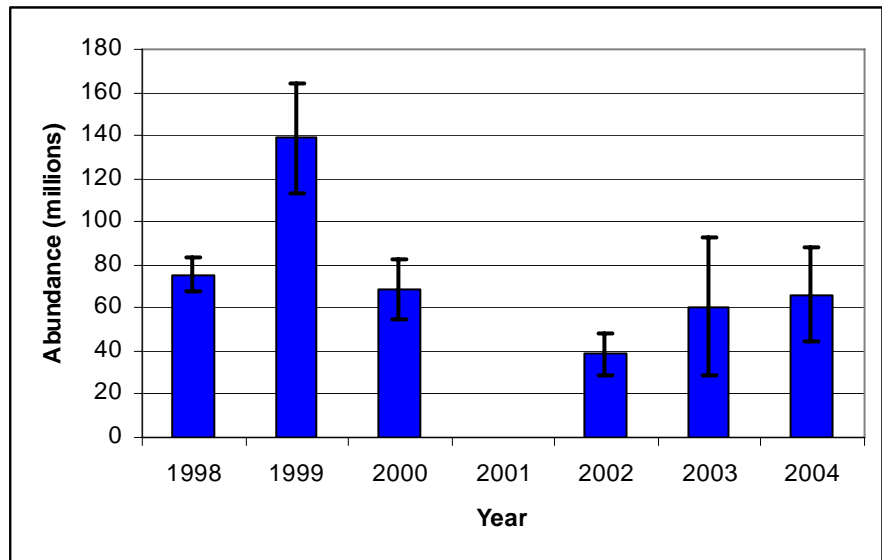
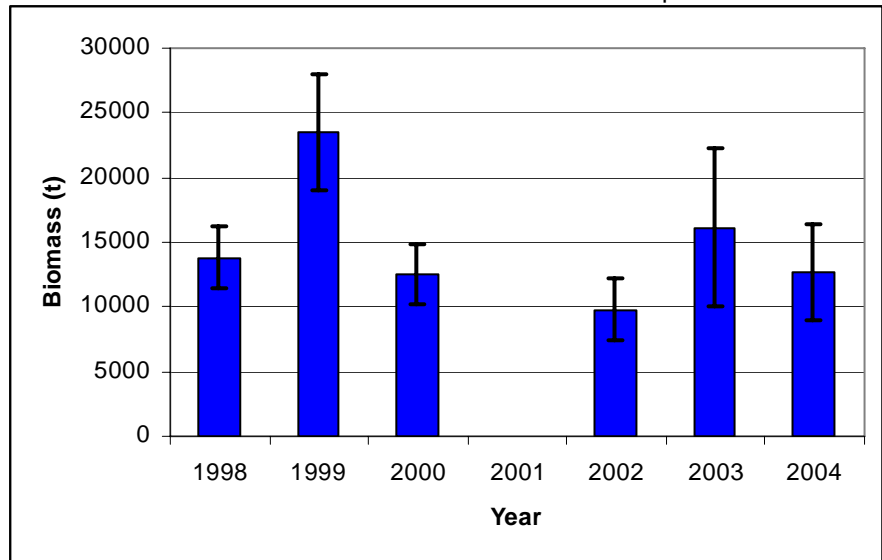


Figure 9.2.4 Total biomass (top), abundance (middle) estimates and associated standard error of demersal *S. mentella* from the Greenland halibut bottom trawl survey of East Greenland (ICES Division XIV) 1998-2004. No survey was conducted in 2001. Also shown is the overall length distribution (number per km²) from the same surveys 2002-2004 (bottom). Dashed line 2002, dotted line 2003, and solid line 2004.

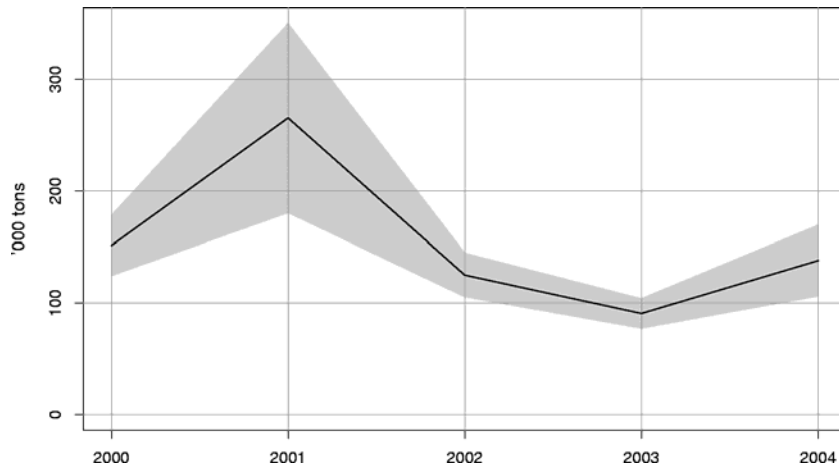


Figure 9.2.5 Total biomass index of the Icelandic shelf demersal *S. mentella* in the autumn survey in Division Va 2000-2004.

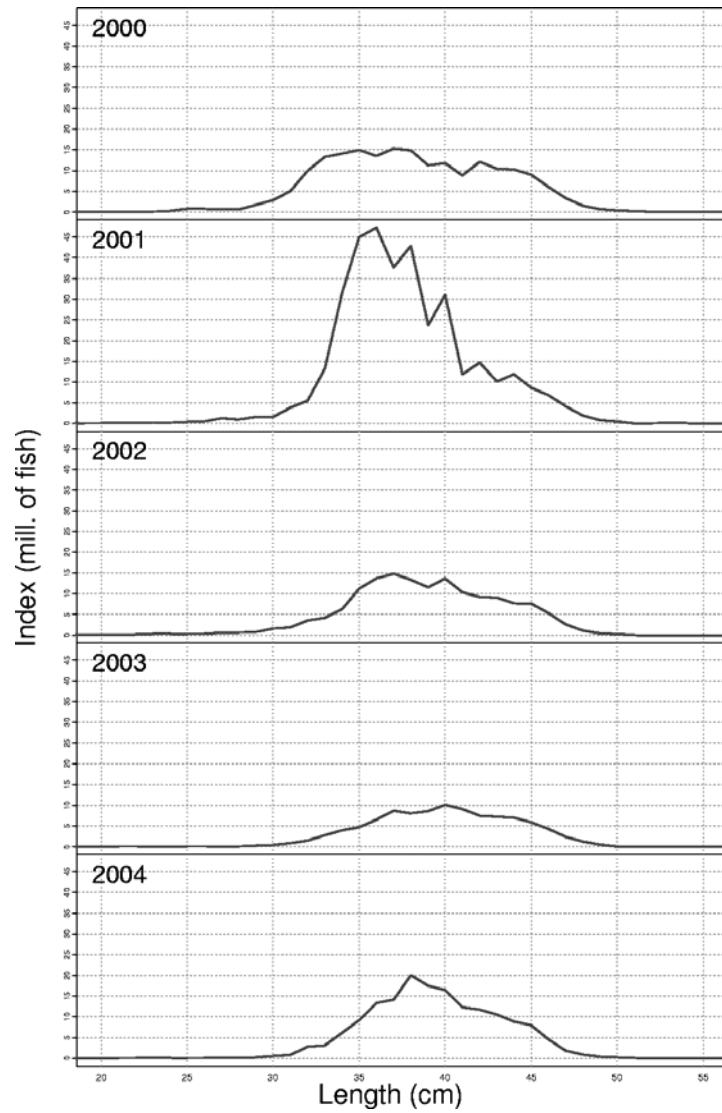


Figure 9.2.6 Length distribution of shelf demersal *S. mentella* in the bottom trawl surveys in October 2000-2004 in ICES Division Va.

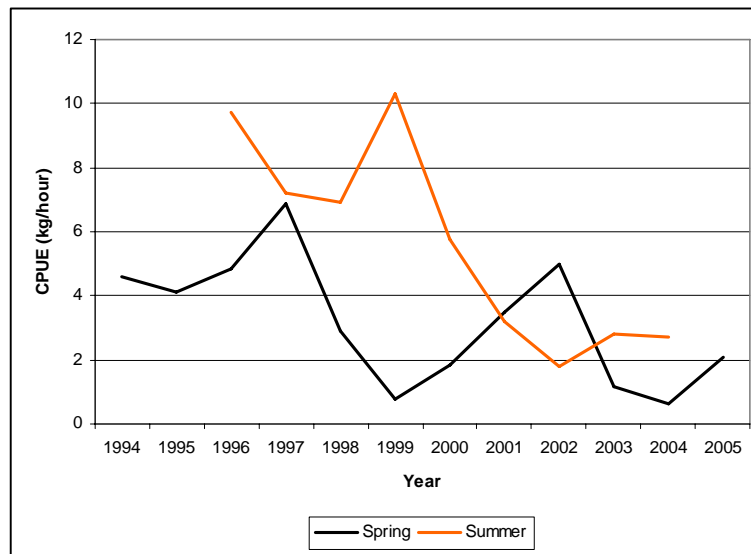


Figure 9.2.7 Demersal *S. mentella*. CPUE (kg/hour) from the Faeroese spring survey 1994-2005 and the summer survey 1996-2004 in ICES Division Vb.