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Assessment of Redfish (*Sebastes marinus*, *S. mentella*) in NAFO Subarea 1
and ICES Div. XIVb Based on Survey Indices, 1982-98

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Abstract

On the basis of survey data there are clear indications that both stocks of *Sebastes marinus* L. and deep sea *Sebastes mentella* Travin off Greenland have undergone significant changes in stock abundance and structure during the past 17 years. Recently, both adult stock components remained severely depleted. Contrarily, juveniles of deep sea *Sebastes mentella* Travin (≥ 17 cm) were very abundant. Considering the absence of a significant commercial fishery, the most recent decrease by 50 % indicated an emigration of the small deep sea *S. mentella* (≥ 17 cm) from the survey area to either pelagic or adjacent eastern habitats. During 1997-98, the dominant year class has grown from 25 to 27 cm displaying an annual growth increment of about 2 cm. The 1998 estimates indicated a weak signal of stock recovery from the severely depleted status for the stock of *Sebastes marinus* L. due to increased recruitment.

All juvenile redfish (<17 cm) were assessed as a unit due to time consuming and difficult species identification. In 1985 and since 1993, small and unspecified redfish (<17 cm) were very abundant and distributed mainly off East Greenland. Juveniles off East Greenland were found to be bigger than those off West Greenland. Reappearing peaks at 6, 10-12 and 15-16 cm might indicate annual growth increments and represent the age groups 0, 1 and 2 years of unspecified juvenile redfish.

Introduction

The shelf areas around Greenland traditionally were important fishery grounds for redfish. The importance of extensive redfish nursery grounds, particularly on the East Greenland shelf, is known since the mid-50's (Magnússon, 1956; Magnússon and Magnússon, 1975) and possible impacts on recruitment success for *Sebastes marinus* and the Irminger Sea stocks of *S. mentella* were described frequently (e.g. Magnússon *et al.*, 1988 and 1990, Magnússon and Magnússon, 1995; Magnússon and Jóhannesson, 1997; Anon., 1998).

Catches of *S. marinus* on the Greenland shelf have been declining over the last three decades, and since 1991, there is no targeted fishery on this stock. Mean lengths in commercial catches have decreased since the mid-70's (Rätz, 1996).

Deep sea *S. mentella* catches on the Greenland shelf have varied considerably, the overall trend being an increase in catch rates over the past two decades (Anon., 1998). The occurrence of large amounts of young redfish on the East Greenland shelf, observed by Magnússon *et al.* (1988), was found to be present over the past five years.

The mean growth rate for young redfish (< 17cm), reported by Friðriksson (1961) from Icelandic surveys in the 30's and by Magnússon *et al.* (1988), was found to be around 2cm/year. Similar observations were made for redfish off Nova Scotia (Perlmutter and Clarke, 1949) and Newfoundland (Sandemann, 1957 and 1961). Age-validation studies by Mayo *et al.* (1981) and Nedreaas (1990) indicated slightly higher growth rates, referring to strong year classes.

This paper presents survey results for *Sebastes marinus* (≥ 17 cm), deep sea *S. mentella* (≥ 17 cm), and juvenile redfish (<17 cm) off West and East Greenland. Estimates of stock abundance and biomass indices as well as mean lengths and length compositions are given for the period 1982-98.

Materials and Methods

Abundance, biomass estimates and length structures have been derived using annual groundfish surveys covering shelf areas and the continental slope off West and East Greenland. Surveys commenced in 1982 and were primarily designed for the assessment of cod. Because of favourable weather and ice conditions and to avoid spawning concentrations, autumn was chosen for the time of the surveys. These were carried out by the research vessel (R/V) WALTHER HERWIG (II) throughout most of the time period. In 1984 and since 1994, she was replaced by R/V ANTON DOHRN and the new R/V WALTHER HERWIG III, respectively. The fishing gear used was a standardized 140-foot bottom trawl, its net frame rigged with heavy ground gear because of the rough nature of the fishing grounds. A small mesh liner (10 mm) was used inside the cod end. The horizontal distance between wing-ends was 25 m at 300 m depth, the vertical net opening being 4 m. Calculations of abundance and biomass indices were based on the 'swept area' method using 22 m horizontal net opening as trawl parameter, i. e. the constructional width specified by the manufacturer. The towing time was normally 30 min. at a speed of 4.5 knots. Trawl parameters were listed in Table 1. Hauls which received net damage or became hangup after less than 15 minutes were rejected. Some hauls of the 1987 and 1988 surveys were also included although their towing time had been intentionally reduced to 10 minutes because of the expected large cod catches as observed from echo sounder traces.

Fish were identified to species or lowest taxonomic level and the catch in number and weight was recorded. Redfish inhabiting the survey area close to the bottom are believed to belong to the traditional stocks off Greenland, Iceland and Faroes (Anon., 1995). Fish (≥ 17 cm) were separated to *Sebastes marinus* L. or deep sea *Sebastes mentella* Travin, whereas juvenile redfish (<17 cm) were classified as *Sebastes spp.* due to time-consuming and difficult species identification. Total fish lengths were measured to cm below.

The surveys were primarily designed for the assessment of cod. In order to reduce the error of abundance estimates, the subdivision of shelf areas and the continental slope into different geographic and depth strata was required due to a pronounced heterogeneity of cod distribution. The survey area was thus split into seven geographic strata. Each stratum was itself subdivided into two depth strata covering the 0-200 m and 201-400 m zones. Figure 1 and Table 2 indicate the names of the 14 strata, their geographic boundaries, depth ranges and areas in nautical square miles (nm²). The inner limit of all strata was the 3 mile offshore line.

The applied strategy was to distribute the sampling effort according both to the stratum areas and to cod abundance. Consequently, fifty percent of the hauls were allocated proportionally to strata by stratum area while the other fifty percent were apportioned on the basis of a review of the historical mean cod abundance/nm², all hauls being randomly distributed within trawlable areas of the various strata. Non-trawlable areas are mainly located inshore. During 1982-98, 2 521 successful sets were carried out, the numbers of valid sets by year and stratum being listed in Table 3. Apart from stratum 7.2 (Dohrn Bank), East Greenland strata were not covered adequately in 1984, 1992 and 1994 due to technical problems. In 1995, the survey area off West Greenland was incompletely covered for the first time again due to technical problems. Only 50 % of the strata of West Greenland were covered, namely the southern strata 3.1, 3.2, 4.1 and 4.2. Stratum 7.1 has a very low area and therefore never been covered. Since 1996, the entire survey area was covered. Figure 1 shows the positions of hauls conducted during the most recent survey.

Stratified abundance estimates were calculated from catch-per-tow data using the stratum areas as weighting factor (Cochran, 1977; Saville, 1977). Strata with less than five valid sets were rejected from the calculation. The coefficient of catchability was set arbitrarily at 1.0, implying that estimates are merely indices of abundance and biomass. Respective confidence intervals (CI) were set at the 5% significance level of the stratified mean.

Results

For the period 1982-98, survey abundance and biomass indices for *S. marinus* (≥ 17 cm) are listed in Tables 4 and 5 by stratum, West and East Greenland, aggregated to total and accompanied confidence intervals. The trends of the survey indices are illustrated in Figures 2 and 3. Values in 1984, 1992 and 1994 were indicated as incorrect due to incomplete sampling off East Greenland. Ignoring these years, total estimates showed a declining trend from 680 million to 325 million individuals and 440 000 tons to 140 000 tons during 1982-1985. Since 1986, an almost continuous reduction in survey biomass from 300 000 tons to 11 000 tons in 1995 was observed, which was the minimum of the time series among years with complete survey coverage. Apart from the year 1990 with the maximum value amounting to 780 million individuals caused by the occurrence of juveniles (< 25 cm), there was a similar decreasing trend regarding the survey abundance. During 1987-1995, abundance estimates decreased from 610 million to 43 million and remained at that low level thereafter. The most recent indices amounted to 176 million individuals and 38 000 tons. It can be seen from Figures 2 and 3 that *S. marinus* (≥ 17 cm) was mainly distributed off East Greenland, while the minor abundance and biomass off West Greenland decreased to non-recognizable parts. It should be underlined that the enormous variation of catch per tow data resulted in high confidence intervals. Weighted mean length and length frequencies of *S. marinus* (≥ 17 cm) were listed for West, East Greenland and aggregated to total in Tables 6, 7 and 8, and illustrated in Figures 4 and 5a and 5b, respectively. They revealed pronounced year and area effects. Usually, the few individuals off West Greenland showed a peak around 30 cm while fish off East Greenland were larger and varied over a wide range. Since 1984, juvenile *S. marinus* (< 30 cm) contributed important and increasing parts to the stock structure and caused continuously decreasing trends in mean fish size. There are marked peaks at lengths of 20, 25, 28, 29 and 30 cm between the successive years 1985-89 and at lengths of 22 and 25 cm between the successive years 1990-91 and 1995-96.

Survey abundance and biomass estimates and accompanied confidence intervals for deep sea *S. mentella* (≥ 17 cm) were presented in Tables 9 and 10, broken down by stratum, West and East Greenland. The trends in stock size in numbers and weight were illustrated in Figures 6 and 7. During the early eighties, the abundance varied among 90-170 million individuals, while the minimum and maximum biomass amounted to 34 000 tons and 65 000 tons. Subsequently, increasing trends were evident for both abundance and biomass. In 1991, 1993 and 1995, when the survey area was completely covered, deep sea *S. mentella* (≥ 17 cm) was found to be very abundant with 970 million, 1 400 million and 2 500 million individuals and 290 000, 230 000 and 375 000 tons, respectively. The peak abundance and biomass were observed in 1997, reaching 7 billion individuals and 1.5 million tons. In 1998, the estimates decreased by almost 50 % although few survey catches yielded more than 5 000 kg/30 min. West Greenland shares were negligible and varied without a clear trend. The high confidence intervals indicated a low precision of these estimates. The weighted mean length and length compositions were given for West, East Greenland and in total in Tables 11, 12 and 13, and shown in Figures 8, 9a and 9b. Since 1985, juvenile deep sea *S. mentella* (≥ 17 cm) contributed significant portions and dominated the stock structure since 1989, the adult stock component remaining severely depleted. Consequently, an almost continuously decreasing trend in fish size was evident until 1994. Since 1995, the mean length increased from 20.7 to 26.4 cm due to the growth of recruiting year classes (Fig. 8). During 1997-98, the dominant year class has grown from 25 to 27 cm displaying an annual growth increment of around 2 cm (Fig. 9b). Other growth indications for single cohorts between successive years were hardly derivable from these length distributions, the only occurring in 1990-92 with pronounced peaks at 21-23, 25-26 and 26-28 cm, respectively.

Trends in survey abundance and biomass for juvenile redfish (< 17 cm) were listed in Tables 14 and 15, again broken down by stratum, West and East Greenland and accompanied with confidence intervals. Respective values were shown in Figures 10 and 11. In 1985 and since 1993, small and unspecified redfish (< 17 cm) were very abundant and distributed mainly off East Greenland. A lack of these size groups during the years 1982-84 might be

caused by irregular recording of catches. Weighted mean lengths and length distributions were listed in Tables 16, 17 and 18 for West, East Greenland and total. These data were illustrated in Figures 12, 13a and 13b. Juveniles off East Greenland were found to be bigger than those off West Greenland. Reappearing peaks at 6-7, 10-12 and 15-16 cm might indicate annual growth increments and represent the age groups 0, 1 and 2 years of unspecified juvenile redfish.

Discussion

After a severe depletion of the *S. marinus* stock on the traditional fishing grounds around Greenland in the early 90's, the most recent survey results provide weak signals of a possible recovery. Marked shifts of size-spectra peaks might indicate annual growth increments of single cohorts. The low mean length and left-skewed size composition in 1998 indicates relatively good recruitment which caused a slight stock increase. The adult stock, however, remains depleted.

The poor status of the deep-sea *S. mentella* stock on the East and West Greenland shelves in the 80's was subject to a steady improvement since the mid-90's. This positive trend was due to successful recruitment of one or two individual year classes. The 1998 survey results indicated a considerable decrease of about half the abundance and biomass of the 1997 peak. Considering the absence of a significant commercial fishery and unchanged natural mortality rates, this decrease indicated an emigration of deep sea *S. mentella* (≥ 17 cm) from the survey area to either pelagic or adjacent eastern habitats. 90 % of the stock was concentrated in one single deep stratum off East Greenland, namely the stratum 6.2. The observed growth rate of about 2cm/year coincides quite closely with results from studies by Perlmutter and Clarke (1949), Sandemann (1957 and 1961), Friðriksson (1961), Mayo *et al.* (1981), Magnússon *et al.* (1988) and Nedreaas (1990). Since the size-spectra are dominated by juvenile fish, a recovery of the adult stock is yet to come.

Juvenile unspecified redfish (<17cm) was found to be bigger in catches off East Greenland, compared to West Greenland, exhibiting growth rates of about 5cm/yr in age-groups 0, 1 and 2.

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Table 1 Trawl parameters of the survey.

Gear	140-feet bottom trawl
Horizontal net opening	22 m
Standard trawling speed	4.5 kn
Towing time	30 minutes
Coefficient of catchability	1.0

Table 2 Specification of strata.

	Stratum geographic boundaries		depth		area (m)	(nm2)
	south	north	east	west		
1.1	64°15'N	67°00'N	50°00'W	57°00'W	1-200	6805
1.2	64°15'N	67°00'N	50°00'W	57°00'W	201-400	1881
2.1	62°30'N	64°15'N	50°00'W	55°00'W	1-200	2350
2.2	62°30'N	64°15'N	50°00'W	55°00'W	201-400	1018
3.1	60°45'N	62°30'N	48°00'W	53°00'W	1-200	1938
3.2	60°45'N	62°30'N	48°00'W	53°00'W	201-400	742
4.1	59°00'N	60°45'N	44°00'W	50°00'W	1-200	2568
4.2	59°00'N	60°45'N	44°00'W	50°00'W	201-400	971
5.1	59°00'N	63°00'N	40°00'W	44°00'W	1-200	2468
5.2	59°00'N	63°00'N	40°00'W	44°00'W	201-400	3126
6.1	63°00'N	66°00'N	35°00'W	41°00'W	1-200	1120
6.2	63°00'N	66°00'N	35°00'W	41°00'W	201-400	7795
7.1	64°45'N	67°00'N	29°00'W	35°00'W	1-200	92
7.2	64°45'N	67°00'N	29°00'W	35°00'W	201-400	4589
Sum						37463

Table 3 Numbers of valid hauls by stratum and total, 1982-98.

Year	1.1	1.2	2.1	2.2	3.1	3.2	4.1	4.2	5.1	5.2	6.1	6.2	7.1	7.2	Sum
1982	20	11	16	7	9	6	13	2	1	10	3	12	1	25	136
1983	26	11	25	11	17	5	18	4	3	19	10	36	0	18	203
1984	25	13	26	8	18	6	21	4	5	4	2	8	0	5	145
1985	10	8	26	10	17	5	21	4	5	21	14	50	0	28	219
1986	27	9	21	9	16	7	18	3	3	15	14	37	1	34	214
1987	25	11	21	4	18	3	21	3	19	16	13	40	0	18	212
1988	34	21	28	5	18	5	18	2	21	8	13	39	0	26	238
1989	26	14	30	9	8	3	25	3	17	18	12	29	0	11	205
1990	19	7	23	8	16	3	21	6	18	19	6	15	0	13	174
1991	19	11	23	7	12	6	14	5	8	11	10	28	0	16	170
1992	6	6	6	5	6	6	7	5	0	0	0	0	0	6	53
1993	9	6	9	6	10	8	7	0	9	6	6	18	0	14	108
1994	16	13	13	8	10	6	7	5	0	0	0	0	0	6	84
1995	0	0	3	0	10	7	10	5	8	6	6	17	0	12	84
1996	5	5	8	5	12	5	10	5	7	9	5	13	0	9	98
1997	5	6	5	5	6	5	8	5	5	5	4	8	0	8	75
1998	9	5	10	7	11	6	10	5	5	8	6	12	0	9	103

Table 4 *S. marinus* (≥ 17 cm). Abundance indices ($n \times 1000$) for West, East Greenland and total by stratum, 1982-98. Confidence intervals (CI) are given in per cent of the stratified mean at 95% level of significance. () incorrect due to incomplete sampling.

YEAR	1.1	1.2	2.1	2.2	3.1	3.2	4.1	4.2	5.1	5.2	6.1	6.2	7.1	7.2	WEST	EAST	TOTAL	CI
1982	7015	6340	88792	5512	5736	14876	4087			195798		312132		38899	132358	546829	679187	55
1983	4025	3186	3355	6523	4043	5885	1697			140766	453	264813		14365	28714	420397	449111	53
1984	1324	3438	460	1209	10671	2776	4214		6888			47974		9890	24092	(64752)	(88844)	65
1985	4658	10451	6158	1569	3220	14441	4973		78118	32397	1787	141500		25944	45470	279746	325216	52
1986	6327	4324	2077	3483	21503	2883	2717			124613	470	298706		22234	43314	446023	489337	53
1987	906	653	1327		9612		659		50961	9422	245	507387		27920	13157	595935	609092	39
1988	831	2239	342	2255	5938	1954	731		3012	5015	148	132458		34352	14290	174985	189275	54
1989	421	422	776	690	6489		361		4003	33320	625	110663		76934	9159	225545	234704	60
1990	120	433	279	709	1038		146	2271	14974	72316	391	653009		37483	4996	778173	783169	75
1991	227	256	96	691	236	527	21	1671	1385	13237	172	64692		28201	3725	107687	111412	51
1992	126	106	73	190	193	477	192	835						32622	2192	(32622)	(34814)	151
1993	169	481	59	267	80	132	0		175	6043	77	54424		4170	1188	64889	66077	93
1994	111	325	156	167	65	46	151	247						3348	1268	(3348)	(4616)	41
1995					51	67	38	146	346	1521	153	38892		2060	302	42972	43274	97
1996	152	267	22	244	381	383	29	298	647	3145	494	21110		2366	1776	27762	29538	47
1997	252	609	16	175	120	311	36	552	721	913		21257		1611	2072	24501	26573	40
1998	116	141	45	142	19	106	126	254	590	1388	328	166868		5837	949	175011	175959	160

Table 5 *S. marinus* (≥ 17.5 cm). Biomass indices (tons) for West, East Greenland and total by stratum, 1982-98. Confidence intervals (CI) are given in per cent of the stratified mean at 95% level of significance. () incorrect due to incomplete sampling.

YEAR	1.1	1.2	2.1	2.2	3.1	3.2	4.1	4.2	5.1	5.2	6.1	6.2	7.1	7.2	WEST	EAST	TOTAL	CI
1982	1798	1354	34440	2558	3206	9794	2532			155971		194379		30115	55682	380465	436147	54
1983	846	945	1572	3042	1873	4815	1084			161687	269	229541		15607	14177	407104	421281	61
1984	308	894	196	519	4935	2284	2089		3601			21281		12052	11225	(36934)	(48159)	55
1985	1020	1819	2968	472	1427	9209	2718		8613	22453	1317	65299		23762	19633	121444	141077	35
1986	1282	1215	752	1229	10122	1705	1762			43119	382	213268		24368	18067	281137	299204	38
1987	255	247	660		4954		438		9539	5346	106	230844		19327	6554	265162	271716	38
1988	146	404	118	942	2570	1342	382		1092	4930	68	98131		48262	5904	152483	158387	60
1989	182	137	272	249	2619		209		970	14920	442	54589		34360	3668	105281	108949	47
1990	39	149	75	275	479		79	1343	6761	27245	154	130530		14723	2439	179413	181852	45
1991	44	83	24	226	120	273	3	1007	725	10631	120	34265		62979	1780	108720	110500	98
1992	18	35	20	61	53	241	70	447						12076	945	(12076)	(13021)	130
1993	46	112	19	114	39	55	0		75	1377	30	20179		2899	385	24560	24945	68
1994	34	146	48	64	26	35	40	80						1540	473	(1540)	(2013)	38
1995					19	19	20	43	114	712	51	8896		1141	101	10914	11015	38
1996	64	102	4	60	128	118	8	132	139	1714	196	10855		1408	616	14312	14928	40
1997	41	261	5	61	35	188	10	246	163	447		15411		1225	847	17246	18092	58
1998	20	43	12	42	14	54	56	117	193	597	112	34680		2005	359	37587	37946	102

Table 6 *S. marinus* (≥ 17 cm). Length disaggregated abundance indices ($n \cdot 1000$) for West Greenland, 1982-1998.

Length (cm)	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
17.5	1003	629	572	1917	1347	64	321	46	131	86	15	0	0	0	6	12	0
18.5	955	510	442	1372	1733	51	131	37	58	94	51	35	90	0	30	0	0
19.5	1068	435	397	1258	1241	76	351	90	45	53	5	94	89	33	34	30	6
20.5	884	657	332	1434	1047	95	253	131	74	121	44	147	85	29	123	113	44
21.5	1170	614	378	1191	940	132	243	109	79	86	146	71	42	30	74	93	5
22.5	1334	770	418	1320	1156	187	303	140	139	134	80	22	48	15	68	81	39
23.5	1701	806	465	1284	1140	264	298	214	177	101	88	23	26	11	174	75	33
24.5	2031	808	532	1119	1787	449	464	320	189	131	146	44	70	11	81	158	86
25.5	3487	1231	690	1374	1611	381	640	343	249	160	106	109	68	4	161	143	71
26.5	4690	1408	833	1556	1717	631	765	561	215	184	139	40	91	7	109	124	131
27.5	6049	1509	994	2049	1879	647	798	678	251	171	95	86	71	29	154	155	103
28.5	9267	1690	1315	1781	2213	767	769	732	270	192	82	35	40	17	65	144	36
29.5	11170	1992	1490	2358	2549	936	913	871	224	273	140	16	65	14	89	83	66
30.5	10818	2524	2054	3193	3285	1023	1081	1070	410	141	144	74	44	14	90	120	53
31.5	14994	1941	1978	2321	3090	1155	947	709	329	192	107	41	45	7	69	113	19
32.5	11490	1797	1928	2872	3224	1028	826	715	266	192	132	49	49	25	21	150	16
33.5	10177	1422	1684	2080	2926	1234	720	625	205	236	150	35	19	0	67	33	10
34.5	8118	1188	1424	2144	2505	946	645	430	263	134	129	40	52	0	57	57	82
35.5	7888	1247	1250	1765	2198	901	721	397	259	184	105	27	54	11	56	78	14
36.5	6925	980	1052	1446	1321	650	562	328	215	133	62	44	49	30	57	40	5
37.5	5731	668	683	1211	945	485	467	219	169	156	57	43	0	0	68	17	43
38.5	3801	650	635	1288	631	251	364	115	130	81	21	20	37	0	27	22	11
39.5	2149	453	379	1091	413	251	252	120	82	114	9	36	40	0	35	38	27
40.5	1566	310	320	1107	415	201	234	51	128	102	62	4	5	0	27	60	7
41.5	995	259	236	537	222	128	127	27	118	25	5	4	11	0	7	45	6
42.5	472	231	179	572	84	56	64	11	82	65	17	23	29	15	0	40	0
43.5	598	222	197	430	94	39	65	22	54	28	14	0	16	0	7	30	5
44.5	234	101	110	243	40	42	53	15	0	27	0	10	23	0	0	6	5
45.5	152	106	120	221	22	22	45	0	42	19	0	12	14	0	6	6	15
46.5	133	119	92	185	25	13	53	0	24	5	0	0	5	0	7	6	5
47.5	23	48	65	94	17	5	16	0	18	14	0	0	0	0	0	0	0
48.5	42	85	64	94	0	0	4	0	12	6	0	0	0	0	0	0	0
49.5	41	23	37	68	0	0	6	4	0	0	0	0	0	0	6	0	0
50.5	37	73	48	22	9	0	0	4	12	0	0	0	0	0	0	0	0
51.5	46	20	9	6	0	4	0	4	0	0	0	0	0	0	0	6	0
52.5	41	71	14	11	0	0	0	3	0	0	0	0	0	0	0	0	0
53.5	20	89	9	6	4	0	8	4	0	0	0	0	0	0	0	0	0
54.5	9	50	10	22	8	4	6	0	0	0	0	0	0	0	0	0	0
55.5	23	39	5	17	12	0	0	0	0	0	0	0	0	0	0	0	0
Mean	31.5	30.5	30.9	29.4	28.8	31.5	29.6	30.2	30.8	30.3	29.0	28.2	28.8	27.6	28.2	29.4	29.2

Table 7 *S. marinus* (≥ 17 cm). Length disaggregated abundance indices ($n \cdot 1000$) for East Greenland, 1982-1998. () incorrect due to incomplete sampling.

Length (cm)	1982	1983	(1984)	1985	1986	1987	1988	1989	1990	1991	(1992)	1993	(1994)	1995	1996	1997	1998
17.5	0	0	164	12374	24	7	0	413	13	286	0	16	0	0	0	0	12049
18.5	206	124	346	12113	875	43	119	1210	751	678	172	997	0	2358	52	0	18047
19.5	735	679	1330	17364	2697	3943	88	9897	33883	997	200	692	29	2503	124	54	16162
20.5	1080	698	983	23545	6561	6845	286	16446	75206	1848	772	874	88	5876	218	110	14261
21.5	2117	1326	1217	21554	13491	9956	322	18186	129790	2440	743	2473	88	5126	449	128	20295
22.5	3602	1958	1584	15097	18907	15099	413	15321	136379	3167	1229	471	88	5433	518	201	16411
23.5	4705	3271	3072	13596	18881	18698	817	5959	113767	5427	1544	504	59	3412	660	652	16778
24.5	5827	3126	2965	7292	32304	20957	1174	5616	75422	5661	2630	981	206	2495	1007	587	11643
25.5	10173	4489	2986	8030	34858	36711	2494	5518	33139	7865	3774	7676	117	1195	2089	798	10370
26.5	14756	5597	2908	10005	28110	46566	4370	7426	24393	7313	5661	7440	440	1018	2232	629	5545
27.5	20687	7166	3610	9017	24507	63071	7626	12137	24720	4924	6690	15610	117	1231	2265	738	3730
28.5	25508	8407	4050	11082	23970	67572	12544	13871	23443	3213	3974	6355	470	1253	1786	985	3996
29.5	26071	10368	3019	11926	25516	58104	14891	18561	20172	2797	2459	4579	529	1327	1352	1175	3509
30.5	29967	12982	4658	10120	28808	40957	14161	17616	18233	3304	629	3232	88	1388	1729	2188	1371
31.5	29508	18058	5000	11605	23402	31245	9314	16793	12870	2404	229	2411	29	1050	1271	979	2994
32.5	34575	15105	3010	4989	16149	19701	5744	10512	7702	2621	286	1426	176	1087	1442	1144	1065
33.5	32036	12852	2908	4262	11813	18289	4216	7796	5636	2052	57	420	117	862	1170	983	921
34.5	29635	11886	2321	4933	8259	16670	2173	3071	4350	2261	86	858	59	940	1624	969	1234
35.5	23774	11918	2325	4945	5734	14077	4078	2289	3186	2161	257	703	88	719	1142	971	797
36.5	22972	16584	1874	6508	7558	10727	3100	1878	2979	1806	57	357	59	760	1128	1088	754
37.5	20321	19848	1307	5301	6608	7792	3517	2305	2629	1841	114	165	0	560	794	1080	966
38.5	19229	17913	1274	4143	6645	6091	3090	1663	1937	1461	57	952	0	390	954	851	1024
39.5	17643	21339	867	5617	6379	7457	5461	1675	2529	2134	57	154	29	399	625	1064	1114
40.5	16976	14537	899	4434	6031	5900	3960	1801	2326	2322	0	1146	59	234	875	1348	1380
41.5	16147	34671	864	5246	7175	5452	5476	2025	2491	2878	0	446	0	164	398	955	1268
42.5	16312	24080	678	3386	7409	5917	4473	2357	1453	2457	114	473	29	154	377	926	971
43.5	16850	23924	859	5482	6184	6303	6433	2260	2255	2780	0	691	88	189	408	720	1200
44.5	19081	26529	1046	3516	8503	5000	7119	2426	1891	2408	86	32	29	100	251	823	857
45.5	17100	19895	1198	3856	8720	4841	8202	2801	1489	4035	143	591	59	207	186	825	509
46.5	20922	16884	1098	3861	9390	7269	8502	2425	1809	3279	57	133	29	168	116	240	554
47.5	14265	14735	1062	2639	7974	7235	5871	2407	1951	2429	29	89	29	83	154	182	403
48.5	10110	11866	546	2521	7165	7354	5635	2084	1248	2634	114	598	59	112	58	313	396
49.5	7369	6013	528	1771	5726	5491	5584	1662	1413	1935	114	92	59	34	99	240	146
50.5	5094	4465	241	1975	5350	3949	2690	1746	1249	2385	143	836	29	17	86	130	97
51.5	3993	4464	370	1557	4226	3909	3762	1614	1594	1572	29	288	0	17	45	189	49
52.5	2225	3219	479	900	2302	1838	1945	895	767	1553	29	32	0	17	0	96	49
53.5	1429	2838	241	501	1510	1566	1622	727	951	1407	57	0	0	17	22	36	24
54.5	1137	2397	168	649	1476	1273	1318	391	774	1170	29	24	0	17	0	57	24
55.5	643	1452	9														

Table 8 *S. marinus* (≥ 17 cm). Length disaggregated abundance indices (n^*1000) for Greenland (total), 1982-1998. () incorrect due to incomplete sampling.

Length (cm)	1982	1983	(1984)	1985	1986	1987	1988	1989	1990	1991	(1992)	1993	(1994)	1995	1996	1997	1998
17.5	1003	629	736	14291	1371	71	321	459	144	372	15	16	0	0	6	12	12049
18.5	1161	634	788	13485	2608	94	250	1247	809	772	223	1032	90	2358	82	0	18047
19.5	1803	1114	1727	18622	3938	4019	439	9987	33928	1050	205	786	118	2536	158	84	16168
20.5	1964	1355	1315	24979	7608	6940	539	16577	75280	1969	816	1021	173	5905	341	223	14305
21.5	3287	1940	1595	22745	14431	10088	565	18295	129869	2526	889	2544	130	5156	523	221	20300
22.5	4936	2728	2002	16417	20063	15286	716	15461	136518	3301	1309	493	136	5448	586	282	16450
23.5	6406	4077	3537	14880	20021	18962	1115	6173	113944	5528	1632	527	85	3423	834	727	16811
24.5	7858	3934	3497	8411	34091	21406	1638	5936	75611	5792	2776	1025	276	2506	1088	745	11729
25.5	13660	5720	3676	9404	36469	37092	3134	5861	33388	8025	3880	7785	185	1199	2250	941	10441
26.5	19446	7005	3741	11561	29827	47197	5135	7987	24608	7497	5800	7480	531	1025	2341	753	5676
27.5	26736	8675	4604	11066	26386	63718	8424	12815	24971	5095	6785	15696	188	1260	2419	893	3833
28.5	34775	10097	5365	12863	26183	68339	13313	14603	23713	3405	4056	6390	510	1270	1851	1129	4032
29.5	37241	12360	4509	14284	28065	59040	15804	19432	20396	3070	2599	4595	594	1341	1441	1258	3575
30.5	40785	15506	6712	13313	32093	41980	15242	18686	18643	3445	773	3306	132	1402	1819	2308	1424
31.5	44502	19999	6978	13926	26492	32400	10261	17502	13199	2596	336	2452	74	1057	1340	1092	3013
32.5	46065	16902	4938	7861	19373	20729	6570	11227	7968	2813	418	1475	225	1112	1463	1294	1081
33.5	42213	14274	4592	6342	14739	19523	4936	8421	5841	2288	207	455	136	862	1237	1016	931
34.5	37753	13074	3745	7077	10764	17616	2818	3501	4613	2395	215	898	111	940	1681	1026	1316
35.5	31662	13165	3575	6710	7932	14978	4799	2686	3445	2345	362	730	142	730	1198	1049	811
36.5	29897	17564	2926	7954	8879	11377	3662	2206	3194	1939	119	401	108	790	1185	1128	759
37.5	26052	20516	1990	6512	7553	8277	3984	2524	2798	1997	171	208	0	560	862	1097	1009
38.5	23030	18563	1909	5431	7276	6342	3454	1778	2067	1542	78	972	37	390	981	873	1035
39.5	19792	21792	1246	6708	6792	7708	5713	1795	2611	2248	66	190	69	399	660	1102	1141
40.5	18542	14847	1219	5541	6446	6101	4194	1852	2454	2424	62	1150	64	234	902	1408	1387
41.5	17142	34930	1100	5783	7397	5580	5603	2052	2609	2903	5	450	11	164	405	1000	1274
42.5	16784	24311	857	3958	7493	5973	4537	2368	1535	2522	131	496	58	169	377	966	971
43.5	17448	24146	1056	5912	6278	6342	6498	2282	2309	2808	14	691	104	189	415	750	1205
44.5	19315	26630	1156	3759	8543	5042	7172	2441	1891	2435	86	42	52	100	251	829	862
45.5	17252	20001	1318	4077	8742	4863	8247	2801	1531	4054	143	603	73	207	192	831	524
46.5	21055	17003	1190	4046	9415	7282	8555	2425	1833	3284	57	133	34	168	123	246	559
47.5	14288	14783	1127	2733	7991	7240	5887	2407	1969	2443	29	89	29	83	154	182	403
48.5	10152	11951	610	2615	7165	7354	5639	2084	1260	2640	114	598	59	112	58	313	396
49.5	7410	6036	565	1839	5726	5491	5590	1666	1413	1935	114	92	59	34	105	240	146
50.5	5131	4538	289	1997	5359	3949	2690	1750	1261	2385	143	836	29	17	86	130	97
51.5	4039	4484	379	1563	4226	3913	3762	1618	1594	1572	29	288	0	17	45	195	49
52.5	2266	3290	493	911	2302	1838	1945	898	767	1553	29	32	0	17	0	96	49
53.5	1449	2927	250	507	1514	1566	1630	731	951	1407	57	0	0	17	22	36	24
54.5	1146	2447	178	671	1484	1277	1324	391	774	1170	29	24	0	17	0	57	24
55.5	666	1491	96	417	1261	960	775	450	407	1245	0	0	0	14	13	0	24
Mean	35.5	38.8	32.0	29.0	31.9	31.1	37.4	29.9	24.7	35.1	27.5	29.1	30.1	25.6	31.6	34.8	23.8

Table 9 Deep sea *S. mentella* (≥ 17 cm). Abundance indices (n^*1000) for West, East Greenland and total by stratum, 1982-98. Confidence intervals (CI) are given in per cent of the stratified mean at 95% level of significance. () incorrect due to incomplete sampling.

YEAR	1.1	1.2	2.1	2.2	3.1	3.2	4.1	4.2	5.1	5.2	6.1	6.2	7.1	7.2	WEST	EAST	TOTAL	CI
1982	0	390	17	348	0	2360	0			9275		19370		58822	3115	87467	90582	65
1983	40	1011	70	2528	0	5236	0			15820	0	42393		28378	8885	86591	95476	42
1984	41	2967	7	1276	0	1115	0	18				34633		76541	5406	(111192)	(116598)	93
1985	0	369	31	27	55	328	0	34904	16909	105	38689			81487	810	172094	172904	47
1986	2141	414	38	292	5	444	0			6932	27	76655		67172	3334	150786	154120	36
1987	987	13679	42		56	0	0	0	18340	64	7182			62458	14764	88044	102808	45
1988	150	3187	25	777	60	4619	0	22025	28158	74	176639			25344	8818	252240	261058	58
1989	0	186	9	102	0		8	847	3067			72046		222281	305	298241	298546	60
1990	0	10	4	705	50	0	3881	329	12453	2354	13513			16046	4650	44695	49345	43
1991	0	0	0	0	0	652	0	1773	0	10707	46	724504		234748	2425	970005	972430	81
1992	0	35	0	15	0	106	0	0						60064	156	(60064)	(60220)	165
1993	0	24	0	159	7	0	0	62	3528	140	1258376			121927	190	1384033	1384223	86
1994	0	271	20	95	94	162	0	36						77891	678	(77891)	(78569)	168
1995					29	234	96	1468	265	24463	1173	2394064		83314	1827	2503279	2505106	55
1996	1527	619	0	236	0	1921	29	7135	396	176448	1215	4246101		75011	11467	4499171	4510638	64
1997	252	1759	0	381	37	3204	144	30742	165	22270		6257093		628353	36518	6907882	6944399	62
1998	0	324	0	212	151	828	10	2543	627	50219	0	2803222		39167	4068	2893235	2897303	67

Table 10 Deep sea *S. mentella* (≥ 17 cm). Biomass indices (tons) for West, East Greenland and total by stratum, 1982-98. Confidence intervals (CI) are given in per cent of the stratified mean at 95% level of significance. () incorrect due to incomplete sampling.

YEAR	1.1	1.2	2.1	2.2	3.1	3.2	4.1	4.2	5.1	5.2	6.1	6.2	7.1	7.2	WEST	EAST	TOTAL	CI
1982	0	96	6	114	0	893	0			5178		4843		22795	1109	32816	33925	68
1983	16	213	26	1158	0	2857	0			8701	0	21047		12747	4270	42495	46765	47
1984	6	798	4	490	0	472	0		2			12786		35202	1770	(47990)	(49760)	97
1985	0	96	15	11	27	110	0	2960	7169	40	17011			38533	259	65713	65972	35
1986	223	39	20	110	3	179	0	0	3943	15	29277			31333	574	64568	65142	36
1987	84	1184	9		31		0	0	4891	17	2328			23264	1308	30500	31808	46
1988	20	425	21	159	45	1878	0	3542	10166	9	55838			11607	2548	81162	83710	56
1989	0	23	7	15	0		1		90	655	0	21151		45452	46	67348	67394	63
1990	0	5	2	87	7		0	542	62	2741	329	1961		3275	643	8368	9011	44
1991	0	0	0	0	0	153	0	445	0	2959	30	211468		69454	598	283911	284509	80
1992	0	3	0	2	0	28	0	0						19856	33	(19856)	(19889)	160
1993	0	5	0	23	2	0	0		34	493	19	194675		34102	30	229323	229353	61
1994	0	31	3	10	12	25	0	3						7122	84	(7122)	(7206)	128
1995					5	25	10	159	29	2859	207	355946		16505	199	375546	375745	52
1996	5	55	0	19	0	235	4	689	13	24445	124	837222		14503	1007	876307	877314	59
1997	20	141	0	38	2	320	18	2973	20	3445		1323965		162744	3512	1490174	1493686	59
1998	0	26	0	17	17	88	3	326	153	6458	0	728848		8719	478	744179	744657	73

Table 11 Deep sea *S. mentella* (≥ 17 cm). Length disaggregated abundance indices ($n \times 1000$) for West Greenland, 1982-1998.

Length (cm)	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
17.5	9	58	140	6	967	2177	217	14	72	0	0	0	0	0	0	6345	0
18.5	29	51	102	9	304	2794	99	18	83	9	17	6	266	700	3187	9988	1341
19.5	6	79	164	41	136	1721	965	64	240	31	25	6	163	365	2673	11375	752
20.5	28	89	149	26	98	1922	748	91	636	9	0	12	76	251	1857	4345	543
21.5	40	96	155	26	54	272	531	30	1078	71	20	6	30	349	930	1446	408
22.5	18	143	130	13	88	131	722	25	1544	300	5	19	62	44	720	1034	364
23.5	41	124	194	35	78	84	408	9	640	390	18	6	25	15	330	658	264
24.5	38	184	160	85	103	137	346	0	191	649	28	13	22	39	171	721	120
25.5	105	265	98	76	30	36	354	19	76	608	9	19	0	29	43	262	80
26.5	83	362	182	52	42	18	320	0	58	165	18	13	5	29	29	111	102
27.5	231	548	184	37	38	47	319	0	18	93	5	25	0	0	0	151	34
28.5	181	559	329	46	93	43	265	5	0	38	0	25	12	0	0	28	29
29.5	315	776	457	38	68	0	296	0	4	19	0	0	5	0	0	6	15
30.5	571	1452	742	55	76	52	454	0	0	29	0	12	0	7	0	6	20
31.5	391	1179	664	44	57	36	324	0	0	0	0	0	0	0	0	0	0
32.5	380	928	522	48	92	24	397	0	0	0	0	6	0	0	0	22	0
33.5	247	744	440	40	49	6	397	0	0	0	0	0	0	0	0	0	0
34.5	125	563	245	32	106	6	421	0	0	0	0	0	0	0	0	0	0
35.5	93	358	139	26	58	0	482	5	0	5	5	13	0	0	0	22	0
36.5	69	137	51	15	43	6	228	0	0	0	0	0	0	0	0	0	0
37.5	28	71	10	4	21	0	129	6	0	0	0	0	5	0	0	0	0
38.5	5	28	24	0	26	4	37	0	0	0	5	0	0	0	0	0	0
39.5	19	10	11	9	13	0	49	5	0	0	5	0	0	0	0	0	0
40.5	19	6	8	7	0	8	18	0	0	0	0	6	5	0	0	0	0
41.5	9	14	5	9	18	12	10	0	0	0	0	0	0	0	0	0	0
42.5	14	0	0	0	0	4	17	8	0	0	0	0	5	0	0	0	0
43.5	9	6	0	0	8	0	13	0	0	0	0	0	0	0	0	0	0
44.5	5	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0
45.5	0	0	5	0	0	0	11	0	0	0	0	0	0	0	0	0	0
46.5	5	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
47.5	5	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0
48.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
49.5	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0
50.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
51.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
52.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
53.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
54.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
55.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mean	30.7	30.3	28.7	27.6	21.9	18.4	26.6	22.3	22.0	24.6	24.2	26.7	20.6	20.1	18.3	19.5	20.7

Table 14 *Sebastes spp.* (<17 cm). Abundance indices (n*1000) for West, East Greenland and total by stratum, 1982-98. Confidence intervals (CI) are given in per cent of the stratified mean at 95% level of significance. () incorrect due to incomplete sampling.

YEAR	1.1	1.2	2.1	2.2	3.1	3.2	4.1	4.2	5.1	5.2	6.1	6.2	7.1	7.2	WEST	EAST	TOTAL	CI
1982	1057	358	121	27	8	42	22			152		607		1553	1635	2312	3947	44
1983	3956	505	14	138	9	17	21			92	8	1709		859	4660	2668	7328	56
1984	5021	3714	20	219	141	28	14		129	2651		693		206	9157	(1028)	(10185)	67
1985	4889	9615	54	2712	47	67	55		817414	149899	210	5068		98	17439	972689	990128	164
1986	10740	237636	113	1811	54	218	38			69	12312			5757	250610	20789	271399	168
1987	12455	113990	4		20		18		2343	2580	132	8961		123715	126487	137731	264218	87
1988	19679	42481	0	107	20	139	0		1579	2983	896	13064		18457	62426	36979	99405	41
1989	7717	13160	3071	5370	18		69		1331	3171	150	4274		2155	29405	11081	40486	36
1990	11256	35932	15417	1538	73		6199		848	2267	3183	482	13708	4358	71263	23998	95261	52
1991	51939	59845	34871	22668	13692	2508	892	1541	45453	3051	209	1708		622	187956	51043	238999	38
1992	25715	19084	12691	17277	17463	13973	41	13718						1373	119962	(1373)	(121335)	54
1993	5460	39035	664	11331	355	2773	14		3401243	2403634	244	810639		6009	59632	6621769	6681401	111
1994	3405	12002	9827	4013	1189	1731	10843	9867						57889	52877	(57889)	(110766)	95
1995					399	10236	855	34694	274128	2671933	4072	188899		3061	46184	3142093	3188277	106
1996	457	14357	5210	9377	26961	11571	2488	107237	405272	223348	1373189	2423		3071	177658	2007303	2184961	98
1997	6519	47117	0	15852	43421	20194	444	68931	225859	89354		374542		1372	202479	691127	893605	62
1998	1558	25350	50177	30834	55983	13090	37049	13318	474804	1219068	13	1911622		4961	227359	3610468	3837828	100

Table 15 *Sebastes spp.* (<17cm). Biomass indices (tons) for West, East Greenland and total by stratum, 1982-98. Confidence intervals (CI) are given in per cent of the stratified mean at 95% level of significance. () incorrect due to incomplete sampling.

YEAR	1.1	1.2	2.1	2.2	3.1	3.2	4.1	4.2	5.1	5.2	6.1	6.2	7.1	7.2	WEST	EAST	TOTAL	CI
1982	37	13	6	1	0	2	1			11		36		72	60	119	179	41
1983	103	21	1	6	0	1	1			5	0	73		17	133	95	228	51
1984	91	104	1	5	5	1	1		4			19		9	208	(32)	(240)	71
1985	82	367	2	58	2	3	1		15335	7129	6	200		5	515	22675	23190	142
1986	454	6645	3	77	2	6	1			123	3	218		73	7188	417	7605	168
1987	265	5021	0	1	0		0		147	137	4	288		6502	5287	7078	12365	93
1988	218	1491	0	4	1	5	0		67	144	42	618		1414	1719	2285	4004	56
1989	111	270	22	49	0		1		81	167	7	317		135	453	707	1160	42
1990	99	369	63	20	0		9	2	67	118	20	833		268	562	1306	1868	58
1991	198	797	73	242	29	24	2	15	563	94	4	63		34	1380	758	2138	46
1992	152	385	49	111	74	220	1	65						18	1057	(18)	(1075)	54
1993	72	512	17	265	6	77	1		51857	75676	12	48523		260	950	176328	177278	90
1994	26	216	55	57	30	64	141	277						2704	866	(2704)	(3570)	132
1995					6	330	10	347	3834	40792	46	9749		190	693	54611	55304	97
1996	3	285	13	117	91	297	19	3301	5840	10853	26882	135		171	4126	43881	48007	96
1997	61	344	0	214	163	544	15	2437	5017	2141		16112		73	3779	23344	27123	81
1998	20	433	165	322	221	351	141	531	7310	29572	1	93376		280	2184	130540	132723	120

Table 16 *Sebastes spp.* (<17 cm). Length disaggregated abundance indices (n*1000) for West Greenland, 1982-1998.

Length (cm)	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4.5	0	0	0	0	5	0	7	0	14	59	0	0	0	0	0	0	0
5.5	0	6	255	25	36	121	97	40	3468	15519	2396	0	2393	26	236	622	182
6.5	6	78	584	111	97	850	486	1814	5708	59605	30723	117	9938	193	7126	32049	44724
7.5	0	219	179	185	459	1394	1940	2111	2758	11108	27897	200	1054	142	28816	54642	124965
8.5	70	518	425	326	1913	902	9815	2176	8484	15959	5799	1935	4092	540	7089	2405	4670
9.5	56	580	835	2162	4221	658	7404	4284	11836	23916	11346	9481	9037	615	7908	4589	3927
10.5	96	359	1432	4165	8596	941	3378	5703	6993	36922	8922	8917	5238	935	28170	13241	10533
11.5	259	594	2150	1470	19713	2446	1453	4835	7050	16198	5788	5980	2910	5090	17615	11127	4294
12.5	187	719	1284	508	106866	7018	1560	3156	7574	2388	7518	9526	6042	9656	12200	6785	2104
13.5	114	511	680	1599	76492	8667	3243	2148	6284	1648	11462	5615	4357	4247	17440	20084	6322
14.5	384	465	681	2715	14064	18412	8866	1020	4611	1196	6079	6020	2687	7343	11415	26222	10205
15.5	461	609	651	4173	4188	47210	13644	709	3556	1549	1220	5822	2402	8718	11658	16131	5645
16.5	0	0	0	0	5121	31716	4826	572	944	1005	391	3914	1329	5090	16748	14577	5203
17.5	0	0	0	0	6513	6136	2998	505	654	591	379	2105	1241	3545	11162	0	4585
18.5	0	0	0	0	1400	0	2514	308	824	218	46	0	68	44	58	0	0
19.5	0	0	0	0	930	0	194	24	133	32	0	0	48	0	15	0	0
20.5	0	0	0	0	0	0	0	0	133	13	0	0	16	0	0	0	0
21.5	0	0	0	0	0	0	0	0	67	0	0	0	32	0	0	0	0
22.5	0	0	0	0	0	0	0	0	67	19	0	0	0	0	0	0	0
23.5	0	0	0	0	0	0	0	0	33	0	0	0	0	0	0	0	0
24.5	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0
25.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mean	13.3	11.7	11.2	12.3	12.9	15.1	13.0	10.9	10.8	8.5	9.3	12.5	10.6	14.1	11.8	10.8	8.7

Table 17 *Sebastes spp.* (<17 cm). Length disaggregated abundance indices (n*1000) for East Greenland, 1982-1998. () incorrect due to incomplete sampling.

Length (cm)	1982	1983	(1984)	1985	1986	1987	1988	1989	1990	1991	(1992)	1993	(1994)	1995	1996	1997	1998
0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4.5	0	0	0	6	0	0	0	0	0	0	0	0	0	23	0	0	0
5.5	0	0	0	59	173	20	0	0	0	11	0	7408	0	208	17	0	105
6.5	0	0	18	169	417	85	9	20	0	293	0	184	0	302	989	803	11703
7.5	0	0	73	193	0	54	0	20	252	373	0	8205	0	87545	2831	1212	67654
8.5	0	0	0	214	460	157	126	46	281	746	0	77003	0	757306	13655	905	31523
9.5	0	32	36	3719	2008	475	356	110	1234	6039	0	693957	0	498875	165504	23970	45502
10.5	21	147	73	80721	7290	754	284	133	1212	21770	0	413320	0	109292	418878	114109	317417
11.5	89	145	219	350908	5780	1896	756	127	1212	17348	28	562208	29	428703	402736	44359	612504
12.5	109	83	127	246177	1054	2689	1470	299	732	2488	168	1753530	543	618072	78735	46097	148411
13.5	380	226	146	35246	365	3763	2818	611	1315	597	56	736969	1745	361458	204342	83578	305157
14.5	268	348	113	41307	658	11437	3287	1028	511	355	168	396137	8237	49198	399689	134051	371674
15.5	224	450	54	66498	704	36338	3090	1778	1381	378	168	652487	11469	52623	163139	117029	457390
16.5	291	831	106	70013	249	53227	3424	2518	2533	501	448	510140	9581	61631	84278	124540	878446
17.5	619	291	59	56546	777	23023	4697	2762	6819	109	112	391937	26285	116858	71454	431	361575
18.5	311	111	0	20913	851	3569	7172	1572	6493	33	224	258	0	0	466	43	1382
19.5	0	0	0	0	0	248	6849	34	20	0	0	418026	0	0	366	0	19
20.5	0	0	0	0	0	0	2313	20	0	0	0	0	0	0	0	0	0
21.5	0	0	0	0	0	0	324	0	0	0	0	0	0	0	224	0	0
22.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mean	15.9	15.1	12.9	13.0	11.5	16.1	17.0	16.1	15.9	10.9	15.8	13.5	16.3	11.2	12.7	13.7	14.1

Table 18 *Sebastes spp.* (<17 cm). Length disaggregated abundance indices (n*1000) for Greenland (total), 1982-1998. () incorrect due to incomplete sampling.

Length (cm)	1982	1983	(1984)	1985	1986	1987	1988	1989	1990	1991	(1992)	1993	(1994)	1995	1996	1997	1998
0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4.5	0	0	0	6	5	0	7	0	14	59	0	0	0	23	0	0	0
5.5	0	6	255	84	209	141	97	40	3468	15530	2396	7408	2393	234	253	622	287
6.5	6	78	602	280	514	935	495	1834	5708	59898	30723	301	9938	495	8115	32852	56427
7.5	0	219	252	378	459	1448	1940	2131	3010	11481	27897	8405	1054	87687	31647	55854	192619
8.5	70	518	425	540	2373	1059	9941	2222	8765	16705	5799	78938	4092	757846	20744	3310	36193
9.5	56	612	871	5881	6229	1133	7760	4394	13070	29955	11346	703438	9037	499490	173412	28559	49429
10.5	117	506	1505	84886	15886	1695	3662	5836	8205	58692	8922	422237	5238	110227	447048	127350	327950
11.5	348	739	2369	352378	25493	4342	2209	4962	8262	33546	5816	568188	2939	433793	420351	55486	616798
12.5	296	802	1411	246685	107920	9707	3030	3455	8306	4876	7686	1763056	6585	627728	90935	52882	150515
13.5	494	737	826	36845	76857	12430	6061	2759	7599	2245	11518	742584	6102	365705	221782	103662	311479
14.5	652	813	794	44022	14722	29849	12153	2048	5122	1551	6247	402157	10924	56541	411104	160273	381879
15.5	685	1059	705	70671	4892	83548	16734	2487	4937	1927	1388	658309	13871	61341	174797	133160	463035
16.5	291	831	106	70013	5370	84943	8250	3090	3477	1506	839	514054	10910	66721	101026	139117	883649
17.5	619	291	59	56546	7290	29159	7695	3267	7473	700	491	394042	27526	120403	82616	431	366160
18.5	311	111	0	20913	2251	3569	9686	1880	7317	251	270	258	68	44	524	43	1382
19.5	0	0	0	0	930	248	7043	58	153	32	0	418026	48	0	381	0	19
20.5	0	0	0	0	0	0	2313	20	133	13	0	0	16	0	0	0	0
21.5	0	0	0	0	0	0	324	0	67	0	0	0	32	0	224	0	0
22.5	0	0	0	0	0	0	0	0	67	19	0	0	0	0	0	0	0
23.5	0	0	0	0	0	0	0	0	33	0	0	0	0	0	0	0	0
24.5	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0
25.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mean	14.8	12.9	11.3	13.0	12.9	15.6	14.4	12.4	12.3	9.1	9.4	13.5	13.4	11.2	12.5	13.1	13.8

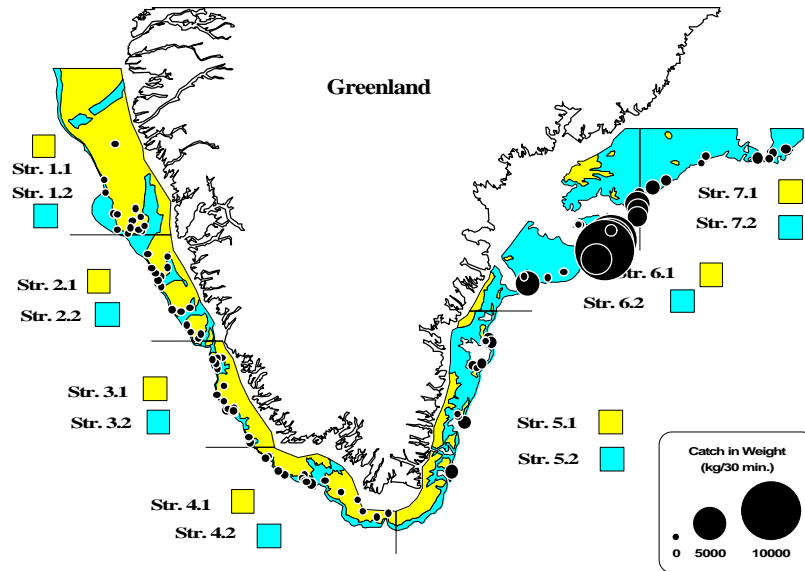


Fig. 1 Stratification of the survey area as specified in Table 2, positions of hauls carried out in 1998 and catches of deep sea *S. mentella* (≥ 17 cm).

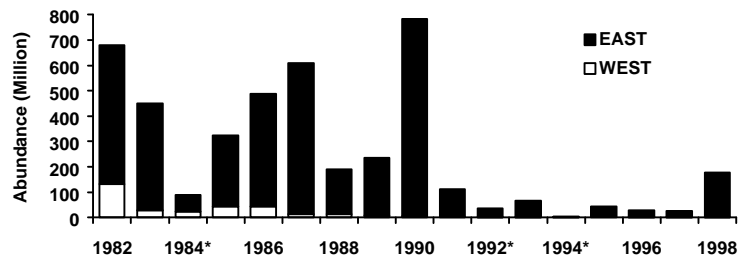


Fig. 2 *S. marinus* (≥ 17 cm). Survey abundance indices for East and West Greenland, 1982-98. *) incomplete survey coverage.

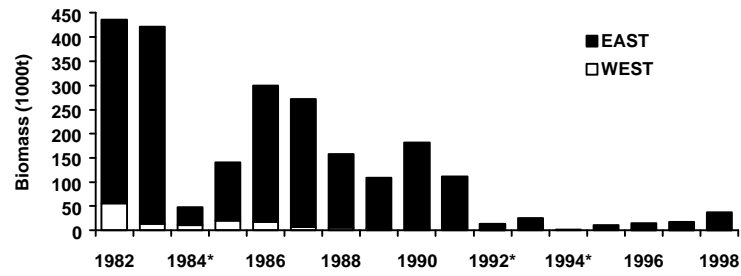


Fig. 3 *S. marinus* (≥ 17 cm). Survey biomass indices for East and West Greenland, 1982-98. *) incomplete survey coverage.

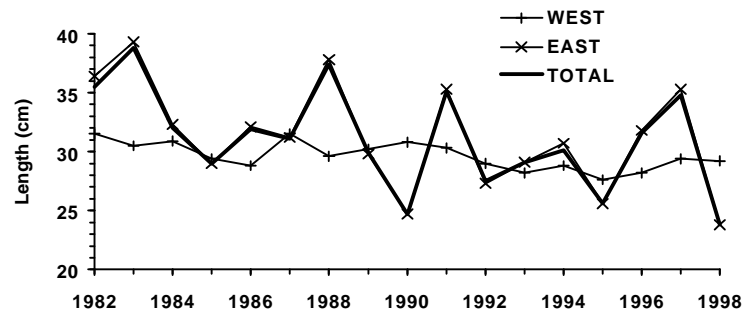


Fig. 4 *S. marinus* (≥ 17 cm). Weighted mean length (by abundance) for West, East Greenland and total as listed in Tables 6-8, 1982-98.

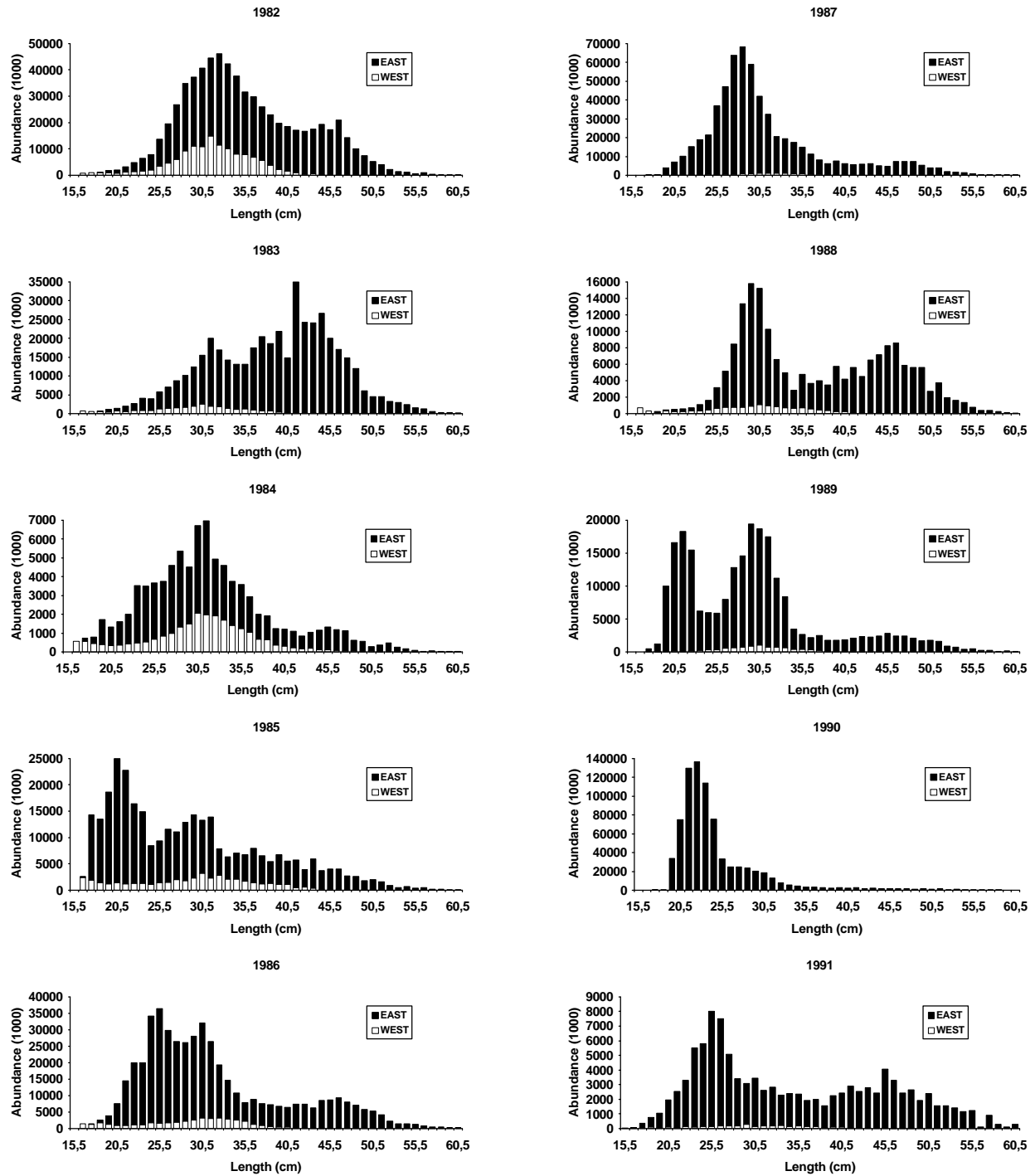


Fig. 5a *S. marinus* (≥ 17 cm). Length frequencies for East and West Greenland, 1982-91.

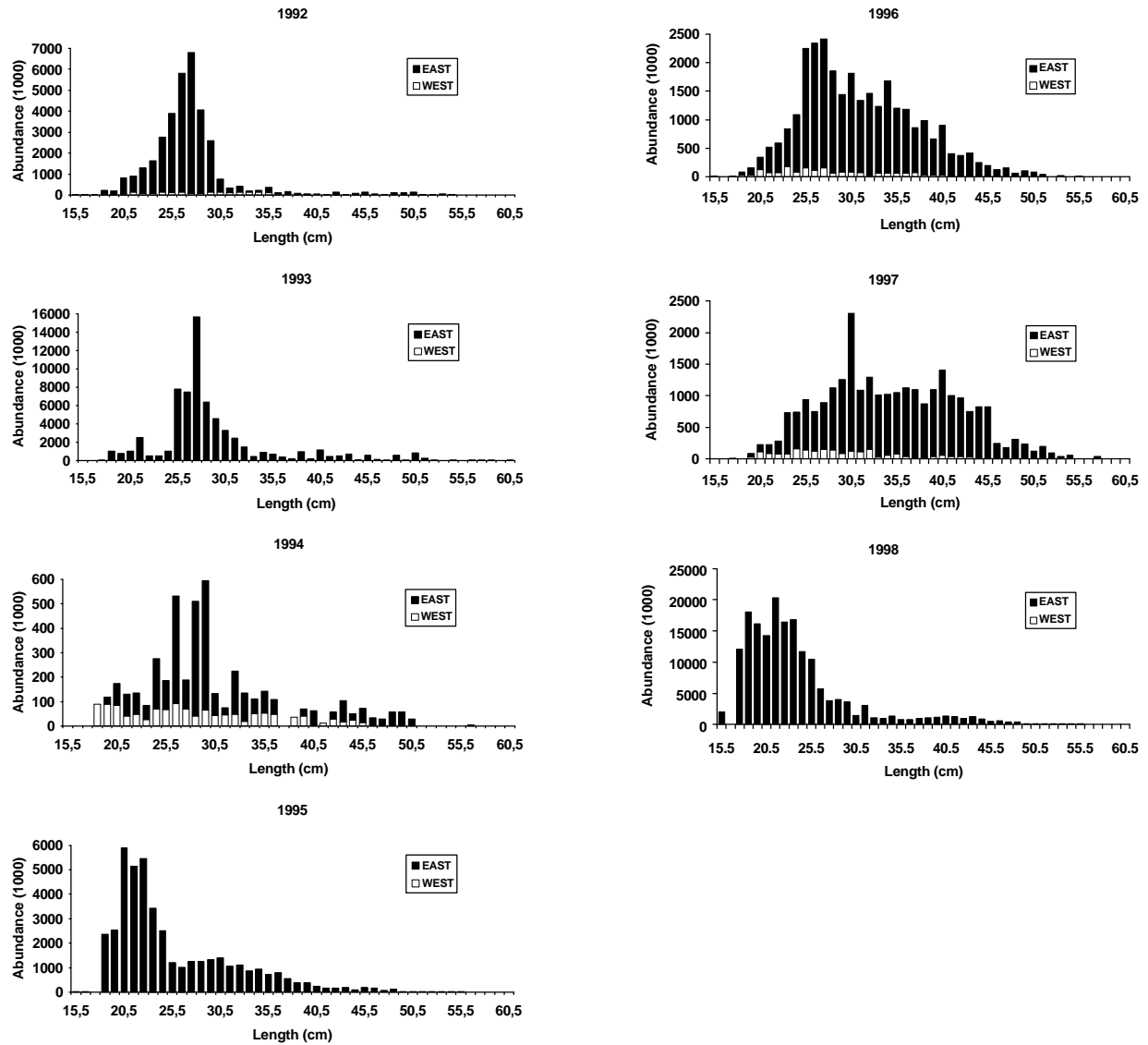


Fig. 5b *S. marinus* (≥17 cm). Length frequencies for East and West Greenland, 1992-98.

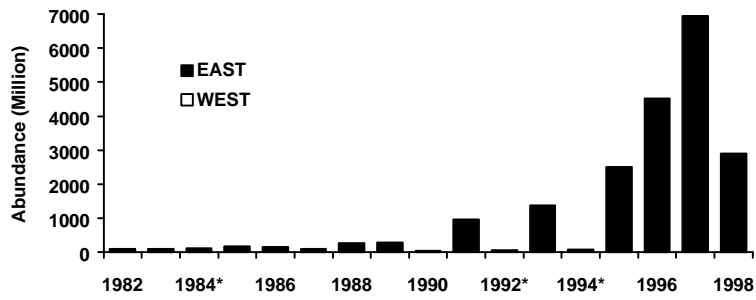


Fig. 6 Deep sea *S. mentella* (≥ 17 cm). Survey abundance indices for East and West Greenland, 1982-98. *) incomplete survey coverage.

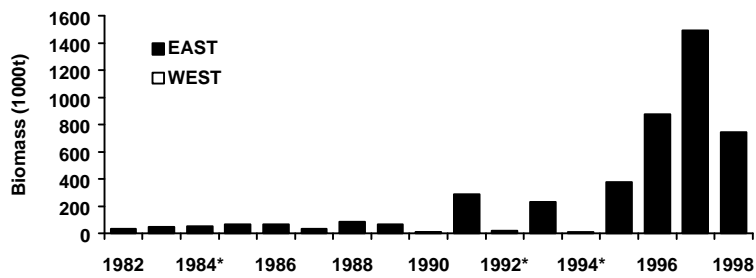


Fig. 7 Deep sea *S. mentella* (≥ 17 cm). Survey biomass indices for East and West Greenland, 1982-98. *) incomplete survey coverage.

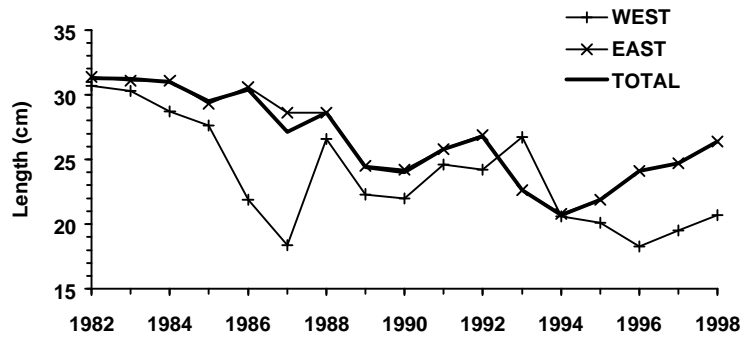


Fig. 8 Deep sea *S. mentella* (≥ 17 cm). Weighted mean length (by stratum abundance) for West, East Greenland and total as listed in Tables 11-13, 1982-98.

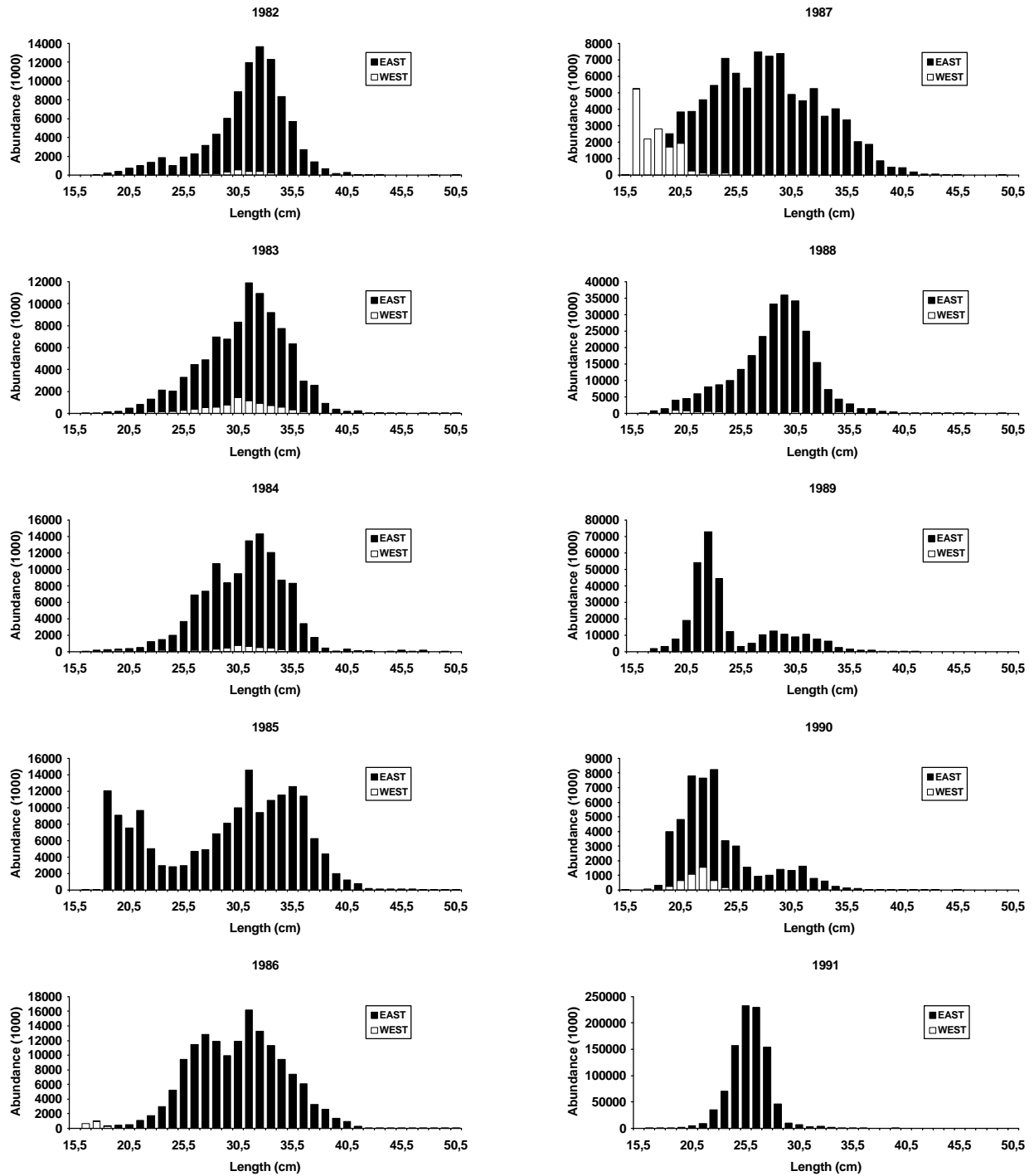


Fig. 9a Deep sea *S. mentella* (≥ 17 cm). Length frequencies for East and West Greenland, 1982-91.

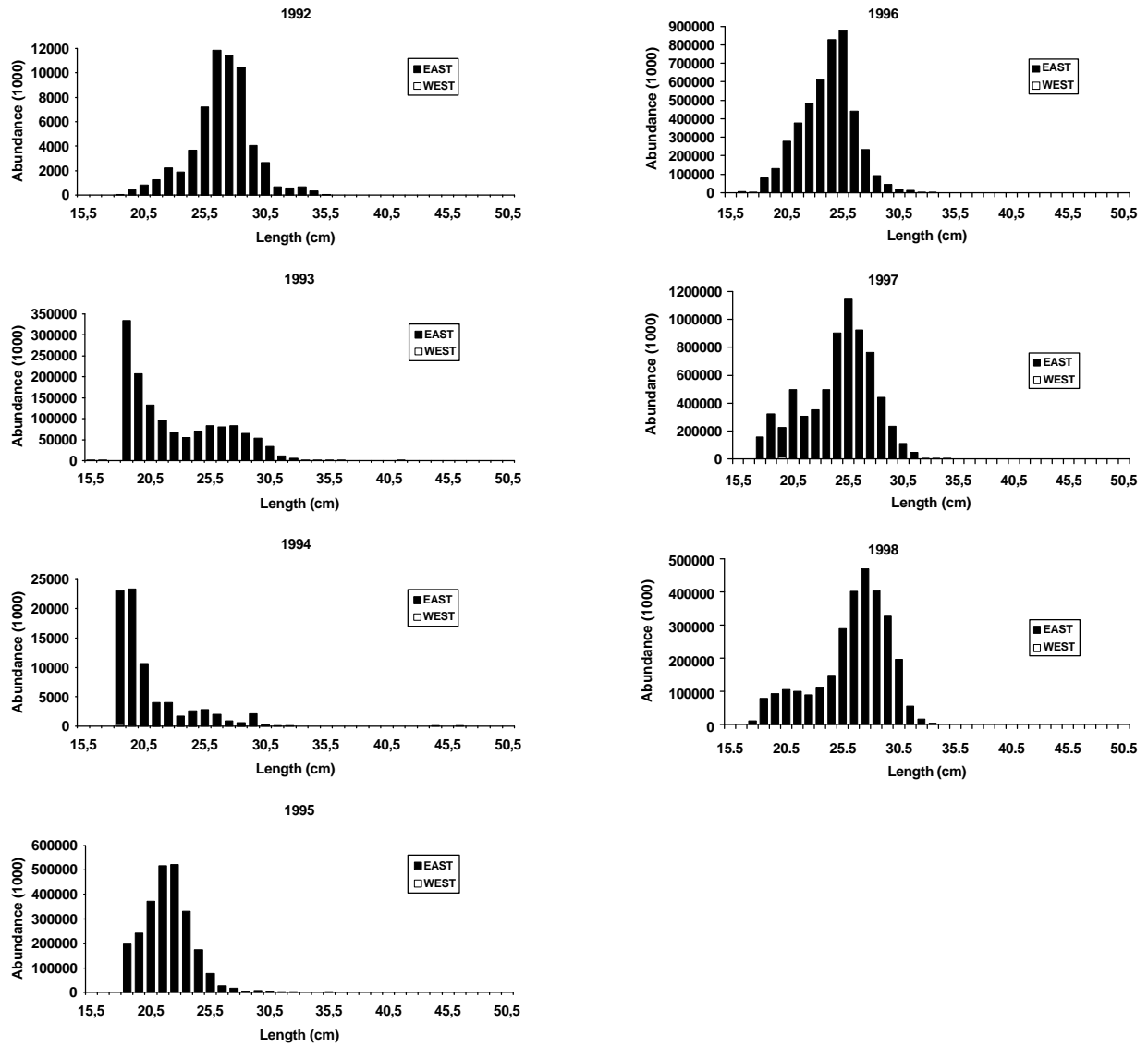


Fig. 9b Deep sea *S. mentella* (≥ 17 cm). Length frequencies for East and West Greenland, 1992-98.

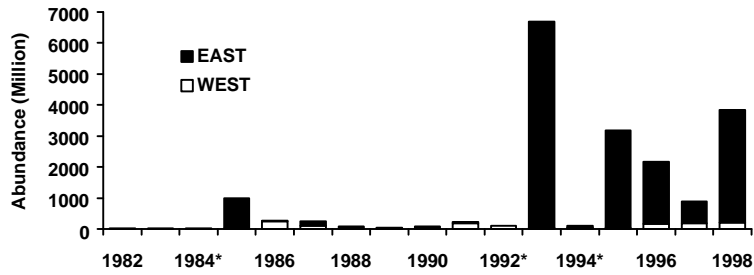


Fig. 10 *Sebastes spp.* (<17 cm). Survey abundance indices for East and West Greenland, 1982-98. *) incomplete survey coverage.

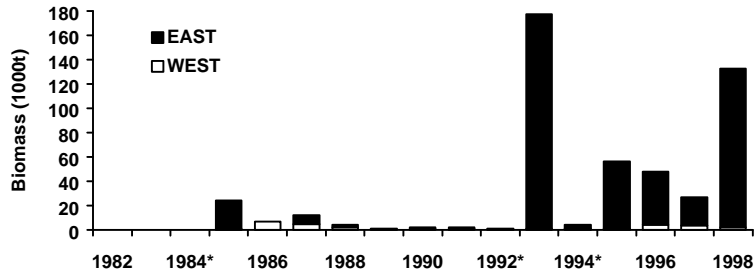


Fig. 11 *Sebastes spp.* (<17 cm). Survey biomass indices for East and West Greenland, 1982-98. *) incomplete survey coverage.

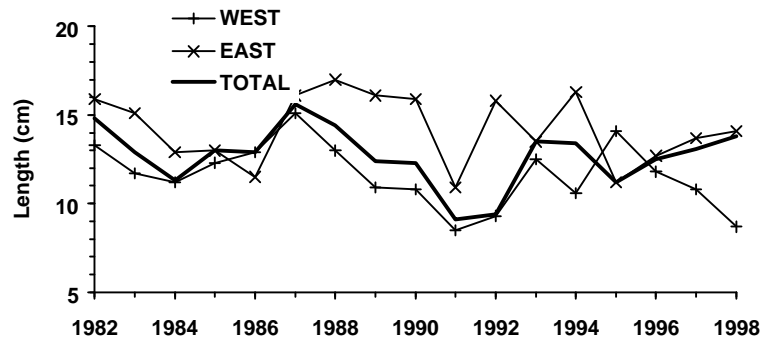


Fig. 12 *Sebastes spp.* (<17cm). Mean weighted length (by stratum abundance) for West, East Greenland and total as listed in Tables 16-18, 1982-98.

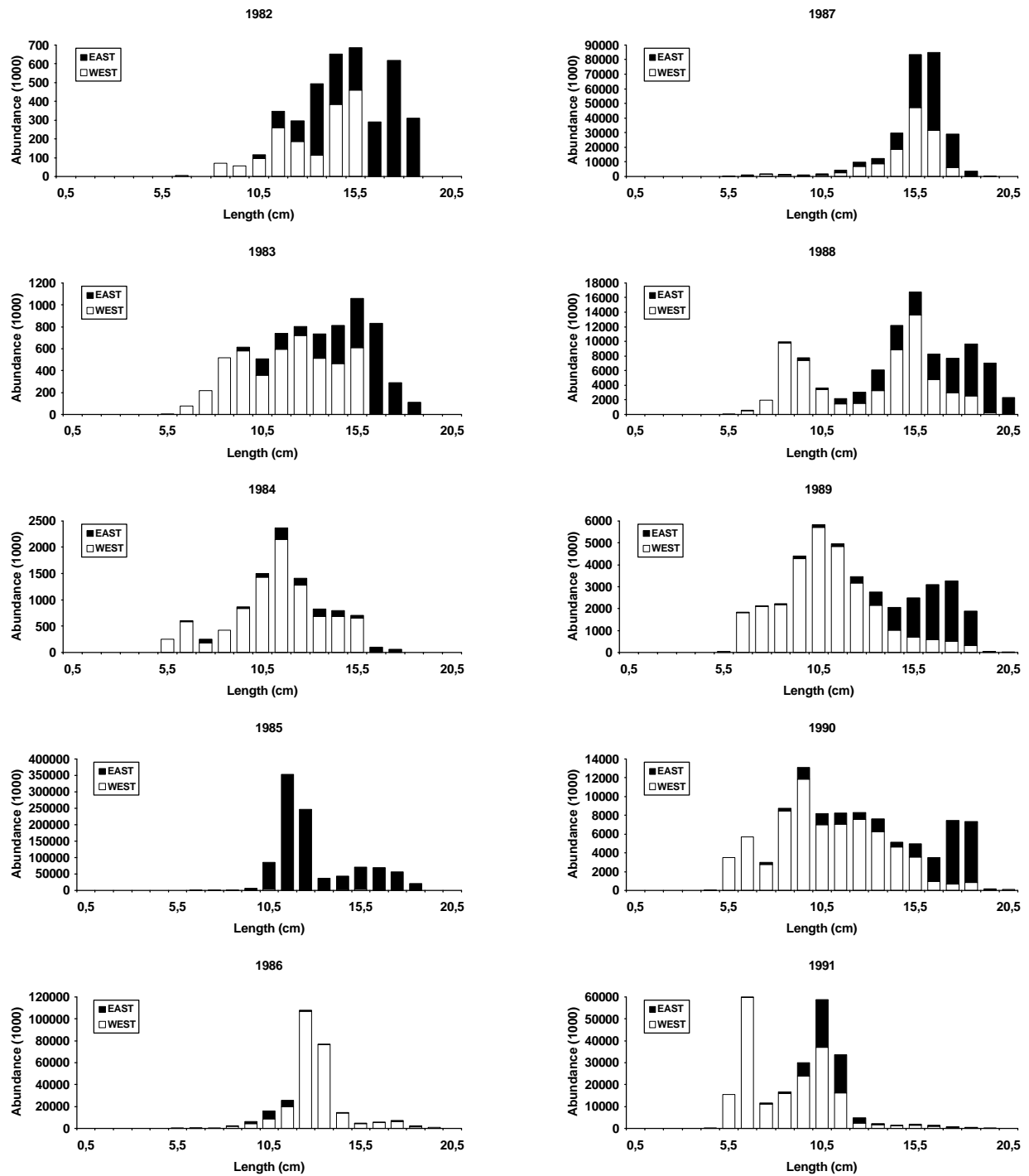


Fig. 13a *Sebastes* spp. (<17 cm). Length frequencies for East and West Greenland, 1982-91.

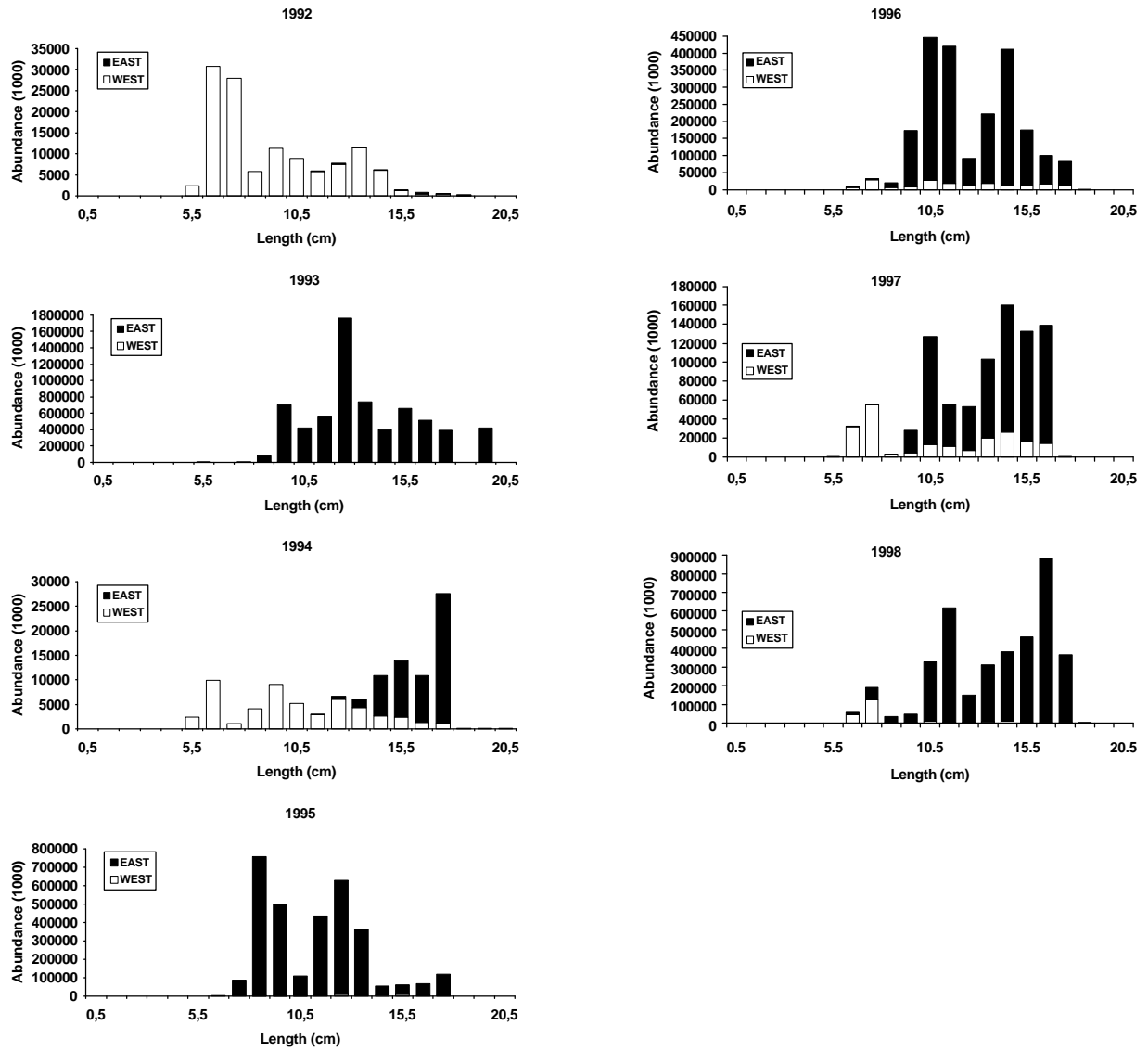


Fig. 13b *Sebastes* spp. (<17 cm). Length frequencies for East and West Greenland, 1992-98.