

## 7 REDFISH IN SUBAREAS V, VI, XII AND XIV

Species of the genus *Sebastes* are common and widely distributed in the North Atlantic. They are found off the coast of Great Britain, along Norway and Spitzbergen, in the Barents Sea, off the Faroe Islands, Iceland, East and West Greenland, and along the east coast of North America from Baffin Island to Cape Cod. All *Sebastes* species are viviparous. The extrusion of the larvae takes place in late winter–late spring/early summer, but copulation occurs in autumn–early winter.

There are three species of redfish commercially exploited in ICES Subareas V, VI, XII, and XIV, *S. marinus*, *S. mentella*, and *S. viviparus*. The last one has only been of a minor commercial value in Icelandic waters and is exploited in 2 small areas south of Iceland at depths of 150–250 m. The landings of *S. viviparus* decreased from 1,160 t in 1994 to 3 t in 2003.

### 7.1 Problems regarding stock identity of *S. mentella*

The WG recommended in 2003 that a separate ICES group with the appropriate expertise would review both existing and pending scientific material. As a response to that, it was decided at the ICES ASC that "A Study Group on Stock Identity and Management Units of Redfishes [SGSIMUR] (Chair: Kjell Nedreaas, Norway) will be established and will meet in Bergen, Norway, from 31 August to 3 September 2004 to a) review all reported material on the stock identity of the various redfish units (*S. mentella*) in the Irminger Sea and adjacent waters; b) identify the most likely definition of biological stocks of *S. mentella* as well as suggest practical management units. SGSIMUR will report by 8 September 2004 for the attention of RMC and ACFM." It has further been decided that there will be a 5 days meeting of the NWWG right after the SGSIMUR meeting to complete the assessment of the *S. mentella* stock(s) based on the outcome of SGSIMUR. This Sub-Group of NWWG will also meet in Bergen; the dates have been set for 6 to 10 September.

Due to this decisions mentioned above, the WG did not discuss further the problems of stock identity, but focused on updating information which will form the basis for the advice. Furthermore, the group focused on dividing the available data in such a way that the outcome of the SGSIMUR could be used on the available data

The existence of more than one stock of *S. mentella* in the area has been discussed in recent years. Historically, *S. mentella* was fished on the continental shelves and slopes of the Faroe Islands, Iceland, and East Greenland and been considered as one stock. A new pelagic fishery started in the open Irminger Sea in 1982, primarily fishing in waters shallower than 500 m. In 1992, the Study Group on Redfish Stocks distinguished between these types as deep-sea *S. mentella* (shelf redfish) and oceanic *S. mentella* (Irminger Sea redfish). In the early 1990's, the pelagic fishery in the open Irminger Sea moved to layers deeper than 500 m. Some researchers considered that the fish caught pelagically deeper than 500 m differed from the fish caught shallower than 500 m and resembled more to the deep-sea *S. mentella* living on the continental shelves and slopes. *S. mentella* living deeper than 500 m has been called "pelagic deep-sea *S. mentella*". Recently, the distribution of the pelagic *S. mentella* in the upper 500 m has extended significantly more southwest and into the NAFO Convention Areas compared to the early 1990's.

It is not known whether these types represent one stock or several biologically different stocks and different hypotheses have been put forward based on comprehensive studies on growth, maturity, morphometrics, parasites as natural tags, and genetic and fatty acid differentiation of the species:

- **Single-stock hypothesis:** All *S. mentella* from the Faroe Islands to the Grand Banks is one stock and is segregated according to age/size.
- **Two-stock hypothesis:** The *S. mentella* living on the shelves (deep-sea *S. mentella*) and those living in deeper pelagic waters of the Irminger Sea (pelagic deep-sea *S. mentella*) is one stock unit, which is separated from the oceanic *S. mentella* living in the upper layers of the Irminger Sea.
- **Three-stock hypothesis:** The three described components are biologically different stocks.

Despite a lot of effort by the WG, there is not a consensus within the WG regarding which hypothesis is the most likely one. Although the uncertainty regarding stock structure of *S. mentella* is great, extensive research have been done. Currently, several studies are ongoing to answer important questions regarding the biology, population structure, and abundance and demography of this highly migratory and straddling species.

## 7.2 Nominal landings and splitting of the landings into stocks

The official statistics reported to ICES do not divide catch by species/stocks (Tables 7.2.1-7.2.5). Information from various sources, are used to split demersal landings into species (see WD 30). In Div, Va if no direct information are available on the catches for a given vessel, the landings are allocated based on logbooks and samples from the fishery. According to the proportion of biological samples from each cell (one fourth of ICES statistical square) the unknown catches within that cell is split accordingly and raised to the landings of a given vessel. For other areas, samples from the landings are used as basis for dividing the demersal redfish catches between *S. marinus* and *S. mentella*. Furthermore, according to Icelandic legislation fishing vessels are obligated to divide their *S. mentella* catches into pelagic *S. mentella* or shelf deep-sea *S. mentella* depending whether they are fishing west or east of the redfish line (see WD 30 for further details). All *S. mentella* caught outside the Icelandic EEZ is reported as pelagic type.

## 7.3 Abundance and distribution of 0-group and juvenile redfish

Available data on the distribution of juvenile *S. marinus* indicate that the nursery grounds are located in Icelandic and Greenland waters. No nursery grounds have been found in Faroese waters. Studies indicate that considerable amounts of juvenile *S. marinus* of East Greenland is mixed with juvenile *S. mentella* (Magnússon et al. 1988; 1990, ICES CM 1998/G:3). The 1983 Redfish Study Group report (ICES CM 1983/G:3) and in Magnússon and Jóhannesson (1997) describes the distribution of 0-group *S. marinus* off East Greenland. The nursery areas for *S. marinus* in Icelandic waters are found all around Iceland, but are mainly located west and north of the island at depths between 50 and 350 m (ICES C.M.1983/G:3; Einarsson, 1960; Magnússon and Magnússon 1975; Pálsson et al. 1997). The migration of juveniles is along the north coast towards the most important fishing areas off the west coast.

Indices for 0-group redfish in the Irminger Sea and at East Greenland areas were available from the Icelandic 0-group surveys from 1970–1995. Thereafter, the survey was discontinued. Above or average year-class strengths were observed in 1972, 1973–74, 1985–91, and in 1995.

Abundance and biomass indices of juvenile (<17 cm) redfish (juveniles were only classified to the genus *Sebastes* spp. due to difficult identification) from the German annual groundfish survey, conducted on the continental shelf and slope of West and East Greenland down to 400 m, shows that juveniles were abundant in 1993 and 1995-1998 (Figure 7.3.1). The 1999-2003 survey results indicate low abundance and are similar to those observed in the late 1980s.

## 7.4 Discards and by-catch of small redfish

An offshore shrimp fishery with small meshed trawl (44 mm in the codend) began in the early 1970s off the west coast of Greenland. This fishery expanded to the east coast in the beginning of the 1980s and was mainly conducted on the shallower part of the Dohrn Bank and on the continental shelf from 65°N to 60°N. Observer samples from the Greenland Fishery Licence Control showed that redfish is bycatch in the shrimp fishery off Greenland. No information was available in recent years to quantify the bycatch and about the length distribution of the fish caught. Since the 1st October 2000, sorting grids have been mandatory to reduce bycatch, but the effect has not been documented. Such documentation is needed in order to estimate the bycatch of young redfish in the shrimp fishery.

In late 1980's, Iceland introduced a sorting grid in the shrimp fishery to reduce the bycatch of juveniles in the shrimp fishery north of Iceland. This was partly done to avoid redfish juveniles as a bycatch in the fishery, but also juveniles of other species. Since the large yearclasses of *S. marinus* disappeared out of the shrimp fishing area, there in the early 1990's, observers report small redfish as being negligible in the Icelandic shrimp fishery.

## 7.5 Special Requests

There are several questions regarding stock structure, distribution, and fishery information of *S. mentella* in the area in the ToR for the Working Group. The following paragraphs deals with ToR *c* and *f* and special requests from NEAFC. The other special request will be adressed during the September session of the WG.

Detailed descriptions of the fishery of different nations are given in Sections 8 for *S. marinus*, 9 for deep-sea *S. mentella*, and 10 for oceanic *S. mentella*, based on various working documents.

The fishery for pelagic *S. mentella* in ICES Sub-areas Va, XII, and XIV and in NAFO areas shows a persistent seasonal pattern in terms of geographical and depth distribution for the past five years (Figures 7.5.1-7.5.3). The main fishing occurs in the second and third quarter of the year. In the second quarter, the fishery takes place in the area east of 32°W and north of 61°N at depths deeper than 500 m. In the third quarter, the fleet moves towards the southwest to ICES Sub-

area XII and NAFO Convention areas and the depth of the hauls are in waters shallower than 500 m. There has traditionally been very little fishing activity from November until late March, and in November 2003 until late March 2004 no activity was reported. The size of the fish caught in the southwest areas in the third quarter of the year is smaller than the fish caught in the northeast area in the second quarter (Figure 7.5.4). Usually, over 95% of the fish caught in all seasons are sexually mature.

Based on the geographical and seasonal distribution of the oceanic *S. mentella*, logbook catches in the Irminger Sea and adjacent waters (Figures 7.5.1-7.5.4) it was concluded that the fishing pattern in 2003 was similar as it was in the past five years. The only new feature in the fishery was that the Icelandic fleet continued its fishery further north in 2003 than previously. The pelagic fishery extended to the shelf area, overlapping with the fishing areas for *S.mentella* on the shelf (see section 10.2.1.).

As has been reported in earlier reports of the Working Group, Iceland has classified its pelagic catches between oceanic and pelagic deep-sea redfish. Based on the samples, the results indicated that at depths shallower than 500-600 m, the proportion "oceanic" is between 85-100%, and the proportion deeper than 600 m between 0-20%. Based on the same samples, divided by areas instead of depth, the results shows that since 1997, more than 90% of the catches in the northeastern fishing area are classified as "deep sea type" and above 90% of the catches in the southwestern fishing area during the same period is classified as "oceanic type" (Table 7.2.6).

The WG acknowledge information on trawling depth as provided by some nations, but recommends that all nations provide depth information in accordance with the NEAFC logbook format.

**Table 7.2.1** REDFISH. Nominal landings (tonnes) by countries, in Division Va 1996-2003, as officially reported to ICES.

Country	1997	1998	1999	2000	2001	2002	2003*
Faroe Islands	242	280	255				
Germany	-	284	428	513	844	467	1,105
Greenland	-	*	*	*	*	3,341*	
Iceland	73,976	108,380	81,430	95,118	48,970	63,247	67,997 <sup>1</sup>
Norway	-	-	18	36	26*	16*	19
UK (E/W/NI)	-	-	542	734	1,037	432	...
UK (Scotland)	-	-	149	70	114	272	...
United Kingdom						704	1,081
Total	74,218	108,944	82,822				

\*Preliminary. <sup>1</sup>Includes 41,231 t Golden redfish; 21,431 t Beaked redfish and 5,335 t Oceanic redfish.

**Table 7.2.2** REDFISH. Nominal landings (tonnes) by countries, in Division Vb 1996-2003, as officially reported to ICES.

Country	1997	1998	1999	2000	2001	2002	2003*
Faroe Islands	7,199	6,484	6,191				
France	98	110*		250	189	221	262
Germany	36	-	207	79	88	2	19
Greenland	-	*	*	*	*	13*	
Iceland	-	-	-	-	54	35	-
Ireland	-	-	-	-	1	-	
Norway	25	39	37	41	24*	30*	31
Russia	-	-	-	12	-	-	-
UK (E/W/NI)	+	4	15	111	92	120	...
UK (Scotland)	36	27	46	142	116	89	...
United Kingdom						409	89
Total	7,394	6,664					

\*Preliminary.

**Table 7.2.3** REDFISH. Nominal landings (tonnes) by countries, in Division VI 1996-2003, as officially reported to ICES.

Country	1997	1998	1999	2000	2001	2002	2003*
Estonia	-	-	-	-	+	-	-
Faroe Islands	12	-	44				
France	395	297*		269	188	97	113
Germany	1	1	+	+	1	-	-
Ireland	10	10	34	54	47	26	
Norway	6	3	8	11	5*	9*	7
Portugal	-	1	-	-	-	-	-
Russia	-	-	243	461	88	19	94 <sup>1</sup>
Spain	-	-	38	16	4	784	
UK (E/W/NI)	19	12	4	20	44	7	...
UK (Scotland)	518	364	762	405	485	376	...
United Kingdom							950
Total	961	688					

\*Preliminary. <sup>1</sup>Reported as *S. mentella*.

**Table 7.2.4** REDFISH. Nominal landings (tonnes) by countries, in Sub-area XII 1996-2003, as officially reported to ICES.

Country	1997	1998	1999	2000	2001	2002	2003*
Estonia	3,720	3,968	2,108	4,000	-	-	-
Faroe Islands	3,822	1,793	528				
France	-	3*	-	+	+	-	1
Germany	8,866	9,746	8,204	1,128	3,833	3,032	565
Greenland	...	1,180*	1,188*	124*	740*	-*	
Iceland	3,856	1,311	5,072	3,121	11,679	5,745	-
Latvia	-	-	-	-	-	1,061	371
Lithuania	-	-	-	-	-	-	14,321
Norway	31	602	2,040	2,200	878*	1,094*	3,111
Poland	662	-	-	-	-	1	-
Portugal	-	-	-	-	387	878	504 <sup>1</sup>
Russia	-	89	7,698	9,243	4,509	6,090	2,430 <sup>2</sup>
Spain	1,155	2,231	1,723	576	1,332	854	
UK (E/W/Nl)	-	+	187	-	-	+	...
UK (Scotland)	-	-	1	+	-	4	...
United Kingdom							1
<b>Total</b>	<b>22,112</b>	<b>20,923</b>	<b>28,749</b>				

\*Preliminary. <sup>1</sup>Reported as V/XII/XIVGRN. <sup>2</sup>Reported as *S. mentella*.

**Table 7.2.5** REDFISH. Nominal landings (tonnes) by countries, in Sub-area XIV 1996-2002, as officially reported to ICES.

Country	1997	1998	1999	2000	2001	2002	2003*
Estonia	-	-	-	3,811	599	-	-
Faroe Islands	123	47	2				
Germany	11,610	9,709	8,935	7,840	6,758	9,576	7,050
Greenland	193	296*	3,152*	3,545*	2,587*	1,171*	
Iceland	33,820	6,441	23,770 <sup>1</sup>	17,999	31,786	41,805	43,063 <sup>2</sup>
Norway	3,187	525	3,253	3,699	4,258*	4,215*	5,073
Poland	114	-	-	-	-	-	141 <sup>4</sup>
Portugal	3,674	4,133	4,302	4,154	2,116	2,208	2,116 <sup>3</sup>
Russia	36,930	25,748	16,652	14,851	23,851	25,309	28,687 <sup>4</sup>
Spain	7,552	4,660	4,175	2,657	4,982	-	
UK (E/W/Nl)	28	43	68	45	179	16	...
UK (Scotland)	-	-	-	-	-	17	...
United Kingdom							378
<b>Total</b>	<b>97,231</b>	<b>51,602</b>	<b>64,309</b>				

\*Preliminary. <sup>1</sup>Note Excluding 58 t reported as area unknown. <sup>2</sup>Oceanic redfish. <sup>3</sup>Reported as V/XII/XIV. <sup>4</sup>Reported as *S. mentella*.

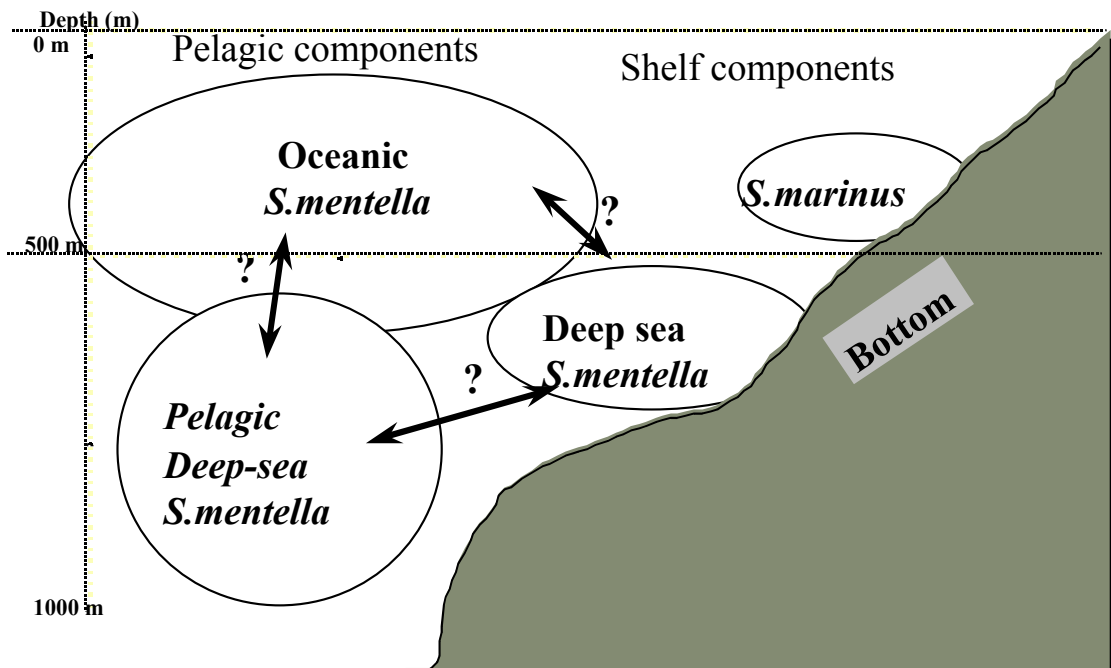
**Table 7.2.6** Icelandic pelagic redfish catch between possible stocks. Iceland has divided samples collected from the fishery between "oceanic" and "deep sea" type since 1995. The table gives the Icelandic landings of these groups based on the sampling and. For definition of northeastern and southwestern areas, see Figure 10.2.5.

Northeastern area

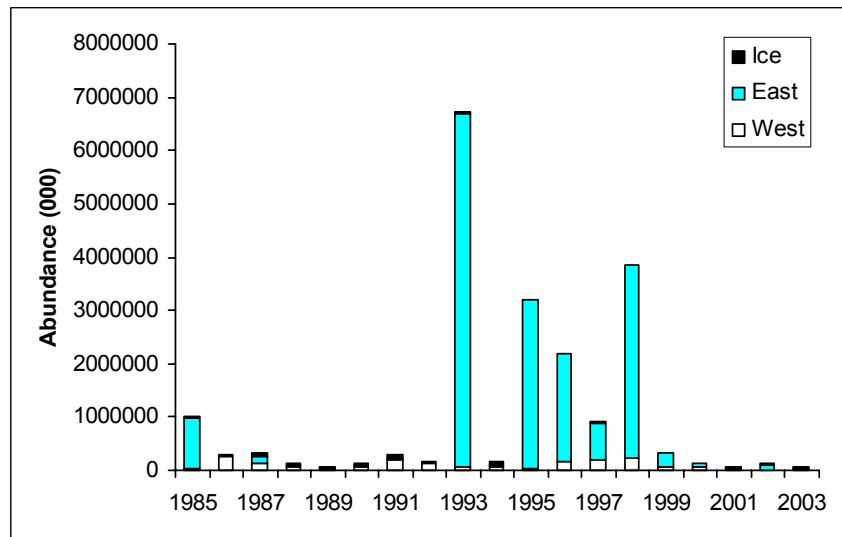
<b>Year</b>	<b>prop unclassified</b>	<b>prop. deep sea</b>	<b>Prop. oceanic</b>	<b>Total catch</b>
1995	0%	71%	29%	7711
1996	4%	36%	61%	58320
1997	0%	31%	69%	39179
1998	0%	8%	92%	46647
1999	0%	6%	94%	38050
2000	0%	5%	95%	44568
2001	1%	4%	95%	28728
2002	2%	4%	94%	38079
2003	3%	5%	91%	43320

Southwestern area

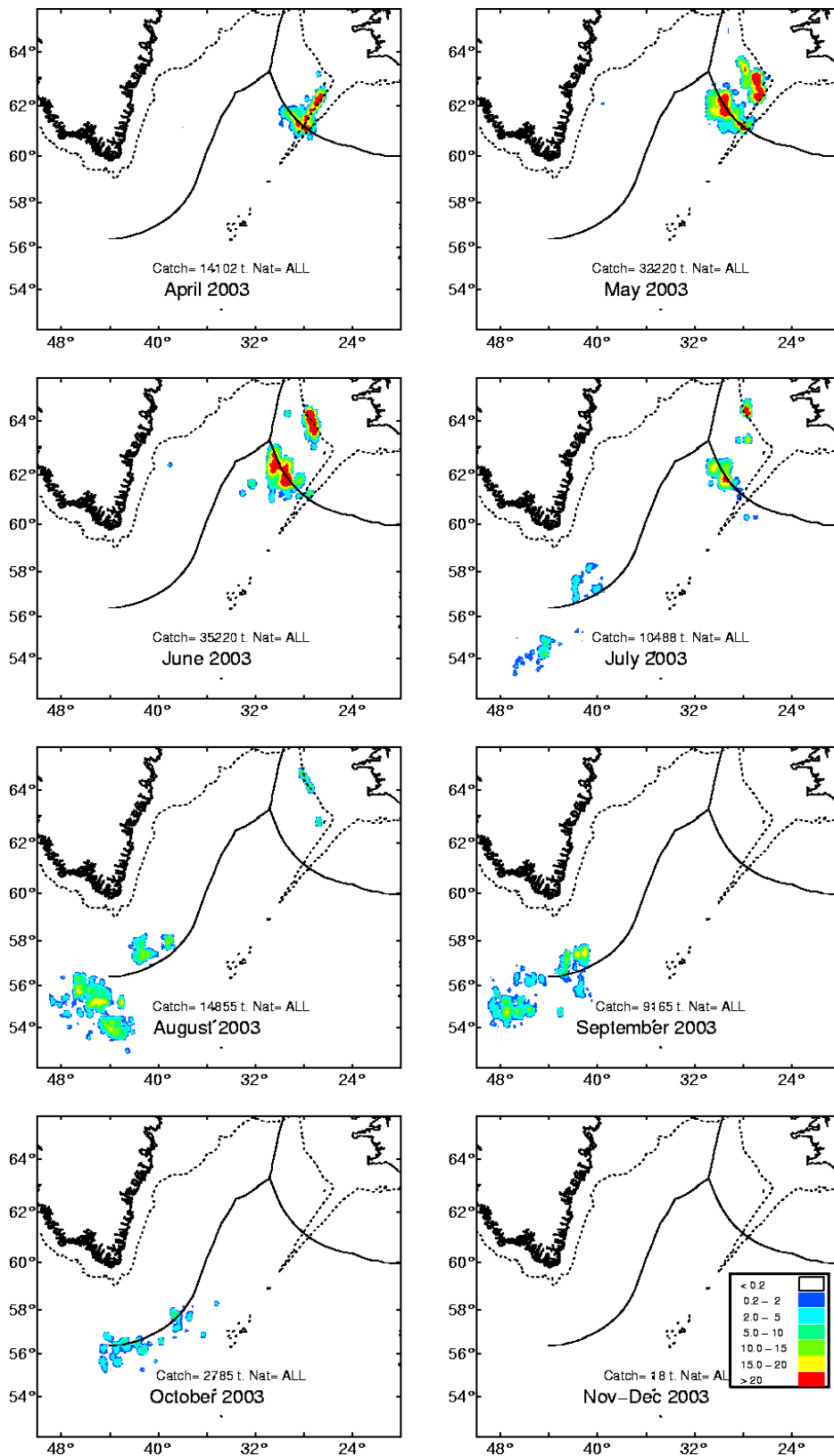
<b>Year</b>	<b>prop unclassified</b>	<b>prop. deep sea</b>	<b>Prop. oceanic</b>	<b>Total catch</b>
1995	0%	69%	31%	26919
1996	74%	25%	0%	4583
1997	22%	67%	11%	2097
1998	100%			1872
1999	1%	98%	1%	5873
2000	100%			664
2001	0%	91%	8%	13744
2002	5%	95%	0%	5373
2003	0%	100%	0%	5078



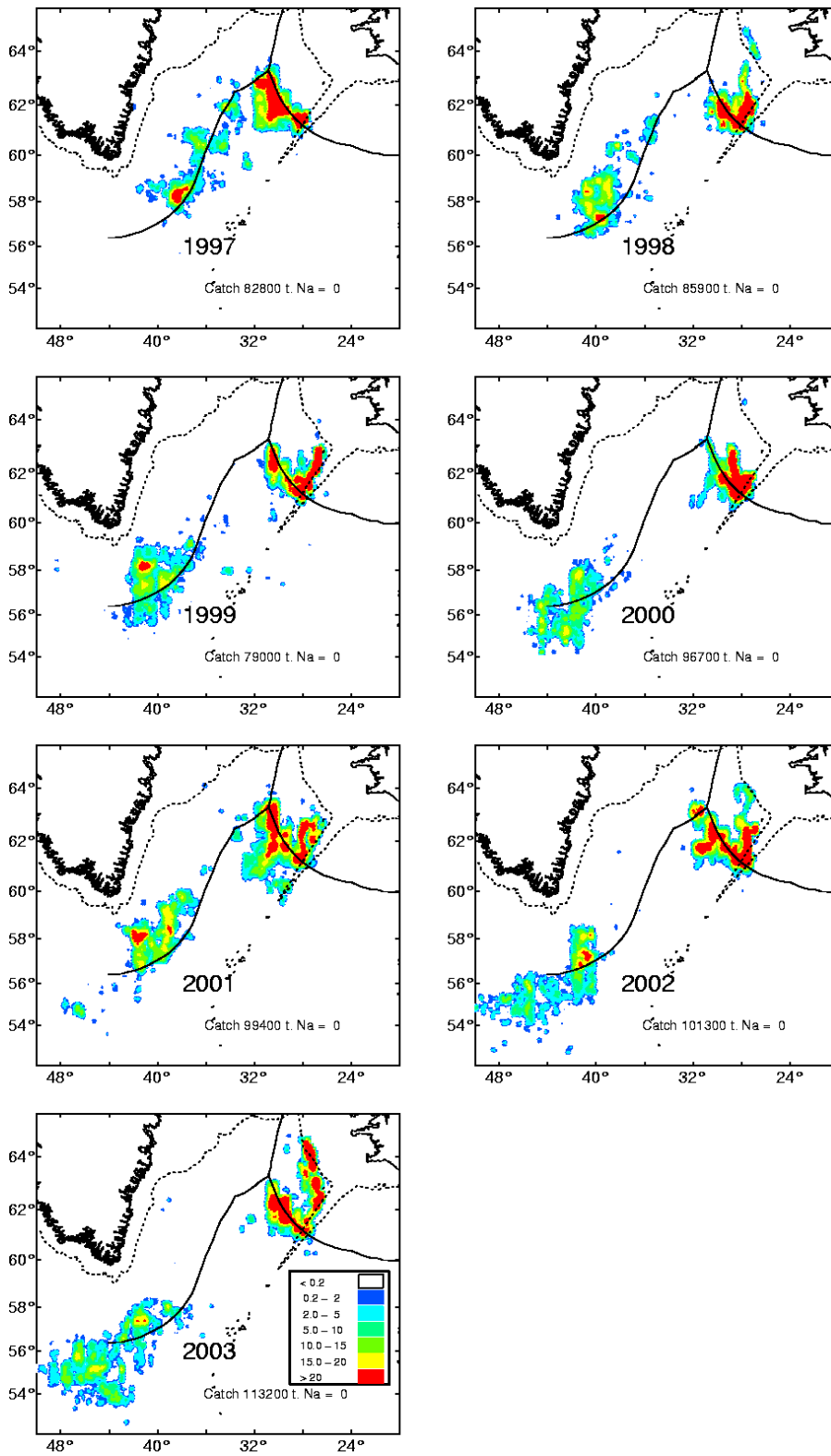
**Figure 7.1.1** Possible relationship between different stocks and species of *S. marinus* and *S. mentella* in the Irminger Sea and adjacent waters.



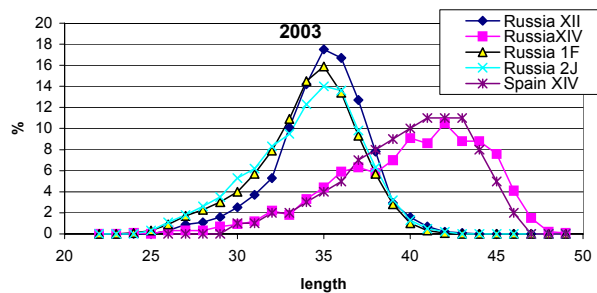
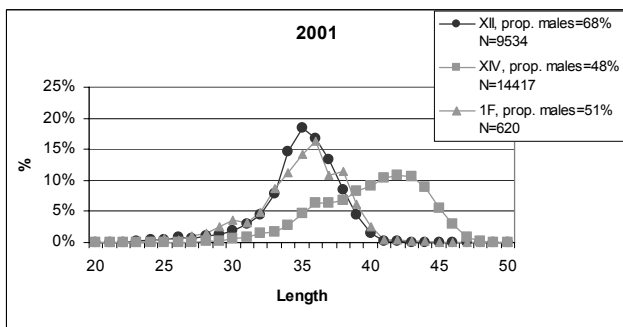
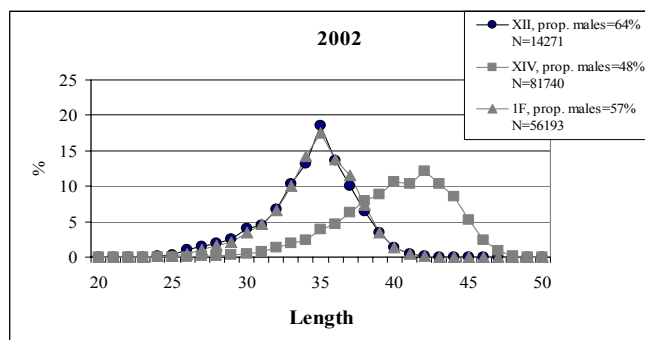
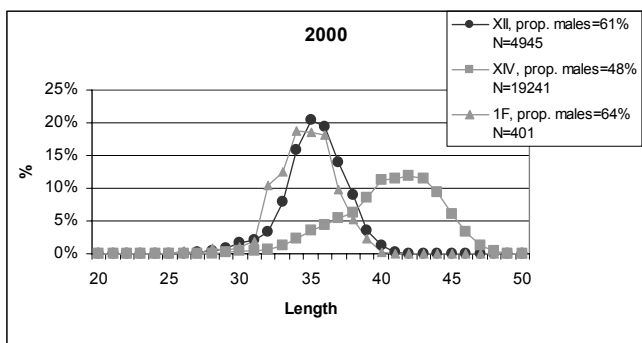
**Figure 7.3.1** Survey abundance indices of *Sebastes* spp. (<17 cm) from the German and Icelandic groundfish surveys conducted on the continental shelves of East and West Greenland and Iceland 1985-2003.



**Figure 7.5.1** Fishing areas and total catch of the pelagic redfish (*S. mentella*) by month in 2003, derived from catch statistics provided by Faroes, Germany, Greenland, Norway, Iceland and Russia. The scale for the catch is in tonnes per squared nautical mile. Total catch for each period is also given.



**Figure 7.5.2** Fishing areas and total catch of the pelagic redfish (*S. mentella*) in the Irminger Sea and adjacent waters 1995-2003. Data are from Germany (1995-2003), Norway (1995-2003) Greenland (1999-2003), Russia (1997-2003), Faroese (1995-2003), and Iceland (1995-2003). The scale given is tonnes per square nautical mile.



**Figure. 7.5.5** Length distribution of the oceanic redfish fishery in ICES Div. XII, XIV and in NAFO Div. 1F by year from 2000-2003. Data from Spain (2000 -2003) and Russia (2002-2003). The proportion of males is also given.