



SCIENTIFIC COUNCIL MEETING – JUNE 2008

A REPORT ON THE PELAGIC REDFISH ICES ADVICE AND DELIBERATIONS OF THE 2008 NORTH-WESTERN WORKING GROUP

By

Fernando González Costas

e-mail: fernando.gonzalez@vi.ieo.es3
Instituto Español de Oceanografía, Vigo, Spain**Introduction**

Redfish are found in the entire North Atlantic and contribute important fishery resources in ICES and NAFO areas. There are four species of redfish commercially exploited in the North Atlantic *S. marinus*, *S. mentella*, *S. fasciatus* and *S. viviparus*. *S. mentella* is one of major commercial fisheries in the North Atlantic.

The stock structure of *S. mentella*, which is found on demersal grounds and in the pelagic zone, is not resolved and advice is given separately for demersal *S. mentella* and pelagic *S. mentella*.

Pelagic redfish (*S. mentella*) fishery in the Irminger Sea and adjacent waters straddle in the ICES Div. Va, Subareas XII and XIV and NAFO Subareas 1 and 2. They occur inside the EEZs of Iceland and Greenland and in the Regulatory Areas of NEAFC and NAFO. NEAFC is the responsible management body, and ICES the advisory body. The ICES North-Western Working Group (NWWG) is in charge of the analyze the information of this stock and provide the first ICES advice draft. The NWWG meeting took place from 21 to 29 April 2008 in Copenhagen. The aim of this document is to present the NWWG and ICES information to respond the Fisheries Commission Special Request (SC agenda item VII.1.e.iii and item VII.3.a).

The ICES Advisory Processes was reformed last year. Now the results of the expert groups like NWWG are not definitive until they had been revised and approved by the ICES Advisory Committee (ACOM) who is the ICES body in charge of the advise.

Review pelagic redfish distribution and stock-affinities (NAFO Scientific Council agenda item VII.1.e.iii and Fisheries Commission request for scientific advice 7)

Fisheries Commission requested NAFO Scientific Council to: “Regarding pelagic *S. mentella* redfish in NAFO Subareas 1-3, the Scientific Council is requested to review the most recent information available on the distribution and abundance of this resource, as well as any new information on the affinity of this stock to the pelagic redfish resource found in the ICES Sub-area XII, parts of SA Va and XIV and to the shelf stocks of redfish found in ICES Sub-areas V, VI and XIV, and NAFO Subareas 1-3.”

This matter was revised by NAFO Scientific Council in the last years. In the 2008 NWWG not new information about the *S. mentella* stock structure was reviewed and the ICES advice about the population units has not changed since 2005 and is the following: “ICES decided to maintain the current advisory units until a comprehensive review of stock identification information is available: a demersal unit on the continental shelf in ICES Divisions Va, Vb, and XIV and a pelagic unit in the Irminger Sea and adjacent areas (V, VI, XII, and XIV). This latter unit also includes pelagic redfish in the NAFO Convention Area. A schematic illustration of the horizontal and vertical

distribution of redfish in these areas is given in Figure 1. An ICES/NAFO expert group will review the available information on stock identification of redfish in early 2009.”

Reviews the ICES evaluation of stock status and scientific advice on oceanic redfish (NAFO Scientific Council agenda item VII.3.a and Scientific Council 2008 recommendation).

1.- NWWG 2008

1.1.- Introduction (Description of the fishery)

Since 1997, the main fishing season occurred during the second quarter. The pattern in the fishery has been reasonably consistent in the last 9 years and can be described as follows: In the first months of the fishing season (which usually starts in early April), the fishery is conducted in the area east of 32°W and north of 61°N, and in July (or August), the fleet moves to areas south of 60°N and west of about 32°W where the fishery continues until October (Figure 2). There is almost no fishing activity in the period from November until late March or early April when the next fishing season starts. In 2005-2007, however, the fishery already stopped in early September, probably due to decreased catch rates in the southwestern area, and in 2006-2007, also due to an increased effort in the pelagic redfish fishery in the Norwegian Sea (ICES Div. IIa) in autumn, where parts of the same fleet are operating.

The fleets participating in this fishery have continued to develop their fishing technology, and most trawlers now use large pelagic trawls ("Gloria"-type) with vertical openings of 80-150 m. The vessels have operated at a depth range of 200 to 950 m in 1998-2007, but mainly deeper than 600 m in the northeastern area in the first and second quarter, and at depths shallower than 500 m in the southwestern area in third and fourth quarter.

1.2.- Data

1.2.1.- Catches

The Group had again difficulties in obtaining catch estimates from the various fleets, especially with respect to pelagic *S. mentella*. Furthermore, landings data were missing from some nations. The Group requests NEAFC and NAFO to provide ICES in time with all information that supports the Group with regard to more reliable catch statistics.

The Group, however, repeatedly faced problems in obtaining catch data. The Group has during the last years identified problems with unreported catches of pelagic redfish. Current data available to the Group indicate that the reported effort (and consequently landings) could represent only around 80% of the real effort.

For pelagic *S.mentella* reported catch statistics to the group for 2007 are 64,000t compared to 83,000 tonnes in 2006 (Table 1).

1.2.2.- Commercial CPUE

Non-standardised CPUE series for the largest fleets (representing about 80% of landings) are given in Figure 3. Since 1995, there is a slightly decreasing trend in CPUE, both in the northeastern and the southwestern area. In 2006-2007, the CPUE increased again, mainly due to higher CPUE in the northeastern area, where especially the Icelandic fleet experienced high CPUE, mainly within their EEZ. In the southwestern area, however, the CPUE was decreasing slightly.

1.2.3.- Surveys

During the last decade, the horizontal and vertical coverage of the survey changed as the fishery explored new fishing grounds in southwesterly direction and deeper layers. Vertical coverage of the hydro-acoustic recording of redfish varied among years in relation to the upper boundary of the deep scattering layer (DSL), in which redfish echoes are difficult to identify. Since 2001, the varying depth layers within and deeper than the DSL were covered by standard trawl hauls to account for the incompletely covered vertical depth distribution of the pelagic redfish. The most recent survey was carried out during June/July 2007 (ICES CM 2007/RMC:12).

1.2.3.1.- Survey acoustic data

Since 1994, the results of the acoustic estimate show a drastic decreasing trend from 2.2 mio t to 0.6 mio t in 1999 and have fluctuated between 100 000-700 000 t in 2001-2007 (Table 2). The 2003 estimate, however, was considered as inconsistent with the time series due to a shift in the timing of the survey.

The most recent trawl-acoustic survey on pelagic redfish (*S. mentella*) in the Irminger Sea and adjacent waters was carried out by Iceland and Russia from mid-June to mid-July 2007. Approximately 350 000 NM² were covered. A total biomass of 372 000 t was estimated acoustically in the layer shallower than the DSL. The highest concentrations of redfish in this layer were found in Division XIVb within the Greenlandic EEZ and in NAFO Div. 1F, 2H and 2J (Fig. 4).

1.2.3.2.- Survey trawl estimates

In addition to the acoustic measurements, redfish were estimated within and below the DSL by correlating catches and acoustic values at depths shallower than the DSL. The obtained correlation was used to convert the trawl data at greater depths to acoustic values and from there to abundance. For that purpose, standardised trawl hauls were carried out at different depth intervals, evenly distributed over the survey area (Figure 5). As the correlation between the catch and acoustic values is based on few data points only, the abundance estimation obtained from this exercise makes the method questionable and also the assumption that the catchability of the trawl is the same, regardless of the trawling depth. The quality of the trawl method cannot be verified as the data series is very short. Such evaluation on the consistency of the method can therefore not be done until more data points are available. Therefore, the abundance estimation by the trawl method must only be considered as a rough attempt to measure the abundance within and deeper than the DSL.

The short time series from 1999-2007 (Table 2) does not show a clear trend in biomass estimates deeper than 500 m (within and deeper than the DSL since 2005).

Table 3 shows the share between NAFO and NEAFC Convention Areas in the surveys 1999-2007. In the acoustic layer, the NAFO shares varied between 46-56%, with the exception of 2003 when it was around 12%. In the layer deeper than 500 m (within and deeper than the DSL since 2005), the NAFO shares varied between 12-35%, with the exception of 2003 when it was 6%.

1.3.- State of the stock

For pelagic redfish in the Irminger Sea and adjacent waters, no analytical assessment is being carried out due to data uncertainties and the lack of reliable age data. Thus, no reference points can be derived. In the absence of reference points and an analytical assessment, the state of the stock cannot be fully evaluated. Stock status is based mainly on the perception of stock trends derived from survey indices. The acoustic estimates from the survey in 2007 indicate that the stock size is low compared to the early 1990s. The stock size has not shown any clear trends since 1999. Above-average recruitment can be derived from recent survey observations on the East Greenland shelf, which is assumed to contribute to the pelagic stock. The mean lengths of pelagic *S. mentella* in the fishery both in the northeastern and in the southwestern area were relatively stable.

1.4.- Uncertainties in assessment

1.4.1.- Assessment quality

The reduction in biomass observed in the surveys in the hydroacoustic layer (about 2 mio. t in the last decade) cannot be explained by the reported removal by the fisheries (about 1.5 mio t in the entire depth range in 1995-2005) alone. During this period, the fishery has also developed towards greater depths and towards bigger fish, and in recent years, the majority of the catch has been caught at depths >600 m. Thus, the acoustic estimates cannot be considered as accurate measures of absolute stock size of redfish in this layer, as availability may have changed during the surveyed period, both horizontally and vertically. A decreasing trend in the relative biomass indices in the acoustic layer, however, is visible since 1991.

The biomass estimates for depths within and deeper than the DSL have to be considered as highly uncertain due to the high variability in the correlation between trawl and acoustic estimates as well as the assumptions that need to be made about constant catchability with depth. Within the time series from 1999 to 2007, the estimates in these depths have not shown a clear trend.

It is not known to what extent CPUE reflect changes in the stock status of pelagic *S. mentella*. The fishery is focusing on aggregations. Therefore, CPUE series might not indicate or reflect actual trends in stock size.

1.5.- Management plans and evaluations

Pelagic redfish in the Irminger Sea and adjacent waters straddle in the ICES Div. Va, Subareas XII and XIV and NAFO Subareas 1 and 2. They occur inside the EEZs of Iceland and Greenland and in the Regulatory Areas of NEAFC and NAFO. NEAFC is the responsible management body, and ICES the advisory body. Management of fisheries on pelagic redfish is based on setting a TAC and technical measures (minimum mesh size in the trawls is set at 100 mm). The NEAFC TAC for pelagic redfish for 2007 was 46 000 t, “of which 2 875 tonnes will be allocated to NAFO, and 123 tonnes will be available to co-operating non contracting parties”. As the NEAFC contracting parties did not reach an unanimous decision on the total TAC and allocation key, the total TAC in force was about 73 000 t in 2007, based on splitting factors set for 2004 and taking into account the autonomous quotas of Iceland and Russia. The total landings in 2007 (64 000 t) were below this total TAC in force. Taking the most recent estimates on IUU fisheries into account, however, the actual removals in 2007 could have reached 80 000 t. ACFM has advised for 2008 that catches of pelagic *S. mentella* are set at 20 000 t as a starting point for the adaptive part of the management plan. For 2008, NEAFC has set a rolled over TAC of 46 000 t. The total TAC in force for 2008 is about 64 000 t, since Russia has decreased its autonomous quota to 20 000 t.

1.6.- Management considerations

The Group had again difficulties in obtaining catch estimates from the various fleets, and new information available indicates that unreported catches might be substantial. Furthermore, landings data were missing from some nations. The Group requests NEAFC and NAFO to provide ICES with all information that supports the Group with regard to more reliable catch statistics.

The main feature of the fishery since 1998 is a clear distinction between two widely separated fishing grounds with pelagic redfish fished at different seasons and different depths. Since 2000, the southwestern fishing grounds extended also into the NAFO Convention Area. Biological data, however, suggest that the aggregations in the NAFO Convention Area do not constitute a separate stock. The NAFO Scientific Council agreed with this conclusion (NAFO, 2005). The Group concludes that at this time there is not enough scientific basis available to propose an appropriate split of the total TAC among the two fisheries/areas.

The Group expects that under the current TAC regulations, a greater share of the catches in 2008 will be taken in the northeastern area, as the fishery in the beginning of the season starts in this area in April.

1.7.- Recommendation

Considering the common features in the biology, fishing patterns and assessment methods of redfish (*Sebastes* spp.) in the North Atlantic, the AFWG and NWWG discussed the possibility of establishing a joint ICES/NAFO redfish working group. There are examples of species-related joint working groups, such as the *Pandalus* Assessment Working Group, the Joint EIFAC/ICES Working Group on Eels and the ICES/NAFO Working Group on Harp and Hooded Seals. The advantages and disadvantages of merging redfish expertise in one group instead of three (AFWG, NWWG, NAFO SC) could not be evaluated during the NWWG/AFWG meetings. One of the advantages is the concentration of redfish expertise in one group which is then counter to the idea of regional expert groups. This issue needs further development by all involved parties before a firm proposal can be put forward.

2.- ICES Advice for 2009

“The new landing and logbook data available for this stock do not change the perception of the stock. The advice for the fishery in 2009 is therefore the same as the advice given in 2007 for the 2008 fishery: ICES advises that a management plan be developed and implemented which takes into account the uncertainties in science and the properties of the fisheries. ICES suggests that catches of *S. mentella* are set at 20 000 t as a starting point for the adaptive part of the management plan.

This advice will be updated in the fall of 2009 on the basis of new survey information and the results of an ICES/NAFO expert group that will review available information on stock identification in early 2009.”

3.- ICES Advise for 2008

3.1- State of the stock

In the absence of reference points and an analytical assessment, the state of the stock cannot be fully evaluated. Stock status is based mainly on the perception of stock trends derived from survey indices. The acoustic-trawl survey in 2007 indicates that the stock size is low compared to the early 1990s, but stock size has not shown any clear trends since 1999. The exploitation rate for this stock is unknown.

ICES advises that a management plan be developed and implemented which takes into account the uncertainties in science and the properties of the fisheries. ICES suggests that catches of *S. mentella* are set at 20 000 t as a starting point for the adaptive part of the management plan.

3.2- Management considerations

3.2.1.- Management strategy

There are a number of uncertainties in the assessment of *Sebastes mentella* in the Irminger Sea. The lack of reliable indices of abundance and accurate recruitment indices prevent precise determination of stock status. The stock definition is still under review and there are concerns that the current approach based on a single stock, without recognition of its possible components, does not capture the stock dynamics. ICES is also concerned about the lack of agreed TACs and allocation schemes, which result in catches greatly exceeding the advice. This increases the risk of overexploitation. The autonomous quotas that have been set are insufficient to constrain catches.

ICES advises that a management plan be developed and implemented which takes into account the uncertainties in science and the properties of the fisheries. It is suggested that NEAFC, in cooperation with ICES, takes the initiative to develop the recommended approach for management of redfish in the Irminger Sea prior to the beginning of the 2008 fishery. A management plan should include:

- Objectives
- Knowledge base (life history considerations, catch statistics, effort, surveys, etc.)
- Rules to determine removal rate (adaptive approach: start low, change according to agreed criteria)
- Instruments (TACs, effort, access rights)
- Implementation and enforcement
- International agreement

A dialogue between managers, scientists, and stakeholders should go much further than specifying a harvest control rule. It should look also at the type of scientific knowledge needed for management, at the type of management system needed in view of uncertainties, and at ways to improve the situation in general.

ICES suggests that catches of *S. mentella* are set at 20 000 t as a starting point for the adaptive part of the management plan. ICES has previously advised that most deepwater species like redfish can only sustain low rates of exploitation, since slow-growing, long-lived species that are depleted have a long recovery period. Fisheries should only be allowed to expand when indicators have been identified and a management strategy including appropriate monitoring requirements has been decided and is implemented.

The basis of the 20 000 t is that this is a significant reduction in catches compared with the recent past. This is expected to result in a lower exploitation rate, but the absolute magnitude cannot be estimated.

3.2.2.- Other issues

In 2005 and in previous years, ICES advised that management action should be taken to prevent a disproportional exploitation rate of any one component. This advice has proven open to different interpretations and is difficult to

support with estimates of sustainable catch by area. Management should prevent a disproportional exploitation rate of the fish in the two distinct fishing areas to prevent local depletion. This should be done for two reasons: 1) to reduce the risk to local ecosystems, and 2) to avoid depletion of local populations in the light of the unresolved stock structure. However, at this time there is no available scientific information to provide a quantitative estimate on the split of catches, which would warrant a sustainable exploitation of redfish in different geographical areas.

A comparison of the number of vessels fishing the resource and reporting to NEAFC by VMS with those visible on satellite images indicates that the unreported effort might be a significant amount. During the observation days in June 2002 to 2006 (in the main fishing season), the effort could be more than 15-33% higher than reported to NEAFC, and thus the unreported catch could be in that order of magnitude. Latest information available for 2006 showed that the unreported effort could be around 19 - 29%.

The stock structure of redfish *S. mentella* in Subareas V, VI, XII, and XIV, and in the NAFO Convention Area has been evaluated by an ICES study group in 2004. The outcome is not conclusive and supports different hypotheses (from a one-stock- to different multi-stock-hypotheses). Consequently, and solely for practical reasons, the perception of stock structure in this report is unchanged from the 2003 report. Additional information on stock structure has been available since 2004. Drawing conclusions from this information would require a comprehensive evaluation that integrates these results with those from other disciplines. It will be done by a panel of external experts on stock identity.

Commercial cpue series were previously used to determine stock size. However, the fishery targets pelagic aggregating fish and fishing technology is improving at an increasing rate. Therefore, stable or increasing cpues are not considered to reflect the stock status reliably, but decreasing cpue likely indicates a decreasing stock. Overall cpues declined between 1995 and 1997 and have since fluctuated without a clear trend.

3.3- Factors affecting the fisheries and the stock

Nursery areas for the stock are found at the continental slope off East Greenland. The juvenile redfish in these areas should therefore be protected, and measures already in place to reduce the bycatches in the shrimp fishery need to be continued.

Changes in fishing technology and fishing patterns

Since 1997, the main fishing season occurred during the second quarter. The pattern in the fishery has been reasonably consistent in the last 7 years and can be described as follows: In the first months of the fishing season (which usually starts in early April) the fishery is conducted in the area east of 32°W and north of 61°N, and in July (or August) the fleet moves to areas south of 60°N and west of about 32°W where the fishery continues until October. There is very little fishing activity in the period from November until late March or early April, when the next fishing season starts. The fleets participating in this fishery have continued to develop their fishing technology, and most trawlers now use large pelagic trawls (Gloria -type) with vertical openings of 80-150 m. The vessels have operated at a depth range of 200 to 950 m in 1998-2005; mainly deeper than 600 m in the first and second quarters, and at depths shallower than 500 m in the third and fourth quarters. Discarding is at present not considered to be significant for this fishery.

The pelagic fishery in the Irminger Sea only exploits the mature part (approximately 95% mature) of the stock. The fishery started in 1982 in the upper 500 m and expanded from 1991 onwards into deep waters where the majority of the catch is now taken. Catches in the southwestern area (almost exclusively shallower than 500 m) have remained relatively stable but low since 1997, with a slight decline in the last 2 years. In the northeastern area (deeper than 500 m) catches increased until 1997 and then fluctuated without a clear trend until 2004. In 2005, the catches from this area dropped to about half the previous level and only increased slightly in 2006. The main feature of the fishery in recent years is a clear distinction between two widely separated grounds fished at different seasons and different depths. Since 2000, the southwestern fishing ground extended also into the NAFO Convention Area. The parameters analysed so far do suggest, however, that the aggregations in the NAFO Convention Area do not form a separate stock. Some biological features distinguish the fisheries in the two areas. The length distributions of the catches differ between the described two main fishing ground/seasons. The fisheries in the northeastern area (2nd quarter) mainly targets larger and postspawning fish.

3.4- Scientific basis

Data and methods

ICES again had difficulties in obtaining catch estimates from the various fleets and there are indications that unreported catches are substantial. Furthermore, landings data were missing from some ICES member countries. In spite of the best of efforts there is a need for a special action through NEAFC and NAFO to provide ICES with all information that might lead to more reliable catch statistics

Cpue series, catch, and length information is available from the commercial fishery. Acoustic surveys conducted since 1991 in the Irminger Sea are available for estimation of the stock biomass above the deep-scattering layer. Trawl information from below this layer is available from 1999. Data on maturity-at-length and maturity-at-weight and some age-reading experiments were available from both fishery and survey. In recent years, data from most fishing nations have been compiled, and this enabled production of detailed charts showing the area and depth distribution of the fisheries.

Uncertainties in assessment and forecast

The acoustic estimates for pelagic redfish only provide stock estimates for redfish distributed shallower than the deepscattering layer (DSL). However, since 1996 only about 20-30% of the total catches have been taken from the shallow layer. The acoustic biomass estimates provide only approximate indexes of stock size due to varying coverage of the stock distribution area and methodological deficiencies.

The quality of the trawl biomass estimate cannot be verified, as the data series is very short. Therefore, the abundance estimates by the trawl-method must only be considered as a rough attempt to measure the abundance within and deeper than the DSL.

Comparison with previous assessment and advice

Key considerations in last years advice of zero catch were the decline in reported landings and cpue in the two preceding years. A further decline in 2006 was not observed. The advice this year is provided in the context of an adaptive management strategy.

REFERENCES

SGSIMUR: ICES CM 2005/ACFM:10

ICES CM 2007/RMC:12

ICES NWWG Report 2008 ICES Advisory Committee ICES CM 2008 /ACOM:03

Table 1. Pelagic *S. mentella*. Catches (in tonnes) by area as used by the Working Group.

YEAR	VA	XII	XIV	NAFO 1F	NAFO 2J	NAFO 2H	TOTAL
1982		39,783	20,798				60,581
1983		60,079	155				60,234
1984		60,643	4,189				64,832
1985		17,300	54,371				71,671
1986		24,131	80,976				105,107
1987		2,948	88,221				91,169
1988		9,772	81,647				91,419
1989		17,233	21,551				38,784
1990		7,039	24,477	385			31,901
1991		10,061	17,089	458			27,608
1992	1,968	23,249	40,745				65,962
1993	2,603	72,529	40,703				115,835
1994	15,472	94,189	39,028				148,689
1995	1,543	132,039	42,260				175,842
1996	4,744	42,603	132,975				180,322
1997	15,301	19,826	87,698				122,825
1998	40,612	22,446	53,910				116,968
1999	36,524	24,085	48,521	534			109,665
2000	44,677	19,862	50,722	11,052			126,313
2001	28,148	32,164	61,457	5,290	1,751	8	128,818
2002	37,279	24,026	66,194	15,702	3,143		146,344
2003	46,676	24,232	57,780	26,594	5,377	325	160,984
2004	14,456	9,679	76,656	20,336	4,778		125,905
2005	11,726	6,784	34,041	16,260	4,899	5	73,715
2006	16,380	2,146	50,607	12,939	593	260	82,925
2007	17,213	378	40,835	2,843	2,561	175	64,004

Table 2 .- Pelagic *S. mentella*. Time series of survey results, areas covered, hydro-acoustic abundance and biomass estimates shallower and deeper than 500 m (based on standardized trawl catches converted into hydro-acoustic estimates derived from linear regression models). ¹within and deeper than the deep-scattering layer (DSL) in 2005 and 2007. *international surveys

YEAR	AREA COVERED (1000 NM ²)	ACOUSTIC ESTIMATES < 500 M (10 ⁶ IND.)	ACOUSTIC ESTIMATES < 500 M (1000 T)	TRAWL ESTIMATES < 500 M (10 ⁶ IND.)	TRAWL ESTIMATES < 500 M (1000 T)	TRAWL ESTIMATES > 500 M (10 ⁶ IND.) ¹	TRAWL ESTIMATES > 500 M (1000 T) ¹
1991	105	3498	2235				
1992*	190	3404	2165				
1993	121	4186	2556				
1994*	190	3496	2190				
1995	168	4091	2481				
1996*	253	2594	1576				
1997	158	2380	1225				
1999*	296	1165	614			638	497
2001*	420	1370	716	1955	1075	1446	1057
2003*	405	160	89	175	92	960	678
2005*	386	940	551			1083	674
2007*	349	731	372			1423	854

Table 3 Pelagic *S. mentella*. Survey biomass estimates 1999-2007 and area splitting between NAFO and NEAFC Convention areas by depth. *acoustically measured

	NAFO (000 T)	NAFO %	NEAFC (000 T)	NEAFC %	SUM (000 T)
1999 < 500 m*	282	46	332	54	614
1999 > 500 m	58	12	439	88	497
1999 Sum	340	31	771	69	1111
2001 < 500 m*	377	53	338	47	716
2001 > 500 m	165	16	892	84	1057
2001 Sum	542	31	1230	69	1773
2003 < 500 m*	11	12	78	88	89
2003 > 500 m	41	6	637	94	678
2003 Sum	52	7	715	93	767
2005 < DSL*	308	56	244	44	551
2005 ≥ DSL	237	35	437	65	674
2005 Sum	545	44	681	56	1225
2007 < DSL*	198	53	174	47	372
2007 ≥ DSL	224	26	631	74	854
2007 Sum	422	34	805	66	1226

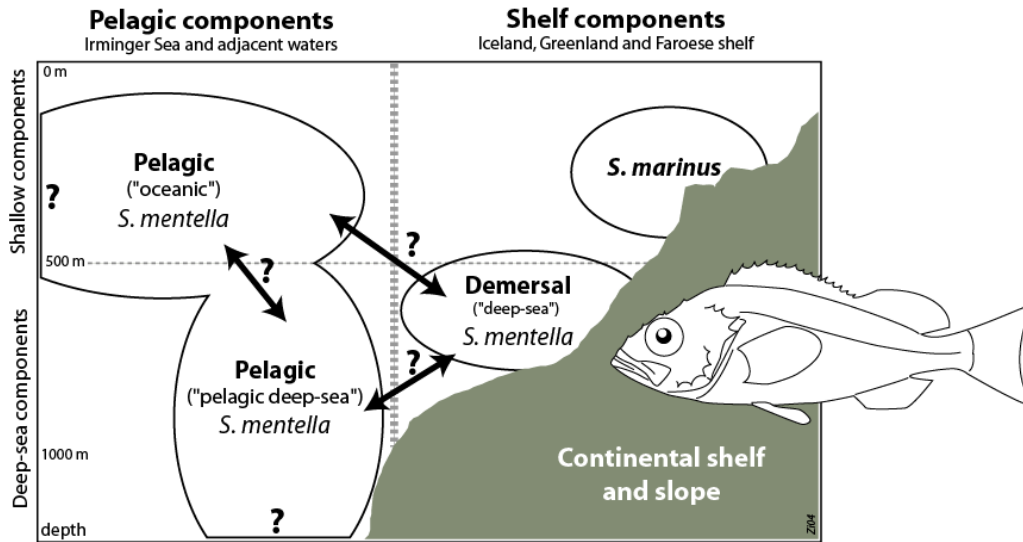


Figure 1.- Possible relationship between redfish occurrences in the Irminger Sea and adjacent waters.

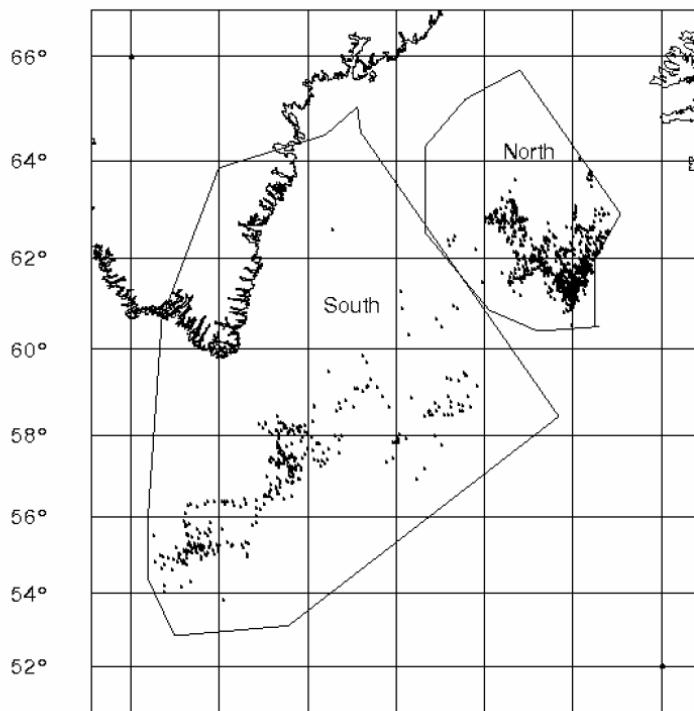


Figure 2. Division of areas between south and north. The points indicate positions of Icelandic available samples from the catches 1995-2005.

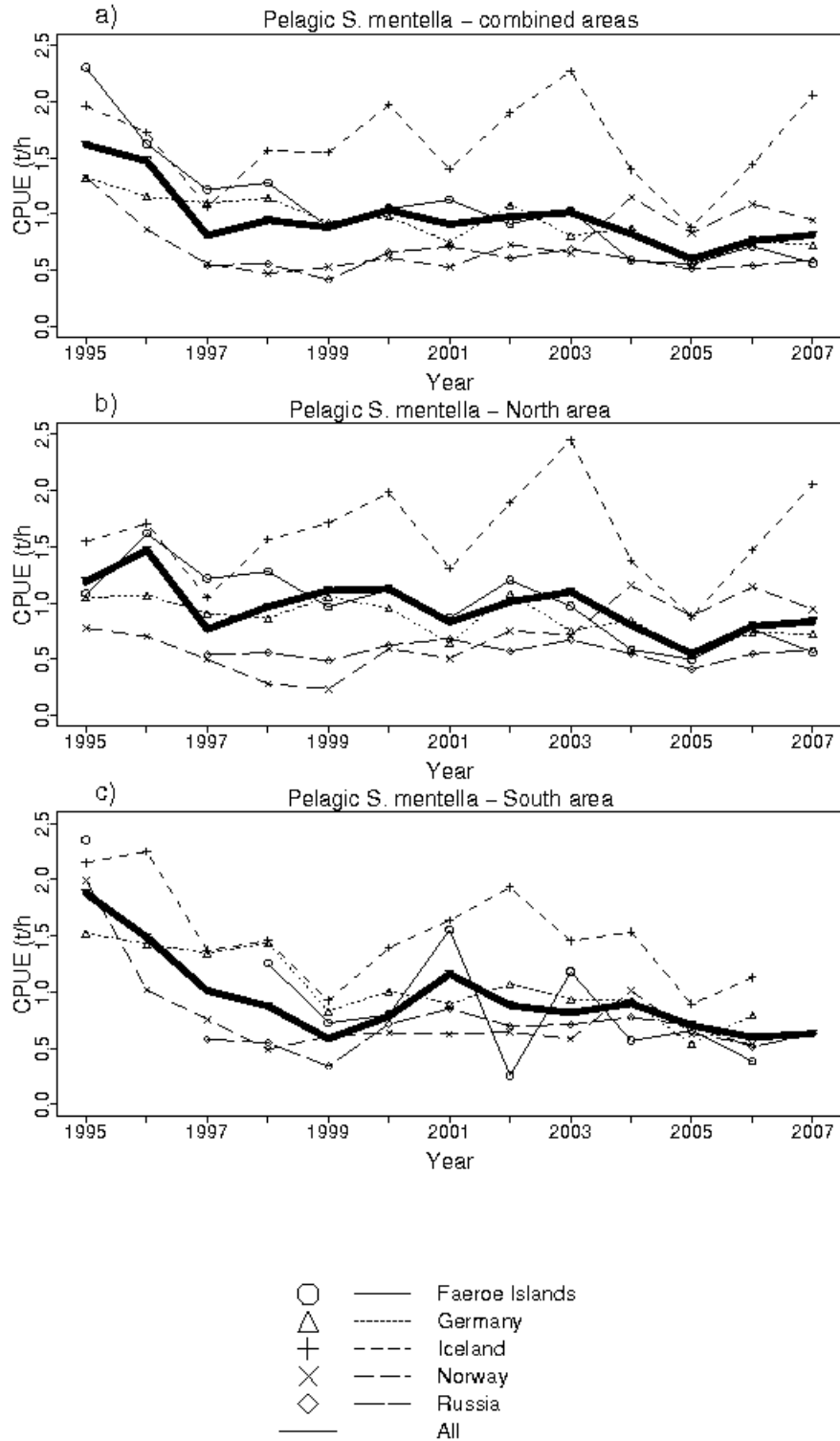


Figure 3.- Trends in national non-standardised CPUE of the pelagic *S. mentella* fishery in the Irminger Sea and adjacent waters, based on log-book statistics in the joint international database. a) all areas, b) northeastern area, c) southwestern area.

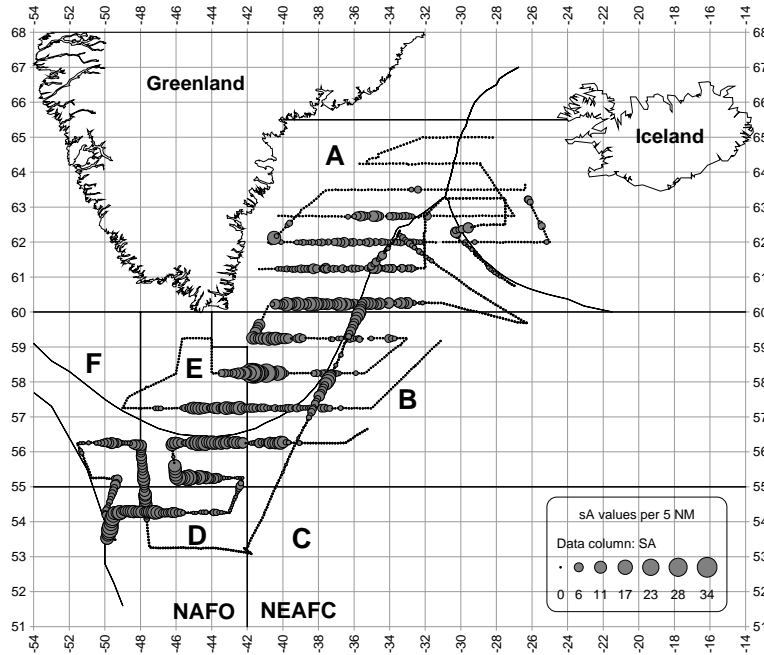


Figure 4.- Pelagic *S. mentella*. Acoustic estimates (average s_A values by 5 NM sailed) shallower than the deep-scattering layer (DSL) from the joint trawl-acoustic survey in June/July 2007.

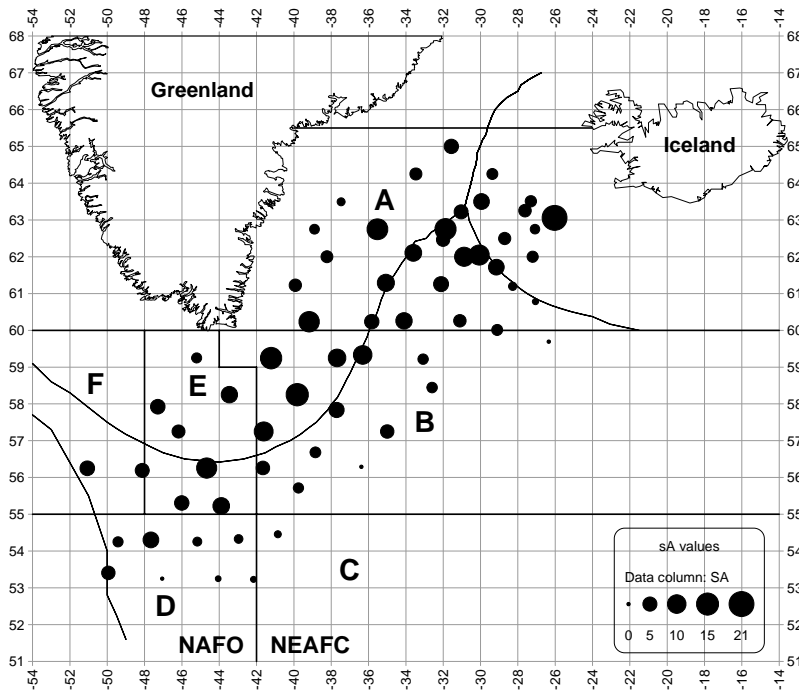


Figure 5.- Pelagic *S. mentella*. Trawl estimates (s_A values calculated from trawls; ICES CM 2007/RMC:12) within and deeper than the deep-scattering layer (DSL) from the joint trawl-acoustic survey in June/July 2007.