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Stock Status Update for Demersal Redfish in NAFO Subarea 1

by

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1. Introduction

Two species of redfish occurr off West Greenland inshore and offshore, golden redfish (*Sebastes marinus* L.) and deep-sea redfish (*Sebastes mentella* Travin). Stock identities in terms of reproduction were investigated by a joint ICES/ICNAF Study Group (Anon., 1983) and are currently under investigation by the EU-Project REDFISH QLK5-CT1999-01222 (www.redfish.de). The concept of self-sustaining units or stocks in NAFO Subarea 1 remains unproved for both species due to a general lack of records of maturing or spawning (bearing) specimens (Saborido-Rey *et al*., 2001). Therefore, the working group suggested strong relations to the two golden and deep-sea redfish stock complexes off East Greenland, Iceland and Faroes (ICES Div. V and XIV) as well as the management unit of pelagic redfish (*Sebastes mentella* Travin) in the central Irminger Sea and adjacent waters (ICES Div. XII and XIV and NAFO Convention Area). However, the common occurrence of golden redfish at length groups being mature in other areas was proved from historical length measurements derived from commercial catches before the 1970s.

2. Description of the Fisheries

Historically, redfish were taken mainly as by-catch in the trawl fisheries for cod and shrimp. However, occasionally during 1984-86, a directed fishery on redfish was observed for German and Japanese trawlers. With the collapse of the Greenland cod stock during the early-1990s resulting in a termination of that fishery, catches of commercial sized redfish were taken inshore by long lining or jigging and offshore by shrimp fisheries only. There are also substantial numbers of juveniles discarded in the shrimp fishery.

3. Catches

Both redfish species golden redfish (*Sebastes marinus* L.) and deep-sea redfish (*Sebastes mentella* Travin) are included in the catch statistics since no species-specific data are available. Other data suggest that until 1986, landings were composed almost exclusively of golden redfish. Subsequently, the proportion of deep-sea redfish represented in the catches increased, and since 1991, the majority of catches are believed to be deep-sea redfish.

In 1977, total reported catches peaked at 31 000 tons (Table 1, Fig. 1). During the period 1978-83, reported catches of redfish varied between 6 000 and 9 000 tons. From 1984 to 1986, catches declined to an average level of 5 000 tons due to a reduction of effort directed to cod by trawlers of the EU-Germany fleet. With the closure of this offshore fishery in 1990, catches decreased further to 1 200 tons, and remained at a low level since then.

Recent and historical catch figures do not include the weight of substantial numbers of small redfish discarded by the trawl fisheries directed to shrimp. With the mandatory use of sorting grids to avoid by-catch of fish in the shrimp fishery since October 2000, the unknown by-catch of redfish should be substantially reduced.

4. Assessment

Due to a lack of adequate commercial data no analytical assessment could be formulated. Therefore, the assessment was based on survey indices.

4.1. Input Data

4.1.1. Commercial fishery data

No data on CPUE were available. Information on historical length composition was derived from sampling of EU-German commercial catches of golden redfish during 1962-90 covering fresh fish landings as well as catches taken by freezer trawlers (Fig. 2). 118 samples were quarterly aggregated and mean length was calculated. These data revealed significant size reductions of fish caught from 45 to 35 cm, with the biggest reductions occurring during the 1970s. There are no data available to estimate the size composition of historical catches of deep-sea redfish.

There was no information available for 2001.

4.1.2. Research survey data

EU-German groundfish survey. Annual abundance and biomass indices were derived from stratified-random bottom trawl surveys commencing in 1982. These surveys covered the areas from the 3-mile limit to the 400 m isobath of Div. 1B to 1F and were primarily designed for cod as target species (Rätz *et al*., 2002). Therefore, the high variation of the estimates for redfish could have been caused as a result of the incomplete survey coverage in terms of depth range and pelagic occurrence of redfish. Nonetheless, the survey results indicated that the biomass estimates of golden redfish (≥17 cm) decreased by more than 90 % until 1990 and remained at that low level since then (Fig. 3). Estimates for deep-sea redfish (≥17 cm) varied without a clear trend but have frequently been very low since 1989 (Fig. 4). However, the 1997, 2000 and 2001 estimates indicated a significant biomass increase due to recruitment, which was not apparent in the preceding years. Unspecified redfish <17 cm were found to be very abundant, especially in 1986, 1991, and 1996-98 (Fig. 5). However, the most recent estimate for 2001 is among the lowest observed since 1982. 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.

Greenland-Japan and Greenland groundfish surveys. During 1987-95, cooperative trawl surveys directed to Greenland halibut and roundnose grenadier have been conducted on the continental slope in Div. 1A-1D at depths between 400 and 1 500 m. This deep-water survey was discontinued in 1996 but conducted again since 1997 by Greenland with another vessel and changed gear (Jørgensen, 2002). Deep-sea redfish were mainly caught at depths less than 800 m. There is no biomass estimate available for 2000 due to bad weather conditions, which severely hampered the realisation of the survey. Despite the technical changes, the increase in stock abundance and biomass from the lowest level since 1995 is consistent with other survey information (Fig. 4). Length measurements revealed that immature individuals <30 cm presently dominate the size composition of the stock.

Greenland groundfish/shrimp survey. Since 1988, a shrimp survey was conducted by Greenland covering the Div. 1A to 1F down to 600 m depth (Engelstoft and Jørgensen, 2002). Due to changes in survey strategy and sampling of fish, determinations of abundance and biomass indices and length composition were considered comparable since 1992. Redfish was found to be most abundant in the northern Div. 1B. Abundance and biomass indices varied without a clear trend but indicated juvenile redfish to be very abundant, especially in 1994 and 1997 (Fig. 5). Since 1998, the survey indicated a very low abundance of small redfish in agreement with other survey information. During the entire survey series, catches were composed almost exclusively of juveniles being smaller than 15 cm.

4.2. **Estimation of parameters**

The golden redfish spawning stock biomass was assessed assuming knife edge maturity at 35 cm as observed in East Greenland applied to the length disaggregated abundance indices derived from the EU-German groundfish survey. The length groups 17-20 cm were chosen as recruitment indices at age 5. SSB and recruitment indices decreased drastically from 1982 and have remained significantly below the average level since 1989 (Fig. 6). No basis exists to calculate exploitation rates. There are indications that the probability of future recruitment is reduced at the current low SSB (Fig. 7).

The German survey biomass of fish >=30 cm and the abundance of length groups 17-20 cm were taken as proxies for deep-sea redfish SSB and recruitment at age 5, respectively. No clear trend can de derived from these estimates but SSB has been extremely low since 1989 (Fig. 8). The recently depleted status of the SSB is confirmed by the lack of adult fish in the Greenland deep-water survey. Recruitment variation is high and the 1997, 2000 and 2001 estimates were above average. No basis exists to calculate exploitation rates. The resulting recruitment-SSB plot is inconclusive.

4.3. **Reference points**

Given the lack of long enough time-series of spawning stock and recruitment data and the uncertainties regarding reproduction and maturation of redfish in this area, the proposals of any limit or buffer reference points for fishing mortality or spawning stock biomass for the stocks of golden and deep-sea redfish stocks in Subarea 1 are impossible. However given the relationship observed for golden redfish between adult biomass and recruitment there appears to be a very high probability of decreased recruitment below biomass index levels of 5000 tons. Recent survey results indicate biomass of golden redfish remains below this level.

4.4. **Management considerations**

In view of dramatic declines in survey biomass indices of golden and deep-sea redfish (=17 cm) to an extremely low level along with significant reduction in fish sizes, it is concluded that the stocks of golden and deep-sea redfish in Subarea 1 remain severely depleted and there are no signs of any short term recovery although pre-recruits (<17 cm) were found to be very abundant until 1998 as indicated in surveys.

Substantial numbers of redfish are caught and discarded by the shrimp fishery, and concern must be expressed about the continuing failure of the juveniles to rebuild the pre-mature and mature stock components. With the mandatory use of sorting grids to avoid by-catch of fish in the shrimp fishery since October 2000, the unknown by-catch of redfish should be substantially reduced.

Considering the depleted SSBs, the recruitment potential of the very abundant early life stages at an age of 0-2 years to the Subarea 1 stocks remains unclear. Recruitment indices for golden redfish have been extremely poor while those for deep-sea redfish indicate some recent increases. Observation in 1986 did not reveal any mature adults. Therefore the relationship between spawning stock and recruitment is unclear in this area.

There should be no directed fishery on dermersal redfish in Subarea 1.

References

Anon. 1983. Report on the Joint NAFO/ICES Study Group on Biological Relationships of the West Greenland and Irminger Sea Redfish Stocks. ICES C. M., G:3: 1-11

Engelstoft, J. J. and O. A. Jørgensen, 2002. Biomass and Abundance of Demersal Fish Stocks off West Greenland Estimated from the Greenland Shrimp Survey, 1988-2001. NAFO SCR Doc. NAFO SCR Doc., announced for the NAFO Scientific Council meeting in June 2002

Jørgensen, O. A. 2002. Survey for Greenland Halibut in NAFO Divisions 1C-1D, 2001. NAFO SCR Doc., announced for the NAFO Scientific Council meeting in June 2002

Jørgensen, O. A. and D. M. Carlsson. 1998. An Estimate of By-catch of Fish in the West Greenland Shrimp Fishery Based on Survey Data. NAFO SCR Doc. 98/41, Ser. No. N3030: 1-21

Rätz, H.-J., M. Stein and C. Stransky 2002. German Research Report for 2001. NAFO SCS Doc., announced for the NAFO Scientific Council meeting in June 2002

Saborido-Rey, F., D. Garabana and C. Stransky 2001. A Review of the Population Structure and Ecology of Redfish in the Irminger Sea and Adjacent Waters. NAFO SCR Doc. 01/107, Ser. No. N4495: 1-19

Siegstad, H. 2001. Denmark/Greenland Research Report for 2000. NAFO SCS Doc. 01/21, Ser. No. N4412: 1-7

Table 1. TAC and annual catches of NAFO Subarea 1 demersal redfish, golden and deep-sea redfish combined (Siegstad, 2001).

Year	TAC (1 000 t)	Catch (1 000 t)
1965		19
1966		17
1967		13
1968		9
1969		5
1970		5
1971		3
1972		3
1973		3
1974		3
1975		9
1976		14
1977		31
1978		8
1979		9
1980		8
1981		6
1982		8
1983		7
1984		6
1985		4
1986	19	5
1987	19	1
1988	19	1
1989	19	1
1990	19	0.4
1991	19	0.3
1992	19	0.3
1993	19	0.8
1994	19	1.0
1995	19	0.9
1996	19	0.9
1997	19	1.0
1998	19	0.9
1999[1]	19	0.1
2000[2]	19	1.4
2001[1]	19	

[1]) Provisional
[2]) Includes pelagic catches

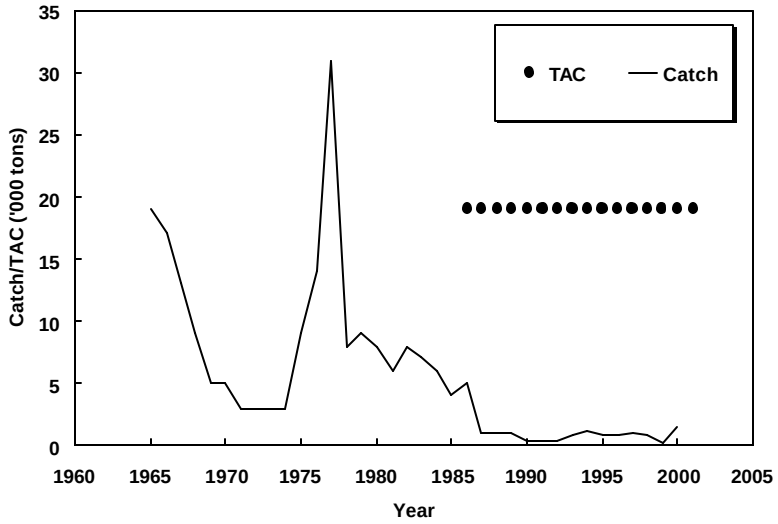

Fig. 1. TAC and catches of redfish in NAFO Subarea 1: both golden and deep-sea redfish combined.

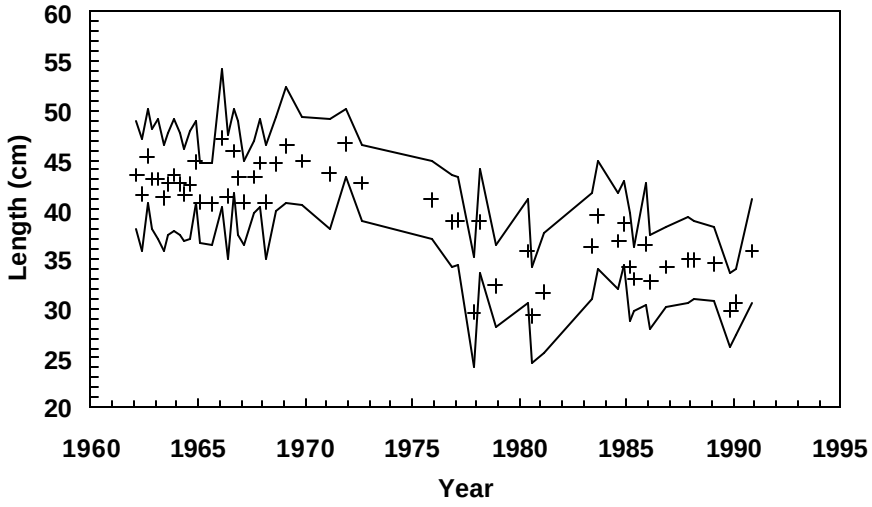

Fig. 2. Mean length ± standard deviation derived from German catches of golden redfish in NAFO Subarea 1, 1962-90.

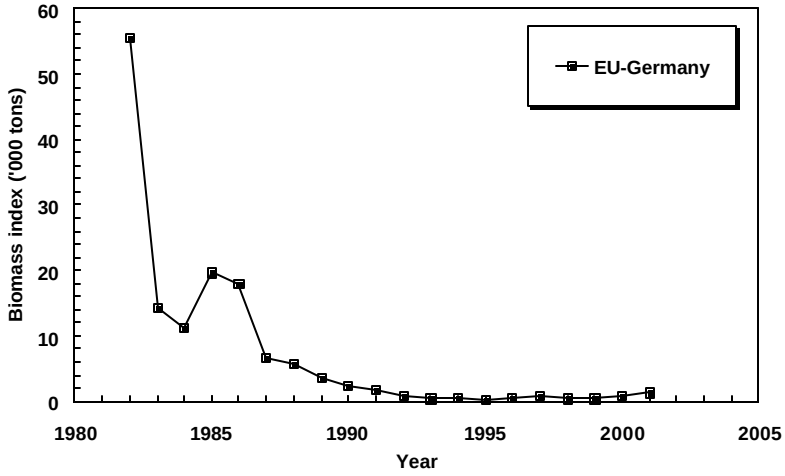

Fig. 3. Survey biomass indices for golden redfish (≥17 cm) in NAFO Subarea 1 derived from the EU-German groundfish survey.

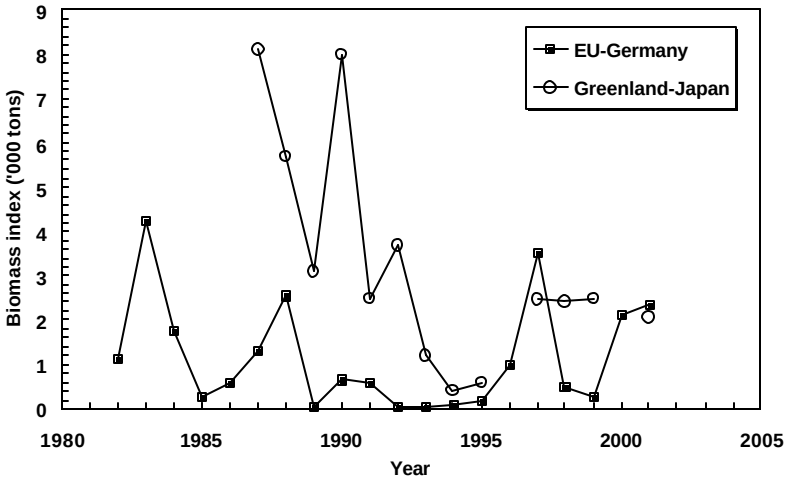

Fig. 4. Survey biomass indices for deep-sea redfish (≥17 cm) in NAFO Subarea 1 derived from the EU-German groundfish survey and from the joint Greenland-Japan survey including the entire length range (since 1997 Greenland only).

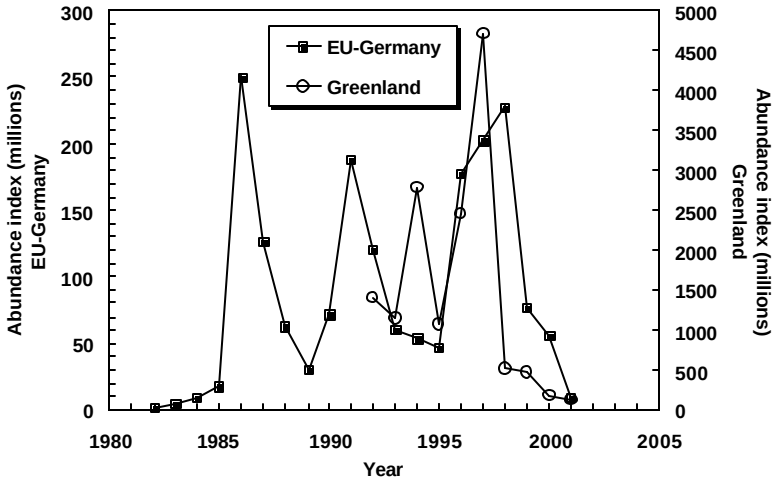

Fig. 5. Abundance indices for juvenile redfish (<17 cm) in Subarea 1: survey abundance indices derived from the EU-German groundfish survey and from the Greenland groundfish/shrimp survey including the entire length range.

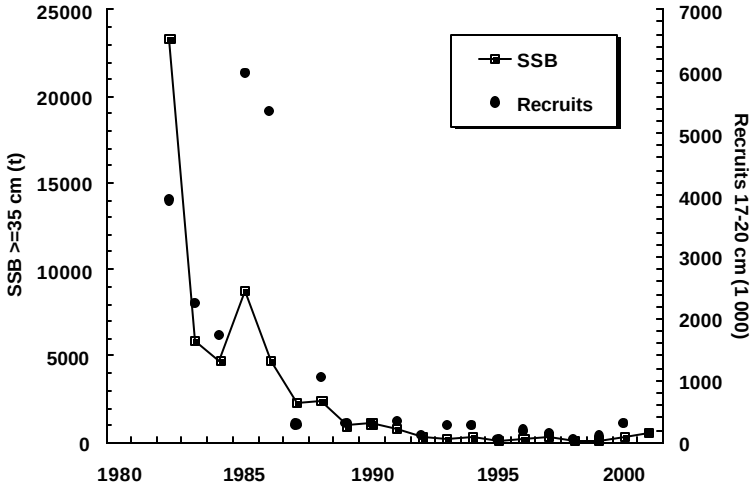

Fig. 6. Golden redfish Subarea 1: SSB and recruitment indices as derived from the German groundfish survey in the given years.

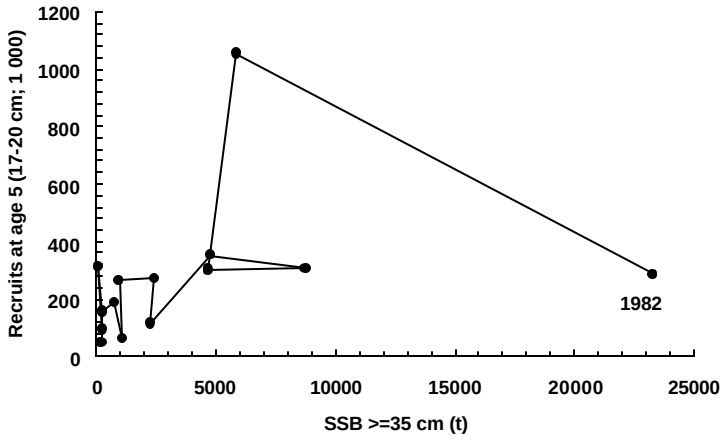

Fig. 7. Golden redfish Subarea 1: SSB-recruitment plot.

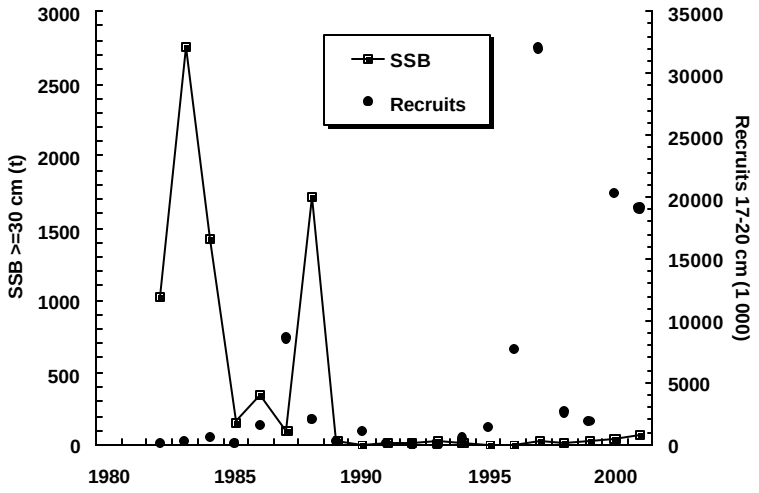

Fig. 8. Deep-sea redfish Subarea 1: SSB and recruitment indices as derived from the German groundfish survey.