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Assessment of 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 the a joint ICES/ICNAF Study Group (Anon., 1983). 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. Therefore, the working group suggested strong relations to the two golden and deep sea redfish stock complexes off East Greenland, Iceland and Faroes (ICES Subareas Vand XIV) as well as the management unit of oceanic redfish (*Sebastes mentella* Travin) in the central Irminger Sea (ICES Subareas VII and XIV). However, the common occurrence of golden redfish at length groups being mature in other areas was proved from historical length measurements before the 70s.

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 90s 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, the latter being suggested to discard juvenile redfish in substantial numbers.

3 Catches

Both redfish species were mixed in the catch statistics since no species specific data or information to precisely split the catches by species were available. Until 1986, landings were indicated to be 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 were believed to be deep sea redfish. In 1977, total reported catches peaked at 31,000 tons (Tab. 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 the offshore fishery in 1987, catches decreased further to 1,200 tons, and remained at that low level. The offical catch figure for 1996 was estimated to amount to 862 tons (Simonsen, 1997).

Recent and historical catch figures do not include the weight of substantial numbers of small redfish discarded by the trawl fisheries directed to shrimp.

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 compostion was derived from sampling of German commercial catches of golden redfish during 1962-90 covering fresh fish landings as well as catches taken by freezer trawlers. 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 70s.

Length frequencies derived from the Greenland shrimp survey revealed that the shrimp gear selected all fish sizes <20 cm (Engelstoft and Jørgensen, 1997).

4.1.2 Survey data

EU-German groundfish survey. Annual abundance and biomass indices were derived from stratified-random bottom trawl surveys commencing in 1982 (Rätz, 1997). 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. Therefore, the high variation of the estimates for redfish could be caused as a result of the incomplete survey coverage in terms of depth range and pelagic occurrence of redfish. The survey results indicated that both abundance and biomass estimates of golden redfish (≥17 cm) decreased by 99 % over the period of the survey (Fig. 3). Estimates for deep sea redfish (≥17 cm) varied without a clear trend but have frequently been extremely low since 1989 (Fig.4). Golden and deep sea redfish showed decreasing trends in their size composition, juveniles dominating the recent stock structures. Juvenile redfish (<17 cm) were found to be very abundant, especially in 1986, 1991, and 1996 (Fig. 5). 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. Comparisons between with the survey results off West and East Greenland revealed that all three redfish components were almost exclusively distributed off East Greenland. Significant recovery signals for deep sea redfish based on both fish abundance and size were limited to the area off East Greenland.

Greenland-Japan groundfish survey. 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 m and 1,500 m (Yokawa et al., 1996) . This survey was discontinued in 1996. Deep sea redfish were mainly caught at depths less than 600 m. During 1994-95, an increase of the biomass index from 400 to 600 tons was observed. However, both estimates represented the lowest values for the time series and a reduction by more than 90 % compared to the maximum of 8,100 tons observed in 1987. Length measurements revealed that the size structure of the stock is presently dominated by individuals <20 cm.

Greenland 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, 1997). 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 northern Div. 1A to 1C. Abundance and biomass indices varied without a clear trend but indicated juvenile redfish to be very abundant. During the entire survey series, catches were composed almost exclusively of juveniles being smaller than 15 cm.

4.2 State of the stocks

In view of dramatic declines in survey abundance and 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 recovery altough pre-recruits (<17 cm) were found to be very abundant as indicated by the surveys. Considering the substantial numbers of redfish caught as by-catch in the shrimp fishery, concern must be expressed about the continuous recruitment failure.

In order to increase the probability of stock recovery the by-catch of redfish in Subarea 1 taken by the shrimp fishery should be limited to the lowest level possible.

4.3 Limit and target reference points

Due to a lack of data, no proposals for appropriate F_{lim} and F_{pa} were formulated. Golden and deep sea redfish are long-lived species. Therefore, rebuilding strategies should consider both stock biomass and age structure. Given the lack of information, first proposals for B_{lim} and B_{pa} were based on the 20 % and 50 % levels of the maximum survey index, respectively. Following this relation, the indices for B_{lim} and B_{pa} for golden redfish were estimated to be 11,000 and 28,000 tons, respectively. For golden redfish estimates of B_{lim} and B_{pa} amounted to 900 and 2,100 tons. As a minimum, the age composition of both stocks should be composed of 50 % mature fish.

References

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Table 1 Annual catches of NAFO Subarea 1 redfish, golden redfish and deep sea fisheries combined.

Year	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	5
1987	1
1988	1
1989	1
1990	0.4
1991	0.3
1992	0.3
1993	0.8
1994	1.0
1995	0.9
1996 [1]	0.9

[1]) Provisional

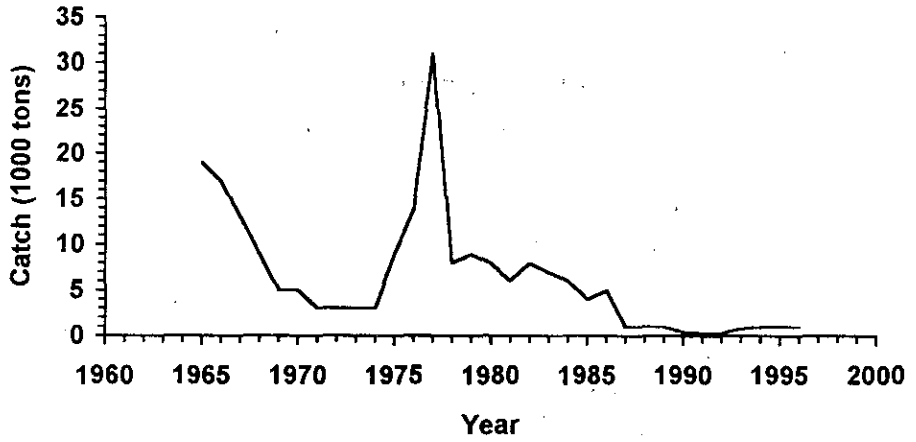

Fig. 1 Catches of redfish in NAFO Subarea 1, both golden and deep sea redfish combined.

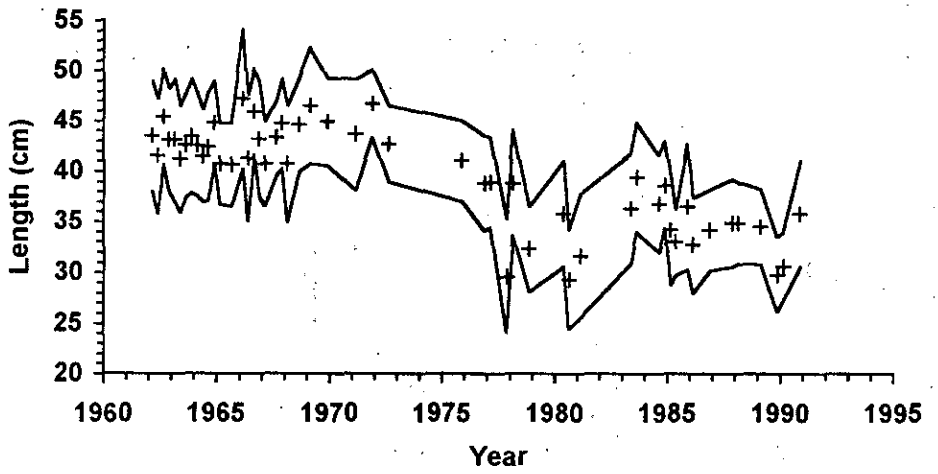

Fig. 2 Mean length ± standard deviation derived from German catches of golden redfish in NAFO Subarea 1, 1962-90.

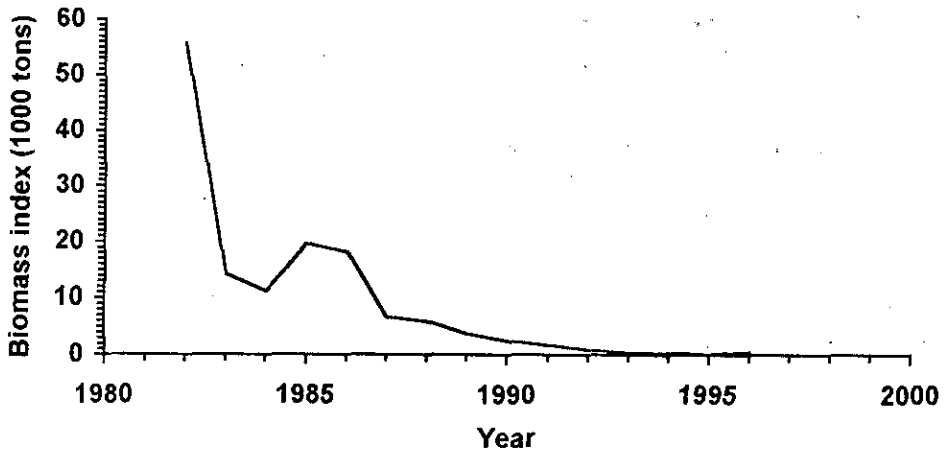

Fig. 3 Survey biomass indices for golden redfish (≥17 cm) in NAFO Subarea 1 derived from the EU-German groundfish survey.

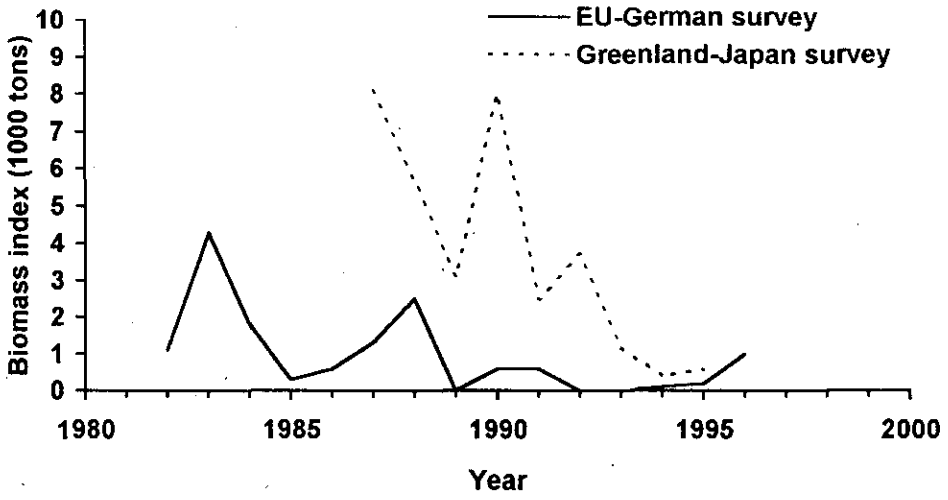

Fig. 4 Survey biomass indices for deep sea redfish (≥17 cm) in NAFO Subarea 1 derived from the EU-German groundfish survey and from the Greenland-Japan survey including the entire length range.

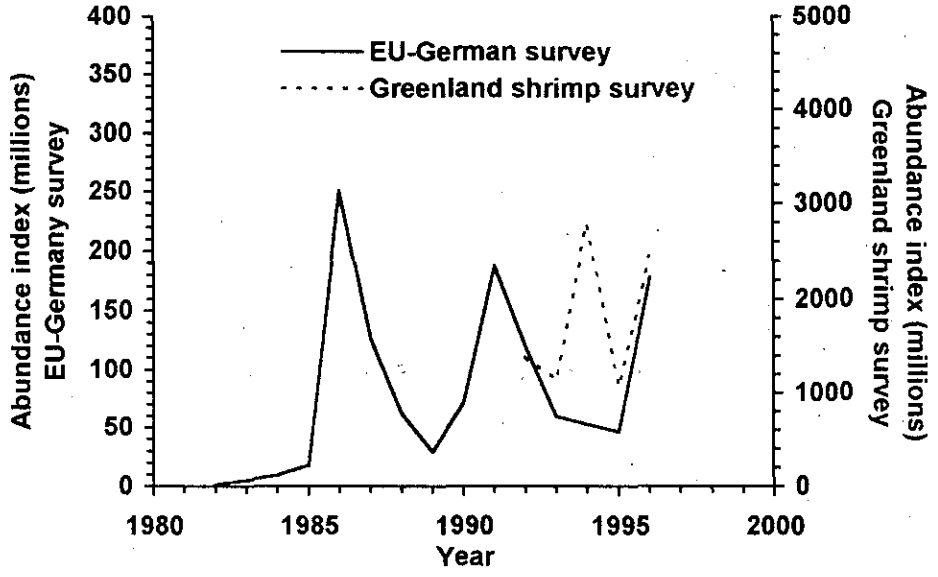

Fig. 5 Abundance indices for juvenile redfish (<17 cm) in Subarea 1: survey abundance indices derived from the EU-German groundfish survey and from the Greenland shrimp survey including the entire length range.