Northwest Atlantic Fisheries Organization

Serial No. N4521 **NAFO SCR Doc. 01/126**

SCIENTIFIC COUNCIL MEETING – SEPTEMBER 2001
(Deep-sea Fisheries Symposium – Oral)

The Boom and Bust of the Norwegian Longline Fishery for Redfish (*Sebastes marinus* 'Giant') on the Reykjanes Ridge

by

Nils-Roar Hareide[1], Greta Garnes[1] and Gjermund Langedal[2]

[1] Støyleråsa 3, 6065 Ulsteinvik Norway. Telephone +4770011755. Telefax +4770012279.
e-mail: nilsroar@online.no
[2] The Norwegian Directorate of Fisheries, P.O. Box 185 Nordnes, 5817 Bergen

Abstract

In March 1996 the Norwegian longliner M/S Førde Jr. made good catches of 'giant' redfish (*Sebastes marinus* 'giant') at 61°N in international waters close to the Icelandic fishery limit. The rumours of the success of this fishery spread and a new fishery was rapidly developed by other Norwegian and Icelandic longliners and gillnetters, and the area of exploitation was expanded south to 54°N on the Reykjanes Ridge (ICES Division XIVb and Sub-area XII). The fishery was conducted near the summits of seamounts or coral banks.

Nine Norwegian vessels participated in the fishery during 1996 and six vessels participated in 1997. Information was collected from all these vessels. The skippers supplied information on gear, catch, effort and fishing areas. Information from one Norwegian and one Faroese exploratory survey is also presented.

Due to difficult bottom conditions, lines of 11 mm diameter were used instead of the traditional 7 or 9 mm. A new type of vertical line was developed for this fishery. The total effort (active fishing days) was 252 days in 1996 and 41 days in 1997, a reduction of 84%. The total Norwegian landings of 'giant' redfish from the Reykjanes Ridge decreased from 963 tons in 1996 to 49 tons in 1997.

The CPUE values for 'giant' redfish decreased approx. 70% in Div. XIVb for both bottom lines and vertical lines from 1996 to 1997. For Sub-area XII, data are available only on vertical lines and the decrease is 27%. The CPUE value for gillnets in Div. XIVb decreased by 85% in the same period.

Results from exploratory fisheries in 1996 and 1997 (Hareide *et al*., 1996; Langedal and Hareide, 1997) have shown that 99% of the redfish caught are of the large or 'giant' type and the remainder (<1%) are *Sebastes mentella*. Information on growth, and maturity of 'giant' redfish is presented in the paper.

Keywords: Redfish; *Sebastes marinus* 'giant', Reykjanes Ridge.

Introduction

In March 1996 the Norwegian longliner M/S Førde Jr. made good catches of redfish (*Sebastes* spp.) at 61°N in international waters close to the Icelandic fishery limit. The rumours of the success of this fishery spread and a new fishery was rapidly developed by other Norwegian and Icelandic longliners and gillnetters, and the area of exploitation was expanded south to 54°N on the Reykjanes Ridge (ICES Div.XIVb and Sub-area XII) (Fig.1). The fishery was conducted near the summits of seamounts or coral banks.

The morphology of the large redfish caught at the Reykjanes Ridge, is similar to *Sebastes marinus*. However, Norwegian and Icelandic investigations have shown that there are genetic differences between the large redfish and the common type (*S. marinus*) (Johansen *et al*., 2000).

Material and Methods

Information on the Norwegian gillnet and longline fishery on the Reykjanes Ridge was collected from all of the twelve vessels that participated in the fishery. The skippers supplied information on gear, catch, effort and fishing areas. In addition, personal logbooks from seven of the vessels were also provided. The logbooks contained information on gear, depth, position, effort and catch for each longline and gillnet set. Catch figures from logbooks were estimated by the skippers. Correct landing figures for all vessels were collected from the sales organisations to adjust the logbook figures.

The fishery for redfish started out as an ordinary fishery with bottom lines. However, due to difficult bottom conditions, lines of 11.5 mm diameter were used instead of the traditional 7 or 9 mm. As the loss of gear was still common a new fishing technique using vertical lines was developed (Fig. 2). The lines were dropped directly into the redfish schools. All vessels were equipped with a Mustad Autoline System and fishing was carried out using both vertical and conventional seabed longlines. The vertical lines were made of 11.5 mm polypropylene with 75 cm snoods spaced 70 cm apart and mounted with Mustad number 12 or 13 "EZ" hooks. The number of hooks on each set was approx. 300. The conventional longlines were 11.5 mm polypropylene with approx. 75 cm snoods, spaced 1.4 m apart. The bait used was mackerel (50-75%) and squid (25-50%). Fishing was carried out around the clock and soaktime varied from 3 to 14 h.

Data on biology and discards were collected during a Faroese (Hareide *et al*., 1996) and a Norwegian (Langedal and Hareide, 1997) exploratory longline survey to the Reykjanes Ridge. Length was measured as total length and maturity was determined in 7 stadiums: 1-2 immature, 3 resting, 4 developing, 5-6 spawning and 7 spent.

Results

Effort

Nine Norwegian vessels participated in the fishery in 1996 and 6 vessels participated in 1997. The total effort (active fishing days) was 252 days in 1996 and 41 days in 1997, a reduction of 84%. The effort in days, number of hooks and nets are given in Tables 1 and 2.

Landings

The official Norwegian landings from the Reykjanes Ridge were reported to the ICES North-Western Working Group (Anon, 1998). The Group found it difficult to separate the landings from the Reykjanes Ridge, mainly because of the fact that ICES Div. XIVb covers both East-Greenland and the Reykjanes Ridge (Fig. 1). Another reason is that some of the vessels only spent parts of their trips in these areas and some of the catch is misreported. However, by using the fishermen's own data it has been possible to obtain more accurate information on the geographical distribution of landings and thereby give more accurate landing statistics for this fishery (Table 3). The fishery boomed in July and August 1996 (Table 4). The total Norwegian landings of 'giant' redfish from the Reykjanes Ridge decreased from 963 tons in 1996 to 49 tons in 1997 (Table 5).

Catch-per-unit of effort (CPUE)

The CPUE values for 'giant' redfish (Table 6) in Div.XIVb decreased by 68% and 72% for bottom lines and vertical lines respectively from 1996 to 1997. For area XII, data are available only on vertical lines and the decrease is 27%. The CPUE value for gillnets in Div.XIVb decreased by 85% in the same period. As mentioned above the fishery for redfish started as a traditional bottom longline fishery. Two vessels made one trip each with this gear before the vertical longline fishery started. The CPUE data from these vessels is presented in Fig. 4. Data for the vertical longline fishery are shown in Fig. 5.

Discards

There was no discards of redfish in the longline fishery. However, some fish (5-20%) were lost during hauling mainly in bad weather. The average number of fish lost is estimated at 8%. No data was collected from the gillnet fishery.

Geographical distribution

The distribution of 'giant' redfish is not described. The species is found along the shelves both off Iceland, Greenland and Norway (J. Magnusson, pers. inf.; Johansen *et al*., 2000). Along the Reykjanes Ridge the species is distributed south to 52°N (Langedal and Hareide, 1997; Hareide and Garnes, 2001).

Depth distribution

The giant redfish was caught between 450 and 1 000 meters, in temperatures between 5 and 7°C in the northern part of the ridge (61°N) (Fig. 6). Further south (56°N) the species was caught in the same depth range (Fig. 7) but the temperature range was 3.5-5°C. The highest densities of the redfish were recorded near the summits of the seamounts.

Length distributions

Length distributions of the 'giant' redfish from longline fishery at the Reykjanes Ridge are shown in Fig. 8 and 9). Mean length was 71.4 cm and mean weight was 6.22 kg.

Length weight relations

Length weight relations are available from Faroese exploratory longline fishery (Hareide *et al*., 1996) and Norwegian exploratory longline fishery on the Reykjanes Ridge (Langedal and Hareide, 1997) able.

$W(g) = L(cm)^{2,6531} * e^{-9,4187}, R^2 = 0,8039$ n = 43 (61°N, 1996)
$W(g) = L(cm)^{3,2658} * e^{-0.9272}, R^2 = 0,9345$ n = 926 (56 °N, 1997)

Age and Growth

Age data is available from both the Faroese exploratory longline fishery 1996 (61°N) and from the Norwegian exploratory longline Fishery 1997 (56°N). The age determinations were carried out under supervision of Dr. K. Nedreaas at Institute of Marine Research, Bergen. The material from 1996 shows that the age ranged between 25 and 49 years. The material from 1997 shows an age range between 14 and 48 years (Fig. 10 and 11). Length distributions were converted to age distributions by means of an age length key (Fig. 6).

Maturity

Of the sampled specimens 43,4 % were females and 56,6% males. In July 1997 most of the fish were spent (stadium7) or resting (stadium 3). Two females were spawning (stadium 5) (Table 7). 87% of the females and 96% of the males were mature.

Discussion

The estimations of effort and landings in this report are as close to the real values as possible in fisheries. Reliable information from all vessels is collected. The mean CPUE values per year are thereby as true as possible. The trends in CPUE do not represent the whole fleet. However, the seven vessels for which we have got logbooks represent approximately 70% of the total effort in the fisheries covered.

The Norwegian fishery on the Reykjanes Ridge declined in 1997 compared with 1996. The catch rates were much reduced, and the reasons for this could be many. The increase of unwanted by-catch could be one. The fishermen have also registered an increased Icelandic effort, which has increased the competition for the best grounds. Some skippers have also registered a change in currents from 1996 to 1997, and others that the deep scattering layer was not as deep in 1997 as in 1996. In 1996 this layer was registered between 450 and 500 meters, and in 1997 from 400 to 450 meters. Based on this information there is no reason to believe that the environment in this area should be static from year to year, and environmental changes could cause the dramatic decline in CPUE.

Besides the evidence a reduction in the stock densities of giant redfish in the exploited areas could have occurred. The dramatic decrease in CPUE for giant redfish is especially alarming because its schooling behaviour makes this species vulnerable to over fishing.

Acknowledgements

The analysis of the results was carried out as a contribution to EC FAIR Project 95/655 (Developing deep-water fisheries: data for their assessment and for understanding their interactions with and impact on a fragile environment). The expeditions were funded by The Norwegian Directorate of Fisheries and The Faroese Government. The authors thank these organizations very much and also all crew and staff involved in the investigations. We would also like to thank Dr. Kjell Nedreaas for supervising age readings, and Dr. Peter Tyndall who have kindly advised us and helped with improving the English.

References

Anon 1998 Report of the North Western Working Group. ICES CM 1998, ACFM:19, 350 pp.

Hareide N.-R., Rasmussen H. Thomsen B., 1996. Rapport fra forsøksfiske med M/S Borgarin april-mai 1996. FRS Smarit no 96/2 19 p.

Johansen T., Nævdal G., Daniélsdóttir A.K., Hareide N.R., 2000. Genetic characterisation of giant *Sebastes* in the deep water slopes in the Irminger Sea. Fisheries Research, 45: 207-216

Langedal G., Hareide N.R-: (1997) Rapport fra forsøksfiske på Reykjanesryggen / Midt-Atlanterhavsryggen med M/S Skarheim. Juli 1997. Rapport i fra Fiskeridirektoratet 58 s.

Table 1. Estimated Norwegian effort (fishing days) by gear on the Reykjanes Ridge in 1996 and 1997.

	XII		XIVb		
Gear	1996	1997	1996	1997	Total
Gillnets			17	10	27
Bottom lines	19		54	12	85
Vertical lines	49	14	113	5	181
Total	68	14	184	27	293

Table 2. Estimated Norwegian effort (1000 hooks and 1000 nets) by gear, in the fishery on The Reykjanes Ridge in 1996 and 1997.

	XII		XIVb		
Gear	1996	1997	1996	1997	Total
Gillnets			1.68	2.34	4.02
Bottom lines	223	0	551	139	913
Vertical lines	335	61	967	33	1395
Total	558	61	1518	172	2308

Table 3. 'Giant' redfish, Norwegian official and estimated landings in ICES areas XII and XIVb.

	XII		XIVb	
	1996	1997	1996	1997
ICES (Anon 1998)	76	21	750	22
Estimated	206	20	757	29

Table 4. 'Giant' redfish, Norwegian estimated landings by month in ICES areas XII and XIVb 1996 and 1997.

	XII		XIVb	
Month	1996	1997	1996	1997
March	0	0	71	11
April	0	0	23	0
May	30	0	30	3
June	0	0	58	11
July	16	20	320	0
August	160	0	218	0
September	0	0	35	5
October	0	0	0	0
Total	206	20	757	29

Table 5. 'Giant' redfish, Norwegian estimated landings by gear in ICES areas XII and XIVb 1996 and 1997.

	XII		XIVb	
Gear	1996	1997	1996	1997
Gillnets	0	0	85	14
Bottom lines	30	0	124	10
Vertical lines	175	20	547	6
Total	206	20	757	29

Table 6. 'Giant' redfish, CPUE (kg/1000 hooks and kg/gillnet) by year and ICES areas.

	XII		XIVb	
Gear	1996	1997	1996	1997
Gillnets			43	6
Bottom lines	137		224	71
Vertical lines	417	313	548	152

Table 7. 'Giant' redfish, maturity stages from the Reykjanes Ridge 1997.

Stadium	Female	Male	Total
1	0	0	0
2	44	18	62
3	15	399	414
4	0	0	0
5	2	0	2
6	0	0	0
7	262	2	264
Total	324	419	745

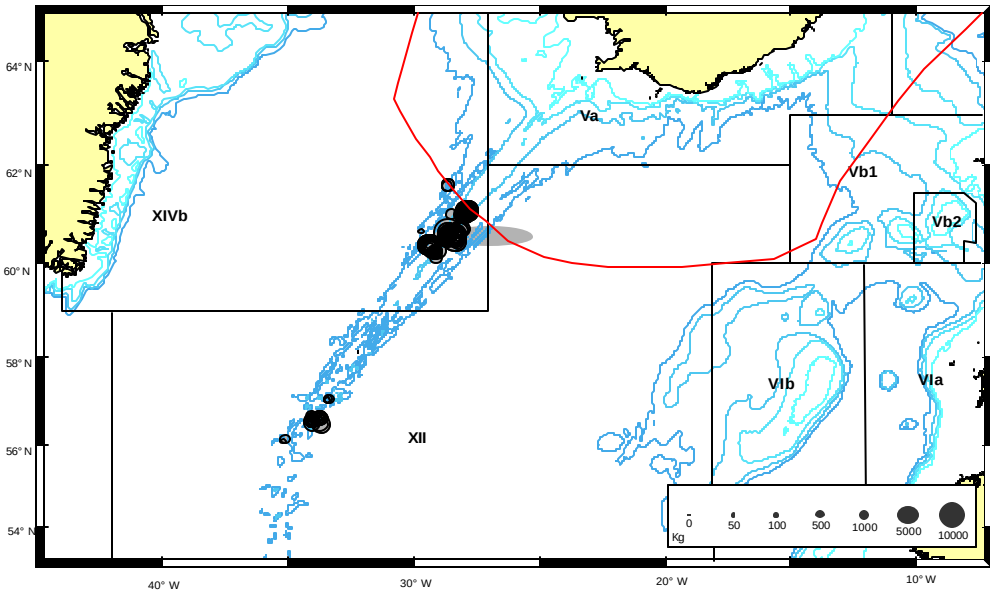

Fig. 1. Catch (kg, round weight) per day. Results from seven Norwegian longliners fishing the Reykjanes Ridge in 1996 and 1997.

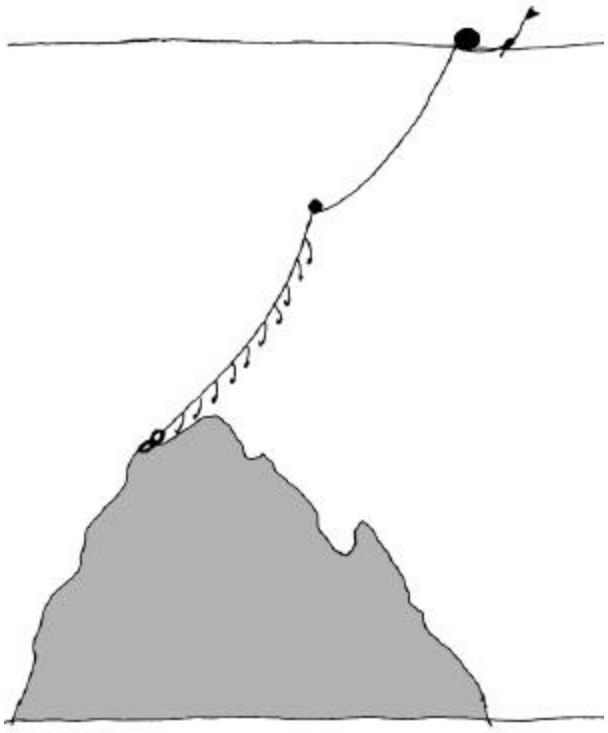

Fig 2. Vertical line as used in the longline fishery for 'giant' redfish on the Reykjanes Ridge.

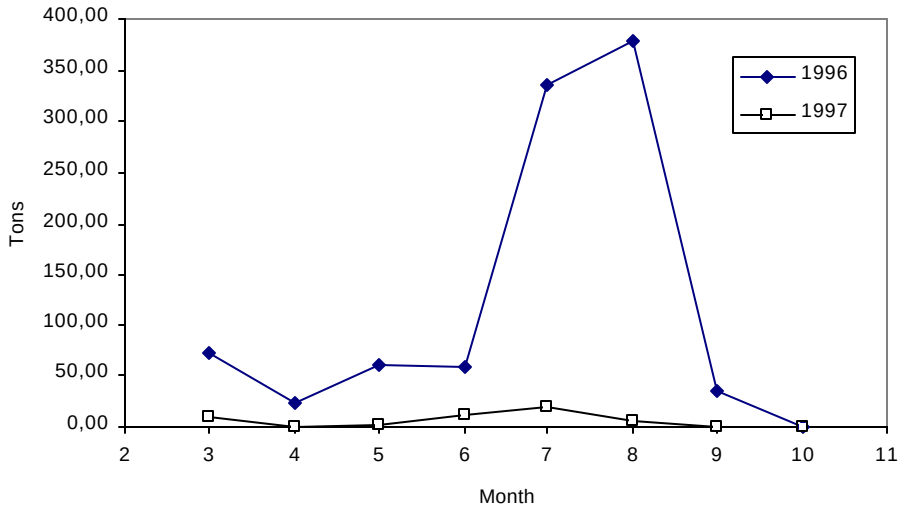

Fig. 3. 'Giant' redfish, catch per month in 1996 and 1997

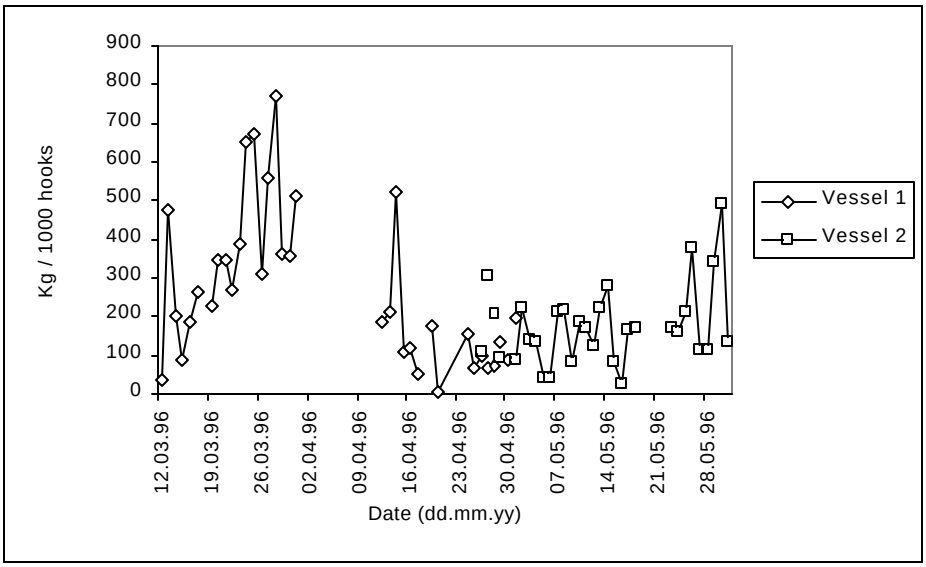

Fig. 4. 'Giant' redfish, CPUE (kg per 1000 hooks) bottom lines 1996, Sub-area XII and Division XIVb combined.

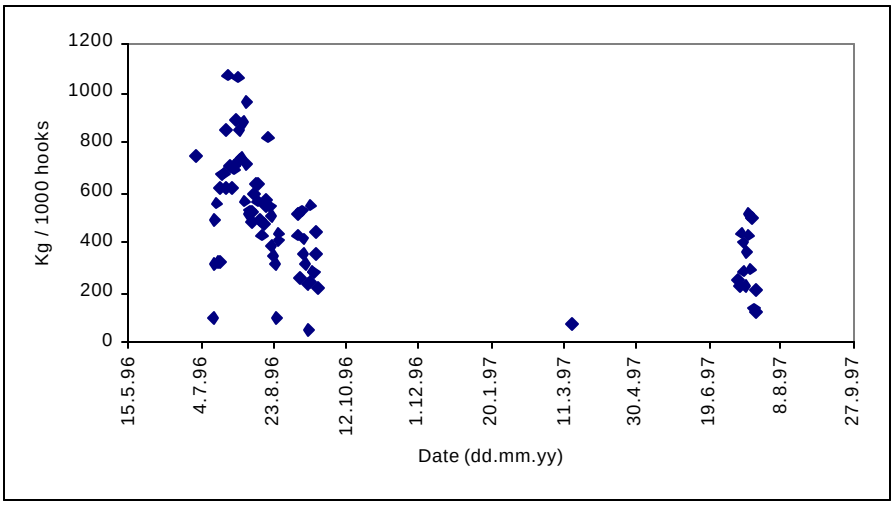

Fig. 5. 'Giant' redfish, CPUE (kg per 1000 hooks) vertical lines 1996, Sub-area XII and Division XIVb combined.

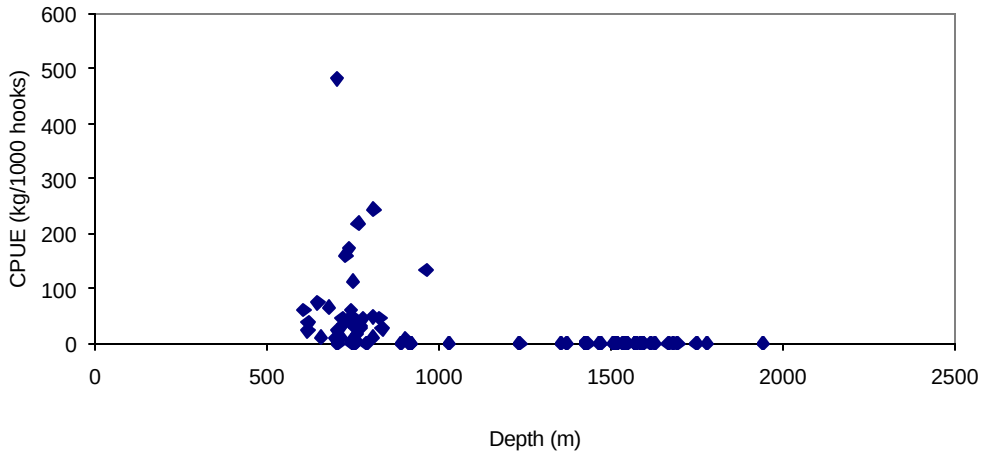

Fig. 6. 'Giant' redfish, kg per 1000 hooks on different depths, on bottom lines, at the Reykjanes Ridge at 61°N. (Hareide and al 1996).

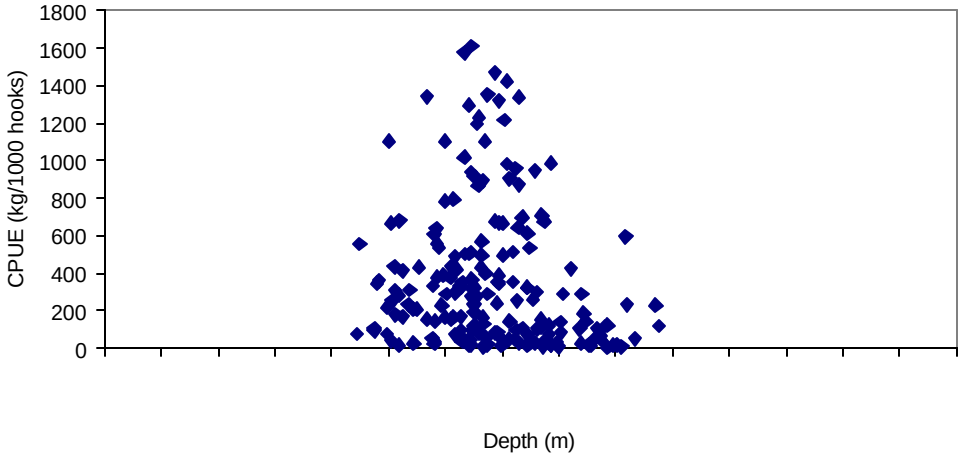

Fig. 7. 'Giant' redfish, kg per 1000 hooks on different depths, on vertical lines at the Reykjanes Ridge at 51-56°N (Langedal and Hareide 1997).

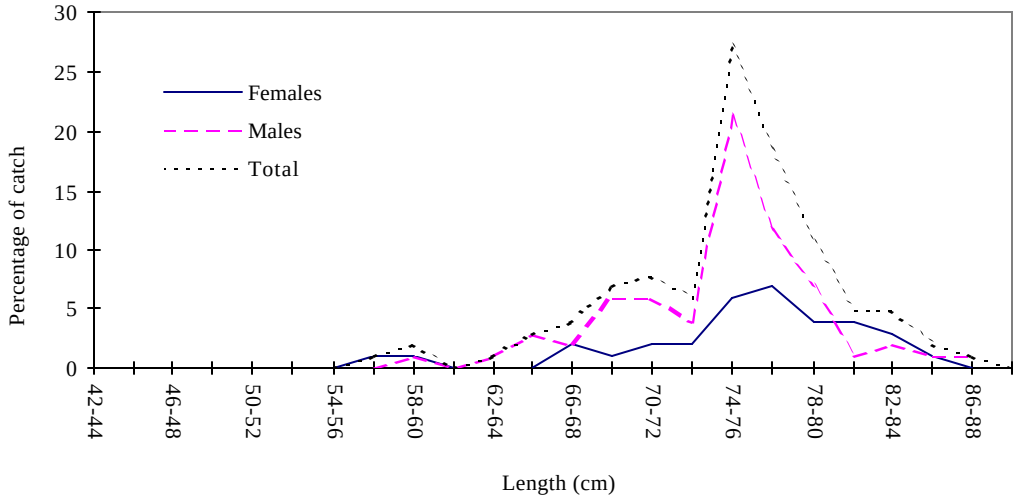

Fig. 8. Length distribution of 'giant' redfish from Faroese exploratory longline fishery on the Reykjanes Ridge (61°N), May 1996 (n = 104).

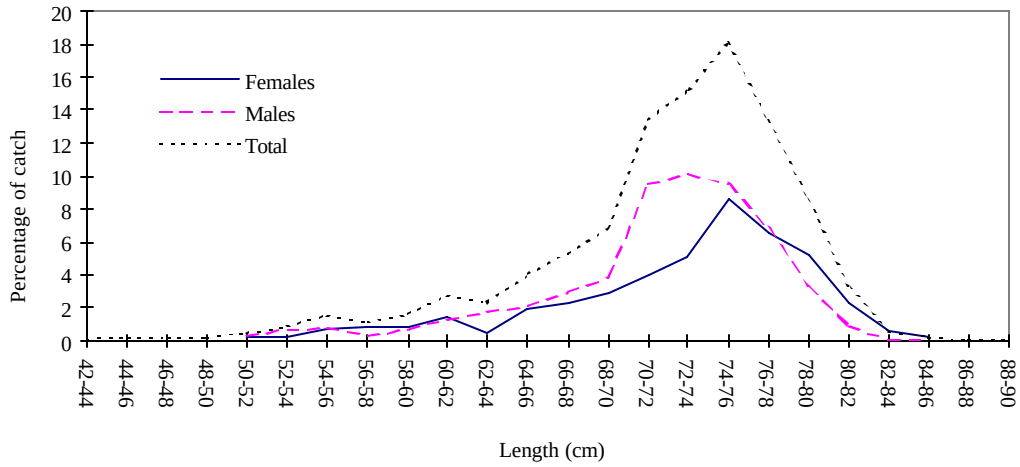

Fig. 9. Length distribution of 'giant' redfish from Norwegian exploratory longline fishery on the Reykjanes Ridge (56°N) July 1997 (n = 3090).

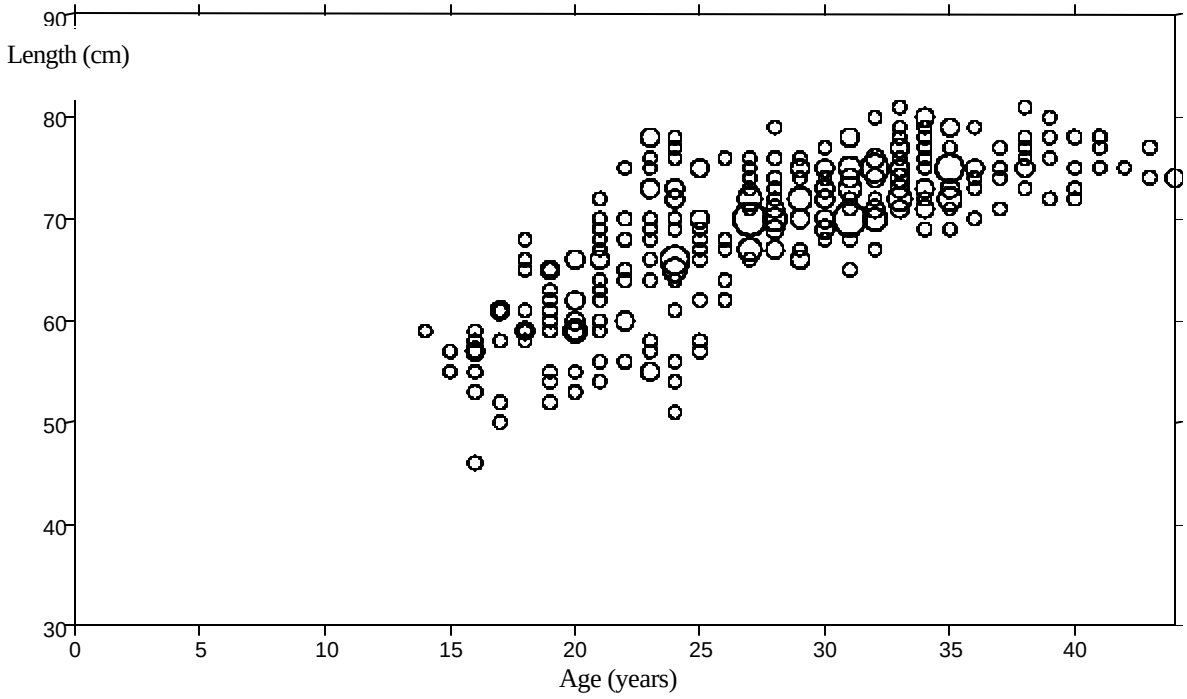

Fig. 10. Age length relation for 'giant' redfish from the Reykjanes Ridge (56°N) 1997 (Langedal and Hareide 1997).

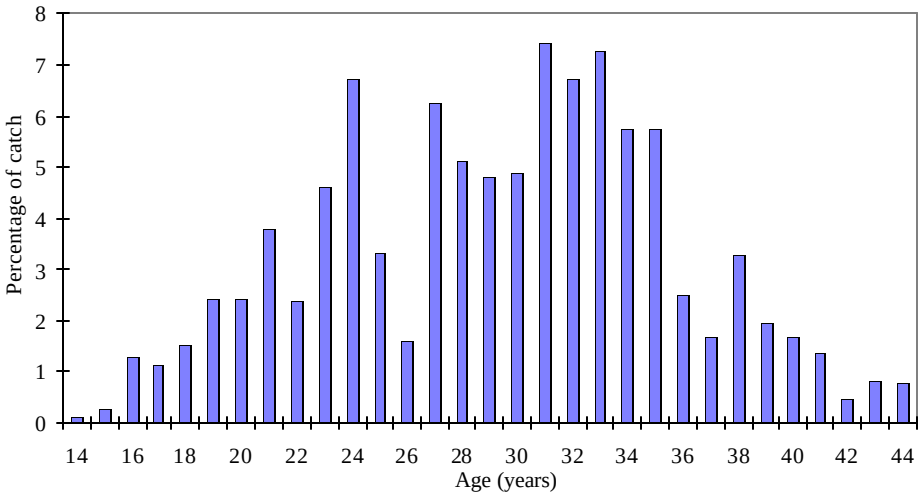

Fig. 11. Age distribution of 'giant' redfish from the Reykjanes Ridge 56°N, 1997.

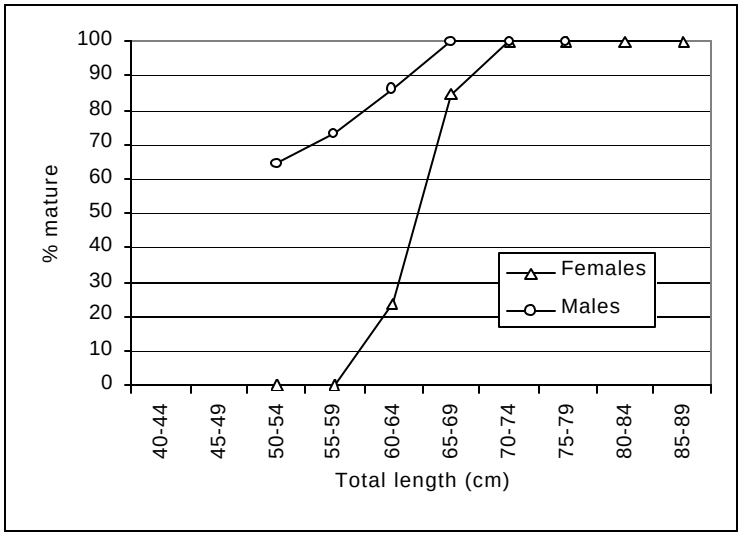

Fig. 12. Percentage maturation at length in male and female 'giant' redfish from the Reykjanes Ridge 56°N, 1997.

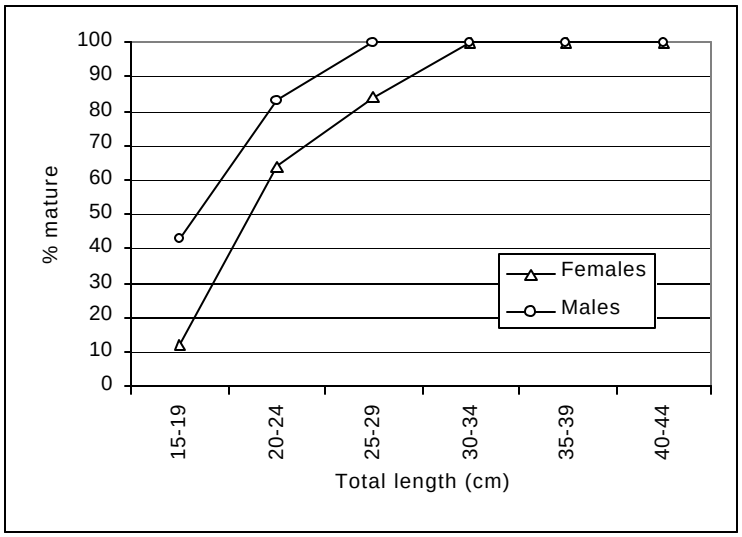

Fig. 13. Percentage maturation at age in male and female ‘giant’ redfish from the Reykjanes Ridge 56°N, 1997.