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Length-age Composition and Distribution of Beaked Redfish from Commercial
Catches Taken on the Flemish Cap Bank in 2000

by

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Abstract

The paper presents data on the distribution and biology of beaked redfish commercial catches taken on the Flemish Cap Bank in 2000. Biological data were gathered by the observers placed onboard the Russian fishing vessels during September-October.

The depths from 300 to 600 m were covered by the fishery. A bottom trawl (130 mm mesh-size) was the fishing gear used.

According to preliminary data, the redfish catch taken by Russian vessels on the Flemish Cap Bank made up 1.8 thou. t in 2000.

A trend of reduction in the proportion of beaked redfish from catches was noted with increasing of fishing depth to 800m.

Males in the catches were represented by individuals of 15-46 cm long, with the mean length being 28.5 cm. The length of females varied from 14 to 46 cm; the mean length was 29.1 cm. The fish length increased with a growth of fishing depths.

Over the period of observations, the sex ratio was close to 1, with a minor proportion of females being predominant.

The age composition of males was represented by fish at age 3-22 yr and major proportion consisted of specimens at age 8-9 yr. Females at age 9-10 yr were preponderant.

The linear growth rates were similar for males and females. The weight growth rate, depending on the age and length of males and females, was also virtually similar.

During the investigations the fishery operated on immature fish. Around 60% of males and 70% of females analyzed were at maturity stage II.

Introduction

The total stock of redfish on the Flemish Cap Bank consists of three species from *Sebastes* genus: *S. marinus*, *S. mentella* and *S. fasciatus*. Two latter species are very often pooled into a so-called group of beaked redfish, since the fishery in this division operates mainly on the mixed aggregations of these species (Avila de Melo *et al.* 2000).

It is impossible to identify redfish in the course of the fishery, therefore, all three species are included into the historic catch statistics.

Since 1995 the international fishery on redfish has drastically reduced and the catch was mainly taken as by-catch during the fishery on halibut. In 1999, the preliminary international catch constituted 792 t (Table 1). Most probably that this was related to the stock status, scattered distribution of aggregations, financial situation in countries, etc. In 2000, the Russian fleet resumed the fishery on redfish in Div. 3M.

Data on the distribution and biology of commercial catches of beaked redfish taken on the Flemish Cap Bank in 2000 are given in the paper. Biological data were gathered by the observers placed onboard the Russian fishing vessels.

Material and methods

Directed fishery on redfish was mainly carried out on the southern slope of the Flemish Cap Bank in 300-600 m depths in September-October. At the depths below 600 m the vessels operated occasionally. Hauls were performed by a bottom trawl (not less than 130 mm mesh-size), with a 2-4-hour duration of haul.

Species composition was identified in each haul. Redfish weight was determined using conversion factors applied to the amount of the products produced. By-catch was weighted separately from the main catch. Zoological length was measured and sex determined.

Redfish from *Sebastes* genus were separated into two groups, i.e. *S. marinus* and *S. mentella* + *S. fasciatus*, since it was difficult to identify and separate *S. mentella* and *S. fasciatus*. In connection with this, the paper presents the fisheries and biological data for *S. mentella* and *S. fasciatus*.

Length composition of redfish at 900-1000m depths was obtained from by-catches during directed fishery for halibut.

Redfish were aged by scales. To stage redfish maturity, a 6-point - and a 9-point maturity scales were applied for males and females, respectively (Sorokin, 1958, 1960; Sorokin, 1961).

International catch statistics for redfish taken on the Flemish Cap Bank were borrowed from the database STATLANT 21A, NAFO site - www.nafo.ca.

Results

The trawl research surveys, including species identification of redfish, conducted by EU, were initiated in 1991. By the results from the surveys for 1991-1999, the total biomass, including the biomass of all three species and juvenile specimens, varied from 59.3 to 139.2 thou. t (Vazquez, 2000). *S. mentella*, the biomass of which varied from 25.1 to 77.9 thou. t and was approximately 80% during specific years, constitutes major proportion of the total stock (Fig. 1). The proportion of Acadian redfish (*S. fasciatus*) in the total stock was minor and made up 6-8%.

Results of the Russian investigations on bathymetrical distribution of *S. mentella* and *S. fasciatus* indicate that the catch of *S. fasciatus* taken at 370-554 m depths constitutes only 3.7% (Fig. 2). Catches from the depths below 554 m consisted only of *S. mentella* (Barsukov *et al.*, 1990).

By the data from the 1996 trawl survey, *S. marinus* occurred at the depths to 800 m (Igashov and Vaskov, 1997). In spite of this, its proportion in the total catch is minor.

Thus, the fishery for redfish on the Flemish Cap Bank southern slope operates mainly on *S. mentella* aggregations.

In 2000, with increasing of fishing depth to 800 m, a trend of decreased proportion of beaked redfish in catches was noted during the fishery (Fig. 3). Thus, if the other fish by-catch at 301-400 m depths was not more than 3%, then at 701-800 m depths it increased to 24%. A proportion of redfish somewhat increased below 800 m depth.

Males in catches were represented by specimens of 15-46 cm long; their mean length was 28.5 cm. The length of females varied within 14-46 cm long, with their mean length being 29.1 cm. With increasing of fishing depth, fish length increased (Fig. 4).

Males (66%) were predominant in catches from 301-400 m depths, insignificant quantities of females were noted in the rest of the depths. On the whole, the male/female ratio was 1:1.04 for all the depth range.

To convert length frequency to age, the length-age keys were applied, which are given in Tables 2, 3 and 4. The age composition of males was represented by fish at age 3-22 yr; the major proportion consisted of specimens at age 8-9 yr (Fig. 5). Females at age 9-10 were preponderant.

Linear growth rates were similar both for males and females (Fig. 6). Similar linear growth rate is noted in beaked redfish from the Irminger Sea (Melnikov, 1999). Weight growth rates, depending on age and length in males and females, virtually coincided also (Fig. 7 and 8).

During the investigations the fishery operated on immature fish. Around 60% of males and 70% of females were at maturity stage II (Fig. 9).

References

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Table 1. Nominal catches by country (tons) of redfish in Division 3M, 1990-1999. STATLANT 21A.

Country	Year										Total	
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999		
Canada		2		10								12
Cuba	8390	1772	2304	945							2	13413
Faroe Is.			19	61	12							92
Greenland			1	55	25	4	2		2			89
France									2			2
Germany	8232	6237	3443	295								18207
Iceland					10							10
Japan	4164	1431	1424	967	488	553	678	212	439	320		10676
Norway					8							8
Portugal	23330	3788	3198	4782	5632	1284	281	83	259	96		42733
Spain	3832	472	204	100	610	165	113	129	262	266		6253
USSR	69162	24763										93925
Russia			2937	2035	2980	3560	52		7	108		11679
U. Kingdom		5							1			6
S. Korea	16664	2936	8350	2962								30912
Lithuania			7441	5099	94	304						12938
Estonia				2188	47	863	13					3111
Latvia			2149	2112	8							4269
Total	133774	41406	31470	21611	9914	6733	1139	424	969	792		248335

Table 2. Age - length key of male redfish from Div. 3M, 2000

Length, cm	Age																				No	Average weight, g
	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22		
15	1																				1	40.0
16		2																			2	48.0
17		1																			1	58.0
18																						
19																						
20			3																		3	104.3
21			5	4																	9	116.8
22			1	9	2																12	134.6
23				4	7																11	160.2
24					10																10	177.7
25				2	8																10	181.3
26					3	8															11	220.7
27						9	1														10	229.5
28						2	9	4													15	270.0
29							2	10	2												14	303.9
30								6	9	5											20	347.0
31								1	7	3											11	365.0
32								1	2	5	6										14	425.0
33										3	5	1									9	471.7
34										2	5	6									13	534.6
35											5	4	2								11	577.7
36												5	4								9	626.1
37												1	7	2							10	663.5
38													4	4	2						10	736.5
39														7	6						13	761.8
40														3	5						8	785.0
41														1	6	1					8	859.4
42																	1				1	905.0
43																		1			1	970.0
44																		3	1	1	5	1067.0
45																				2	2	1240.0
46																					1	1200.0
No	1	3	9	19	30	19	12	22	20	18	21	17	17	17	19	2	4	1	3	1	255	
Average weight,g	40.0	51.3	112.4	138.1	176.0	228.8	262.1	318.0	361.5	395.3	502.9	572.9	663.5	743.5	823.7	930.0	1006.3	1130.0	1188.3	1200.0		429.8
Average length,c m	15.0	16.3	20.8	22.3	24.1	26.7	28.1	29.3	30.4	31.7	33.4	34.9	36.8	38.8	39.8	42.0	43.5	44.0	44.7	46.0		30.9

Table 3. Age - length key of female redfish from Div. 3M, 2000.

Length, cm	Age																				No	Average weight, g
	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22		
14	2																				2	36.0
15		1																			1	48.0
16		1																			1	56.0
17																						
18																						
19																						
20		1	4																		5	103.6
21			4	7																	11	123.7
22				9	2																12	139.1
23			2	5	6																13	153.3
24				3	9																12	175.6
25				1	9	1															11	198.5
26					3	6															9	211.7
27						6	5														11	245.9
28						3	8	2													13	277.7
29							4	10	4												18	312.2
30								7	2												19	347.9
31								10	8	3											13	381.5
32								2	3	5	4										12	429.2
33									1	3	7										11	455.5
34										1	5	4									10	542.5
35												7	4								11	620.5
36												5	6	1							12	620.0
37												2	8	1							11	673.6
38													4	5	2						11	723.6
39														5	7						12	805.0
40														4	7						11	844.1
41															5	3					8	865.6
42															1	3	3				8	987.5
43																1		1			2	995.0
44																		1			1	1170.0
45																		1	1		2	1170.0
46																					1	1270.0
No	2	4	10	25	29	16	17	24	23	14	16	18	22	16	22	7	3	4	1	1	274	
Average weight,g	36.0	81.0	118.1	142.9	180.4	240.3	265.3	328.8	367.4	418.6	484.4	591.9	667.7	754.1	850.9	910.7	991.7	1130.0	1220.0	1270.0		442.3
Average length,c m	14.0	18.3	21.0	22.28	24.2	26.7	27.9	29.5	30.6	31.9	33.1	35.3	36.6	38.6	39.8	41.7	42.0	43.5	45.0	46.0		30.9

Table 4. Age - length key of male and female redfish from Div. 3M, 2000.

Length, cm	Age																				No	Average weight, g
	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22		
14	2																				2	36,0
15	1	1																			2	44,0
16		3																			3	50,7
17		1																			1	58,0
18																						
19																						
20		1	7																		8	103,9
21			9	11																	20	120,6
22		1	1	18	4																24	136,8
23			2	9	13																24	156,5
24				3	19																22	176,5
25				3	17																21	190,3
26					6	14															20	216,6
27						15	6														21	238,1
28						5	17	6													28	273,6
29							6	20	6												32	308,6
30								16	16	7											39	347,4
31								3	15	6											24	374,0
32								1	5	10	10										26	426,9
33									1	6	12	1									20	462,8
34										3	10	10									23	538,0
35											5	11	6								22	599,1
36												10	10	1							21	622,6
37												3	15	3							21	668,8
38													8	9	4						21	729,8
39														12	13						25	782,6
40														7	12						19	819,2
41														1	11	4					16	862,5
42															1	3	4	1			9	978,3
43																2	1				3	986,7
44																	3	2	1		6	1084,2
45																		1	3		4	1205,0
46																				2	2	1235,0
No	3	7	19	44	59	35	29	46	43	32	37	35	39	33	41	9	7	5	4	2	529	
Average weight,g	37.3	68.3	115.4	140.8	178.2	243.1	264.0	323.6	364.7	405.5	494.9	582.7	665.9	748.6	838.3	915.0	1000.0	1130.0	1196.3	1235.0		436,2
Average length,c m	14.3	17.4	20.9	22.3	24.1	26.7	28.0	29.4	30.5	31.8	33.3	35.1	36.6	38.7	39.8	41.8	42.9	43.6	44.75	46.0		30,9

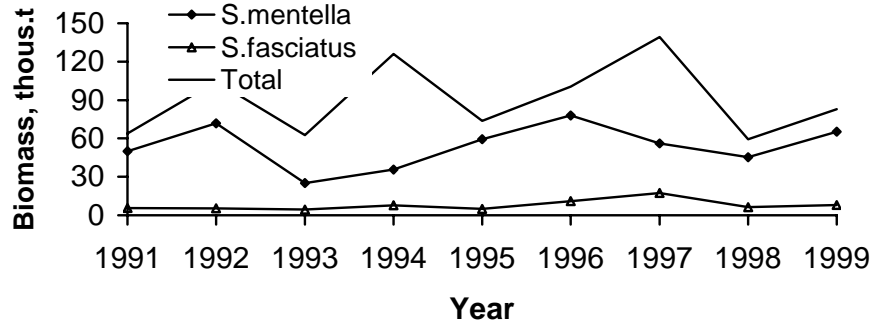


Fig. 1. Biomass of Redfish in Div. 3M by EU survey in 1991-1999.

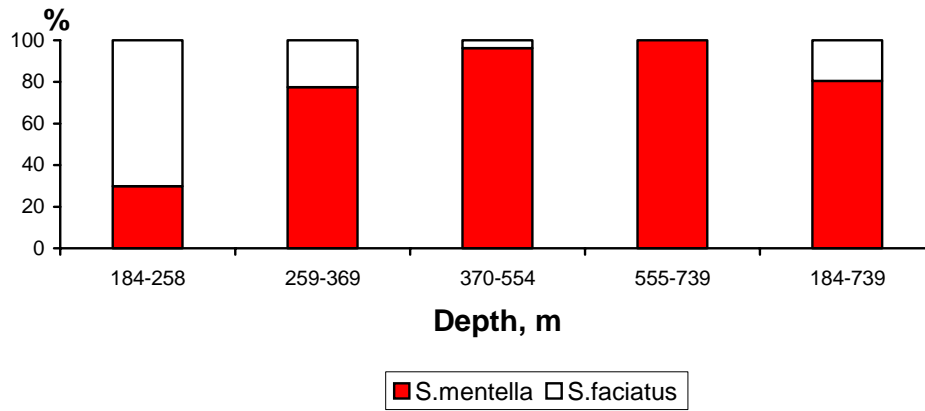


Fig. 2. Bathymetric distribution of *S. mentella* and *S. fasciatus* in Div. 3M.

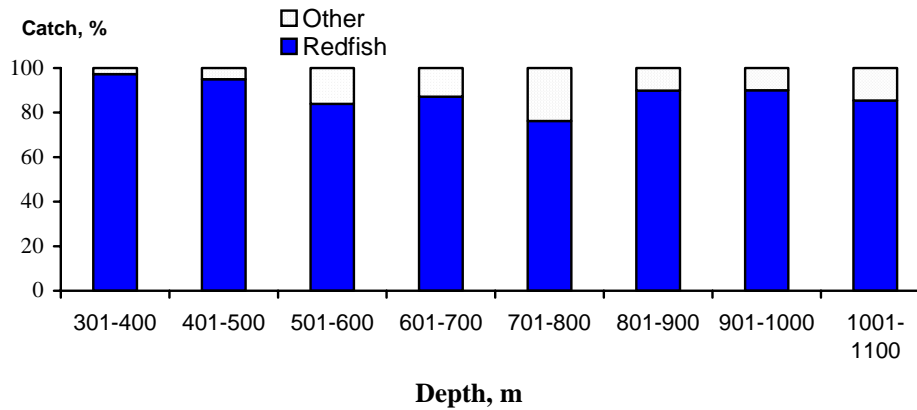


Fig. 3. Catch distribution of Redfish in Div. 3M by depth in 2000.

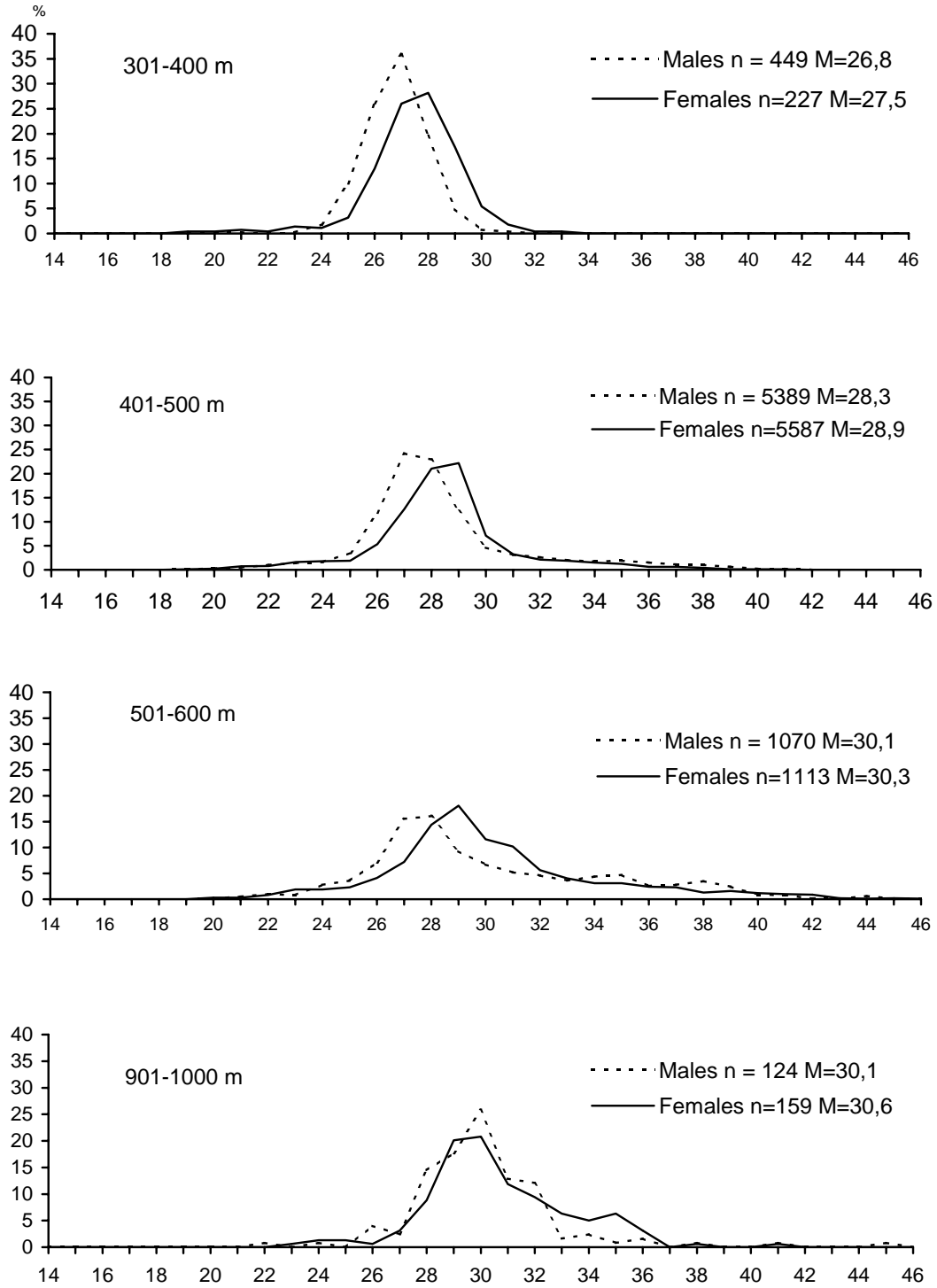


Fig. 4. Length distribution of beaked Redfish in Div. 3M by depth in 2000.

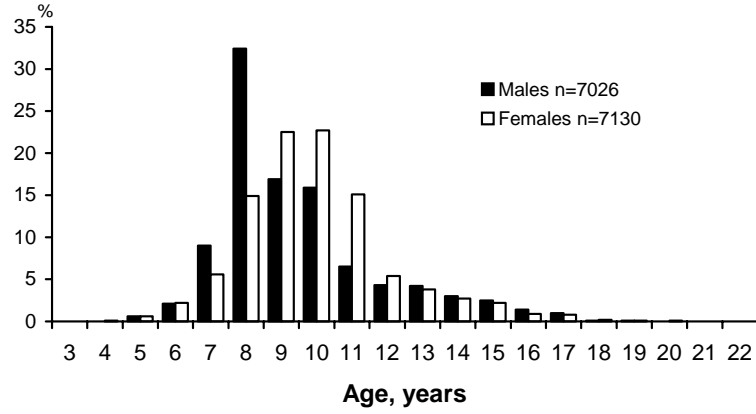


Fig. 5. Age distribution of beaked Redfish in Div. 3M in 2000.

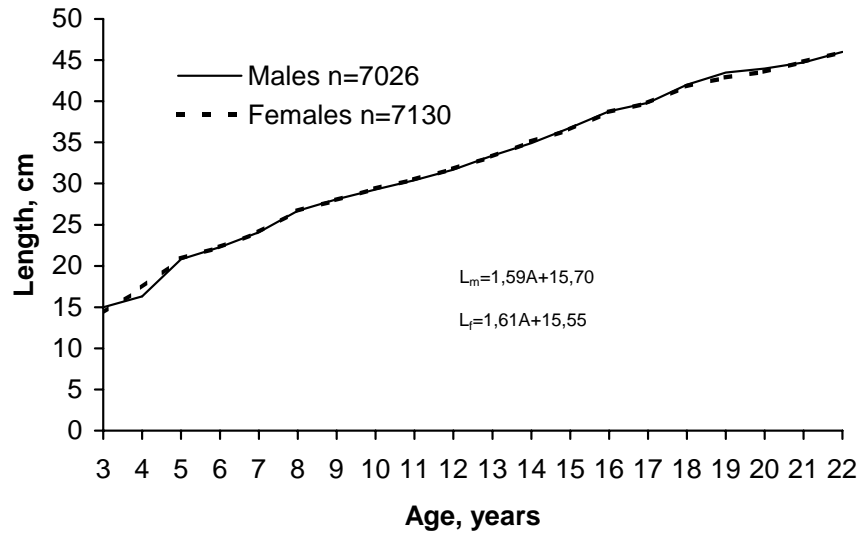


Fig. 6. Linear growth of beaked Redfish from Div.3M, 2000.

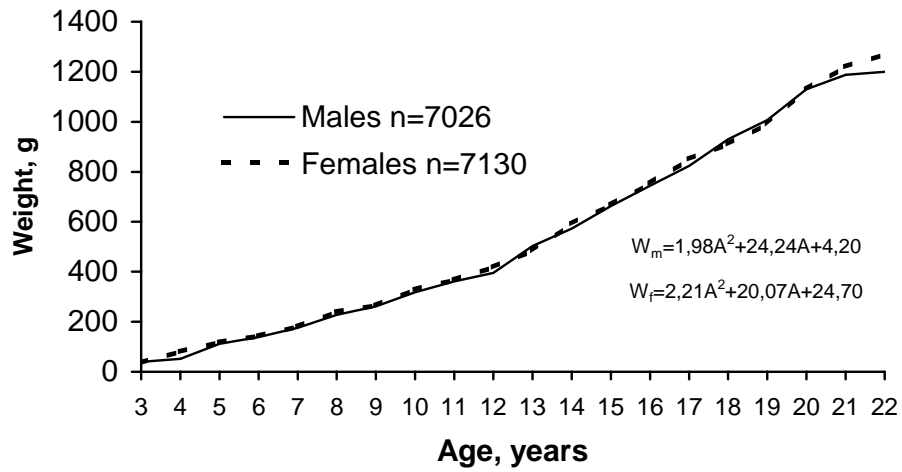


Fig. 7. Age-weight relationships of beaked Redfish from Div.3M, 2000.

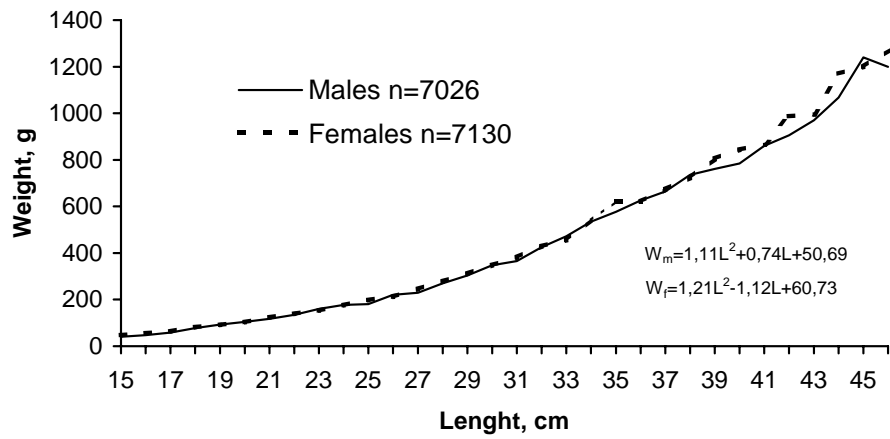


Fig. 8. Length-weight relationships of Beaked redfish from Div.3M, 2000.

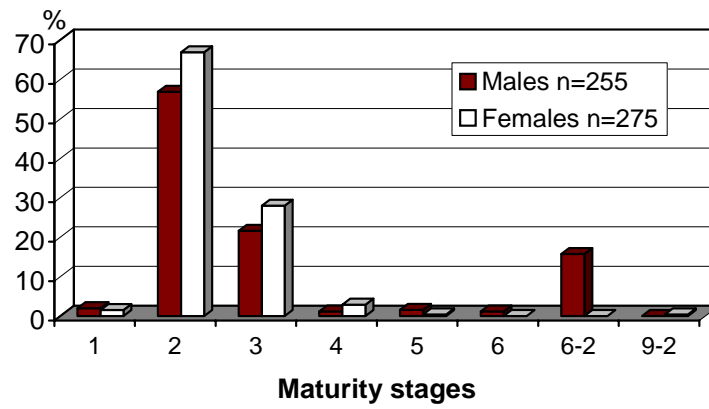


Fig. 9. Sexual maturity of beaked Redfish in Div. 3M, 2000.