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Status of the Redfish Stocks in NAFO Div. 3M (Flemish Cap) in 1995

by

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Introduction

There are three species of redfish which are commercially fished on Flemish Cap: beaked redfish (*Sebastes mentella*), golden redfish (*Sebastes marinus*) and American (arcadian) redfish (*Sebastes fasciatus*). Because of the difficulties to identify and to separate, all three species are reported together under redfish in the commercial fishery. Only commercial data from sampling of the portuguese fishery are separated by species. Survey results from the EU-bottom-trawl-survey provide also species separation of redfish.

Description of the fishery

Directed fishing on redfish on 3M in 1995 was mainly conducted by non-contracting parties, Russia, Latvia, Portugal and Japan.

The Russian redfish fishery with pelagic trawl started in March on the southern slopes in the depth range from 800 to 1000 m. There were few redfish in mid-April on the western and north-western slopes. The fishery continued end of April on the southern slopes. In May the fishery mainly occurred in the same area in the depth range from 600 to 950 m. There was nearly no fishery from end of May to end of June. The fishery recovered during July and August again on the southern parts of the bank and produced the best catch rates in 1995. The fishery ceased in late September. (SCS 96/3 part 2)

The Portuguese redfish fishery on Flemish Cap started in March and ceased in December. It is conducted with bottom trawls and gillnets. 30% of the catches were taken by the gillnetters. The trawlers operated in March and April in the depth range from 350 to 980 m, in August between 260 and 480 m and from October to December in the range from 140 to 910 m. The gillnetters were active from April to August fishing in depths between 260 to 1100m and in October/November in the depth range from 470 to 1010 m. The main by-catch in this component of the fishery was Greenland halibut. (SCS 96/12)

The Japanese redfish directed fishery was conducted during February to April and October/November with bottom trawls. (SCS 96/13)

There was no directed Spanish redfish fishery on Flemish Cap and catches of redfish were exclusively by-catch

Catches

Nominal catches by countries and STACFIS total catch estimates are shown in Table 1.

Catches doubled TAC in 1987 and were about three times higher in 1989. In the period from 1991 to 1993 catches have been at the TAC level and were falling to substantially less than the TAC in 1994. They increased only slightly in 1995 but are still half of TAC level:

Recent catches ('000 tons) are as follows:

Year	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
TAC	20	20	20	20	20	50	50	43	30	26	26	26
Catch	20	29	44	23	158	181	1,2 48	1,2 43	1,2 29	1,2 11	13	

¹ Includes estimates of non-reported catches from various sources

² Provisional

Commercial fisheries data

Sampling data: The following sampling data were available from the 1994 redfish fisheries on Flemish Cap: Russian trawler fleet directed redfish fishery with bottom trawls length composition of redfish catch in July (sex separated) Portuguese fleet redfish as by-catch in the cod fishery length and age comp. (trawl) from 1., 2., 3. Quarter (*S. mentella*) length and age comp. (gillnets) from 2. Quarter (*S. mentella*) cpue trawl and gillnet fleet.

The available length distribution of Russian catches in the 3. Quarter show a peak at 20 and 21 cm, in total as well as for males and females (Table 2).

The Portuguese sampling data on *S. mentella* from trawl catches are dominated by the length classes 25 to 41 cm with two modes at about 29 and 36 cm for males and 30 and 37 cm for females. This corresponds to a range of age groups from between 4 and 25, dominated by ages 10 and 12 for males and ages 12 and 13 for females. Gillnet catches of *S. mentella* were dominated by lengths between 28 and 43 cm for males and 30 to 44 cm for females. For both males and females there is a peak at 37 cm. This corresponds to year-classes 1979 and 1980 at age 16 and 15 for males and yearclasses 1973 to 1980 at ages 21 to 15 for females. The mean length decreased by 2 cm and mean weight by 100 gr compared to 1994. (SCS 96/12)

CPUE data

Reflecting the discussion at last year's assessment on the quality of the combined standardized cpue series based on official 21B data for redfish in 3M it is not considered here. The reasons are repeated in the following. There are general problems in using cpue as an indicator of stock situation especially for redfish. There are only few fleets operating on Flemish Cap which regularly aim at redfish. Most of the fleets use redfish as substitute when cod is rare or cod quotas are restrictive. Redfish will turn immediately to a by-catch when cod fishing or recently Greenland halibut fishing become more profitable. Also the vertical distribution of redfish varies widely in space and time and therefore the availability of this species to the bottom trawl and gillnets which are mostly used in the redfish fishery on Flemish Cap is also subject to high variability. It can be concluded that the combined 21B based cpue data from redfish fisheries are not appropriate as an indicator of the state of redfish stocks.

Standardized CPUE series of the Portuguese trawler fleet from 1988 onwards was available for consideration (Fig 1). This fishery is well known and sampled (3 of 12 trawlers). This fleet started fishing for cod and occasionally for redfish until April. Thereafter cod catches became poor and the fleet concentrated on redfish and Greenland halibut. CPUE data were taken only from sampled vessels and only from hauls directed on redfish. In contrast to the combined 21B based cpue data the direct observed data are considered as more appropriate as an indicator of trends in the stock. As the gillnet fleet targeted on cod and later on Greenland halibut the data of this fishery were not used. CPUE declined from the high value in 1994 to a level even below that of 1993. This may be explained by a fishery of more mixed type in 1995. Basic data are given in Table 3. Catch as function of effort is shown in figs. 2 (hours) and 3 (days). Catch versus effort in hours for the years 1988 to 1995 are given in figs. 4a to 4h.

Research survey data

There are two survey series which give information on the state of the redfish stocks on Flemish Cap. A Russian bottom trawl survey was conducted in the period 1983 to 1993. Acoustic estimates are available from the same survey series since 1988. This survey was not continued in 1994 but fortunately conducted again in 1995. Since 1988 the EU conducted a bottom trawl survey providing estimates of all three redfish species.

Year	EU	Russia (bottom)	Russia (bottom + pelagic)
1983		154900	
1984		132300	
1985		51900	
1986		309500	
1987		106400	
1988	158222	47000	379000
1989	136633	83300	365900
1990	104193	17700	246400
1991	63846	45400	107700
1992	104477	18200	99500
1993	62589	69800	147100
1994	126011		
1995	73641	20702	

Biomass in tons

The increase in total biomass from 1993 to 1994 is mainly due to a drastic increase of *S. marinus* biomass and juvenile redfish biomass (SCR 95/26). In comparison to 1993 in 1994 *Sebastes marinus* biomass is at the same level as *S. mentella* biomass. Fish of age 8 are dominating the golden redfish stock and age group 5 the beaked redfish stock. In 1995 fish of ages 5 and 6 were dominant in all three species. The biomass of *Sebastes marinus* declined again to a slightly higher level than in the period from 1991 to 1993. The biomass of *Sebastes mentella* however increased further in 1995, whereas that of *Sebastes fasciatus* remained constant at a level seen from 1991 to 1994. In total the biomass decreased to the level of 1993. (Fig.5). The high value of golden redfish biomass in 1994 was due to concentration of older fish (age 8) in strata 6 and 7 (Fig. 6a,b). The sudden drastic increase of the golden redfish biomass which is not due to juveniles proves the perception of a highly variable biomass time series caused by variable availability of this species to the survey gear mainly due to changes in the spatial distribution. The survey catch rates in kg per strata are shown in fig. 6,7,8 and tables 3,4,5 for *Sebastes marinus*, *Sebastes mentella* and *Sebastes fasciatus*, respectively. Development of length and age composition of *Sebastes marinus* by strata over the period 1988 to 1995 is shown in tables 6 and 7, respectively.

The Russian trawl survey fortunately could be continued in 1995 after a break in 1994. Since 1988 the total redfish biomass varied between levels of about 20 000 and 70 000 tons. In 1995 age groups 5 and 6 were dominant corresponding to lengths of 19 to 21 cm. There was no separation of species. Survey catch rates in kg per stratum in the period from 1989 to 1995 are shown in Fig. 9 and Table 8.

Redfish by-catch in the shrimp fishery

Sampling data of the shrimp fishery of Canada and Norway are available. Redfish (*Sebastes spp.*) was the most large component in the by-catch in terms of weight for the period 1993 to 1995. The percentage of total redfish by-catch declined from 28.4% in 1993 to 1.1% in 1995. In terms of numbers the estimates are 89 million fish (79% of age 6 and 7) in 1994 and 4.8 million fish (70% of age 6 and 7) in 1995. There was no sampling in 1993 but extrapolation based on 1994 sampling suggest 138 million redfish caught as by-catch in the shrimp fishery. The available data suggest that there is an effect of introducing the Nordmore grate in 1994 and a subsequent reduction in the bar spacing of the grate in 1995. However, the impact of changes in redfish abundance in this time period are not included in this conclusion. Specifically it is not clear if the drop in by-catch of redfish from 1994 to 1995 can be related to the reduction of the bar spacing from 28 to 22 mm taking into account the estimation of juvenile redfish by EU survey of only 235 tons in 1995 compared to 49 000 tons in 1994.

State of the stocks

The EU survey estimated the trawlable biomass of the redfish stocks on Flemish Cap at about 126 000 tons in 1994. The biomass estimated for 1995 at 74 000 tons is back at a level slightly higher than 1993 (at 63 000 tons). The peaking of biomass in 1994 can be explained by a concentration of golden redfish of age 8 in strata 6 and 7 which

is not seen in the 1995 survey.

The Russian trawl survey based on the same stratification as the EU-survey results in a total redfish biomass of about 20 000 tons, a level seen in the years 1990 and 1992 also.

Although there is no information on the absolute biomass of the redfish stocks the trawlable biomass estimates of the two survey series indicate stabilisation of the redfish stocks since 1991. There was expectation of good recruitment indicated by the increase of juvenile redfish biomass in 1994. However juvenile redfish biomass in 1995 nearly vanished (235 tons).

It is not clear if this is an effect of the variation in availability of redfish or an effect of by-catch in the 1993 started shrimp fishery on Flemish Cap.

Fishing mortality is expected to have been reduced reasonably due to the reduction of effort from 1993 to 1994 and 1995. If present levels of effort and by-catch in the shrimp fishery are kept in future years the probability of a further recovery of the redfish stocks on Flemish Cap is increasing.

References

SCR 96/64
SCR 96/12
SCR 96/09
SCR 96/54
SCWP 96/??
SCWP 96/07
SCS 96/03 Part 2
SCS 96/12
SCS 96/13
SCS 96/14

NOMCATCH

Species	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
Redfish													
3M													
Country													
CAN	0	0	0	0	0	0	0	0	2	0	10	0	0
CUB	2324	1562	1831	1764	1757	1759	1765	4195	1772	2303	945		
DDR	40	98	0	88	0	0	0	4025					
GRL	0	0	0	0	0	0	0	0	0	1	0	26	
JPN	390	389	313	400	131	393	885	2082	1432	1424	967	488	553
SUN/RUS	14517	15005	15703	15045	19875	13747	13937	34581	24661	2937	2035	2980	3560
LVA									7441	5099	94	304	
LTU										0	2128		
EST											2188	47	
E GER	0	769	848	145	0	0	2	91	5847	3443	0	0	
E ESP	589	282	281	643	825	146	211	1916	472	204	100	610	
E GBR	0	0	0	0	0	0	0	0	5	0	0	0	
E PRT	1667	2123	1306	10783	21823	7101	13012	11665	3787	3198	4781	5630	1282
KOR-S	0	0	0	5	0	43	17885	8332	2956	8350	2962		
FAROE IS.	0	0	0	0	0	0	0	0	0	16	0		
NORWAY	0	0	0	0	0	0	0	0	0	0	0	8	3
TOTAL	19527	20228	20282	28873	44411	23189	47697	66887	40914	29317	21215	9883	9883
STACFIS Estimates of total catches from various sources:													
TOTAL	19527	20228	20282	28873	44411	23189	58102	81046	48489	43317	28993	11315	13495

Table 1

basicdata

portuguese cpue							
division	3M						
species	redfish						
fleet	trawlers						
no. ships	year	month	days	hours	cpue(t/hour)	catch t	
1	88	4	13	186	0,798	148,428	
1	88	5	17	201	0,935	187,935	
1	88	6	13	193	0,409	78,937	
3	89	1	25	313	0,383	119,879	
3	89	2	7	105	0,495	51,975	
1	89	2	1	18	0,518	9,324	
3	89	3	17	255	0,684	174,420	
1	89	3	15	160	0,654	104,640	
5	89	3	16	173	0,352	60,896	
1	89	4	30	408	0,930	379,440	
4	89	5	5	48	1,485	71,280	
1	89	5	19	201	1,548	311,148	
4	89	6	3	41	0,528	21,648	
2	89	6	1	17	0,829	14,093	
2	89	7	16	307	0,457	140,299	
4	89	7	5	81	0,438	35,478	
4	89	8	12	207	0,524	108,468	
2	89	8	7	118	0,509	60,062	
1	89	8	4	75	0,391	29,325	
1	89	9	4	75	0,367	27,525	
5	90	1	2	14	1,240	17,360	
5	90	2	5	64	0,377	24,128	
1	90	2	1	12	0,178	2,136	
2	90	2	4	36	0,345	12,420	
11	90	2	3	18	0,425	7,650	
11	90	3	5	41	0,459	18,819	
2	90	3	12	166	0,587	97,442	
1	90	3	3	33	0,288	9,504	
5	90	4	10	151	0,349	52,699	
2	90	4	4	33	0,907	29,931	
1	90	4	9	88	0,897	78,936	
11	90	4	7	64	1,852	118,528	
11	90	5	9	91	1,047	95,277	
1	90	5	1	10	0,297	2,970	
2	90	5	1	14	0,209	2,926	
2	90	7	10	182	0,521	94,822	
1	90	7	6	115	0,417	47,955	
11	90	7	4	78	0,340	26,520	
11	90	8	11	200	0,363	72,600	
1	90	8	6	105	0,403	42,315	
2	90	8	27	535	0,554	296,390	
4	90	9	6	100	1,038	103,800	

Table 2 cont.

basicdata

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2	90	9	11	183	0,477	87,291
1	90	9	7	129	0,400	51,600
11	90	9	6	104	0,693	72,072
2	90	10	6	84	0,435	36,540
1	90	10	5	67	0,398	26,666
1	90	11	5	49	0,753	36,807
1	90	12	3	34	0,554	18,836
1	91	4	6	73	0,858	62,634
4	91	4	5	63	1,344	84,672
11	91	4	4	40	1,398	55,920
11	91	5	10	109	0,552	60,168
4	91	5	2	27	0,683	18,441
1	91	5	3	38	0,473	17,974
1	91	8	1	11	0,407	4,477
4	91	8	5	82	0,491	40,262
4	91	9	2	36	0,463	16,668
11	91	9	7	121	0,300	36,300
11	91	10	8	144	0,268	38,592
4	91	10	9	160	0,393	62,880
4	91	11	18	286	0,694	198,484
11	91	11	16	254	0,655	166,370
4	91	12	7	95	0,562	53,390
1	92	3	6	69	0,980	67,620
2	92	3	7	74	0,400	29,600
4	92	3	8	88	1,193	104,984
4	92	4	6	71	1,097	77,887
1	92	4	11	160	1,356	216,960
7	92	4	5	66	1,095	72,270
7	92	5	5	64	0,874	55,936
4	92	5	9	88	0,983	86,504
1	92	5	13	163	0,744	121,272
1	93	4	6	69	0,201	13,869
1	93	8	19	323	0,317	102,391
1	93	9	5	75	0,317	23,775
1	93	11	1	9	0,818	7,362
1	94	8	2	18	0,420	7,560
8	94	8	1	17	0,278	4,726
8	94	9	1	14	0,434	6,076
8	94	10	3	31	1,165	36,115
8	95	3	15	224	0,105	23,520
16	95	4	6	101	0,211	21,311
16	95	8	1	10	0,227	2,270
1	95	10	1	11	0,378	4,158
1	95	11	6	66	0,506	33,396

Table 3

surveycatch

Redfish (<i>Sebastes marinus</i>) catch (kg) by strata		1989		1990		1991		1992		1993		1994		1995			
catch per mile towed		area		depth (fathoms)		min		max		min		max		min		max	
stratum 1		342	0,68	70	80	7,19	7,38	0,15	1,85	1,62	1,85	1,62	11,07				
stratum 2		838	0,12	81	100	1,5	1,6	0,84	3,21	0,97	3,21	0,97	1,84				
stratum 3		628	5,99	101	140	2,11	3,21	1,51	1,25	8,32	1,25	8,32	7,64				
stratum 4		348	6,68	101	140	0,37	30,8	0,15	0,71	0,84	0,71	0,84	2,12				
stratum 5		703	15,91	101	140	0,71	4,58	3,9	1,39	3,33	1,39	3,33	9,57				
stratum 6		496	11,85	101	140	11,28	9,08	2,65	2,89	180,17	2,89	180,17	18,55				
stratum 7		822	2,88	141	200	5,1	2,66	1,08	2,31	125,19	2,31	125,19	9,98				
stratum 8		646	2,19	141	200	3,36	1,91	3,63	0,95	0,65	0,95	0,65	1,69				
stratum 9		314	84,68	141	200	4,44	1,32	0,81	4,23	12	4,23	12	1,51				
stratum 10		951	14,46	141	200	17,15	9,76	10,92	17,24	25,08	17,24	25,08	22,44				
stratum 11		806	33,52	141	200	87,1	4,48	13,98	3,88	24,04	3,88	24,04	11,99				
stratum 12		670	0	201	300	0,05	0,14			0,02		0,02	0,06				
stratum 13		249	0	201	300	0,18			0,13		0,13		0,27				
stratum 14		602	10,38	201	300	0,06		0,05		0,37		0,37	0,05				
stratum 15		666	1,2	201	300					0,23		0,23	0,10				
stratum 16		634	0	301	400								0,03				
stratum 17		216	0	301	400												
stratum 18		210	68,15	301	400												0,08
stratum 19		414	0	301	400	0,19											
Summe		10555															
stratified mean		10,99	16,32	2,91	10,01	2,93	2,86	23,62	6,42								
biomass in t		15289	22958	4093	14699	4130	4173	33240	9042								

Table 4

catchrates

Redfish (<i>Sebastes mentella</i>) catch (kg) by strata											
catch per mile towed											
depth (fathoms)											
stratum	min	max	area	1988	1989	1990	1991	1992	1993	1994	1995
stratum 1	70	80	342								
stratum 2	81	100	838								6,54
stratum 3	101	140	628								0,18
stratum 4	101	140	348					0,11			0,29
stratum 5	101	140	703					0,02	0,03	0,00	2,98
stratum 6	101	140	496						0,04		1,18
stratum 7	141	200	822					20,52	6,53	36,13	69,14
stratum 8	141	200	646					74,10	1,76	1,80	24,61
stratum 9	141	200	314					53,74	5,51	257,33	107,96
stratum 10	141	200	951					160,91	13,17	5,28	88,11
stratum 11	141	200	806					88,41	10,12	10,58	50,31
stratum 12	201	300	670					89,85	56,45	39,38	65,8
stratum 13	201	300	249					83,98	40,66	51,98	153,09
stratum 14	201	300	602					55,36		46,84	70,99
stratum 15	201	300	666					85,64	52,34	74,98	81,63
stratum 16	301	400	634					50,70	23,84	14,29	14,25
stratum 17	301	400	216					73,32	185,19	17,20	57,82
stratum 18	301	400	210					20,42		9,02	6,29
stratum 19	301	400	414					21,47	16,95	25,32	8,87
Summe			10555								
stratified mean								51,03	16,47	25,37	42,16
biomass in t								71810	25056	35710	59332

1 9 1

Table 5

survey catchrate

Redfish (<i>Sebastes fasciatus</i>) catch (kg) by strata		1988	1989	1990	1991	1992	1993	1994	1995
catch per mile towed									
depth (fathoms)									
stratum	min	max	area						
stratum 1	70	80	342					0,03	0,17
stratum 2	81	100	838		1,06			0,07	0,14
stratum 3	101	140	628		1,48		0,23	0,67	4,94
stratum 4	101	140	348		0,33		0,13	0,58	1,21
stratum 5	101	140	703		2,71		0,4	0,49	2,05
stratum 6	101	140	496		1,38		0,39	5,65	4,55
stratum 7	141	200	822		3,71		1,93	15,67	3,59
stratum 8	141	200	646		6,85		1,4	1,78	2,94
stratum 9	141	200	314		3,13		16,13	66,67	14,03
stratum 10	141	200	951		12,86		21,54	7,27	16,41
stratum 11	141	200	806		12,44		2,51	2,43	2,95
stratum 12	201	300	670		2,24		0,65	2,08	0,90
stratum 13	201	300	249				0,34	1,14	0,86
stratum 14	201	300	602		2,89			5,69	1,14
stratum 15	201	300	666		1,76		1,91	8,74	2,26
stratum 16	301	400	634				0,13	0,02	0,10
stratum 17	301	400	216						
stratum 18	301	400	210		0,63				
stratum 19	301	400	414		0,04		0,1	0,24	0,08
Summe			10555						
stratified mean					3,77		3,09	5,56	3,58
biomass in t					5308		4425	7828	5032

Table 6

stratum06

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Redfish (<i>Sebastes marinus</i>) length frequency (*1000) by strata.								
stratum 6								
length	1988	1989	1990	1991	1992	1993	1994	1995
cm								
3								
4								
5								
6								
7		5						
8		5						
9		27						
10		38						
11		16					7	
12		76					14	12
13		44					33	182
14		76		18			99	450
15		49		18	6		125	954
16		49	26	50	13		119	1398
17		55	37	151	70		205	1205
18		60	32	251	44	13	381	1078
19		60	82	246	44	53	232	1065
20		110	94	258	120	53	254	995
21		49	106	287	70	113	111	634
22		71	152	187	76	93	46	605
23		77	128	211	32	67	129	172
24		72	173	140	67	40	272	101
25		105	181	105	20	54	279	124
26		67	106	53	51	67	270	171
27		94	100	64	19	66	346	95
28		151	158	94	6	47	472	59
29		66	136	53	12	20	339	83
30		39	166	82	32	33	315	30
31		44	82	41	6	14	458	60
32		22	146	53	6		350	59
33		17	67	59	6	14	896	36
34		22	54	47	6	7	1309	12
35		5	24	12	6	14	1127	24
36		6	30	24	13		833	18
37		5	28	30			907	6
38		11	16	12			970	12
39							657	
40		10	8	6		7	376	6
41			8	12			445	
42			14				594	6
43				18				6
44			8				563	
45			8	6			657	
46							344	
47		6					63	
48							125	
49							156	
50			8				125	
51		6					63	
52							63	
53				6			31	
54								
55								
56								
57								
58								
59								
60								
Summa		1615	2178	2594	715	775	15160	9658

Table 6 cont.

stratum07

Redfish (<i>Sebastes marinus</i>) length frequency (*1000) by strata.								
stratum 7								
length	1988	1989	1990	1991	1992	1993	1994	1995
cm								
3								
4								
6								
6								
7								
8								
9								
10		25						
11		68						
12		86						
13		178						13
14		258						7
15		209		7			7	39
16		98					35	111
17		80		28			84	223
18		18		41		14	536	275
19		18	7	48	14	15	203	464
20		30	7	75	42	37	133	622
21		49	7	54	7	97	772	641
22		43	68	41	28	60	320	406
23		43	34	20	42	82	313	354
24		56	75	21	28	67	1322	260
25		55	94	14	49	37	1976	163
26		86	74	7		62	1677	242
27		80	74	14	7	74	3492	223
28		105	88	7	7	45	3361	216
29		62	95	21	21	30	2504	98
30		43	74	14	7	44	3778	72
31		86	88	7	14		3340	72
32		68	88	27		22	2561	91
33		92	81	14	14	15	2379	85
34		98	88	27		22	1955	13
35		49	74	20	7	7	1141	27
36		37	27	34	7	22	278	27
37		37	20	21		15	424	7
38		24	21	14	28	7		27
39		25	7	27			7	7
40		30	14	7	7		139	7
41		18	7	20	7			
42		24	14	14		7		
43		25	7	14				7
44		6	7	7				
45		6	7				146	
46			7				146	7
47								
48				14				
49				7			7	
50							7	
51								
52								7
53			7				14	
54								
55			7					
56			7					
57							7	
58								
59								
60								
Summa		2315	1275	686	336	771	33064	4813

table 7

stratum06

Age composition of redfish (Sebastes marinus) catches. (X 1000)										
Stratum 6	1988	1989	1990	1991	1992	1993	1994	1995		
age										
1							0	0		
2	39						0	0		
3	71						60	230		
4	85	83	9	53	35	40	380	2680		
5	150	187	23	607	153	100	680	3370		
6	64	151	140	865	257	239	540	2270		
7	56	122	323	310	127	191	700	370		
8	62	200	331	230	52	116	890	310		
9	45	168	416	82	24	39	700	120		
10	22	43	316	51	16	8	480	60		
11	12	112	142	81	9	13	580	70		
12	8	55	91	47	9	13	1380	50		
13	6	28	47	47	6	5	940	30		
14	2	29	15	29	6	1	2140	30		
15	1	10	13	2	1	7	950	20		
16	3	20	52	50			1540	10		
17							190	10		
18							560	10		
19							230	0		
20							430	0		
21							0	0		
22							140	0		
23							70	0		
24							80	0		
25+							370	0		
Summa	626	1208	1918	2454	695	776	14030	9640		

Tabela 7 cont.

stratum07

Age composition of redfish (Sebastes marinus) catches. (X 1000)										
Stratum 7										
age	1988	1989	1990	1991	1992	1993	1994	1995		
1							0	0		
2	8	8					0	0		
3	12	12					0	10		
4	20	20		10		17	430	170		
5	52	52		112	37	71	740	1000		
6	22	22	23	170	110	193	1170	1750		
7	18	18	69	40	66	199	4150	590		
8	27	27	132	40	24	126	7030	560		
9	27	27	273	19	19	49	5480	250		
10	15	15	196	24	13	15	4440	110		
11	9	9	136	33	9	23	3140	100		
12	10	10	105	21	14	16	2420	90		
13	6	6	70	38	6	24	1860	40		
14	2	2	20	48	19	12	1380	40		
15	2	2	19	10	7	7	110	20		
16	5	5	86	60	10		410	20		
17					1		0	20		
18						4	120	10		
19							0	0		
20						7	30	0		
21							0	0		
22							60	0		
23							30	0		
24							0	0		
25+							50	10		
Summa	235	235	1129	625	335	763	33050	4790		

table 8

surveycatchrates

Results from the Russian trawl surveys for redfish in Division 3M by stratum										
catch/tow [kg]										
stratum	area sq. nm	depth min	depth max	1989	1990	1991	1992	1993	1994	1995
stratum 501	342	127	146	0	0	0,04	0	0		0,04
stratum 502	838	147	183	0	0	0,4	0	0		0
stratum 503	628	184	255	84,9	0	0,4	1,7	0,4		0,4
stratum 504	348	184	255	0,5	0,01	0,6	0	0		1,8
stratum 505	703	184	255	0,4	0	1	0,1	0,3		1,2
stratum 506	496	184	255	0,9	0,2	1,2	2,3	0		0,6
stratum 507	822	256	364	45,1	3,8	23,7	7,7	319,7		1,8
stratum 508	646	256	364	259,1	1,9	1	10,3	94		0,8
stratum 509	314	256	364	191,6	44,9	12	0	350,4		18,3
stratum 510	951	256	364	112,7	94,2	25,3	19,1	161		44,1
stratum 511	806	256	364	363,3	42,2	190,8	8,3	119,4		5,1
stratum 512	670	365	546	286,3	39,9	32,4	35,2	65,2		6
stratum 513	249	365	546	68,2	25	22,1	0	266,9		35,4
stratum 514	602	365	546	70,2	32,1	61,9	14	59,4		131
stratum 515	666	365	546	83,5	29,7	88,8	91,6	110,6		4,9
stratum 516	634	547	728	75,5	18,7	50,4	59,5	12		127,2
stratum 517	216	547	728	88	33	18,6	0	104,8		51,1
stratum 518	210	547	728	23,6	12,9	533,1	20,5	29,2		140,4
stratum 519	414	547	728	65,7	7,6	333,7	171,1	9,1		16,7
total area	10555									
stratified mean										
biomass in t				83291	17699	45447	18236	69849		20702

cpuestand

portuguese cpue			
division	3M		
species	redfish		
fleet	trawlers		
corrected for the month and division of each observation			
	standardized		
year	CPUE	st. error	c.v.
1988	0,576	0,040	11,900
1989	0,672	0,087	38,900
1990	0,655	0,047	24,000
1991	0,570	0,094	43,500
1992	0,804	0,177	36,500
1993	0,453	0,147	64,900
1994	0,794	0,202	44,000
1995	0,305	0,077	56,200
1996			
year	CPUE	+st.error	-st.error
1988	0,576	0,616	0,536
1989	0,672	0,759	0,585
1990	0,655	0,702	0,608
1991	0,570	0,664	0,476
1992	0,804	0,981	0,627
1993	0,453	0,600	0,306
1994	0,794	0,996	0,592
1995	0,305	0,382	0,228
1996			

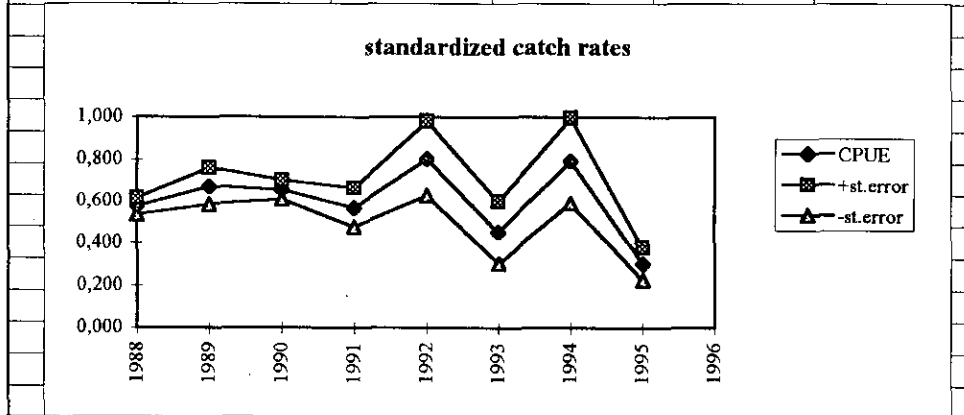


Fig 1

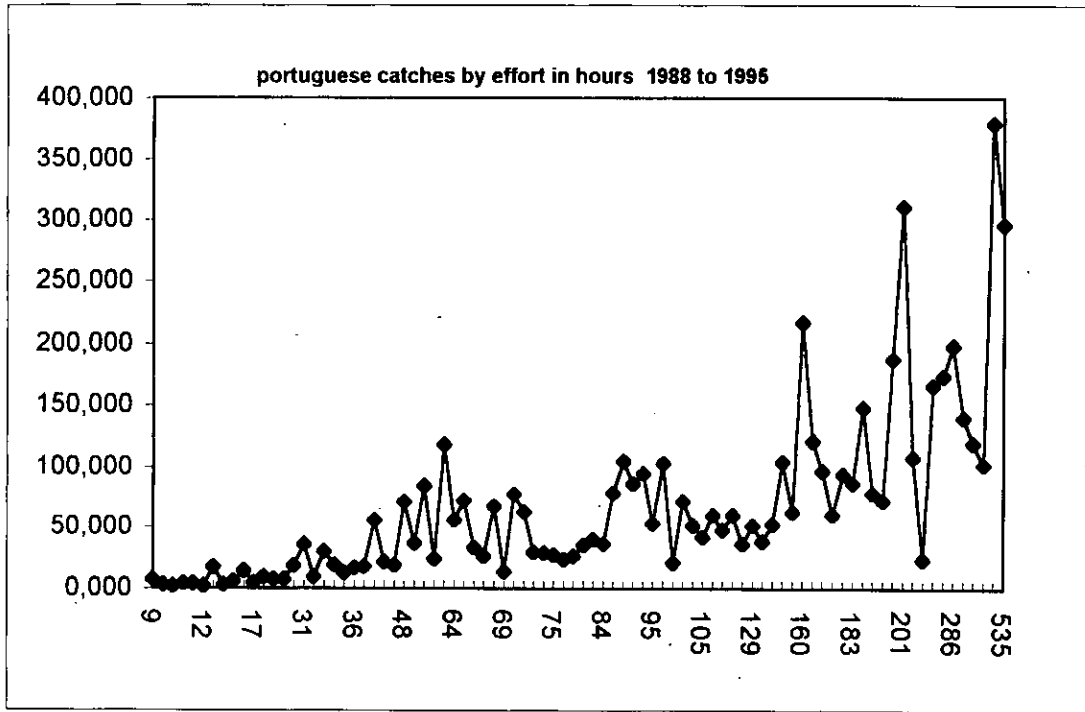


Fig 2

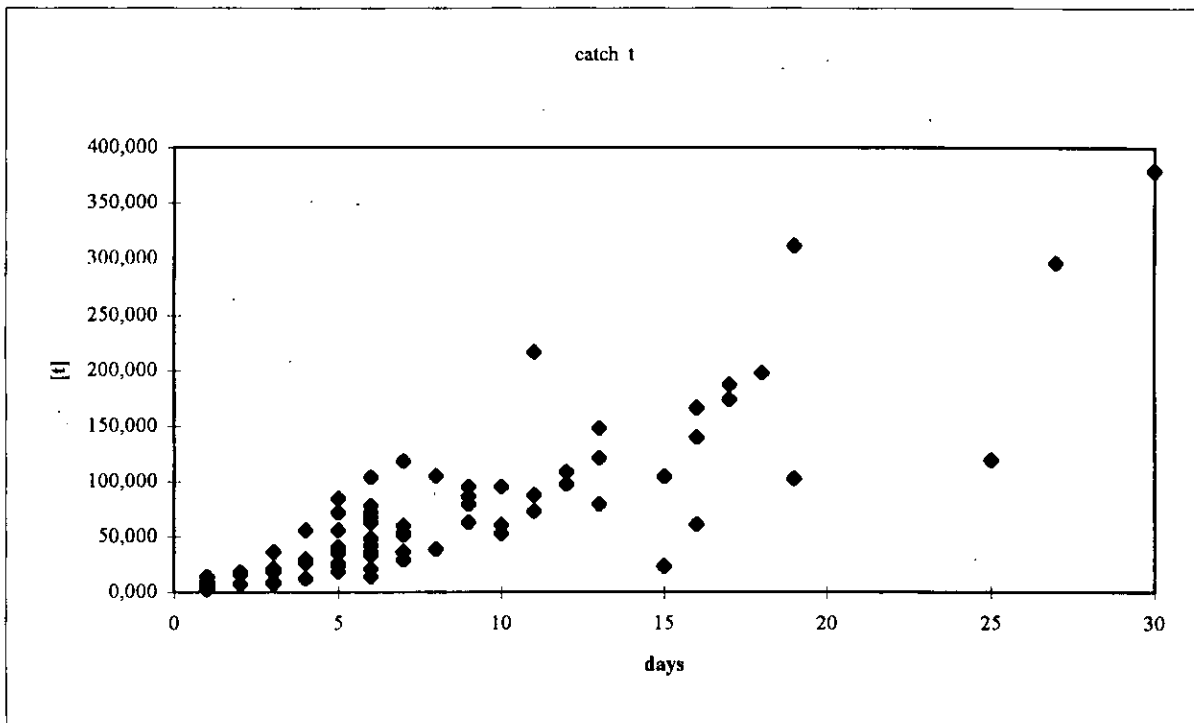
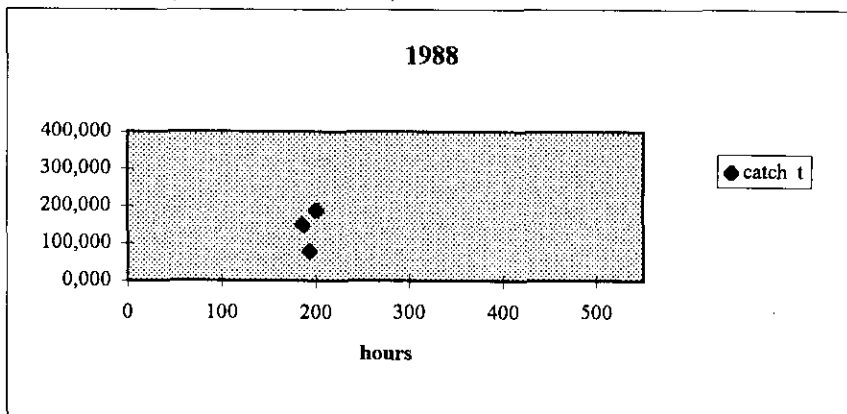


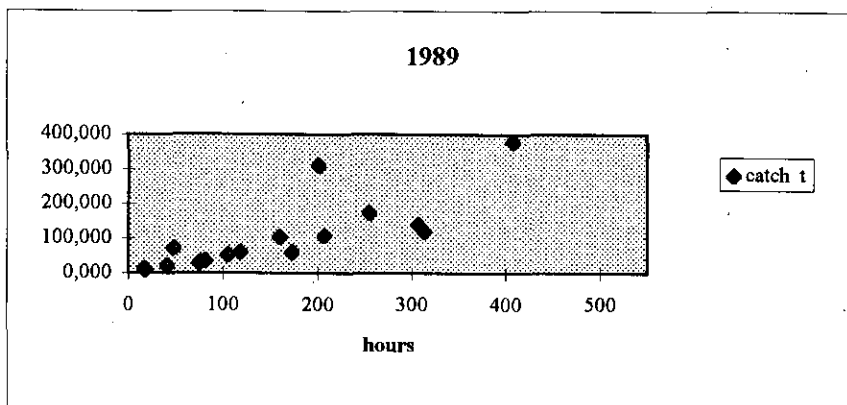
Fig 3

plots

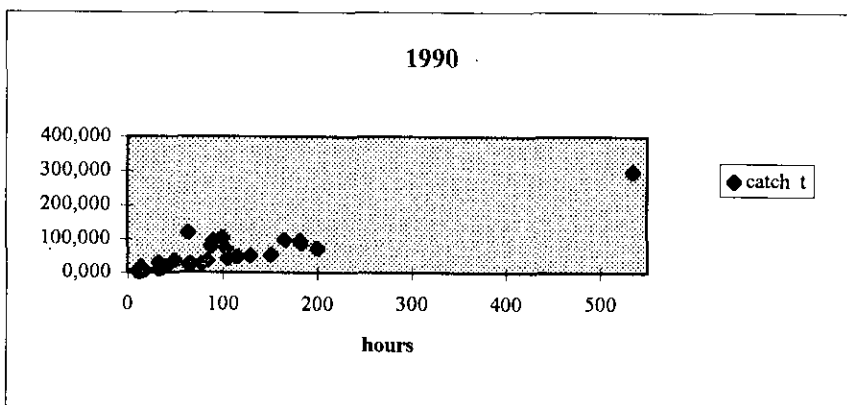
Fig 4



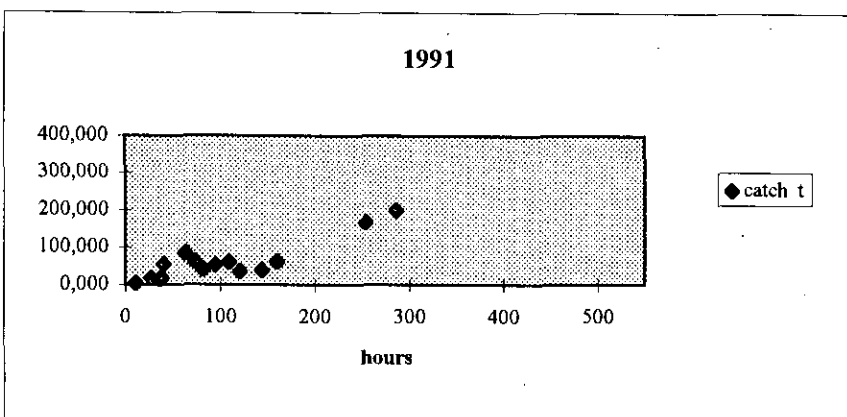
a)



b)



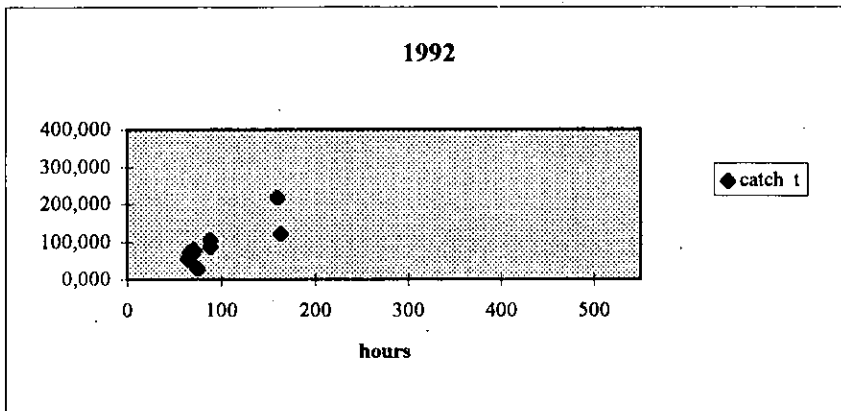
c)



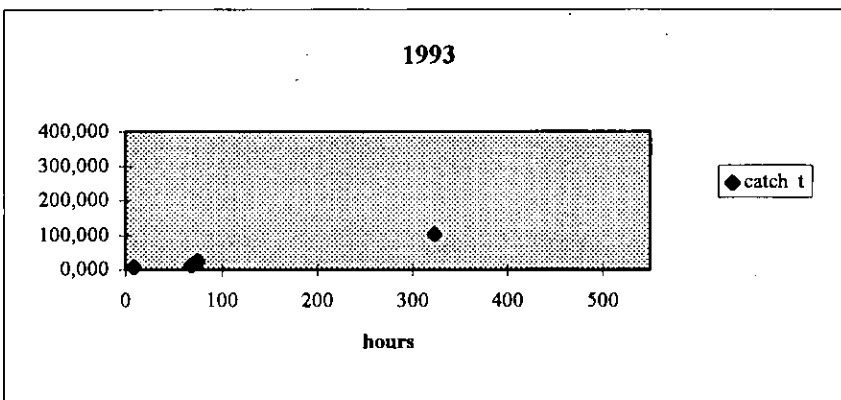
d)

plots

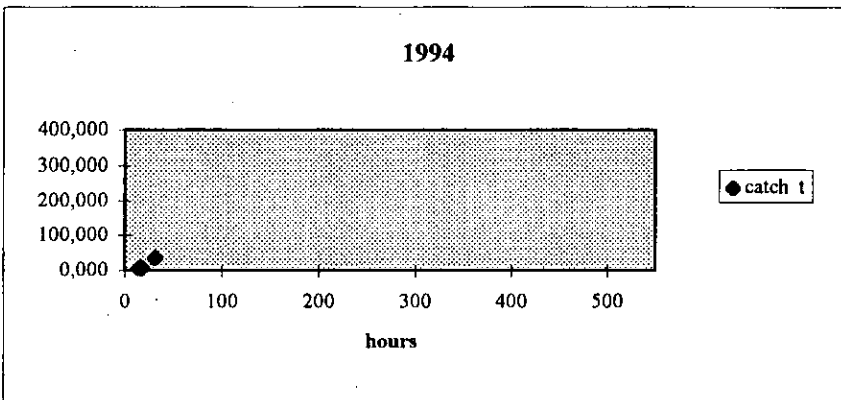
Fig 4



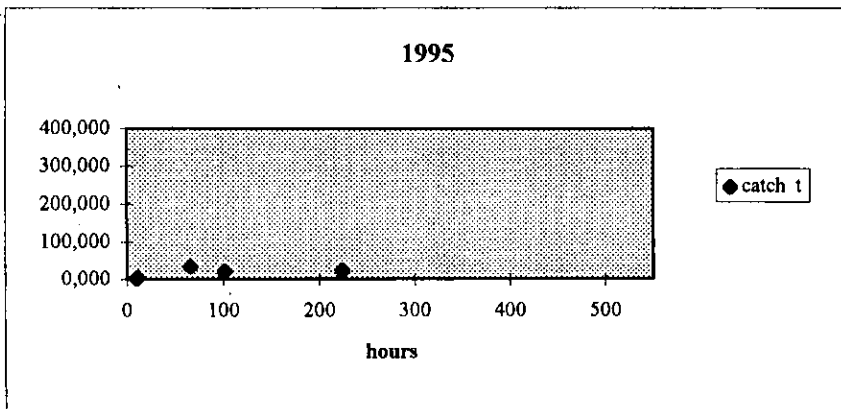
e)



f)



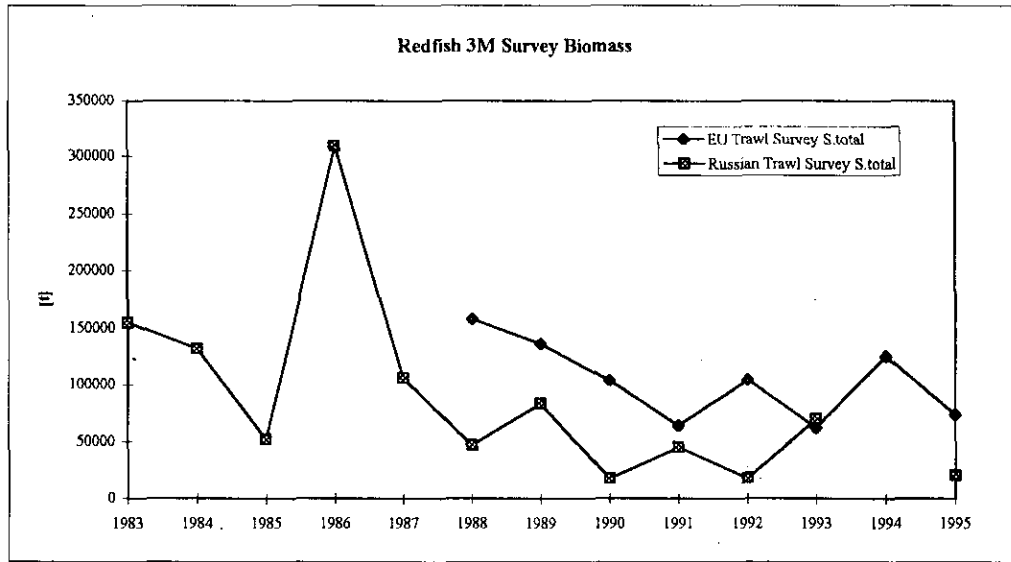
g)



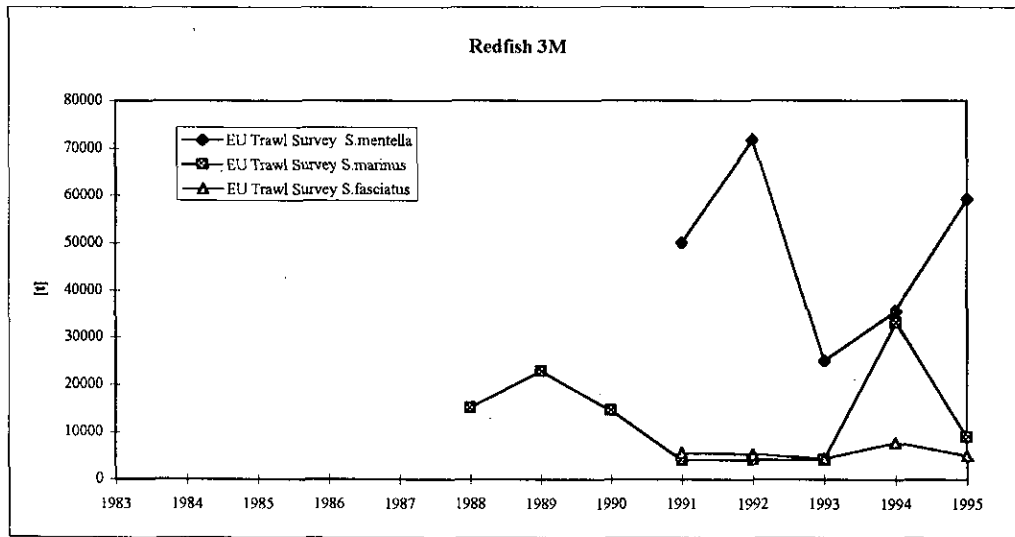
h)

biomass

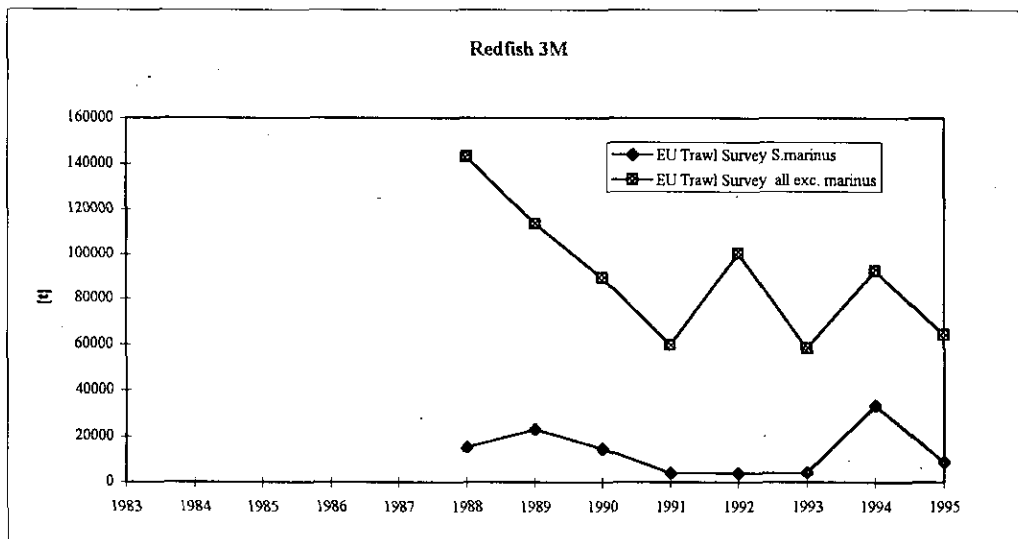
Fig 5



a)

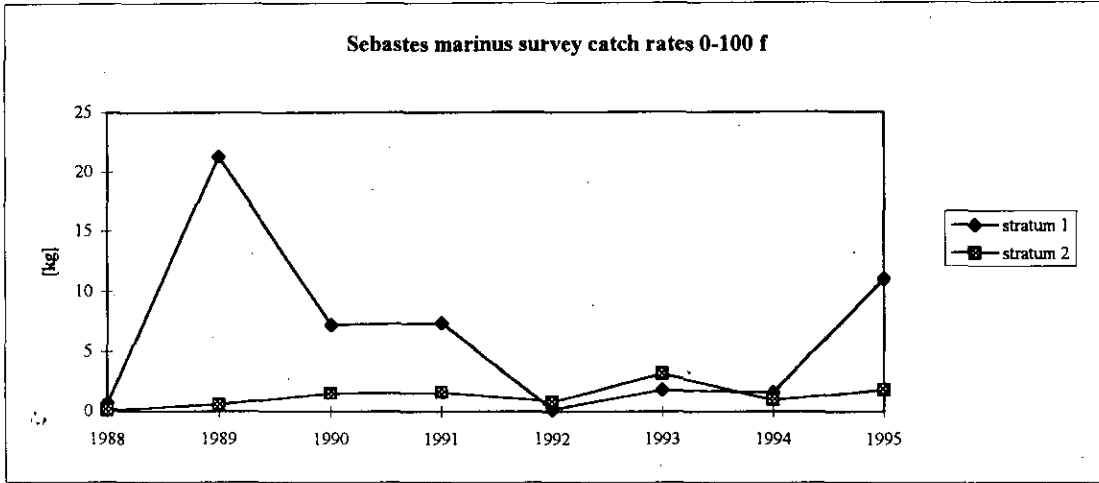


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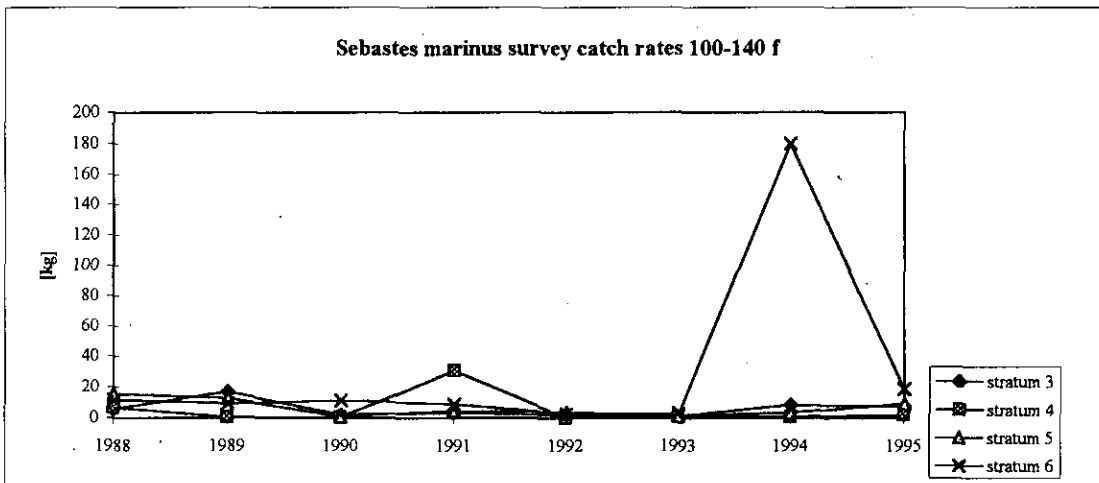


c)

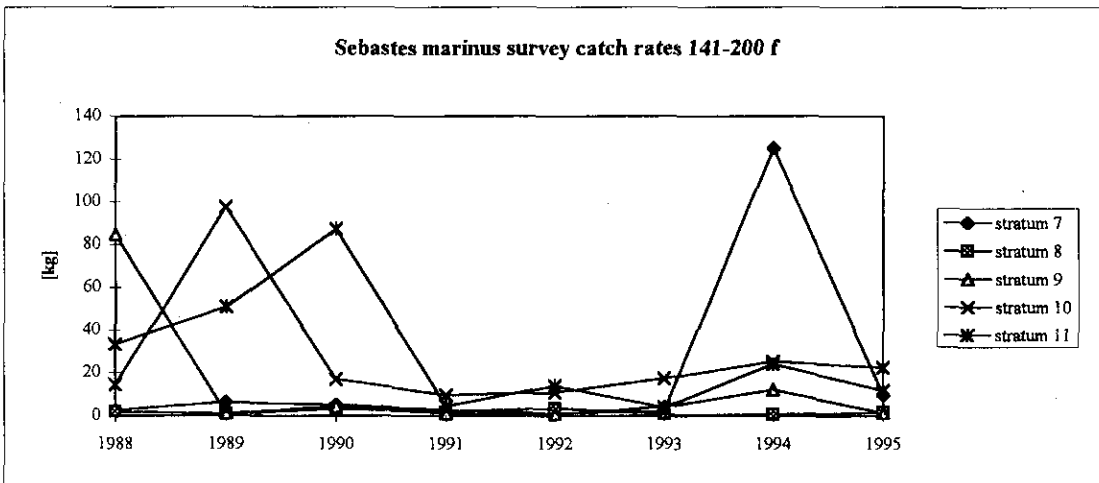
Fig 6



a)

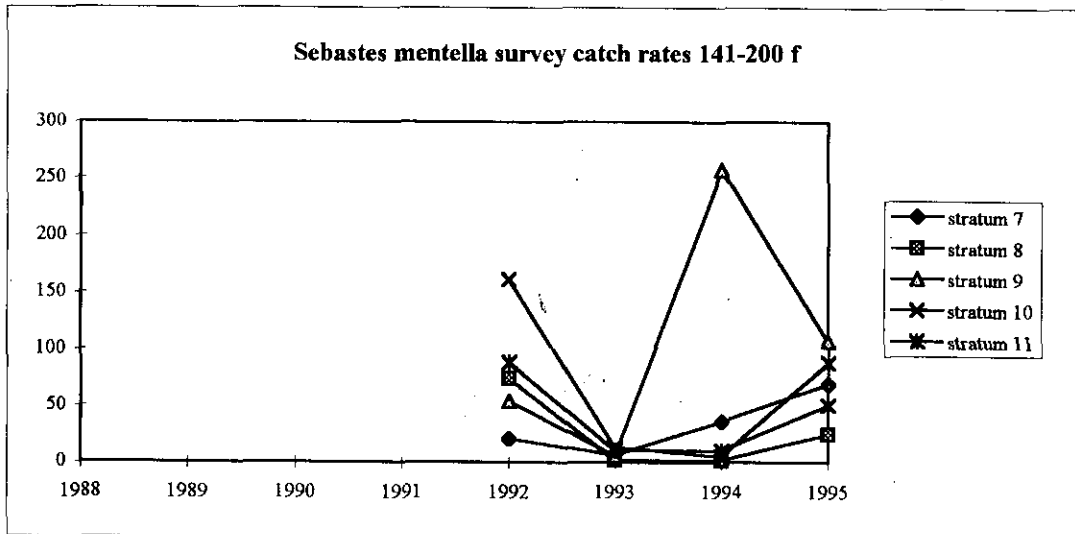


b)

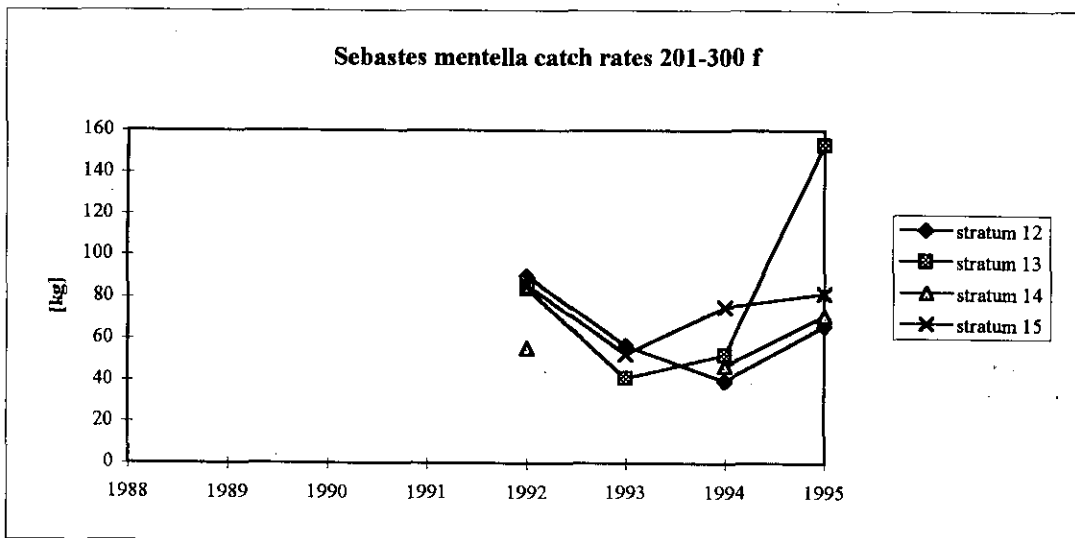


c)

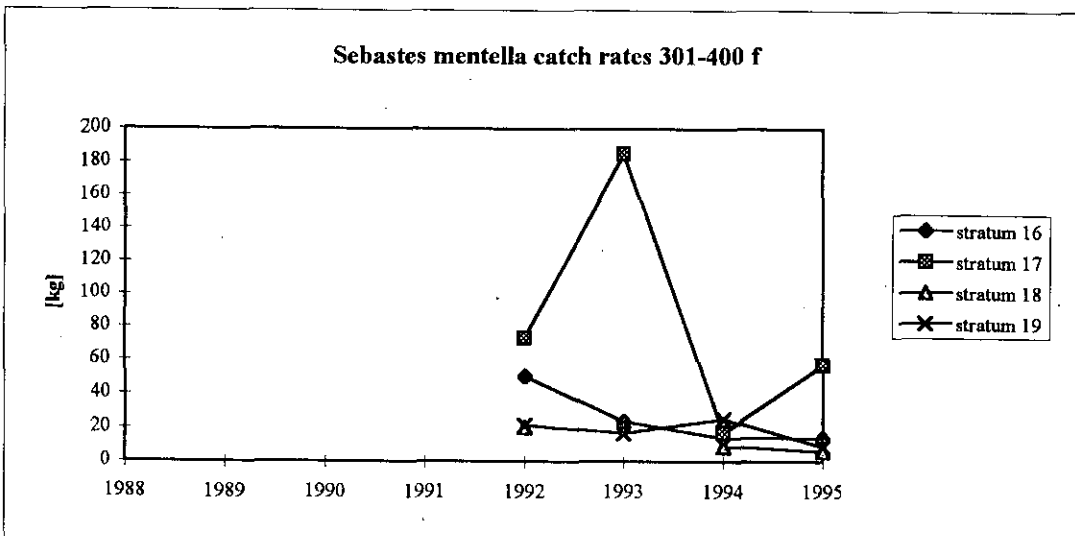
Fig 7



a)

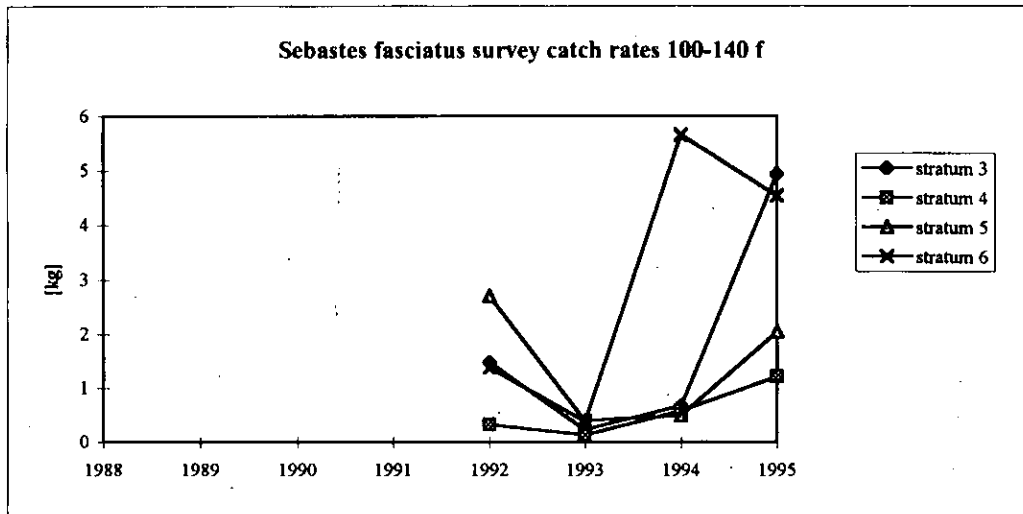


b)

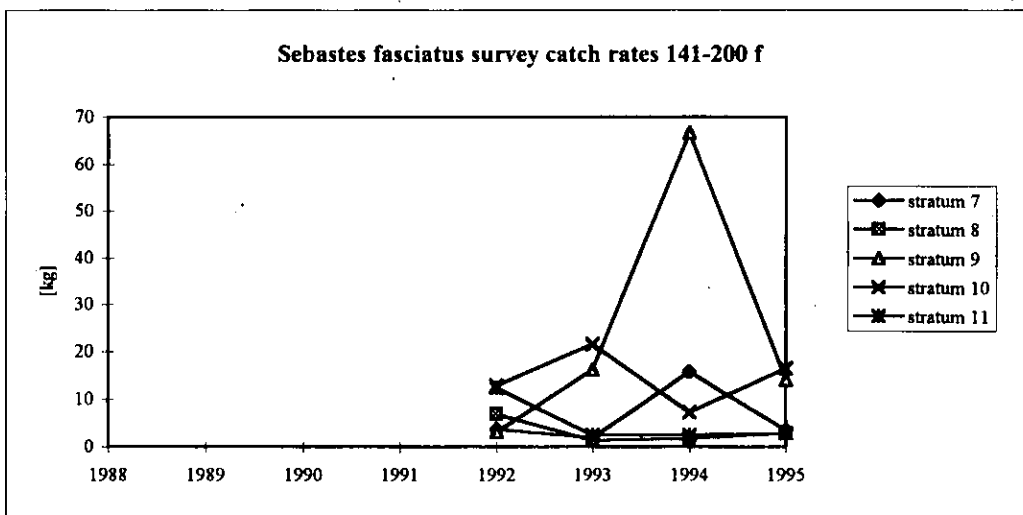


c)

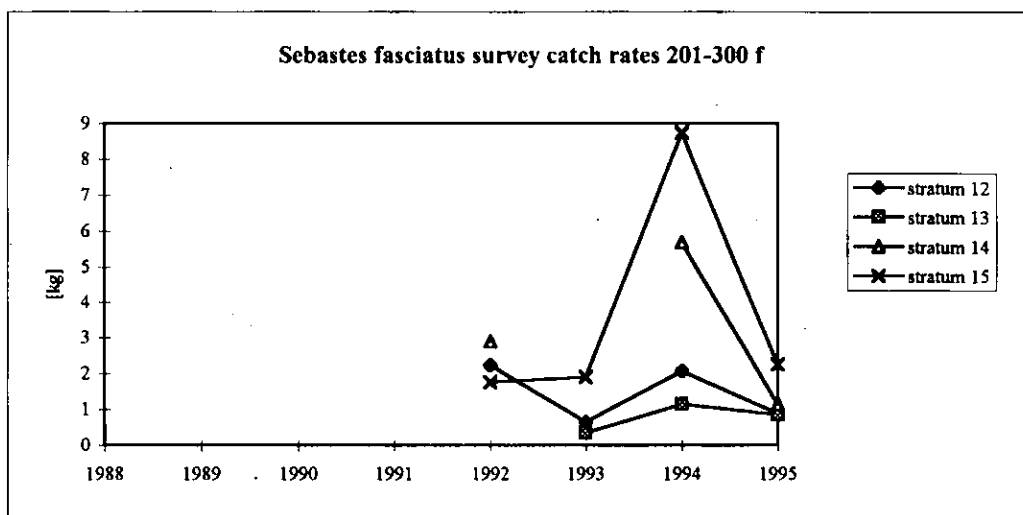
Fig 8



a)

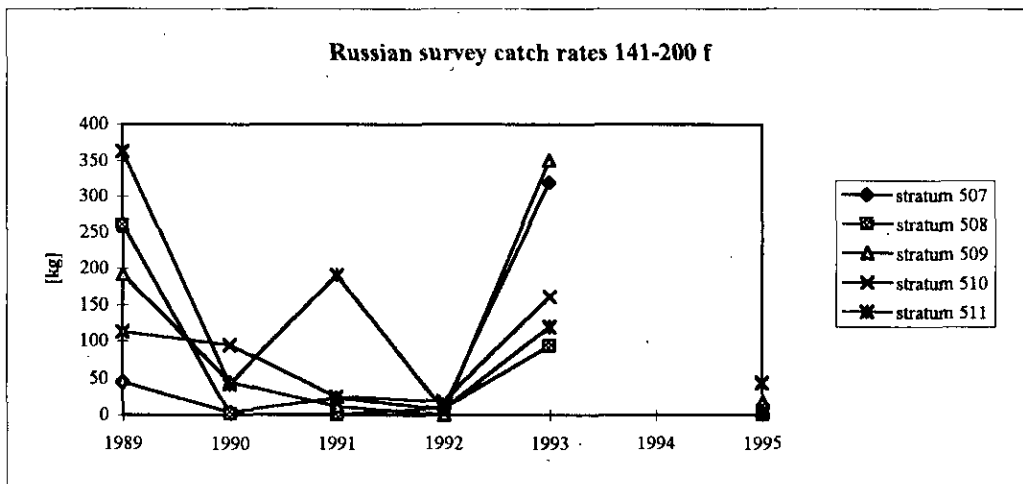


b)

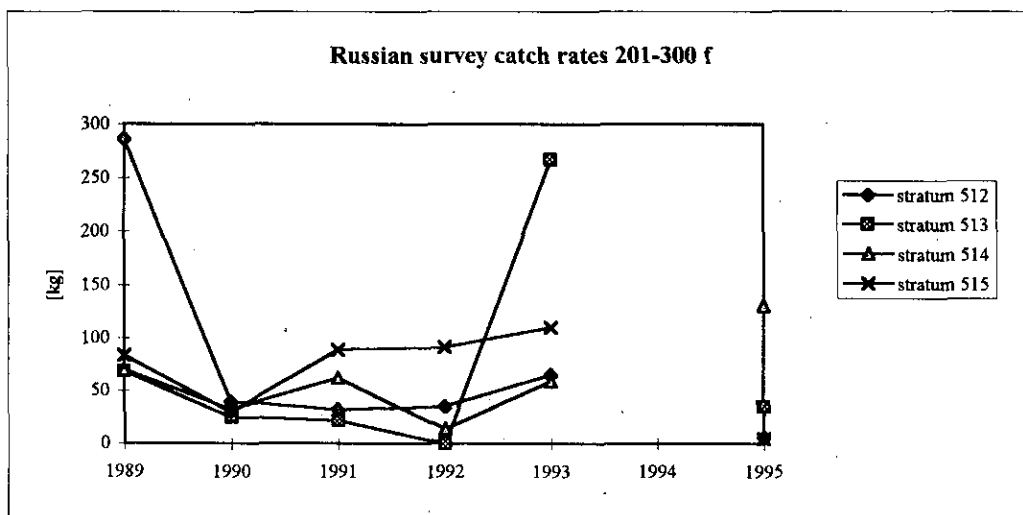


c)

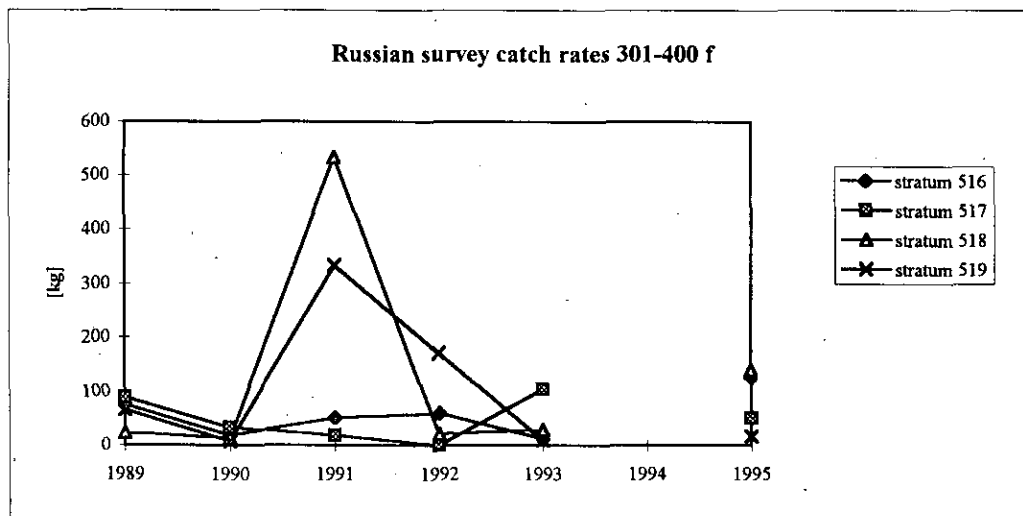
Fig 9



a)



b)



c)