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**Infestation of beaked redfish *Sebastes mentella* by copepod *Sphyrion lumpi* in the different regions of fishing in the opened part of North Atlantic.**

By

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**Abstract**

Unlike many other types of fish, beaked redfish, dwelling in the opened waters of North Atlantic, is characterized an infection by a few types of vermin most widespread from which is copepod *Sphyrion lumpi*. Researches routine that certain distinctions of degree of infestation of fish depend from a sex, size, region and season of works. It enables to use the infestation by copepod as additional factor for differentiation of accumulations of redfish.

**Introduction**

Beaked redfish (*Sebastes mentella*) is one of major commercial fish, dwellings both in Northeastern (NEA) and in Northwestern (NWA) Atlantic. Redfish fishery is conducted practically from the beginning of XX century, and almost always basic commercial type of redfish was beaked redfish. At the beginning of 80th of the last century commercial redfish fishery began outside EEZ in the Irminger Sea (NEA), at the end of 90th – in the Labrador Sea (NWA), from 2005 in the Norwegian Sea (NEA). For the last 30 years of XX century the total catch of redfish in NWA was about 2.5 million т (Chepel, 2001). Presently fishery in all regions is regulated.

Infestation of redfish by copepod *Sphyrion lumpi* is a substantial factor, which is interested both scientific workers and commercial fishermen. In this work information about infestation of *Sebastes mentella* from the different regions of North Atlantic for the last 8 years was generalized.

**Material and Methods**

In basis of work materials are fixed collected an author aboard the Latvian f/v “Dorado”, on which he worked as a scientific observer NAFO and NEAFC in North Atlantic from 2002 to 2009. Aboard a ship mass measurements and biological analyses of redfish was executed in obedience to methods accepted in YUGNIRO.

Total length (TL) of fish was measured by a tapeline within 1 cm. Length distribution was summarized with an interval in 1 cm. Weight of fish was measured by electronic scales within 5 g. Except for information of 2002, all measurements were made separately for females and males.

61090 measurements were executed in all, including: Irminger Sea - 40340, Labrador Sea - 16000, Norwegian Sea - 4750.

During each measured of redfish presence of copepods was fixed. Copepods were fixed with allowance for remained of *S. lumpi* presence. The fact of presence of copepods, but not their quantity, was taken into account only; i.e. extensivity, but not intensity of infestation.

Data of last year (2009) was used for determination of dependence infestation from size of fish separately for males and females.

The order of consideration of regions corresponds fishery motion – at first the Irminger Sea, after the Labrador Sea and last the Norwegian Sea (Fig.1, and Fig.2).

## **Results**

**Irminger Sea.** This is the basic region of redfish fishery. Most statistical material is collected exactly on this region. It is characterized most seasonal scope – a period from March to September is observed. Spatial scope, opposite, not very many great - almost all individuals behaved to the division XIVb, and only small part behaves to the division XII (in May).

**Labrador Sea.** Here both general volume of information and temporal scope (June-September) is less. But here information succeeded to be broken up by divisions (1F, 2J and 2H).

**Norwegian Sea.** On this region the least amount of information is collected. Direct redfish fishery began in the opened waters from 2005; however information on length-weight composition of redfish in catches were collected in 2006-2009.

**Spatial changeability.**(table 1-6). The least infested fish registers in Irminger Sea. The redfish from NAFO was infested stronger. The most strongly infested redfish was from the Norwegian Sea. Within the limits of one region distinctions are small. So, in Irminger Sea the average infestation of redfish was 19,3% in division XIVb, and 17,2% in division XII. In NAFO division 1F average infestation was 25,4%, in 2J – 24,3%, and only in 2H was 36,5%, that can be explained the small volume of information in this division.

**Seasonal changeability.** In Irminger Sea, division XIVb, on the whole there was a decreasing of infestation from 21,0 % in April to 16,9 % in September. Infestation in March also was below, than in April. Approximately the same situation was in division XII in Irminger Sea.

In division 1F NAFO was observed approximately analogical situation with diminishing of infestation from 31% in June to 19% in September, and approximately that was observed and in 2J division.

Seasonal changeability in division 2H NAFO and IIa NEAFC (Norwegian Sea) was not succeeded, because in both cases there was information only for one month.

**Interannual changeability.** In division XIVb in Irminger Sea we can see increasing infestation from 2002 (10,5%) till 2006 (25,8%), later decreasing before 2008 (17,5%) and growth in 2009. Separate information on a division XII on the whole confirms it.

In division 1F NAFO increasing of infestation of redfish was observed from 2002 till 2005 and decreasing was later (table 3). Approximately the same we can see in divisions 2J and 2H.

In Norwegian Sea (division IIa) after minimum of infestation in 2007 increasing is observed (table 6).

**Changeability by sex.** In 2009 data was generalized separately by sex and by size (table 7-48). In all region for all period (except division XIVb in September) females were more infested, than males. Ratio **infestation of females/infestation of males** is shown in table 49. In XIVb division we can see diminishing this ratio from April to September (except August). Ratio is minimal in Irminger Sea (division XIVb and XII NEAFC) and maximal in Norwegian Sea (division IIa NEAFC).

**Changeability by size.** In connection with large variation of data it is better to look at tables 40-42, where data for division XIVb is generalized. For females we see increasing of infestation with the increase of size to the size groups 31-45 cm, where a maximal infestation was observed, and small decrease for more large fish (46-50 cm). For males increasing of infestation is characteristic with increasing of length for all range of size. It is interesting to that the largest males and females (46-50 cm) are infested identically.

Redfish with size 21-25 cm is infested far fewer, than more large, and males of such size are not infested in general (at least were not fixed).

In other divisions we can see situation. There is increasing of infestations of both females and males with increasing of size in divisions 1F NAFO and IIa NEAFC. A maximal infestation is observed for the largest fish. Both females and males with size 31-35 cm are maximally infested in division XII NEAFC.

**Infestation of redfish fillet.** In 2003-2004 the study of infestation of fillet was made (table 50). Infestation of fillet in NEA was higher, than infestation of fish, in NWA it was lower. It was not seasonal changeability of infestation a fillet, but the interannual one is similar to changeability of fish infestations.

### Discussion and Conclusions

A change the degree of infestation in space and time depends on the stage of life cycles both redfish and copepod.

In XIVb in March there are only separate examples of redfish, which, possibly, constantly dwell in the opened waters and less infested. In April the mass exit of the infested redfish begins from EEZ, and the infestation rises. The second of infestation is on July and related to the period of reproduction of copepod. Approximately in the same period a maximum of infestation of redfish is d in NWA.

With diminishing of size of redfish an infestation diminishes on the whole. As routine earlier (Paramonov, 2009), in a period from March for September there is diminishing of average sizes of redfish in NEA. Diminishing of infestation of redfish can be explained by this reason.

A redfish in NWA is infested stronger, than in NEA (Irminger Sea). As a redfish in NWA on the whole is, than in NEA, it would be possible to expect opposite. To the same conclusion came Mel'nikov and Bakay (2009) besides their conclusion is confirmed statistically. But the fact remains: every year from 2003 to a 2009 infestation of redfish in NWA was higher, than in NEA (Irminger Sea). This fact is well known to captains of fishing ships, who not very much gladly go to fish a redfish in NWA not only because fish is smaller there but also because fish is more infested. Obviously it can be explained that the period of stay of redfish in NWA corresponds the period of reproduction of copepod (July-August).

Redfish is yet more infested in the Norwegian Sea. If to suppose that an infestation by copepod is a biological indicator for differentiation of local accumulations of redfish, as it was made earlier (Mel'nikov and Bakay, 2009), that supposition, done in work (Stroganov et al, 2009), that redfish accumulations in the Norwegian Sea (or part of them) can be an origin from the Irminger Sea, not confirmed. It would be very useful to compare the infestation of redfish in the opened and off-shore parts of the Norwegian Sea (and fishery confirms that accumulations go out from the EEZ of Norway and leave there), but author has no such information.

### References

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Table 1. Extensivity of infestation in the division XIVb NEAFC, %

Month	Year							
	2003	2004	2005	2006	2007	2008	2009	Average
March	5,0	-	-	20,8	28,0	-	-	17,9
April	11,8	10,2	32,3	20,6	26,4	-	24,5	21,0
May	9,6	14,0	22,5	28,6	20,8	20,5	16,9	19,0
June	7,2	14,3	19,3	33,1	19,5	17,5	16,2	18,2
July	10,7	26,0	-	-	22,3	14,4	19,5	18,6
August	-	-	-	-	18,8	-	15,5	17,2
September	18,5	-	-	-	-	-	15,3	16,9
Average	10,5	16,1	24,7	25,8	22,6	17,5	18,0	19,3

Table 2. Extensivity of infestation in the division XII NEAFC, %

Month	Year				
	2002	2003	2007	2009	Average
May	-	-	-	20,1	20,1
August	12,0	-	18,8	-	15,4
September	14,0	18,5	-	-	16,2
Average	13,0	18,5	18,8	20,1	17,2

Table 3. Extensivity of infestation in the division 1F NAFO, %

Month	Year								
	2002	2003	2004	2005	2006	2007	2008	2009	Average
June	-	-	-	-	31,0	-	-	-	31,0
July	9,5	20,5	25,7	32,5	33,3	27,0	25,5	-	24,9
August	10,4	19,8	20,3	42,5	34,8	29,3	25,1	24,0	22,8
September	14,3	-	23,7	-	-	-	-	-	19,0
Average	11,4	20,2	23,2	37,5	33,0	28,2	25,3	24,0	25,4

Table 4. Extensivity of infestation in the division 2J NAFO, %

Month	Year						
	2002	2003	2004	2005	2006	2007	Average
July	8,5	18,5	30,0	36,0	29,3	31,3	25,6
August	-	24,0	20,5	35,1	-	30,3	27,5
September	8,0	20,8	30,5	-	-	-	19,8
Average	8,2	21,1	27,0	35,6	29,3	30,8	24,3

Table 5. Extensivity of infestation in the division 2H NAFO, %

Month	Year		
	2006	2007	Average
July	40,0	33,0	36,5

Table 6. Extensivity of infestation in the division IIa, NEAFC, %

Month	Year				
	2006	2007	2008	2009	Average
September	38,5	22,1	28,4	31,0	30,0

Table 7. Infestation of females. April, 2009, NEAFC, XIVb

Size, cm	Amount of the infested individuals	Total amount	% of infestation
26-30	4	7	57,1
31-35	94	341	27,6
36-40	96	301	31,9
41-45	12	49	24,5
Total	206	698	29,5

Table 8. Infestation of males. April, 2009, NEAFC, XIVb

Size, cm	Amount of the infested individuals	Total amount	% of infestation
26-30	1	24	4,2
31-35	33	188	17,6
36-40	17	137	12,4
41-45	11	52	21,2
46-50	1	1	100,0
Total	63	402	15,7

Table 9. Total infestation. April, 2009, NEAFC, XIVb

Size cm,	Amount of the infested individuals	Total amount	% of infestation
26-30	5	31	16,1
31-35	127	529	24,0
36-40	113	438	25,8
41-45	23	101	22,8
46-50	1	1	100,0
Total	269	1100	24,5

Table 10. Infestation of females. May, 2009, NEAFC, XII

Size, cm	Amount of the infested individuals	Total amount	% of infestation
21-25	0	1	0
26-30	2	14	14,3
31-35	78	309	25,2
36-40	105	439	23,9
41-45	34	157	21,7
46-50	0	1	0
Total	219	921	23,8

Table 11. Infestation of males. May, 2009, NEAFC, XII

Size, cm	Amount of the infested individuals	Total amount	% of infestation
26-30	1	12	8,3
31-35	26	148	17,6
36-40	34	286	11,9
41-45	21	133	15,8
Total	82	579	14,2

Table 12. Total infestation. May, 2009, NEAFC, XII

Size cm,	Amount of the infested individuals	Total amount	% of infestation
21-25	0	1	0
26-30	3	26	11,5
31-35	104	457	22,8
36-40	139	725	19,2
41-45	55	290	19,0
46-50	0	1	0
Total	301	1500	20,1

Table 13. Infestation of females. May, 2009, NEAFC, XIVb

Size, cm	Amount of the infested individuals	Total amount	% of infestation
26-30	1	9	11,1
31-35	40	170	23,5
36-40	92	478	19,2
41-45	58	223	26,0
Total	191	880	21,7

Table 14. Infestation of males. May, 2009, NEAFC, XIVb

Size, cm	Amount of the infested individuals	Total amount	% of infestation
26-30	3	9	33,3
31-35	18	175	10,3
36-40	58	525	11,0
41-45	34	209	16,3
46-50	0	2	0
Total	113	920	12,3

Table 15. Total infestation. May, 2009, NEAFC, XIVb

Size, cm	Amount of the infested individuals	Total amount	% of infestation
26-30	4	18	22,2
31-35	58	345	16,8
36-40	150	1003	15,0
41-45	92	432	21,3
46-50	0	2	0
Total	304	1800	16,9

Table 16. Infestation of females. May, 2009, NEAFC, XII+XIVb

Size, cm	Amount of the infested individuals	Total amount	% of infestation
21-25	0	1	0
26-30	3	23	13,0
31-35	118	479	24,6
36-40	197	917	21,5
41-45	92	380	24,2
46-50	0	1	0
Total	410	1801	22,8

Table 17. Infestation of males. May, 2009, NEAFC, XII+XIVb

Size, cm	Amount of the infested individuals	Total amount	% of infestation
26-30	4	21	19,0
31-35	44	323	13,6
36-40	92	811	11,3
41-45	55	342	16,1
46-50	0	2	0
Total	195	1499	13,0

Table 18. Total infestation. May, 2009, NEAFC, XII+XIVb

Size, cm	Amount of the infested individuals	Total amount	% of infestation
21-25	0	1	0
26-30	7	44	15,9
31-35	162	802	20,2
36-40	289	1728	16,7
41-45	147	722	20,4
46-50	0	3	0
Total	605	3300	18,3

Table 19. Infestation of females. June, 2009, NEAFC, XIVb

Size, cm	Amount of the infested individuals	Total amount	% of infestation
26-30	1	7	14,3
31-35	32	163	19,6
36-40	83	404	20,5
41-45	39	208	18,8
46-50	0	2	0
Total	155	784	19,8

Table 20. Infestation of males. June, 2009, NEAFC, XIVb

Size, cm	Amount of the infested individuals	Total amount	% of infestation
26-30	0	14	0
31-35	27	210	12,9
36-40	81	592	13,7
41-45	45	299	15,1
46-50	0	1	0
Total	153	1116	13,7

Table 21. Total infestation. June, 2009, NEAFC XIVb

Size, cm	Amount of the infested individuals	Total amount	% of infestation
26-30	1	21	4,8
31-35	59	373	15,8
36-40	164	996	16,5
41-45	84	507	16,6
46-50	0	3	0
Total	308	1900	16,2

Table 22. Infestation of females. July, 2009, NEAFC, XIVb

Size, cm	Amount of the infested individuals	Total amount	% of infestation
21-25	0	2	0
26-30	4	14	28,6
31-35	38	214	17,8
36-40	155	665	23,3
41-45	80	324	24,7
46-50	1	2	50,0
Total	278	1221	22,8



Table 23. Infestation of males. July, 2009, NEAFC, XIVb

Size, cm	Amount of the infested individuals	Total amount	% of infestation
26-30	7	27	25,9
31-35	43	304	14,1
36-40	158	1053	15,0
41-45	119	495	24,0
Total	327	1879	17,4

Table 24. Total infestation. July, 2009, NEAFC, XIVb

Size, cm	Amount of the infested individuals	Total amount	% of infestation
21-25	0	2	0
26-30	11	41	26,8
31-35	81	518	15,6
36-40	313	1718	18,2
41-45	199	819	24,3
46-50	1	2	50,0
Total	605	3100	19,5

Table 25. Infestation of females. August, 2009, NEAFC, XIVb

Size, cm	Amount of the infested individuals	Total amount	% of infestation
21-25	1	6	16,7
26-30	4	33	12,1
31-35	34	139	24,5
36-40	75	387	19,4
41-45	43	181	23,8
Total	157	746	21,0

Table 26. Infestation of males. August, 2009, NEAFC, XIVb

Size, cm	Amount of the infested individuals	Total amount	% of infestation
21-25	0	4	0
26-30	3	53	5,6
31-35	22	207	10,6
36-40	86	752	11,4
41-45	58	337	17,2
46-50	0	1	0
Total	169	1354	12,5

Table 27. Total infestation. August, 2009, NEAFC, XIVb

Size, cm	Amount of the infested individuals	Total amount	% of infestation
22-25	1	10	10,0
26-30	7	86	8,1
31-35	56	346	16,2
36-40	161	1139	14,1
41-45	101	518	19,6
46-50	0	1	0
Total	326	2100	15,5

Table 28. Infestation of females. August, 2009, NAFO, 1F

Size, cm	Amount of the infested individuals	Total amount	% of infestation
21-25	0	1	0
26-30	0	3	0
31-35	14	48	29,2
36-40	23	56	41,1
Total	37	108	34,3

Table 29 Infestation of males. August, 2009, NAFO, 1F

Size, cm	Amount of the infested individuals	Total amount	% of infestation
26-30	0	1	0
31-35	22	129	17,1
36-40	13	62	21,0
Total	35	192	18,2

Table 30. Total infestation. August, 2009, NAFO, 1F

Size, cm	Amount of the infested individuals	Total amount	% of infestation
21-25	0	1	0
26-30	0	4	0
31-35	36	177	20,3
36-40	36	118	27,7
Total	72	300	24,0

Table 31. Infestation of females. September, 2009, NEAFC, XIVb

Size, cm	Amount of the infested individuals	Total amount	% of infestation
26-30	0	5	0
31-35	6	28	21,4
36-40	5	39	12,8
41-45	1	14	7,1
46-50	0	1	0
Total	12	87	13,8

Table 32. Infestation of males. September, 2009, NEAFC, XIVb

Size, cm	Amount of the infested individuals	Total amount	% of infestation
26-30	1	4	25,0
31-35	6	61	9,8
36-40	14	98	14,3
41-45	13	50	26,0
Total	34	213	16,0

Table 33. Total infestation. September, 2009, NEAFC, XIVb

Size, cm	Amount of the infested individuals	Total amount	% of infestation
26-30	1	9	0
31-35	12	89	13,5
36-40	19	137	13,9
41-45	14	64	21,9
46-50	0	1	0
Total	46	300	15,3

Table 34. Infestation of females. September, 2009, NEAFC, IIa

Size, cm	Amount of the infested individuals	Total amount	% of infestation
31-35	4	14	28,6
36-40	12	19	63,2
41-45	1	1	100,0
Total	17	34	50,0

Table 35. Infestation of males. September, 2009, NEAFC, IIa

Size, cm	Amount of the infested individuals	Total amount	% of infestation
31-35	7	34	20,6
36-40	7	32	21,9
Total	14	66	21,2

Table 36. Total infestation. September, 2009, NEAFC, IIa

Size, cm	Amount of the infested individuals	Total amount	% of infestation
31-35	11	48	22,9
36-40	19	51	37,3
41-45	1	1	100,0
Total	31	100	31,0

Table 37. Infestation of females. September, 2009, NEAFC, XIVb, Гренландия

Size, cm	Amount of the infested individuals	Total amount	% of infestation
26-30	7	25	28,0
31-35	21	72	29,2
36-40	31	121	25,6
41-45	6	39	15,4
Total	65	257	25,3

Table 38. Infestation of males. September, 2009, NEAFC, XIVb, Гренландия

Size, cm	Amount of the infested individuals	Total amount	% of infestation
21-25	0	2	0
26-30	14	40	35,0
31-35	17	122	13,9
36-40	38	258	14,7
41-45	21	120	17,5
46-50	0	1	0
Total	90	543	16,6

Table 39. Total infestation. September, 2009, NEAFC, XIVb Гренландия

Size, cm	Amount of the infested individuals	Total amount	% of infestation
21-25	0	2	0
26-30	21	65	32,3
31-35	38	194	36,1
36-40	69	379	18,2
41-45	27	159	17,0
46-50	0	1	0
Total	155	800	19,4

Table 40. Infestation of females. April-September, 2009, NEAFC, XIVb

Size, cm	Amount of the infested individuals	Total amount	% of infestation
21-25	1	8	12,5
26-30	14	75	18,7
31-35	244	1055	23,1
36-40	506	2274	22,3
41-45	233	999	23,3
46-50	1	5	20,0
Total	999	4416	22,6

Table 41. Infestation of males. April-September, 2009, NEAFC, XIVb

Size, cm	Amount of the infested individuals	Total amount	% of infestation
21-25	0	4	0
26-30	15	131	11,5
31-35	149	1145	13,0
36-40	414	3157	13,1
41-45	280	1442	19,4
46-50	1	5	20,0
Total	859	5884	14,6

Table 42. Total infestation. April-September, 2009, NEAFC, XIVb

Size, cm	Amount of the infested individuals	Total amount	% of infestation
21-25	1	12	8,3
26-30	29	206	14,1
31-35	393	2200	17,9
36-40	920	5431	16,9
41-45	513	2441	21,0
46-50	2	10	20,0
Total	1858	10300	18,0

Table 43. Infestation of females, 2009, in different divisions.

Size, cm	% of infestation				
	NEAFC, XIVB	NEAFC, XII	NEAFC, XIVb, Greenland EEZ	NEAFC, IIa	NAFO, 1F
21-25	12,5	0	-	-	0
26-30	18,7	14,3	28,0	-	0
31-35	23,1	25,2	29,2	28,6	29,2
36-40	22,3	23,9	25,6	63,2	41,1
41-45	23,3	21,7	15,4	100,0	-
46-50	20,0	0	-	-	-
Total	22,6	23,8	25,3	50,0	34,3

Table 44. Infestation of males, 2009, in different divisions.

Size, cm	% of infestation				
	NEAFC, XIVB	NEAFC, XII	NEAFC, XIVB, Greenland EEZ	NEAFC, IIa	NAFO, 1F
21-25	0	-	0	-	-
26-30	11,5	8,3	35,0	-	0
31-35	13,0	17,6	13,9	20,6	17,1
36-40	13,1	11,9	14,7	21,9	21,0
41-45	19,4	15,8	17,5	-	-
46-50	20,0	-	0	-	-
Total	14,6	14,2	16,6	21,2	18,2

Table 45. Total infestation, 2009, in different divisions

Size, cm	% of infestation				
	NEAFC, XIVB	NEAFC, XII	NEAFC, XIVB, Greenland EEZ	NEAFC, IIa	NAFO, 1F
21-25	8,3	0	0	-	0
26-30	14,1	11,5	32,3	-	0
31-35	17,9	22,8	36,1	22,9	20,3
36-40	16,9	19,2	18,2	37,3	27,7
41-45	21,0	19,0	17,0	100,0	-
46-50	20,0	0	0	-	-
Total	18,0	20,1	19,4	31,0	24,0

Table 46. Changeability of infestation of females by months, NEAFC, XIVb

Size, cm	% of infestation					
	April	May	June	July	August	September
21-25	-	-	-	0	16,7	-
26-30	57,1	11,1	14,3	28,6	12,1	0
31-35	27,6	23,5	19,6	17,8	24,5	21,4
36-40	31,9	19,2	20,5	23,3	19,4	12,8
41-45	24,5	26,0	18,8	24,7	23,8	7,1
46-50	-	-	0	50,0	-	0
Total	29,5	21,7	19,8	22,8	21,0	13,8

Table 47. Changeability of infestation of males by months, NEAFC, XIVb

Size, cm	% of infestation					
	April	May	June	July	August	September
21-25	-	-	-	-	0	-
26-30	4,2	33,3	0	25,9	5,6	25,0
31-35	17,6	10,3	12,9	14,1	10,6	9,8
36-40	12,4	11,0	13,7	15,0	11,4	14,3
41-45	21,2	16,3	15,1	24,0	17,2	26,0
46-50	100,0	0	0	-	0	-
Total	15,7	12,3	13,7	17,4	12,5	16,0

Table 48. Total changeability of infestation by month, NEAFC, XIVb

Size, cm	% of infestation					
	April	May	June	July	August	September
21-25	-	-	-	0	10,0	-
26-30	16,1	22,2	4,8	26,8	8,1	0
31-35	24,0	16,8	15,8	15,6	16,2	13,5
36-40	25,8	15,0	16,5	18,2	14,1	13,9
41-45	22,8	21,3	16,6	24,3	19,6	21,9
46-50	100,0	0	0	50,0	0	0
Total	24,5	16,9	16,2	19,5	15,5	15,3

Table 49. Infestation of females/infestation of males ratio in 2009.

Region and division	Month	Infestation of females/infestation of males ratio
NEAFC, XIVb	April	1,88
	May	1,76
	June	1,45
	July	1,31
	August	1,68
	September	0,86
NEAFC, XII	May	1,68
NAFO, 1F	August	1,88
NEAFC, IIa	September	2,36

Table 50. Infestation of fillet of redfish, 2003-2004.

Month	Region	Year	
		2003	2004
April	XIVb NEAFC	-	38,2
May	XIVb NEAFC	24,5	35,2
June	XIVb NEAFC	21,3	34,1
July	XIVb NEAFC	26,8	35,4
September	XII NEAFC	23,0	35,7
Average	NEAFC	23,9	35,7
July	1F NAFO	16,2	23,6
July	2J NAFO	24,5	23,8
August	1F NAFO	18,6	23,1
August	2J NAFO	21,0	21,5
September	1F NAFO	-	22,3
September	2J NAFO	18,0	25,0
Average	NAFO	19,7	23,2

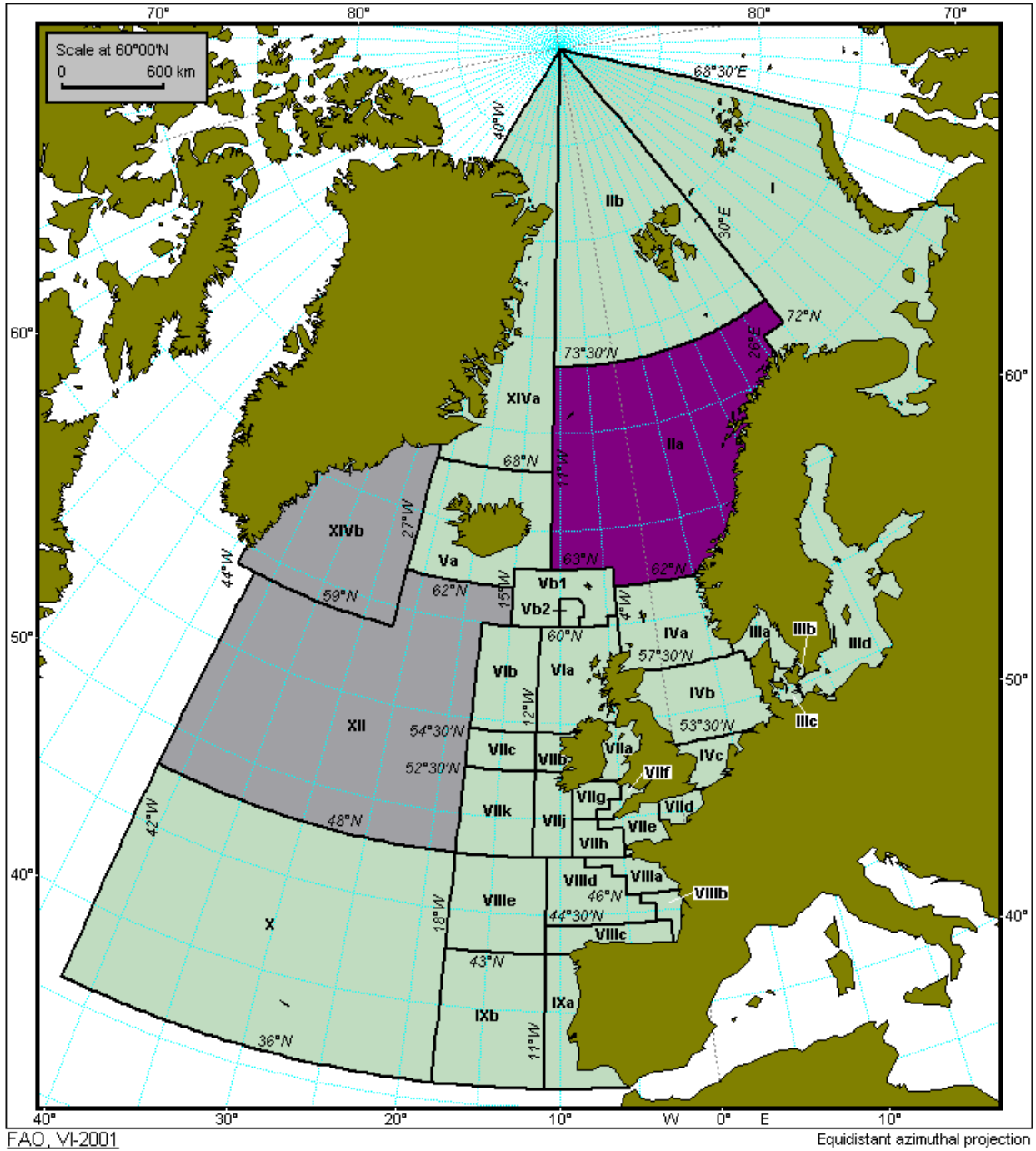
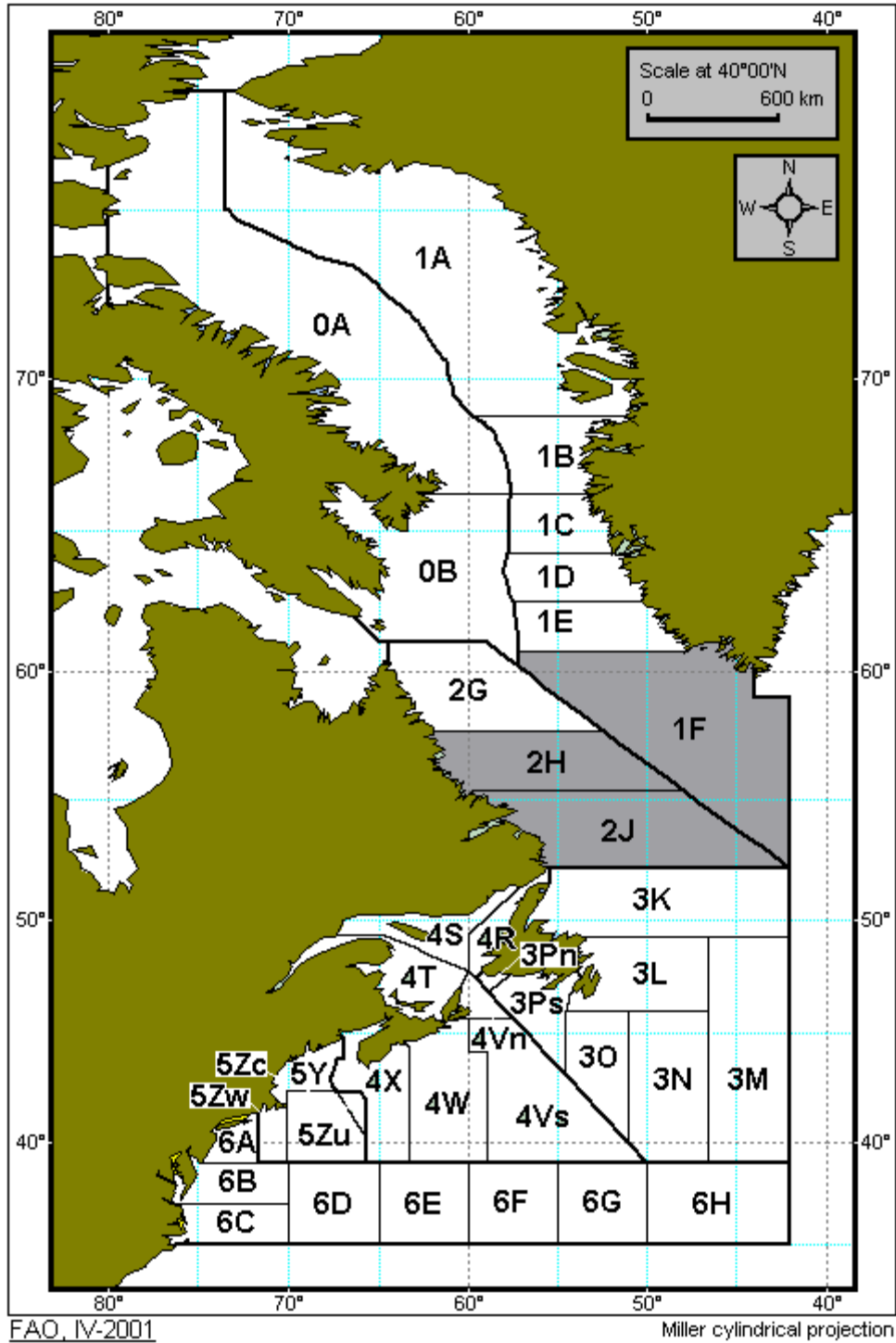


Fig 1.Divisions of redfish fishery in NEAFC region





**Fig 2. Divisions of redfish fishery in NAFO region**