



THE USE OF BIOECONOMIC CRITERIA FOR OPTIMAL LONG-TERM EXPLOITATION OF THE BARENTS SEA COD

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Terms, definitions and abbreviations

Directed fishery – fishery at which proportion of the target species in the catch constitutes more than 50 % by weight.

Effectiveness – the intended result, social effectiveness and the desired social effect reached per time unit or unit of natural resource;

Economic efficiency – output per cost unit or unit of natural resource, labour productivity, a satisfactory result, productivity.

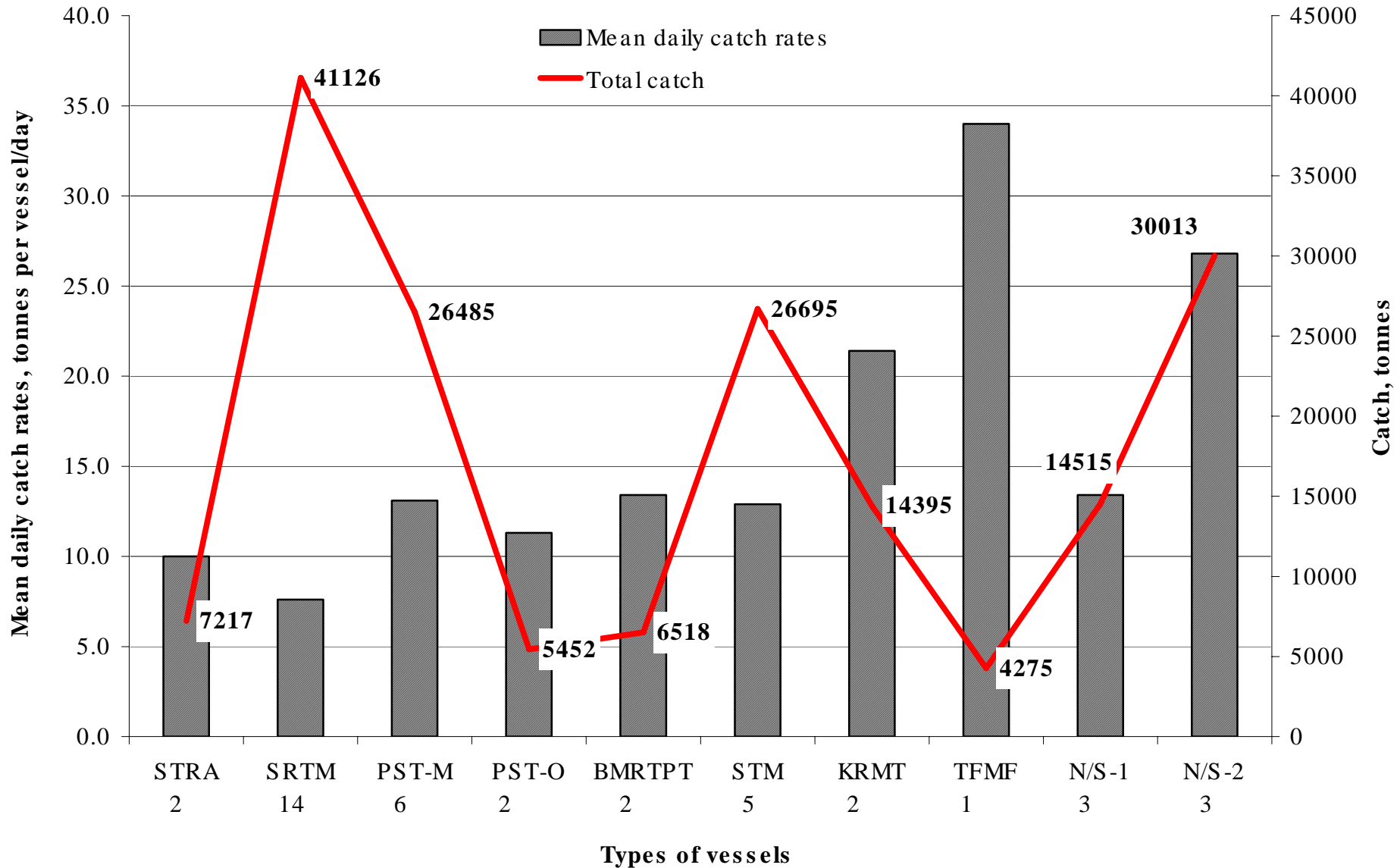
Price of fish in. first demand – value in terms of money at the first sale or first exchange of product by its direct manufacturer.

Gross domestic product (G.D.P.) - cost of all goods and services produced on the territory of the country by its residents or temporal residents regardless whether citizens of this country or foreigners demand them.

- Aquatic biological resources;
- Exclusive Economic Zone of RF (EEZ RF);
- Exclusive Economic Zone of Norway (NEZ);
- Loophole (enclave) of the Barents Sea;
- Spitsbergen area;
- Vessel daily reports;
- Research vessels (R/V).



Mean daily catch rates in the cod fishery (tonnes) and total catch by trawlers of different type in 2004



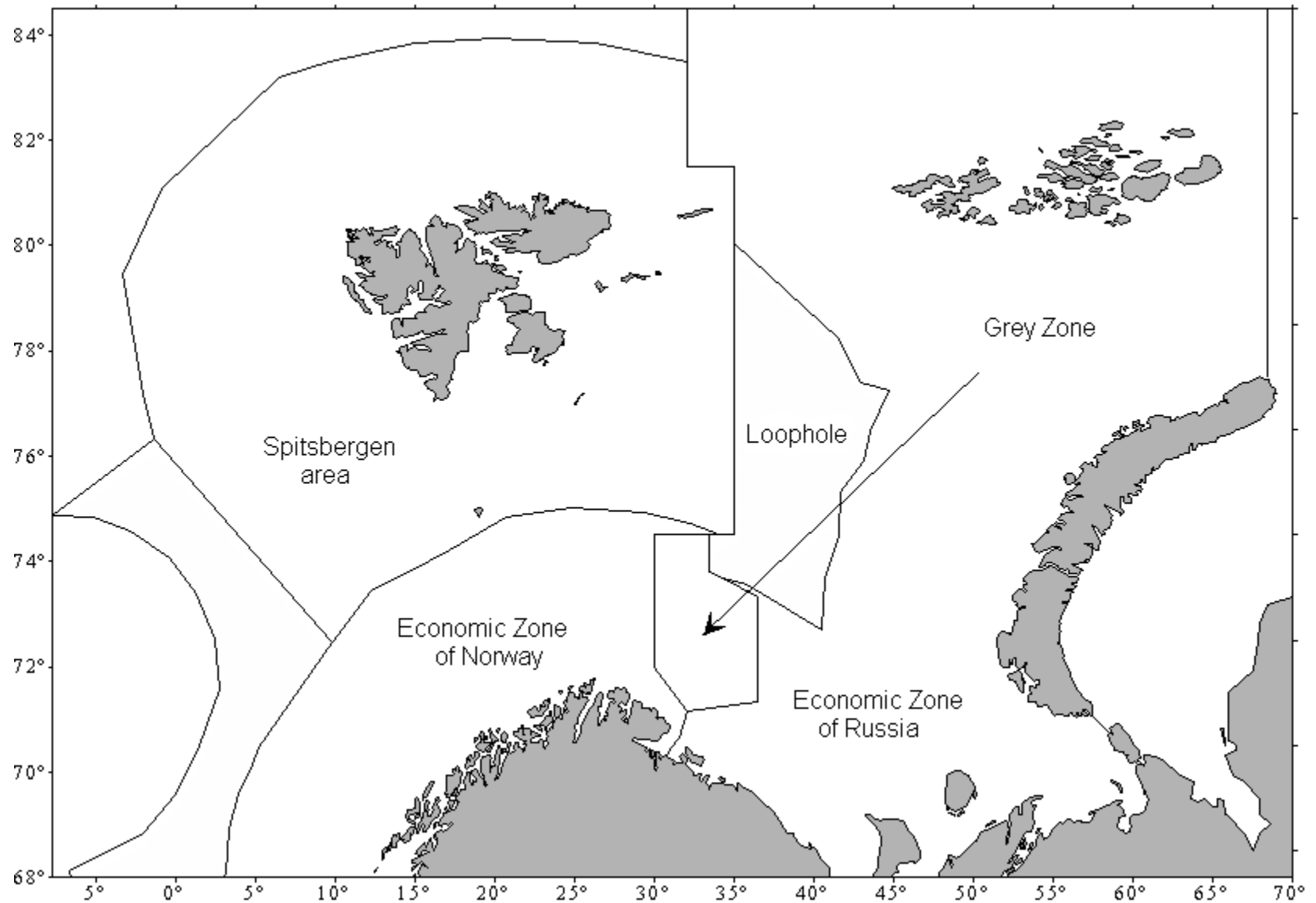


Biological data on cod collected by PINRO observers on trawlers
of fisheries enterprises in 2003-2004

Fishing areas	Measured	Field analysis of feeding	Short version of quantitative analysis of feeding
EEZ RF (including Grey Zone)	487 817	50 693	5 393
NEZ	59 526	4 788	858
Spitsbergen area	711 825	52 086	7 511
Total over the study areas	1 259 168	107 567	13 762

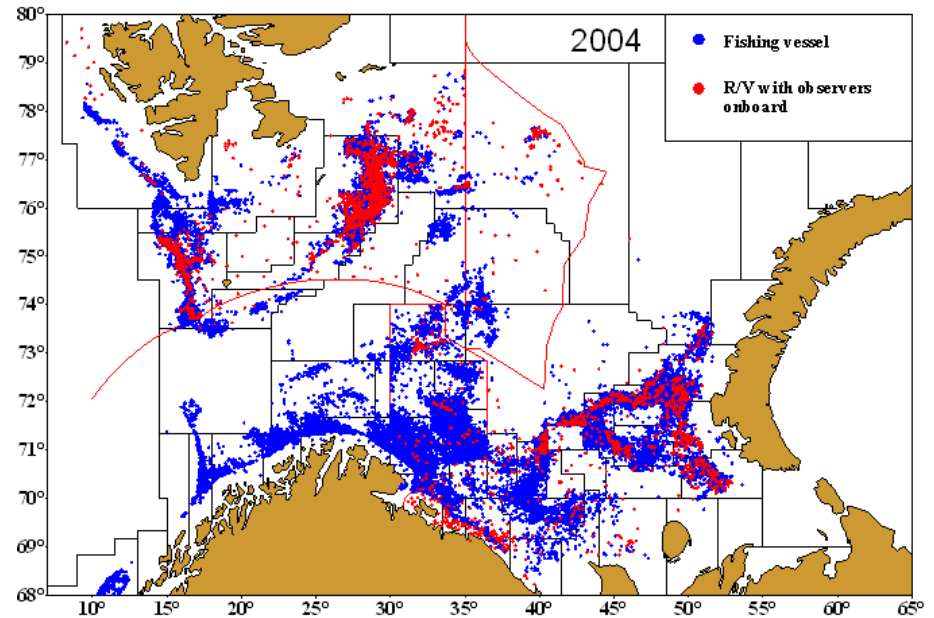
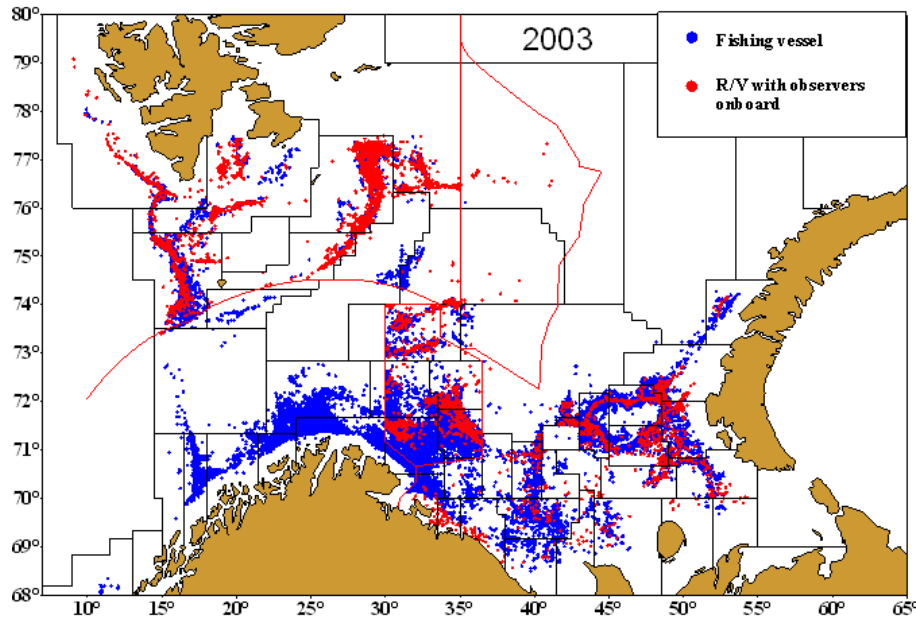


Scheme of areas of the Barents Sea and adjacent waters





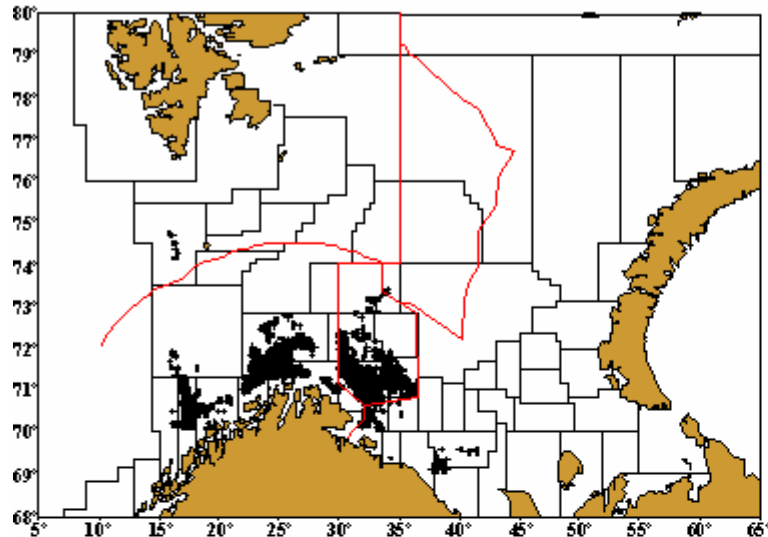
Location of fishing and research vessels during the fishery for cod concentrations in 2003 and 2004



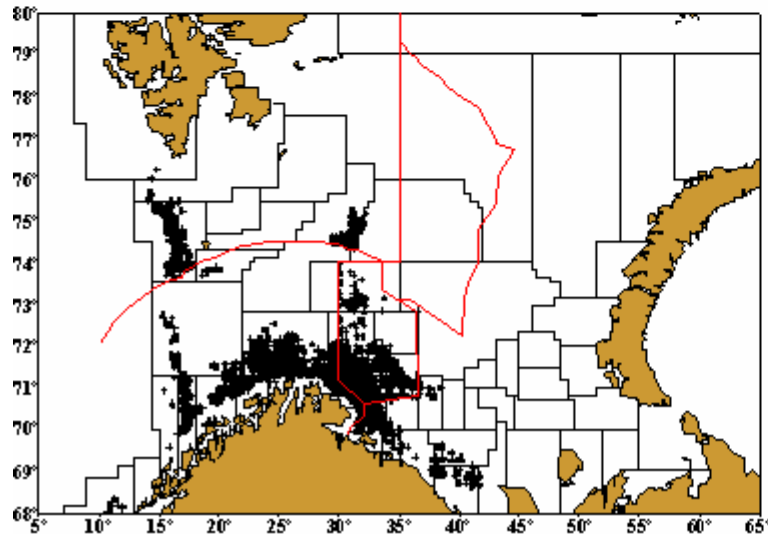


Distribution of trawlers during cod fishery in 2003-2004

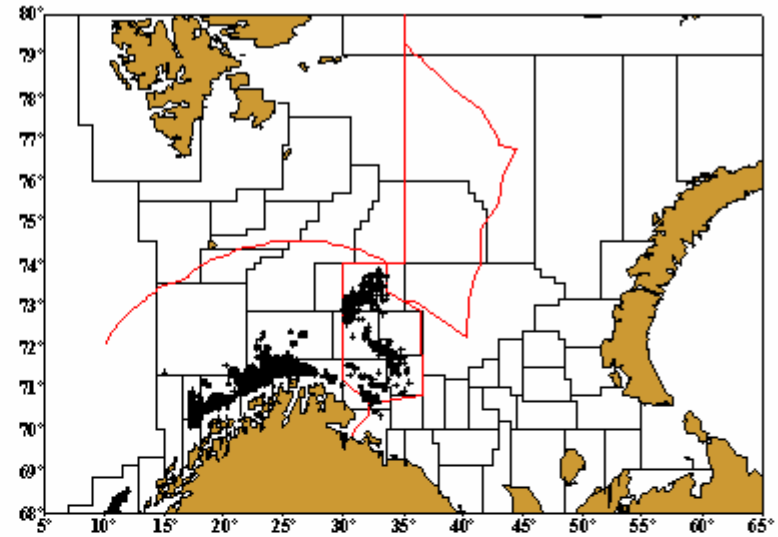
January-February 2003



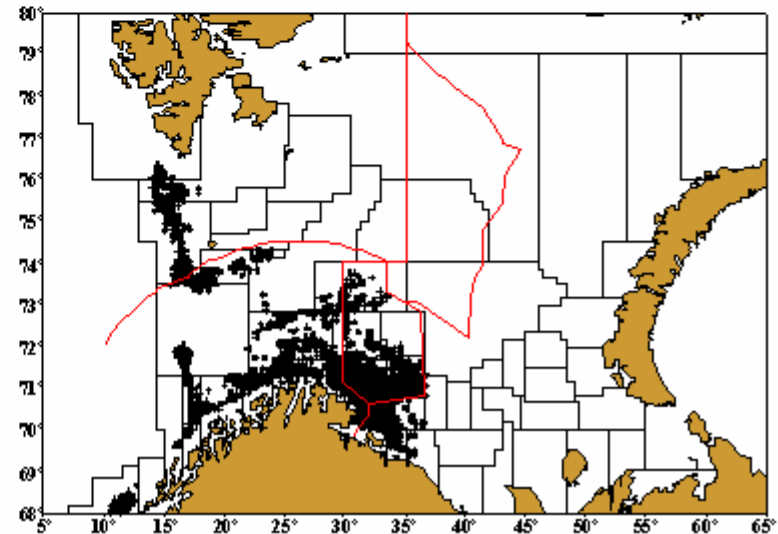
March-May 2003



January-February 2004



March-May 2004

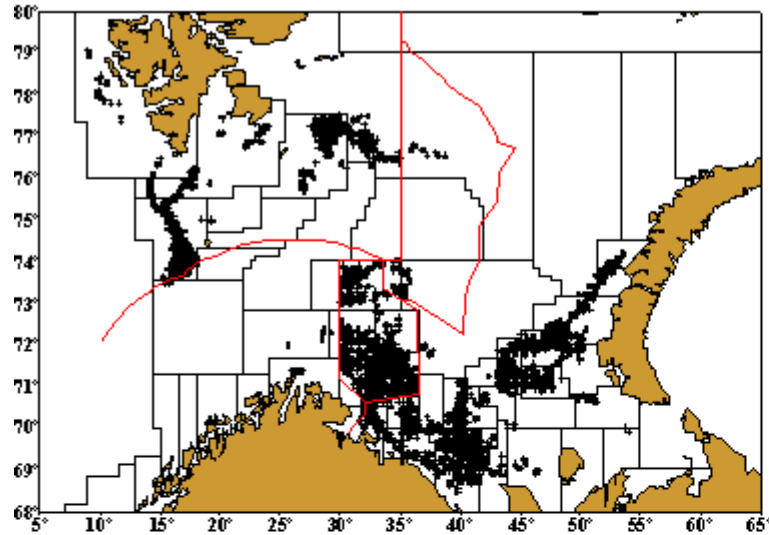




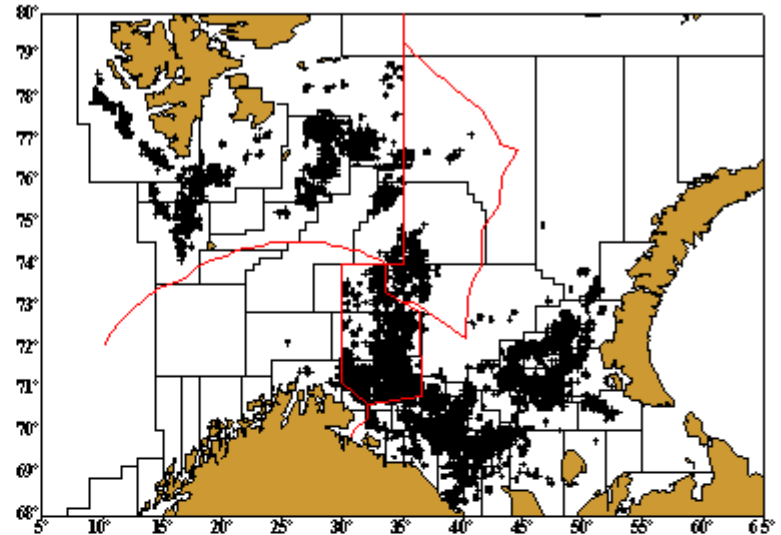
Distribution of trawlers during cod fishery in 2003-2004 (continued)



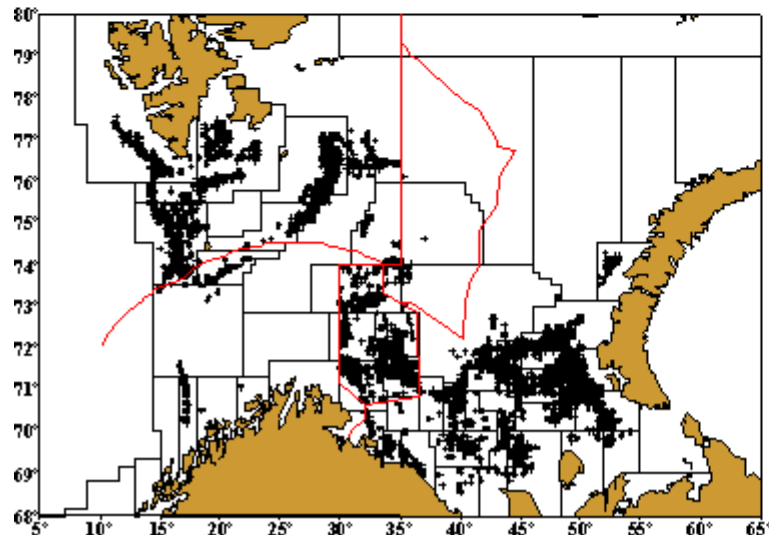
June-September 2003



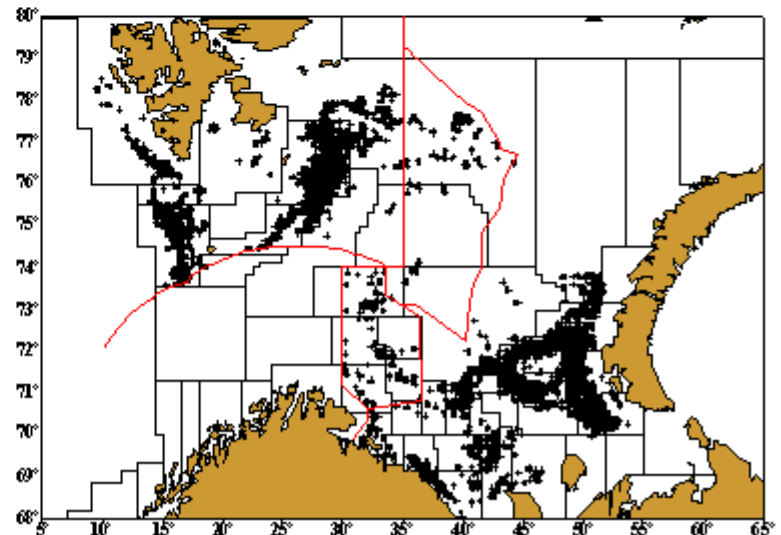
June-September 2004



October-December 2003

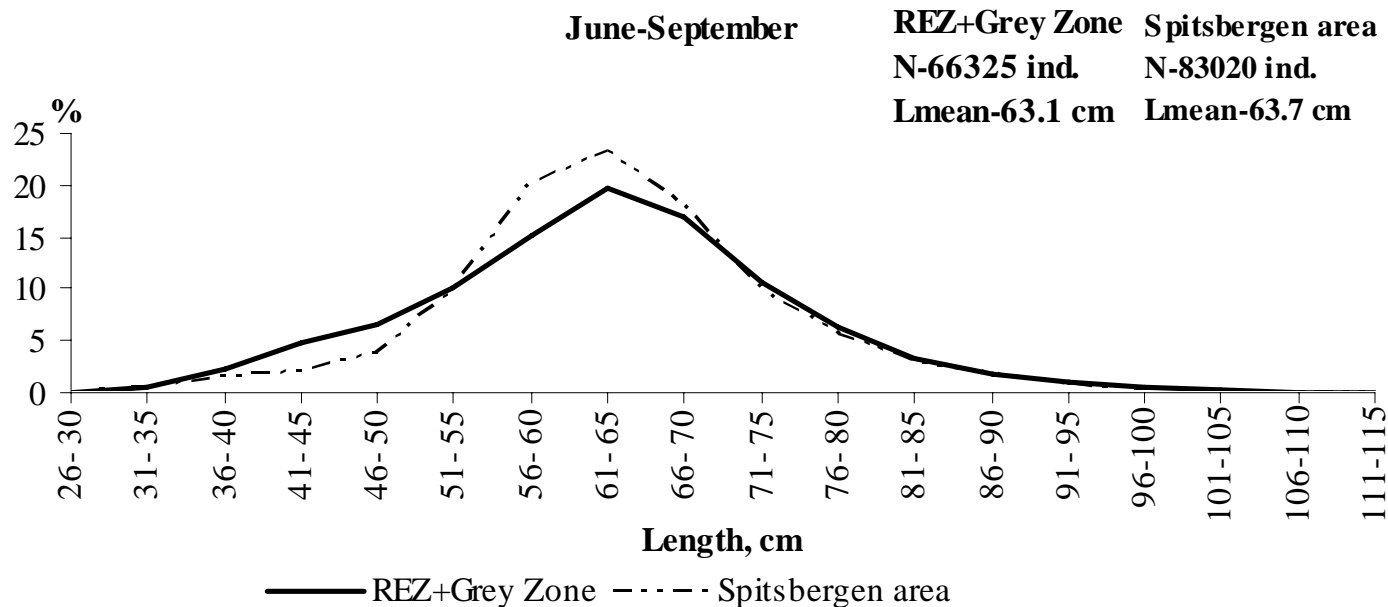
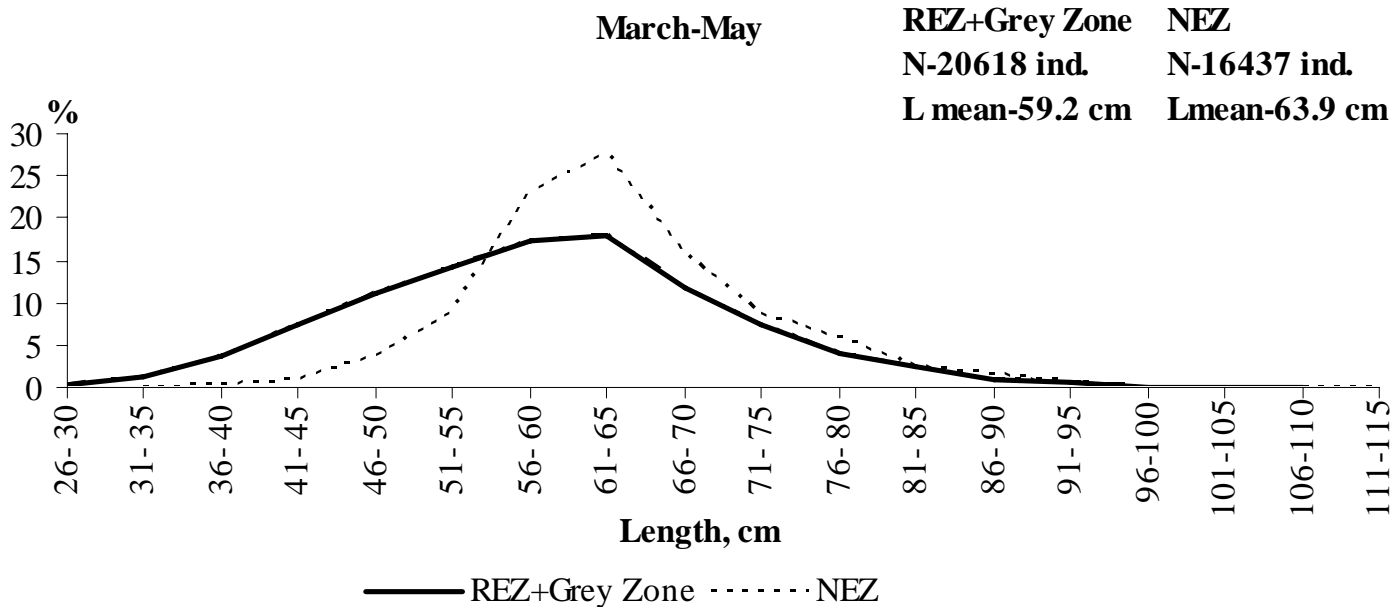


October-December 2004



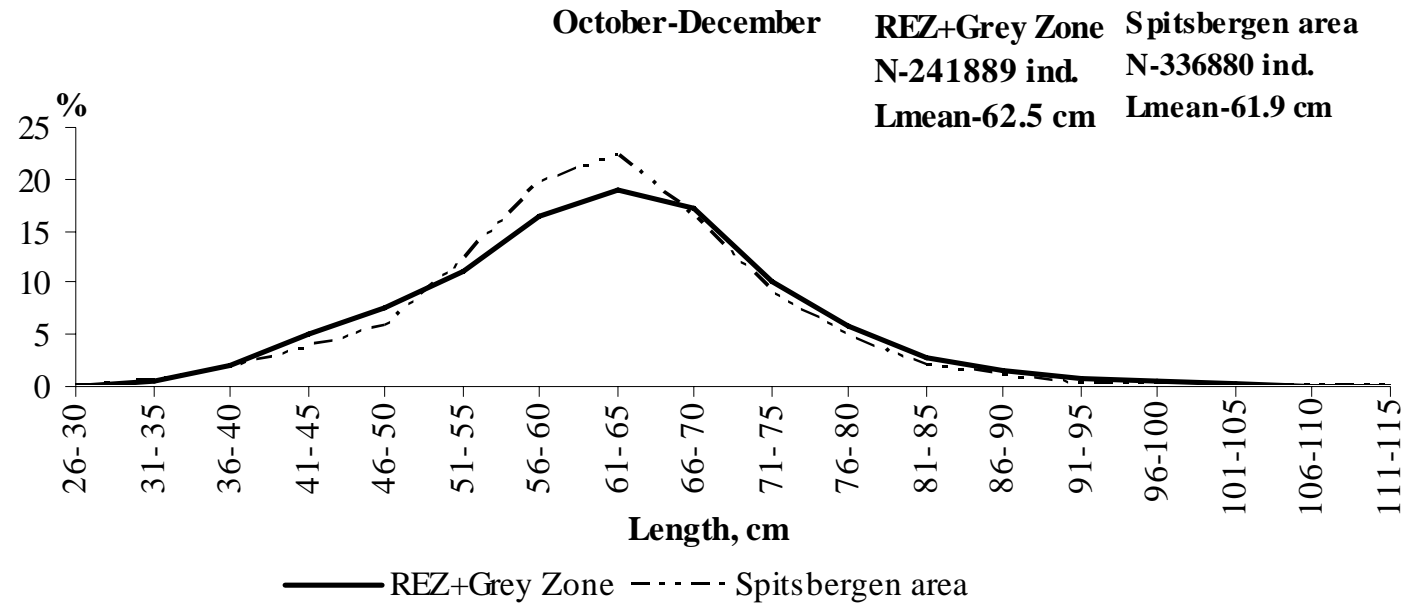


Size composition of cod in trawl catches (mesh size 125 mm and more) within economic zones by fishing seasons in 2003



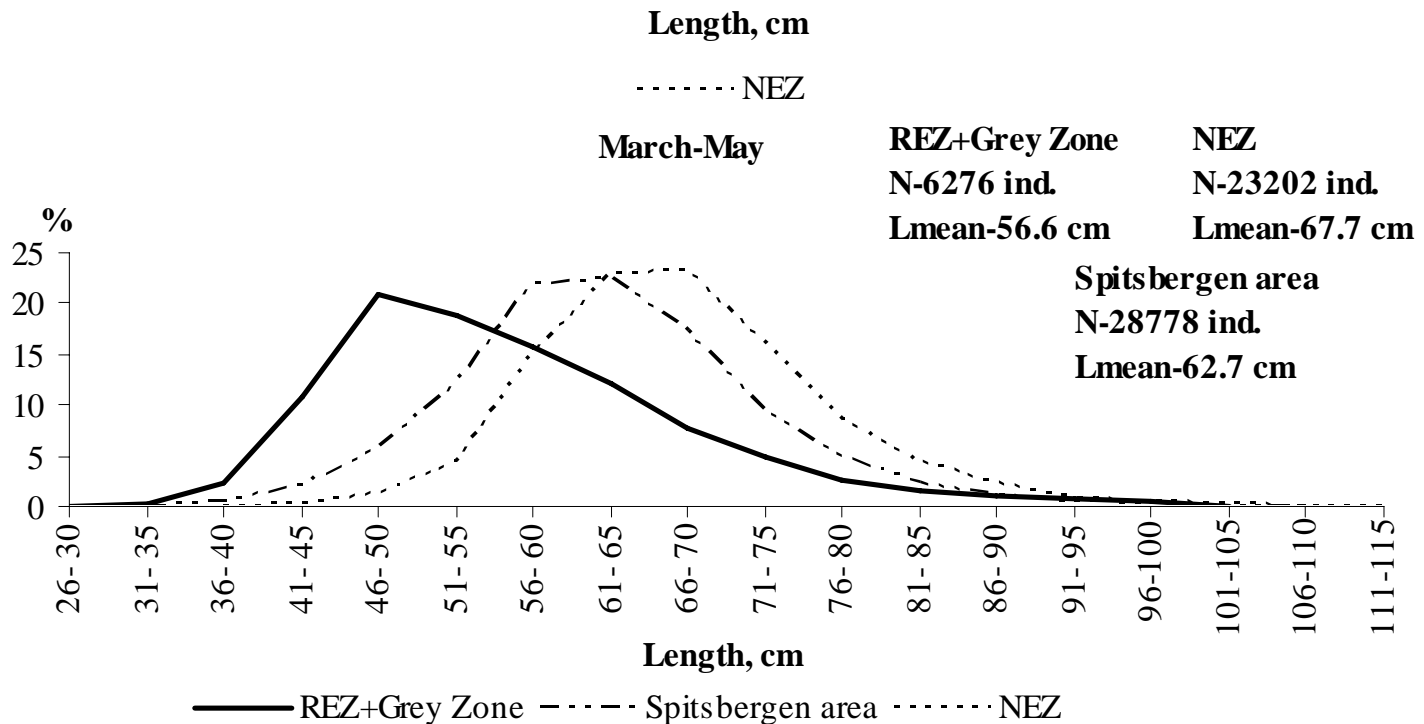
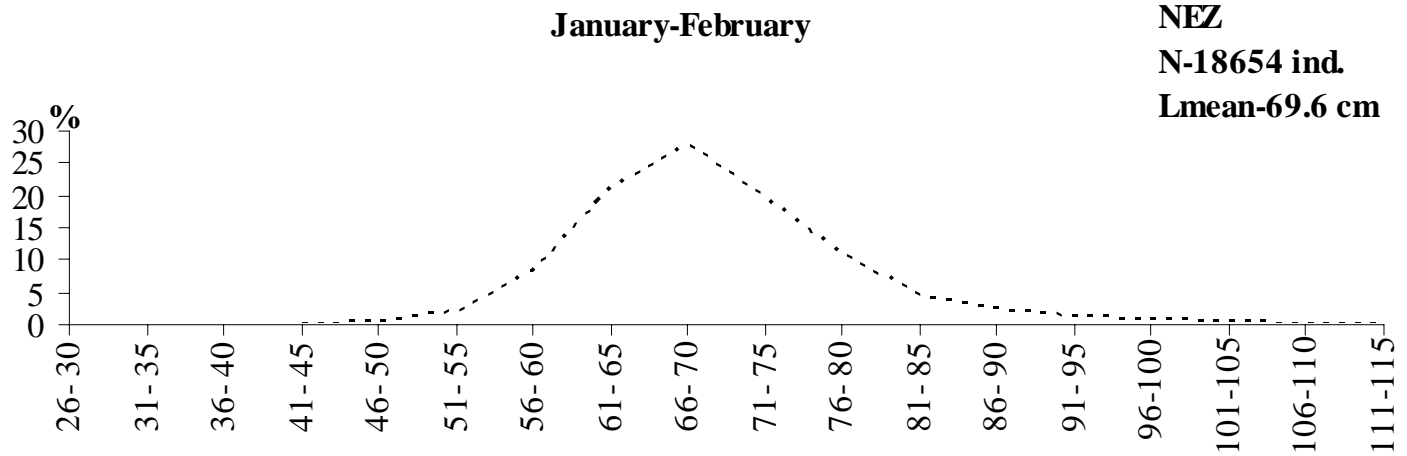


Size composition of cod in trawl catches (mesh size 125 mm and more) within economic zones by fishing seasons in 2003 (continued)





Size composition of cod in trawl catches (mesh size 125 mm and more) within economic zones by fishing seasons in 2004





Size composition of cod in trawl catches (mesh size 125 mm and more) within economic zones by fishing seasons in 2004 (continued)



June-September

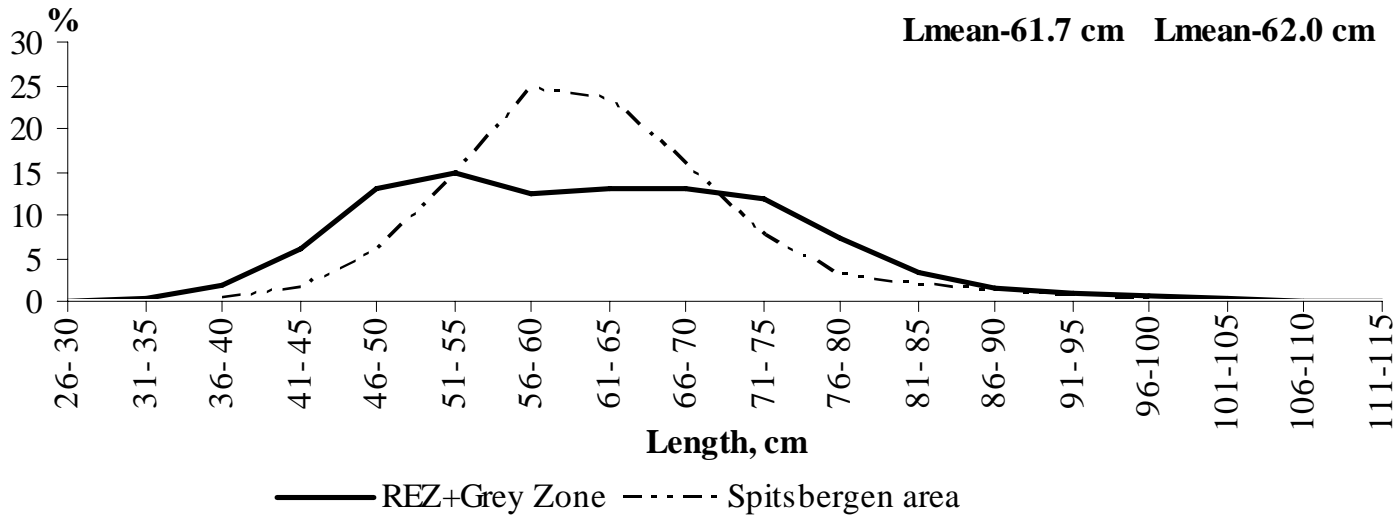
REZ+Grey Zone Spitsbergen

N-34090 ind.

N-3566 ind.

Lmean-61.7 cm

Lmean-62.0 cm



October-December

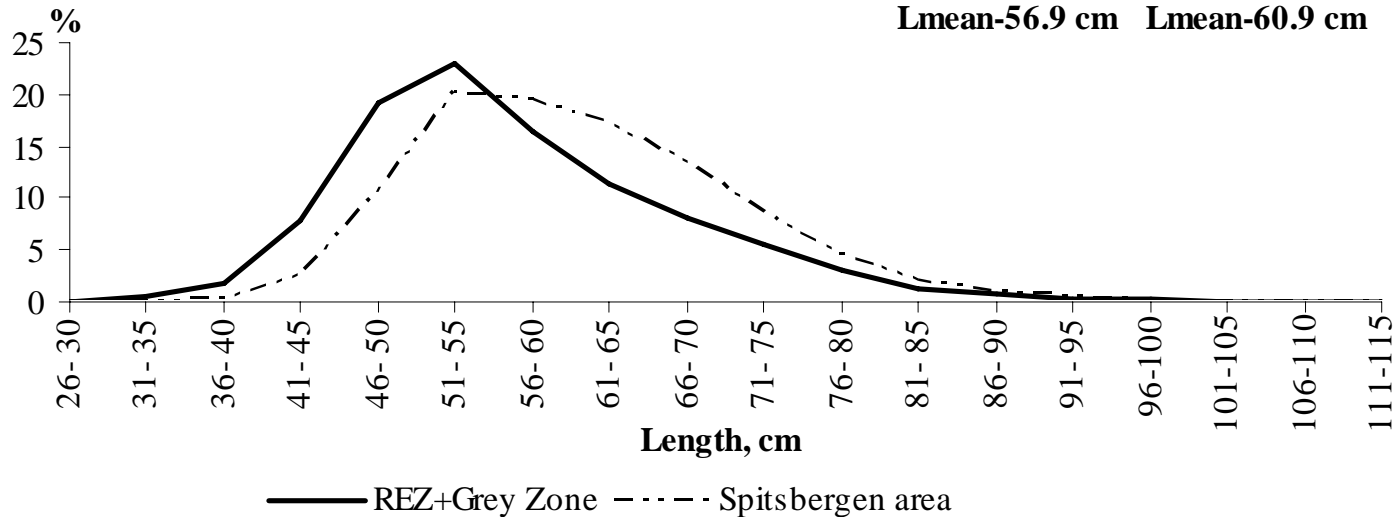
REZ+Grey Zone Spitsbergen area

N-55699 ind.

N-18545 ind.

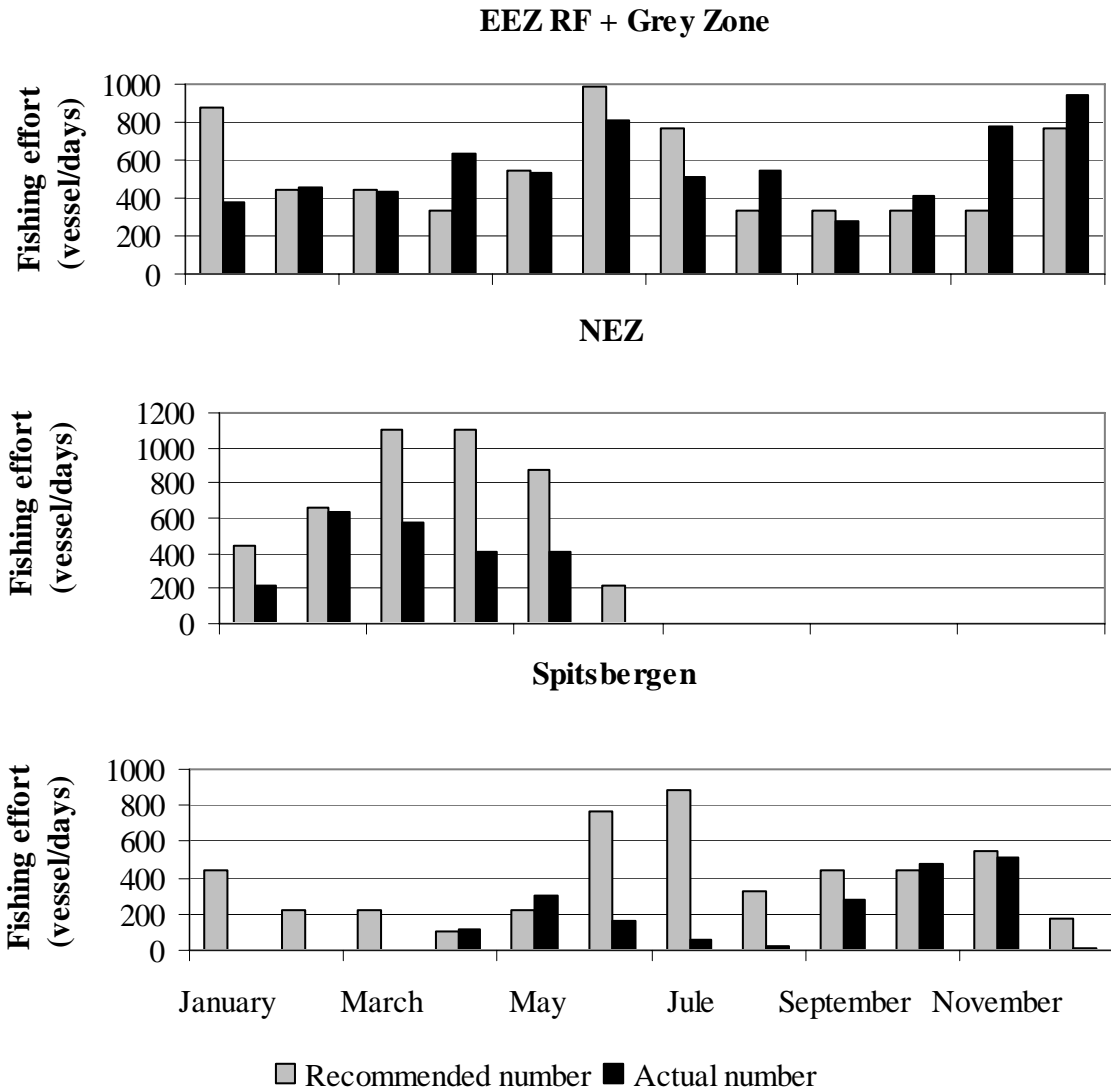
Lmean-56.9 cm

Lmean-60.9 cm





Recommended and actual number of vessel/days in the directed fishery for cod in the economic zones and fishing areas in 2003

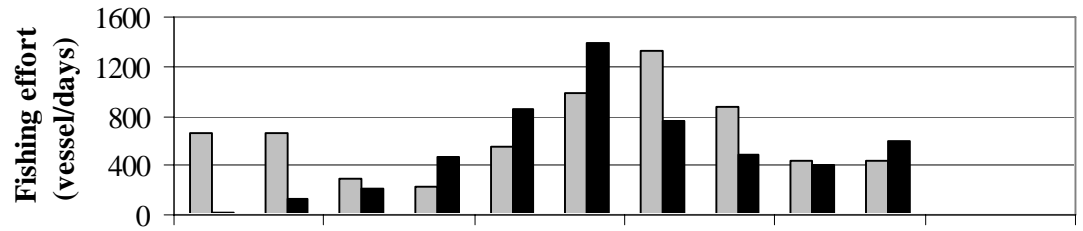




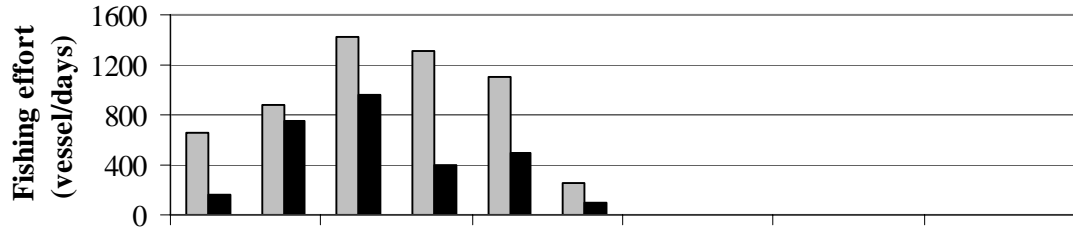
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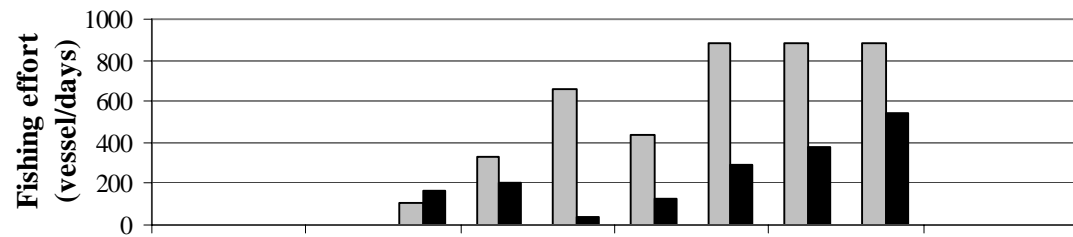
EEZ RF + Grey Zone



NEZ



Spitsbergen



□ Recommended number ■ Actual number



Characteristics of cod catches and efficiency of the use of national cod quota by domestic vessels of SRTM-type in January-May 2004

Fishing areas	January-February									March-May								
	Mean length, cm	Mean weight of cod, kg	Mean catch rate, tonnes	Percentage of mature cod in catches	Percentage of cod less than 45 cm long	Mean daily number of SRTM-type vessels (fishing)	Number of vessel/days (SRTM)	Mean dayli profit USD'000	Catch by trawlers of all types, '000 tonnes	Mean length, cm	Mean weight of cod, kg	Mean catch rate, tonnes	Percentage of mature cod in catches	Percentage of cod less than 45 cm long	Mean daily number of SRTM-type vessels (fishing)	Number of vessel/days (SRTM)	Mean dayli profit USD'000	Catch by trawlers of all types, '000 tonnes
NEZ	69.6	2.7	10.2	72	0.1	3	90	11.7	17,3	67.7	2.6	9.2	61	0.8	4	250	9.9	34,4
EEZ RF and Grey Zone	56.2	1.4	4,9	11	14	7	273	2,5	0,9	56.6	1.4	7.6	21	14	11	1873	6.3	15,8



Size-weight composition of catches and cost of product of cod caught by SRTM-type vessels in NEZ in January-February 2004

Mean length 69.6 cm	Size composition of cod, cm															
	<35	36-40	41-45	46-50	51-55	56-60	61-65	66-70	71-75	76-80	81-85	86-90	91-95	96-100	>100	
Size composition, fish	0	0	19	93	410	1548	3955	5186	3656	2033	858	429	224	131	131	
Size composition, %	0.0	0.0	0.1	0.5	2.2	8.3	21.2	27.8	19.6	10.9	4.6	2.3	1.2	0.7	0.7	
Number of fish in the given commercial grade, %	2.8					76.8					20.4					
Discards, % by number	0.1															
Weight of 1 cod, g	0	0	820	930	1280	1631	2011	2524	3029	3928	4686	5483	6783	9007	15000	
Weight of 1 product, g	0	0	547	620	853	1087	1341	1683	2019	2619	3124	3655	4522	6005	10000	
Weight of product in size group, kg	0.0	0.0	10	58	350	1683	5302	8726	7383	5324	2680	1568	1013	787	1310	
Commercial grade, kg	0 - 1 kg					1 - 2,5 kg					2.5 kg and more					
Weight of product by grade, kg	418					23095					12682					
Grades is catch weight, %	1.2					63.8					35.0					
Cost of 1 tonne of product, \$	1627					2222					2698					
Cost of grade in 1 tonne of product, \$	19					1418					945					
	Catch rate per vessel/day, tonne			Weight of product per vessel/day,		Cost of 1 tonne of product, \$			Totsl cost of product per vessel/day \$							
	10.2			6.8		2382			16197							



Size-weight composition of catches and cost of product of cod caught by SRTM-type vessels in EEZ RF and Grey Zone in January-February 2004

Mean length 56.2 ñ	Size composition of cod, cm														
	<35	36-40	41-45	46-50	51-55	56-60	61-65	66-70	71-75	76-80	81-85	86-90	91-95	96-100	>100
Size composition, fish	19	144	684	1318	1174	985	753	490	314	163	94	63	44	25	6
Size composition, %	0.3	2.3	10.9	21.0	18.7	15.7	12.0	7.8	5.0	2.6	1.5	1.0	0.7	0.4	0.1
Number of fish in the given commercial grade, %	53.2					40.5					6.3				
Discards, % by number	13.5														
Weight of 1 cod, g	307	470	659	890	1190	1573	1904	2264	2765	3500	4340	5718	8100	8190	10000
Weight of 1 product, g	205	313	439	593	793	1049	1269	1509	1843	2333	2893	3812	5400	5460	6667
Weight of product in size group, kg	3.9	45.1	301	782	931	1033	956	740	579	380	272	240	238	137	40
Commercial grade, kg	0 - 1 kg					1 - 2,5 kg					2.5 kg and more				
Weight of product by grades, kg	2063					3307					1307				
Grades is catch weight, %	30.9					49.5					19.6				
Cost of 1 tonne of product, \$	1627					2222					2698				
Cost of grade in 1 tonne of product, \$	503					1101					528				
	Catch rate per vessel/day, tonne			Weight of product per		Cost of 1 tonne of product, \$		Totsl cost of product per vessel/day \$							
	4.9			3.3		2131		6962							



Characteristics of cod catches and efficiency of the use of national cod quota by domestic vessels of SRTM-type in June-December 2004

Fishing areas	June-September									October-December									
	Mean length, cm	Mean weight of cod, kg	Mean catch rate, tonnes	Percentage of mature cod in catches	Percentage of cod less than 45 cm long	Mean daily number of SRTM-type vessels (fishing)	Number of vessel/days (SRTM)	Mean dayli profit USD'000	Catch by trawlers of all types, '000 tonnes	Mean length, cm	Mean weight of cod, kg	Mean catch rate, tonnes	Percentage of mature cod in catches	Percentage of cod less than 45 cm long	Mean daily number of SRTM-type vessels (fishing)	Number of vessel/days (SRTM)	Mean dayli profit USD'000	Catch by trawlers of all types, '000 tonnes	Fishable stock from TAC data, '000 tonnes
NEZ	62.0	2.0	7,9	40	1.4	4	429	7.2	14,2	60.9	2.1	10.7	41	2.7	8	697	11	25.2	250
EEZRF and Grey Zone	61.7	1.9	7,5	35	8.2	19	2222	6.8	43,8	56.9	1.6	6.6	32	10.2	23	2067	6.1	31.3	500



Characteristics of cod catches and efficiency of the use of national cod quota by domestic vessels of SRTM-type in January-May 2003

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NEZ	-	-	10.1	-	-	1	22	11.7	18.7	63.9	1.9	13.3	22.1	1.2	3	288	15.7	34.5
EEZ RF and Grey Zone	-	-	7.9	-	-	11	552	8.2	8.7	59.2	1.6	7.8	23.2	12.3	20	1776	7	17.5

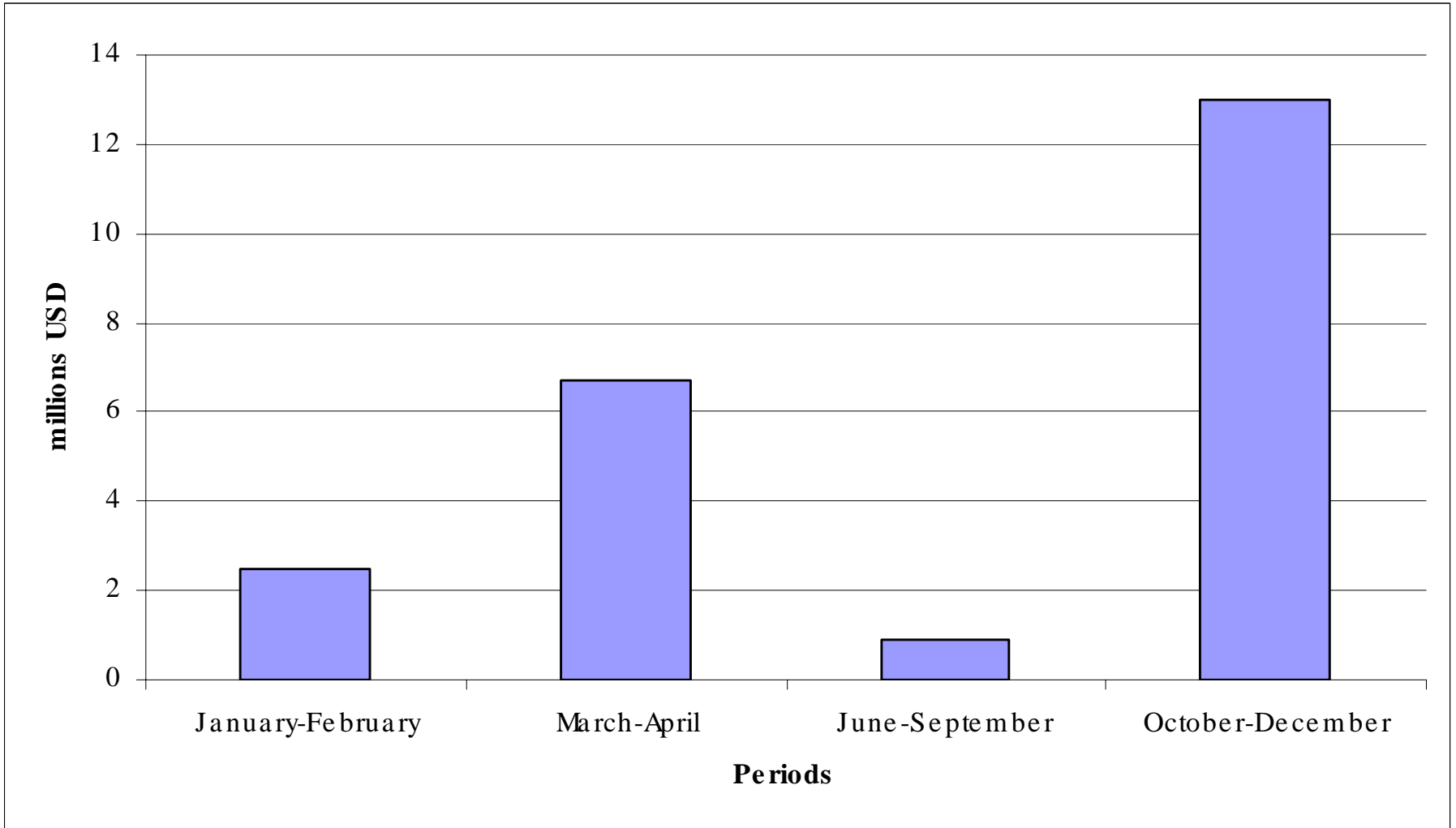


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NEZ	63.7	2.1	9.7	37	3.7	4	298	10.3	9.9	61.9	1.9	9.7	43	6.1	7	436	10	12.7
EEZ RF and Grey Zone	63.1	2.0	7.7	21	7.7	16	1977	7.2	34.2	62.5	1.9	8.4	47	7.4	21	1891	8.3	26.9



Estimated deficiency in the profit from cod fisheries by Russian trawlers of SRTM-type by periods in 2004





Conclusion

1. In 2003-2004, conditions for effective exploitation of the cod stocks were the most favourable in the Economic Zone of Norway and Spitsbergen area compared to other areas of the sea. There were the highest catch rates, percentage of large, high-priced cod in catches, proportion of valuable marine organisms taken as by catch and the lowest by-catches, and thus, discards of undersized fish.

2. A great number of fishing vessels did not fully use resource advantages of the western and northwestern areas of the sea. Number of fishing efforts during the cod fishery in NEZ and Spitsbergen area in 2003-2004 was in fact 1.5 –2 times lower than recommended. At the same time, the most of fishing time was spent in the Grey Zone and EEZ RF, where the great part of catches usually consists of small and middle-sized fish.

3. Insufficient use of the cod resources in NEZ and Spitsbergen area entailed quite a substantial deficiency in the profit of fisheries enterprises, which (**only from SRTM-type vessels**) was estimated at no less than 52 million US dollars in 2003-2004.



Conclusion

4. Along with economic losses, the excess of fishing efforts in the nursery areas in EEZ RF and Grey Zone, where small immature cod are mostly concentrated, also caused negative biological implications for the cod population.

5. In view of the ineffective use of the Barents Sea cod potential as a natural valuable resource of Russia it is necessary to improve the current system of the all-year-round state fisheries monitoring, based on which flexible management measures should be developed and introduced including a system taking into account size-weight and species composition of catches that will contribute to an increase of bioeconomic efficiency of the cod stock exploitation.

6. To achieve the above aims as well as pursuant to Article 21 of the “Law of RF of fisheries...” it is necessary that Government of Russia would annually allocate to fisheries research institutes a strongly reasonable amount of marine resources **to be used for fisheries monitoring.**