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An Assessment of the Cod Stock in NAFO Division 3M

by

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Introduction

From 1974, when a TAC was first established, to 1979, catches ranged from 22 000 to 33 000 tons. Catches had been at that level or higher for the previous ten years. The TAC was 13 000 tons for 1980-87, while the reported nominal catches were about 12 000 tons.

A moratorium on the Flemish Cap cod fishery was established by the Fisheries Commission for 1988 to 1990. However, catches for 1989 and 1990 have been estimated to be about 40 000 and 32 000 tons, respectively. Reported catches for 1989 and 1990 were about 1000 and 2000 tons, respectively. No estimate of unreported catches were available for 1988, but it is believed that actual catches also exceeded those reported for that year.

Catch trends

Cod catches in last two years were:

	1991	1992
Faroese	1,943	
Japan	54	
Norway	795	
Portugal	2,838	2,201
Russia	1	1
Spain	1,416	4,215
UK	26	
Others	1,277	
Total	8,356	6,417
Total estimated	11,000	11,000

The "total estimated" figure includes catch estimates for non member countries and no reported catches. The Spanish pair-trawl fleet fishing in NAFO area, composed by 18 units, left the area after the first half of the year. Nevertheless, Spanish catch was greater than in 1991. This increase catch seems not to be a consequence of an increase of abundance in Division 3M but to an increase of effort.

The stock was dominated in 1992 by small fish of the 1990 year class, that appeared as relatively abundant in surveys. Juveniles can make more dense concentrations than adult fish and could attract some fleets for a fishery dominated by juvenile fish.

Sampling data

Sampling catch data are available for Portuguese trawlers and gillnetters and Spanish pair-trawlers and freezers. Samples were selected from the hole catch in all cases, that is to say, before catch was sorted and discards were retired. Gillnetter catches were dominated by relatively abundant 1985 and 1986 year-classes. Those year-classes are no longer significant in trawl catches, which are based on younger age-groups. Pair-trawl catches have an age composition intermediate between those previous fleets. Non reported catches age composition was estimated as been equal to Portuguese trawlers and Spanish pair-trawlers in same amount. Catch at age calculated in this way (Table 1) is considered a

rough estimate, but it is included for comparison with stock age composition estimate. The EEC survey was carried out in July, just after the bulk of the fleet left the fishery. So, survey age composition roughly corresponds to remaining stock after 1992 fishing. Partial recruitment figure, calculated between catch and remainder stock, is not adequate for other use than to illustrate how youngest age-classes supported a large proportion of the catch.

Survey results

Two surveys were made during 1992: The Russian trawl-acoustic survey, carried out in April on board R/V Kapitan Shaitanov, and the EEC bottom trawl survey, carried out in July on board R/V Cornide de Saavedra. Both survey are continuation of two independent series. Cod biomass estimates are summarized in the following table:

year	EEC (1)	Russia: (2)	(3)
1983		23.070	
1984		31.210	
1985		28.070	
1986		26.060	
1987		10.150	21.600
1988	37.127	7.720	34.200
1989	103.644	36.520	78.300
1990	55.360	3.920	17.300
1991	36.597	6.740	8.200
1992	24.295		2.500

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- 1) Biomass estimated from bottom trawl survey (Vazquez, 1993)
- 2) Biomass estimated from bottom trawl survey (Kuzmin, 1992)
- 3) Russian estimates of bottom trawlable plus pelagic biomass (Kuzmin, 1992; Borokov et al., 1993)

Both surveys indicate a reduction of total biomass from 1991 to 1992. Both surveys indicate a maximum of stock biomass in 1989, when abundant 1985 and 1986 had 4 and 3 years, respectively. The stock biomass reduces since then. The 1990 year class constitutes a 40% of total biomass, according to EEC survey results.

Abundance decrease of each cohort in EEC survey (Vazquez, 1993), expressed by its fishing mortality coefficient equivalence, is presented in Table 2. Apart from sampling errors and variability, the positive value of the coefficient at age 1 and 2 between 1991 and 1992 would indicate a quite deep reduction in youngest age-classes. In spite of the low catchability of small size cod by bottom-trawl gears, important catches can be achieved fishing on large agregations.

Assessment

The relatively abundant 1990 year-class was overfished during 1992. Its contribution to the future spawning stock will be equivalent to any poor year-class. Exploitable stock was quite reduced in 1992, and there is no indication of any abundant year-class that could rebuild the fishery in the next four years. The feasibility of a cod trawl directed fishery in 1993 is questioned.

A fishery in 1994 would be based on the remainder of the 1990 year-class, being four years old, and its catch rates will be low. The exploitation of 1990 year-class should start in 1994, but the abundance of this year-class at that time is not expected to be high, after the fishery in 1992 and 1993. Catches should be maintained at a minimum level to allow an increase of spawning stock, and to prevent the 1991 year-class to be caught before 4 years old, irrespective of its abundance.

The present fishing pattern, which reflectes large catches of undersized fish, should be improved in 1994 in order to prevent high fishing mortality in the youngest age groups, no matter the size of the respective year-class

References

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Table 1. Catch at age in 1992 compared with stock structure calculated in EEC survey. (p.r. = partial recruitment) ('000)

age	Spanish		Portuguese		others	total	EEC survey	p.r.
	OTB	PTB	OTB	GLL				
1 :	0	6			3	9	71180	0.00
2 :	122	653	2754		3374	6903	37060	0.20
3 :	25	599	2333	0	2887	5844	4750	1.30
4 :	3	1079	192	1	873	2148	2030	1.12
5 :	0	158	43	3	144	348	330	1.00
6 :	0	571	5	20	358	954	1270	1.00
7 :	0	97		27	60	185	210	1.00
8 :	0	5		5	3	14	10	1.00
9 :				1		1		1.00
10 :				0		0		1.00
11 :				0		1	10	1.00
12 :				0		0		1.00
catch	166	4049	2039	162	4800	11000		tons

Table 2. Cod stock fishing mortality coefficients calculated between EEC survey abundances at each age.

age	1988	1989	1990	1991	1992	mean
1 :	-1.08	0.37	-2.58	1.11		0.46
2 :	-0.36	0.66	-0.47	1.48		-0.10
3 :	-0.40	1.47	0.69	1.83		0.54
4 :	-0.74	1.02	0.74	1.56		0.47
5 :	-0.19	1.35	1.93	1.39		1.40
6 :	0.18	1.18	2.56	1.91		1.84
7 :	0.65	-0.06	3.27	3.02		1.11
8 :		0.21	0.98			0.93
9 :						0.90
10 :			0,90			0.49
11 :						
12 :						
F 3+	-0.47	1.28	1.16	1.69		
Y 3+	-13338	63039	35216	19272		
catch		40000	32000	11000	11000	