

International Commission for



the Northwest Atlantic Fisheries

Serial No. 5051
(D.c. 9)

ICNAF Res. Doc. 77/VI/26

ANNUAL MEETING - JUNE 1977

Status of the Cod stock in Division 2J, 3KL

by

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Sampling in 1976

Division	Country	Gear	Length frequencies	Age-length key	Comments
2J	France	OT	Feb	-	Research
	USSR	OT	Jan, Feb	✓	Research
	GDR	OT	Feb	✓	Research, 120 mesh
	Canada	OT	Oct	✓	
	Canada	inshore gears	Jul, Aug	✓	
	FRG	OT	Feb	✓	Age-length key for 2J, 3K combined
3K	France	OT	Feb	-	Research
	USSR	OT	Feb	✓	Research
	Poland	OT	Feb	✓	
		OT	Apr	-	
	GDR	OT	Feb	✓	Research, 120 mesh
	Canada	OT	Apr, May, Nov	✓	
	Canada	inshore gears	Jun, Jul, Aug, Sep	✓	
	FRG	OT	Feb	✓	Age-length key for 2J, 3K combined
3L	France	OT	Feb	-	Research
	Poland	OT	Mar	✓	
	GDR	OT	Feb	✓	Research, 120 mesh
	Canada	OT	Jun, Oct, Nov	✓	
	Canada	inshore gears	Jun, Jul	✓	

Nominal Catches

At the 1976 Assessments Subcommittee meeting, records of nominal catches for 1975 were incomplete. In addition, some countries had reported catches for the stock area 2J, 3KL and not for divisions separately. Where necessary, catches for 1975 were estimated and catches reported by stock area were separated into divisions on the basis of catches reported by divisions in 1974. In Figure 1 the age composition of the catches derived from their catch figures and from sampling data is compared to the age composition subsequently made using actual nominal catches by division is reported in the Statistical Bulletin for 1975. The agreement is remarkably good.

A similar situation exists for the 1976 nominal catch data. For each country which had not reported catches for the entire year, it was assumed that the entire quota would be taken. For each country reporting by stock area only, the catch was assigned to Division 2J, 3K and 3L on the basis of the proportions reported in the Statistical Bulletin for 1974 and 1975. The nominal catches thus estimated are shown in Tables 1 - 3.

Estimation of age composition of catch in area 2J, 3KL

Age compositions were derived for Div. 2J, 3K and 3L separately and combined.

In 2J, catches by GDR, USSR and FRG in quarter I were assigned age compositions separately based on the respective sampling data from each country. These three age compositions were combined and the resultant age composition adjusted to the total catch offshore in quarters I and II. Catches offshore in quarters III and IV were assigned an age composition based on the sampling in quarter IV by Canada. To the combined age composition for quarters I - IV, the age composition of inshore catches by Canada was added to arrive at a final age composition. See Table 4.

In 3K, an age composition was derived for QI for each of Poland, GDR, USSR and FRG. These four age compositions were combined and adjusted to the total catch offshore in quarter I. All offshore catches in quarter II were assigned an age composition based on the Canadian sampling in quarter II. Catches offshore in quarters III and IV were assigned age compositions from the Canadian sampling in quarter IV. The age compositions for quarter I, II and III - IV were combined and the Canadian inshore age composition added. See Table 5.

In 3L, the age composition for all catches offshore in quarter I was derived from the Polish sampling data. In quarter II, the age composition was derived from Canadian sampling and in quarters III and IV, Canadian sampling data was used to assign an age composition. To the combined age composition, the inshore age composition was added to arrive at a grand total for this Division. See Table 6.

The total age composition for area 2J, 3KL is shown in Table 7.

Effort and F

Monthly catch-per-hour-fished values for Spanish and Portuguese OT tonnage class 901-1800 (1000-2000) were taken from the Statistical Bulletins and adjusted seasonally. Portuguese CPUE was converted to equivalent of Spanish CPUE. (Table 8). The regression instants were:

<u>Div.</u>	<u>R</u>	<u>T</u>	<u>DF</u>
2J	.59	2.80	15
3K	.57	2.69	15
3L	.54	2.48	15

Effort values were calculated for the Divisions separately and then combined. CPUE for 2J, 3KL in standard Spanish units is given in Table 9.

F values, derived from cohort analysis are also given in Table 9. A regression of effort values on F give the regression $F = .00534 f \times 10^{-4} + 0.085$ with $R = .66$, $T = 3.15$ and degrees freedom = 13.

Unfortunately no suitable effort data are presently available for 1976 to estimate F in 1976.

Cohort Run

- Inputs were: (1) age compositions 2J, 3KL, 1962-76
 (2) $M = 0.2$
 (3) partial recruitment as in WP 76/IV/77 Addendum 2
 (4) average weights as in WP 76/IV/77 Addendum 2

See Tables 10 and 11 for two runs at different terminal F values.

Recruitment

USSR young fish surveys in 2J and 3K indicate that the 1972 and 1973 year-classes were relatively poor. FRG research vessel results show that the 1972 year-class was much stronger than other year-classes present in catches taken in November-December.

Regressions of numbers of 4-year-old cod present in the stock (from VPA) against numbers and biomass of cod of 7 years and older (from VPA) four years earlier had the following constants (log: stock wt. or number, arithmetic: number of 4-year-olds):

	<u>Slope</u>	<u>Intercept</u>	<u>r</u>	<u>T</u>	<u>df</u>
1. log biomass (7+) vs 4's	14273	-53480	.89	5.52	8
2. log number (7+) vs 4's	17808	-60861	.88	5.29	8

See Table 11.

For the 1972 year-class, therefore, the estimates of numbers of 4 year olds present in the stock are 2520×10^5 and 2331×10^5 . The corresponding figures for the 1973 year-class are 1879×10^5 and 1799×10^5 .

TABLE 1. Cod Nominal Catches, 1976 - Div 2J

COUNTRY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	TOTAL
BUL													-
CAN(N)		73				171	1656	1689	93	50	5	4	3741
CAN(M)													-
CUBA													-
DEN(F)													-
DEN(G)													-
FRAN		612	867		1	2							1482
FRG	2401	1834	902										5137
GDR	2151	4357	89										6597
ICE													-
ITALY													-
JAP													-
NOR	173	268		10	10	44							505
POL	1192	614				44	131	181	304	13			2479
PORT	35	2082	446	515	300	80	257	396	793	760	990	8056	14710
ROM													-
SPAN			7	32	160								199
USSR	2180	3571	2	1001	148	108	455	1313	821	1034	898	1238	12769
UK													-
USA													-
TOTAL	8132	13411	2313	1558	619	449	2499	3579	2011	1857	1893	9298	47619

TABLE 2. Cod Nominal Catches - Div 3K, 1976

COUNTRY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	TOTAL
BUL													-
CAN(N)	1	11		12	1364	4910	9033	3669	1760	610	105	52	21527
CAN(M)													-
CUBA													-
DEN(F)													-
DEN(G)													-
FRAN		751	2601	269	4	14							3639
FRG	134	9293	2147										11574
GDR	8	5114	97										5219
ICE													-
ITALY													-
JAP													-
NOR	67	922	4	135	291	162							1581
POL	670	7530	2782	1904	996	7				57	159	209	14314
PORT	66	2169	3820	1864	4298	90	466	746	1679	1439	916	1446	18999
ROM													-
SPAN		1075	73	365	822			4	3552	161	1339		7391
USSR	2370	6407	18	5649	333	218	881	2669	2687	3825	2940	4517	32514
UK					98								98
USA													-
TOTAL	3316	33272	11542	10198	8206	5401	10380	7488	9678	6092	5459	6224	116856

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TABLE 3. Cod Nominal Catches - Div 3L, 1976

COUNTRY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	TOTAL
BUL							19						19
CAN(N)	35	45	216	532	3104	8522	14202	4902	3459	1499	386	308	37210
CAN(M)									22	38	30	39	129
CUBA													-
DEN(F)		263		60	155								478
DEN(G)													-
FRAN	-	28	144	1075	2	6					146	320	1721
FRG			254						249	14			517
GDR													-
ICE													-
ITALY													-
JAP													-
NOR		5	15	1		10			6	4			41
POL	6		1625	69									1700
PORT	64	4425	2101	1586	400	830	1609	1190	2193	1799	1759	826	18782
ROM													-
SPAN	-	161	94	1189	1024	-	-	182	18651	5211	2600	4297	33409
USSR	190	525	2	501	31	21	85	254	224	310	245	433	2821
UK					135								135
USA													-
TOTAL	295	5452	4451	5013	4851	9389	15915	6528	24804	8875	5166	6223	96962

Table 4. Age composition of cod in Division 2J, 1976.

Age	Off. I + II	Off. III + IV	Off. Total	Can(N) Ins	Grand Total
3	12407	2128	14535	145	14680
4	17554	1422	18976	277	19253
5	2598	981	3579	217	3796
6	1295	1206	2501	229	2730
7	1418	1239	2657	165	2822
8	1923	973	2896	192	3088
9	3089	291	3380	100	3480
10	965	83	1048	76	1124
11	347		347	67	414
12	129		129	43	172
13	24		24	15	39
14	11		11	12	23
15	-		-	19	19
16	5		5	4	9
17				2	2
18				-	-
19				1	1
20				3	3
21				-	-
22				1	1
23				-	-
24				-	-
25				-	-
26				1	1
#	41765	8323	50088	1569	51657
Wt.	26312	17644	43956	3663	47619
Av. Wt.	.63	2.12	(.88)	2.33	(.92)

TABLE 5. Age composition of cod in Div. 3K, 1976

AGE	QL	QII	Q III + IV	TOTAL	CAN (INS)	GRAND TOTAL
3	1818		5144	6962	303	7265
4	5001	546	4691	10238	3654	13892
5	5450	1252	1733	8435	3805	12240
6	7594	2055	2675	12324	2175	14499
7	6242	1220	1733	9195	1224	10419
8	5849	1124	1507	8480	793	9273
9	5398	449	584	6431	253	6684
10	1891	225	659	2775	185	2960
11	914	96	113	1123	168	1291
12	367	-	-	367	56	423
13	139	96		235	59	294
14	91			91	29	120
15	-				35	35
16	-				10	10
17	33			33	9	42
18					6	6
19					-	-
20					4	4
21					4	4
22					-	-
23					-	-
24					4	4
TOTAL #	40787	7063	18839	66689	12776	79465
CATCH WT	48129	18082	29766	93977	20879	114856
AV WT	1.18	2.56	1.58		1.63	1.45

TABLE 6. Age composition of cod in Div. 3L, 1976.

AGE	QI	Q II	Q III + IV	TOTAL	INS	TOTAL
2					15	15
3		124	590	714	5668	6382
4	928	564	18276	19768	11474	31242
5	1889	367	9728	11984	6594	18578
6	1190	263	3931	5384	2498	7882
7	1227	256	1769	3252	1486	4738
8	685	375	491	1551	954	2505
9	318	104	295	717	416	1133
10	100	77		177	209	386
11	6	40		46	123	169
12	-	60		60	39	99
13	-	35		35	44	79
14	6	72		78	16	94
15		22		22	8	30
16		22		22	2	24
17		15		15	2	17
18		27		27	-	27
19		20		20	-	20
20		20		20	4	24
21		7		7	2	9
22		-		-		-
23		5		5		5
24		5		5		5
25		5		5		5
CATCH #	6349	2485	35080	43914	29554	73468
CATCH WT	10159	7854	43850	61863	35099	96962
AV	1.60	3.16	1.25	1.67	1.19	1.32

TABLE 7. Age composition of cod in area 2J3LK, 1976

AGE	2J	3K	3L	2J3KL
2			15	15
3	14680	7265	6382	28327
4	19253	13892	31242	64387
5	3796	12240	18578	34614
6	2730	14499	7882	25111
7	2822	10419	4738	17979
8	3088	9273	2505	14866
9	3480	6684	1133	11297
10	1124	2960	386	4470
11	414	1291	169	1874
12	172	423	99	694
13	39	294	79	412
14	23	120	94	237
15	19	35	30	84
16	9	10	24	43
17	2	42	17	61
18	-	6	27	33
19	1	-	20	21
20	3	4	24	31
21	-	4	9	13
22	1	-	-	1
23	-	-	5	5
24	-	4	5	9
25	-	-	5	5
26	1	-	-	1
CATCH #	51657	79465	73468	204590
CATCH W	47619	114856	96962	259437
AV WT	.92	1.45	1.32	1.27

TABLE 8. CPUE of cod in Div. 2J, 3KL (Standard Spanish units).

Div.	Gear	Ton.Class	Units	Year	Port C/HR	Equiv. Spain C/HR	Spain C/HR	Stand C/HR Spain
2J	OT	901-1800 Spain	C/HR	1959	1.413	1.061	0.984	1.022
				1960	1.744	1.299	1.028	1.163
				1961	1.067	0.812	1.221	1.017
	OT	901-1800 Port	C/HR	1962	1.288	0.971	1.253	1.112
				1963	1.265	0.955	1.032	0.993
				1964	1.012	0.773	1.031	0.902
				1965	1.018	0.777	0.935	0.856
				1966	1.033	0.788	0.841	0.815
				1967	1.082	0.823	0.971	0.897
				1968	1.194	0.904	0.999	0.951
				1969	0.898	0.691	0.765	0.728
				1970	0.819	0.634	0.771	0.703
				1971	0.746	0.582	0.668	0.625
				1972	0.709	0.555	0.391	0.473
				1973	0.731	0.571	0.325	0.448
				1974	0.860	0.664	0.310	0.487
				1975	1.066	0.812	0.146	0.479
3K	OT	901-1800 Spain	C/HR	1959	1.167	1.415	1.334	1.375
				1960	1.051	1.306	1.869	1.588
				1961	1.160	1.408	1.402	1.405
				1962	1.101	1.353	1.355	1.354
	OT	901-1800 Port	C/HR	1963	1.274	1.515	1.454	1.485
				1964	1.130	1.380	1.508	1.444
				1965	1.039	1.295	1.173	1.234
				1966	1.093	1.346	1.196	1.271
				1967	1.182	1.429	1.486	1.458
				1968	1.035	1.291	1.217	1.254
				1969	0.893	1.158	1.027	1.093
				1970	0.842	1.110	0.822	0.966
				1971	0.614	0.897	0.786	0.841
				1972	0.666	0.945	0.698	0.822
				1973	0.625	0.907	0.876	0.891
				1974	0.589	0.873	0.466	0.670
				1975	0.618	0.900	1.861	1.381
3L	OT	901-1800 Spain	C/HR	1959	0.925	0.785	0.640	0.712
				1960	0.882	0.766	0.739	0.753
				1961	1.020	0.826	0.888	0.857
				1962	1.065	0.845	1.094	0.970
	OT	901-1800 Port	C/HR	1963	1.315	0.953	1.030	0.991
				1964	1.175	0.892	0.932	0.912
				1965	0.960	0.800	0.730	0.765
				1966	1.240	0.920	0.833	0.877
				1967	1.349	0.967	1.093	1.030
				1968	1.360	0.972	0.922	0.947
				1969	1.121	0.869	0.754	0.812
				1970	0.933	0.788	0.721	0.755
				1971	0.734	0.702	0.551	0.627
				1972	0.563	0.629	0.454	0.541
				1973	0.625	0.656	0.582	0.619
				1974	0.592	0.641	0.468	0.555
				1975	0.525	0.612	1.193	0.903

TABLE 9. Catch, effort and CPUE (Standard Spanish units) for cod in Div. 2J, 3KL.

Year	Catch				CPUE			
	2J	3K	3L	2J,3KL	2J	3K	3L	2J,3KL
1959	57000	139267	133307	329574	1.022	1.375	0.712	.957
1960	141033	92125	160419	393577	1.163	1.588	0.753	1.003
1961	260690	91733	145655	498078	1.017	1.405	0.857	1.013
1962	250265	88370	164117	502752	1.112	1.354	0.970	1.094
1963	211693	122830	156361	490884	0.993	1.485	0.991	1.082
1964	195032	151622	215099	561753	0.902	1.444	0.912	1.008
1965	252326	72634	185825	510785	0.856	1.234	0.765	.856
1966	243688	89764	181474	514926	0.815	1.271	0.877	.893
1967	240076	101919	258205	600200	0.897	1.458	1.030	1.020
1968	359177	157833	266144	783154	0.951	1.254	0.947	.998
1969	360908	99375	229183	689466	0.728	1.093	0.812	.794
1970	198786	91000	196559	486345	0.703	0.966	0.755	.763
1971	150216	79546	190755	420517	0.625	0.841	0.627	.658
1972	149763	146183	158644	454590	0.473	0.822	0.541	.577
1973	57727	172951	123831	354509	0.448	0.891	0.619	.678
1974	121266	159951	91430	372647	0.487	0.670	0.555	.571
1975	81988	128385	77135	287508	0.479	1.381	0.903	.823
TOTAL	3331634	1985488	2934143	8251265				
	Effort							
1959	55773	101285	187229	344287				
1960	121267	58013	213040	392320				
1961	256332	65290	169959	491581			0.31	
1962	225058	65266	169193	459517			0.25	
1963	213185	82714	157781	453680			0.28	
1964	216222	105001	235854	557077			0.32	
1965	294773	58861	242908	596542			0.36	
1966	299004	70625	206926	576555			0.32	
1967	267643	69903	250684	588230			0.37	
1968	377683	125864	281039	784586			0.51	
1969	495753	90919	282245	868917			0.66	
1970	282768	94203	260396	637367			0.50	
1971	240346	94585	304234	639165			0.44	
1972	316624	177838	293242	787704			0.43	
1973	128855	194109	200050	523014			0.32	
1974	249006	238733	164739	652478			0.51	
1975	171165	92965	85421	349551			0.49	
TOTAL	4211457	1786174	3704940	9702571				

TABLE 10. CUD 2J3KL 1962-76

NATURAL MORTALITY 0.20

PARTIAL RECRUITMENT MULTIPLIER

0.3400 0.8700 1.0900 1.1800 0.9600 0.8400 0.7400 1.0000 1.0000 1.0000 1.0000

ASSUMED FISHING MORTALITY FOR LAST AGES

0.4100 0.3200 0.4700 0.5800 0.4000 0.5600 0.6800 0.6700 0.3300 0.2800 0.3100 0.2700 0.4500 0.3000 0.2500

ESTIMATED POPULATION

AGE	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
4	6200	6049	5219	7024	8320	9334	6794	6163	5997	7005	5724	2911	2326	2543	6707
5	7319	4834	4707	4031	5498	6212	6932	4733	4701	4393	5111	3985	2015	1938	1946
6	3779	5397	3732	3345	2888	3649	4173	3874	3003	3150	2762	3129	2391	1328	1156
7	2141	2551	3370	2268	2148	1792	2108	2104	1784	1608	1725	1573	2026	1182	7774
8	1198	1314	1564	1872	1288	1216	967	994	813	748	813	905	968	1104	697
9	869	724	813	825	1277	1777	644	449	368	422	394	398	494	466	582
10	724	524	455	484	540	540	380	325	201	210	243	216	197	236	124
11	824	509	326	266	264	297	297	324	162	132	133	141	108	69	124
12	679	495	343	191	156	173	134	194	211	115	133	82	108	39	35
13	617	467	368	226	123	107	111	79	121	163	84	58	47	40	20
14	720	433	347	258	150	84	69	74	39	94	124	56	36	30	25

KNOWN CATCHES

AGE	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
4	267	271	267	280	663	785	916	381	572	690	798	407	138	150	644
5	658	592	563	456	942	1092	1390	264	773	921	1166	945	355	259	346
6	600	1159	590	632	532	972	1450	1534	940	923	762	593	737	347	251
7	486	579	981	629	598	553	809	1006	788	57	580	353	613	389	180
8	284	288	498	671	307	388	379	493	269	241	296	273	361	356	149
9	207	152	202	334	240	172	224	115	100	113	118	142	166	132	112
10	186	114	118	147	88	161	76	115	36	43	64	76	102	177	45
11	108	81	84	168	47	60	54	60	19	21	30	38	55	24	19
12	98	41	61	37	23	34	34	42	11	12	17	22	29	13	17
13	80	39	48	39	18	21	19	28	5	11	14	12	10	9	4
14	221	108	119	104	45	33	31	33	10	21	30	12	12	7	5

ESTIMATE FISHING MORTALITY

AGE	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
4	0.0488	0.0508	0.0582	0.0451	0.0922	0.0976	0.1614	0.0708	0.1114	0.1153	0.1673	0.1679	0.0710	0.0674	0.0
5	0.1046	0.2709	0.2114	0.1336	0.2099	0.1979	0.3817	0.2550	0.2005	0.2636	0.2906	0.3057	0.2166	0.1846	0.0
6	0.2888	0.2888	0.3882	0.3660	0.2769	0.3487	0.2846	0.4755	0.4245	0.4023	0.3635	0.2836	0.4236	0.3407	0.0
7	0.3039	0.2775	0.4335	0.4046	0.3682	0.4170	0.5519	0.7514	0.6697	0.4825	0.4445	0.2851	0.4070	0.4086	0.0
8	0.3057	0.2641	0.3202	0.4086	0.3378	0.4350	0.5676	0.7947	0.6554	0.4804	0.4450	0.4054	0.5312	0.4405	0.0
9	0.2858	0.2751	0.3378	0.4086	0.2978	0.2807	0.4850	0.5933	0.3577	0.3209	0.4018	0.5021	0.5379	0.3789	0.0
10	0.1800	0.1935	0.3355	0.3324	0.2195	0.3995	0.1923	0.4966	0.2505	0.2560	0.3436	0.4931	0.5492	0.4466	0.0
11	0.1737	0.0959	0.2187	0.2413	0.2195	0.3240	0.2246	0.2287	0.1390	0.1933	0.2898	0.3529	0.8277	0.4852	0.0
12	0.1546	0.0967	0.1555	0.2118	0.1770	0.2447	0.2095	0.2734	0.0593	0.1222	0.2369	0.3515	0.5016	0.4650	0.0
13	0.4100	0.3200	0.4700	0.5800	0.4000	0.5600	0.6800	0.5002	0.3300	0.2800	0.2099	0.2619	0.2563	0.2836	0.0
14	0.4100	0.3200	0.4700	0.5800	0.4000	0.5600	0.6800	0.5002	0.3300	0.2800	0.3100	0.2700	0.4500	0.3000	0.2500

POPULATION WTS AND NOS

AGE	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
WT	39139	36224	30709	27706	26181	27182	26486	23077	19873	20161	19566	16758	14531	11818	13929
NO	25073	23297	20937	20795	22133	24113	22707	19314	17400	18040	17202	13432	10590	8835	14326
POPULATION WTS AND NOS AGE 7 TO 14															
WT	24641	20004	19487	16181	13215	12056	11527	10756	8743	8569	8521	7819	8593	7292	6006
NO	7776	7016	7589	6395	5428	4919	4809	4543	3698	3493	3604	3428	3958	3266	2517

TABLE 11. COD 2JJKL 1962-76

NATURAL MORTALITY		0.20														
PARTIAL RECRUITMENT MULTIPLIER																
0.3000 0.8700 1.0900 1.1800 1.0700 0.9600 0.8400 0.7400 1.0000 1.0000																
ASSUMED FISHING MORTALITY FOR LAST AGES																
0.4100 0.3200 0.4700 0.5800 0.4400 0.5600 0.6800 0.6700 0.3300 0.2800 0.3100 0.2700 0.4500 0.3000 0.3500																
AGE	YEAR	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	
ESTIMATED POPULATION																
4	1962	6200.	6049.	5219.	7024.	8274.	6750.	6032.	5774.	6604.	5337.	2563.	1797.	1933.	6321.	
5	1962	7319.	6937.	5707.	9037.	10981.	8907.	7698.	7594.	8210.	4742.	2647.	1730.	1344.	1447.	
6	1962	3719.	3397.	3122.	3845.	4888.	3876.	3079.	2877.	3082.	2613.	2860.	2131.	1089.	1858.	
7	1962	2141.	2551.	3370.	2268.	2186.	2105.	2079.	1767.	1584.	1633.	1450.	866.	1069.	593.	
8	1962	1198.	1314.	1564.	1812.	1288.	967.	994.	1792.	1734.	1793.	846.	868.	384.	523.	
9	1962	869.	724.	812.	830.	925.	644.	649.	369.	405.	383.	382.	446.	384.	434.	
10	1962	627.	524.	455.	484.	378.	480.	480.	201.	210.	259.	207.	184.	197.	194.	
11	1962	724.	509.	326.	266.	264.	297.	324.	162.	132.	133.	130.	100.	58.	91.	
12	1962	679.	495.	343.	191.	156.	134.	194.	121.	115.	89.	82.	100.	33.	26.	
13	1962	617.	467.	368.	226.	173.	111.	179.	121.	163.	84.	58.	47.	33.	15.	
14	1962	720.	433.	347.	258.	150.	69.	74.	39.	194.	124.	56.	36.	30.	19.	
KNOWN CATCHES																
AGE	YEAR	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
4	1962	267.	271.	267.	280.	663.	1085.	916.	381.	572.	690.	798.	407.	138.	150.	644.
5	1962	658.	592.	563.	456.	942.	1092.	1901.	964.	773.	921.	1162.	945.	355.	259.	346.
6	1962	500.	1159.	590.	655.	632.	972.	1480.	2574.	940.	941.	782.	592.	747.	347.	251.
7	1962	486.	579.	281.	629.	598.	553.	809.	1006.	788.	557.	540.	363.	613.	389.	180.
8	1962	284.	288.	290.	371.	307.	358.	379.	493.	269.	241.	296.	272.	361.	356.	149.
9	1962	207.	122.	202.	327.	282.	172.	228.	184.	109.	113.	118.	142.	189.	139.	113.
10	1962	186.	114.	116.	147.	89.	161.	75.	115.	38.	43.	84.	76.	102.	77.	43.
11	1962	108.	81.	84.	68.	47.	60.	54.	60.	21.	30.	38.	38.	55.	24.	19.
12	1962	98.	41.	61.	37.	23.	34.	34.	42.	11.	17.	22.	29.	13.	7.	7.
13	1962	80.	48.	49.	39.	18.	21.	19.	28.	11.	14.	12.	10.	9.	9.	5.
14	1962	221.	108.	119.	104.	45.	33.	31.	33.	10.	21.	12.	12.	7.	7.	5.
ESTIMATE FISHING MORTALITY																
AGE	YEAR	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
4	1962	0.0488	0.0508	0.0582	0.0451	0.0927	0.0979	0.1625	0.0724	0.1160	0.1227	0.1806	0.1929	0.0897	0.0897	0.0
5	1962	0.1046	0.1454	0.2148	0.2336	0.2099	0.1992	0.3834	0.2572	0.2057	0.2768	0.3140	0.3374	0.2571	0.2391	0.0
6	1962	0.1930	0.2709	0.2114	0.2439	0.2769	0.3487	0.4802	0.5796	0.4297	0.4166	0.4590	0.4590	0.4901	0.4390	0.0
7	1962	0.2888	0.2688	0.3882	0.3660	0.3682	0.4170	0.5519	0.7652	0.6787	0.4919	0.4692	0.3134	0.4701	0.5146	0.0
8	1962	0.3039	0.2775	0.4335	0.3046	0.3058	0.4350	0.5476	0.7947	0.6707	0.4507	0.5318	0.4408	0.6157	0.5557	0.0
9	1962	0.2858	0.2641	0.3322	0.2880	0.2378	0.2895	0.4850	0.6033	0.3577	0.3687	0.5164	0.4298	0.6179	0.4827	0.0
10	1962	0.2858	0.2641	0.3322	0.2880	0.2378	0.2895	0.4850	0.6033	0.3577	0.3687	0.5164	0.4298	0.6179	0.4827	0.0
11	1962	0.1800	0.1925	0.3328	0.3224	0.2195	0.3419	0.2324	0.2287	0.1390	0.1933	0.2588	0.3908	0.9492	0.5627	0.0
12	1962	0.1737	0.0959	0.2187	0.2413	0.1778	0.2445	0.3502	0.2734	0.0593	0.1232	0.2589	0.3619	0.6801	0.5971	0.0
13	1962	0.1348	0.0967	0.1255	0.2118	0.1770	0.2447	0.2502	0.2502	0.0498	0.0775	0.2589	0.3619	0.6801	0.5971	0.0
14	1962	0.4100	0.3200	0.4700	0.5800	0.4400	0.5600	0.6800	0.6700	0.3300	0.2800	0.3100	0.2700	0.4500	0.3000	0.3500
POPULATION WTS AND NOS																
POPULATION WTS	AND NOS	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
WT	NO	39139.	34224.	30709.	27706.	26156.	27092.	26412.	22907.	19548.	19558.	18645.	15515.	12912.	9698.	10309.
WT	NO	25073.	23297.	20937.	20795.	22087.	24045.	22608.	19101.	17003.	17314.	16220.	12281.	9218.	7101.	10521.
POPULATION WTS AND NOS AGE 7 TO 14																
WT	NO	24541.	20004.	19487.	16181.	13215.	12054.	11527.	10714.	9672.	8456.	8287.	7377.	7780.	6102.	4482.
WT	NO	7776.	7016.	7589.	6395.	5428.	4919.	4809.	4517.	3661.	3439.	3486.	3210.	3560.	2727.	1885.

TABLE 12. Recruitment estimates from USSR young fish surveys, spawning stock and numbers at age 4.

YEAR	SPAWN STOCK WT	SPAWN STOCK #	USSR young fish surveys						VPA at 4 years
			3K		3L		3KL		
			2 years	3 years	2 years	3 years	2	3	
62	24641	7776	2	22	8	56	10	78	8293
63	20004	7016	1	51	11	44	12	95	9316
64	19487	7589	4	11	22	68	26	79	6768
65	16181	6395	1	27	2	17	3	44	6087
66	13215	5428	4	38	10	61	14	99	5867
67	12054	4919	11	48	15	36	26	84	6770
68	11527	4809	10	46	68	118	78	164	5498
69	10732	4528	3	19	31	60	34	79	2708
70	8702	3676	1	8	7	8	8	16	1975
71	8503	3461	1	4	1	12	2	16	2187
72	8385	3536	0	8	3	7	3	15	
73	7561	3301	7	-	9	-	16	-	

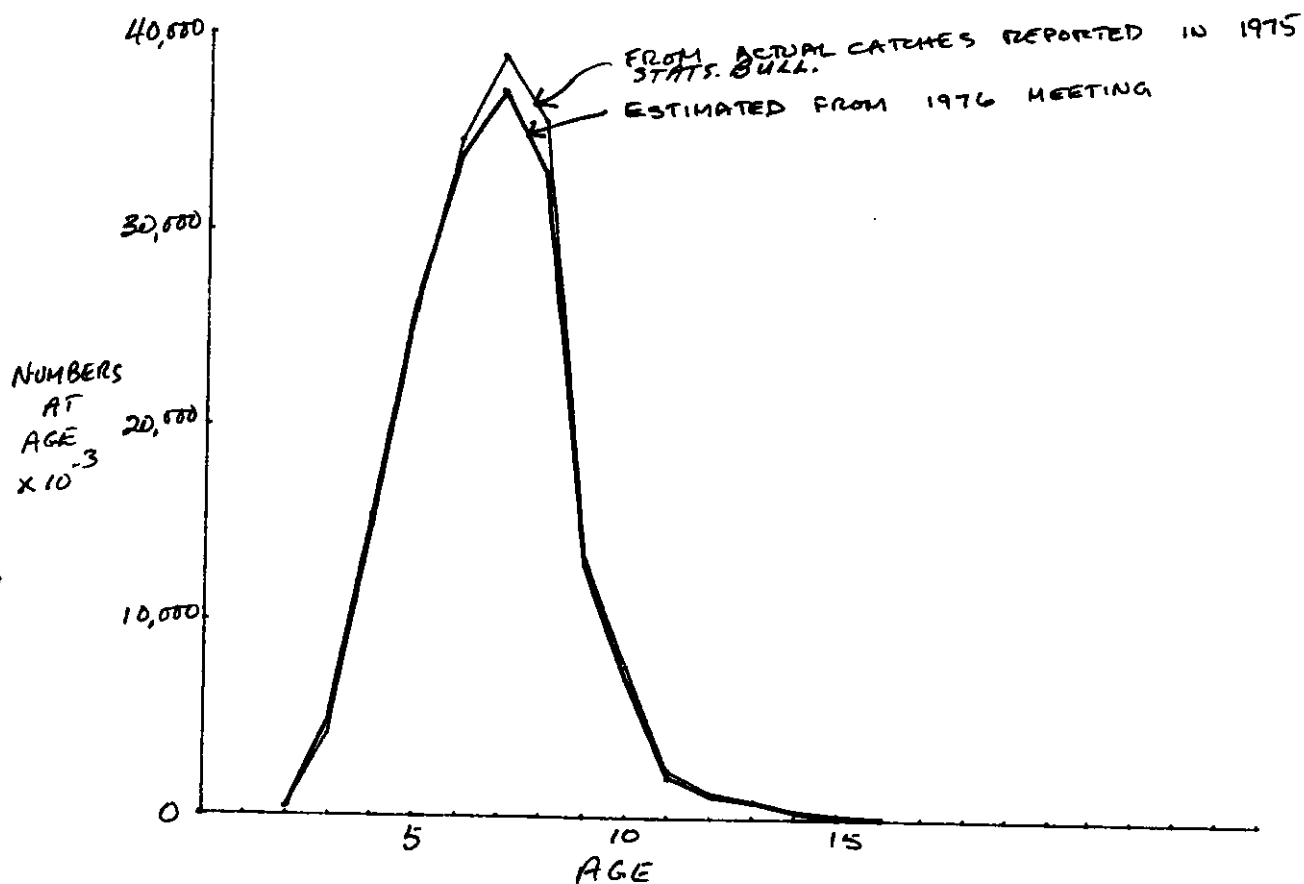


Fig 1. Age composition of 253KL cod in 1975.



Serial No. 5051
(D.c.9)

ICNAF Res.Doc. 77/VI/26
ADDENDUM I

ANNUAL MEETING - JUNE 1977

Status of the cod stock in Div. 2J-3KL

Recruitment of the stock of 4-year olds

Results of the Soviet young fish surveys to date are given in Table 18 of the USSR Research Report (Summ.Doc. 77/VI/15) log-log regressions of the numbers of 4-year-old cod present in the stock against numbers per hour caught at ages 2 and 3 for the period 63-75 are:

Div	Age	Slope	Intercept	R	Comments
3K	2	.4776	3.3594	.84	omitting 62, 63 and 65
	3	.4799	3.0691	.74	
3L	2	.0998	3.6131	.23	
	3	.2997	3.2613	.50	

Estimates of recruitment for the 1972, 73 and 74 year-classes are given in Table 1. Values of recruitment used in projecting catches in 1978 and beyond were:

Year class	H
1972	3500
1973	5500
1974	4000

Terminal F in 1976

Effort data in 1976 were available for Subarea 2 and Div. 3K combined. Catches in 1976 were not available by tonnage classes, and it did not appear feasible to extract catch and effort information sufficient to derive a value of F in 1976 from the available regressions of F against effort.

Estimates of F in 1975 were obtained from 2 regressions (a) F against (USSR >2000 tons) standard effort

$$F = .0000 f - .0613; \quad r = .74$$

$$F_{1975} = .66 \text{ with effort of } 23,400 \text{ standard units}$$

(b) F against (Spain 901-1800 tons) standard effort

$$F = .00534 f + 0.085; \quad r = .66$$

$$F_{1975} = .27; \text{ with effort of } 349,551$$

An average value of F in 1975 is therefore around 0.5.

Projected catches of cod in Div 2J3KL

Table 2 shows the projections of catches and biomass at different values of recruitment and at $F_{opt} = .20$, $F = .15$ and $F = .10$ in 1978 and thereafter.

Table 3 shows the projected spawning stock biomass (7+) for these same runs.

TABLE 1. Estimates of recruitment in 2J3KL cod

USSR Young Fish Survey					Stock-Recruitment Predictor from		
YC	USSR Young Fish	Age	#	Av	Spawning Biomass	# biomass	Av
1972	3K	2	0	3676	2448	2224	2336
	3K	3	3180				
	3L	2	4578				
	3L	3	3270				
1973	3K	2	5794	5650	1727	1581	1654
	3K	3	6967				
	3L	2	5108				
	3L	3	4730				
1974	3K	2	3866	4289	2056	2382	2219
	3L	2	4712				

TABLE 2. Projected Catches, 1975-88, 2J3KL Cod

YEAR	Catches					
	RUN 5	6	7	8	9	10
1975	297	297	297	297	297	297
6	218	218	218	218	218	218
7	159	159	159	159	159	159
8	162	162	125	125	85	85
9	199	191	159	153	108	112
80	233	200	192	166	123	140
81	257	196	217	168	128	163
82	276	187	236	164	128	181
83	290	181	253	161	128	197
84	304	178	268	161	130	211
85	317	180	283	165	136	227
86	327	182	295	168	141	240
87	331	178	300	165	138	246
88	331	170	301	156	129	247

TABLE 3. Projected Spawning stock biomass in 2J3KL cod at the beginning of each year, 1975-88.

Beginning of year	Run 5	6	7	8	9	10
75	6110	6110	6110	6110	6110	6110
76	4526	4526	4526	4526	4526	4526
77	3916	3916	3916	3916	3916	3916
78	3923	3923	3923	3923	3923	3923
79	4811	4811	5060	5060	5334	5334
80	6949	6949	7675	7675	8503	8503
81	7813	7813	9001	9001	10393	10393
82	9000	7562	10655	9045	10864	12673
83	10039	7414	12156	9134	11303	14793
84	10947	7346	13492	9245	11720	16749
85	11706	7309	14643	9350	12078	18488
86	12362	7315	15673	9485	12459	20094
87	12622	7068	16121	9211	12180	20849
88	12634	6584	16139	8490	11107	20891

