

Status of the cod stock in Subdivision 3Ps

by

C.A. Bishop
Department of Fisheries and Oceans
P.O. Box 5667
St. John's, Newfoundland
A1C 5X1

Abstract

Catches declined in the 1970's to a low of approximately 26,000 t in 1978. Catch at age data from the commercial fishery in 1979 indicate that the 1974 year-class made up 50% of the catch. Survey data show that the 1978 year-class is strong. From a series of cohort runs an appropriate terminal F in 1979 was determined using the relationship of cohort biomass with standard C.P.U.E. Using this cohort biomass at age and an estimate of recruitment, the projected catch in 1981 fishing at $F_{0.1}$ would be approximately 32,700 t.

Résumé

Les prises ont diminué durant les années 1970 pour atteindre un minimum d'environ 26,000 t en 1978. La composition en âge des prises commerciales en 1979 montre que la classe d'âge de 1974 constitue plus de 50% des prises. Les croisières de recherches indiquent que la classe d'âge 1978 est abondante. La relation entre la biomasse des cohortes et la prise par unité d'effort fut utilisée pour ajuster l'analyse de cohortes afin de déterminer la mortalité par pêche en 1979. Les résultats de l'analyse de cohortes combinés à une estimation du recrutement indiquent que les captures en 1981 seront aux environs de 32,700 t à un taux de pêche de $F_{0.1}$.

Nominal catches

Cod catches in Subdivision 3Ps averaged approximately 63000 t in the 1960s. In the early 70s catches declined and were below TAC level up to 1976. The TAC's and corresponding catches are as follows:

	<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>
TAC('000 t)	70	70	62.4	47.5	32.5	25	25	28
Catch('000 t)	52.6	44.9	35.4	37.1	32.4	26.3	30.3*	

* Preliminary.

Catch compositions at age were obtained for the commercial fishery in 1979. Table 1 indicates the catch by Can(N) in 3Ps by month and gear. The sampling data available from Can(N) is shown in Table 2 while Table 3 shows 1979 age compositions by gear for all components of the commercial fishery. The age composition of the French catch was obtained using age frequency data on inshore and offshore fisheries provided by the St. Pierre Research Laboratory. The catch by Can(M) was adjusted using the age composition data from the Can(N) otter trawl fishery. The 1974 year-class predominated, making up almost 50% of the total catch.

Survey data

Surveys have been conducted in this area each year since 1972 on a stratified random basis. The results of these surveys in metric tons per strata by depth range are shown in Table 4. The variability in the surveys in terms of intensity of coverage in a given year and the biomass estimates produced can be readily seen. In only the most recent years has there been coverage over all depth ranges. Table 5 indicates the mean number of cod

caught at age, per tow, from the same research surveys. The data from the 1979 survey appears to be anomalous as compared with the 1978 and 80 surveys. Both the 79 and 80 surveys indicate that the 1978 year-class is strong.

Partial selection

Partial selection values were obtained using two data sources as shown in Tables 6 and 7. In Table 6, average F's for the period 1974-76 from a cohort run were used to estimate partial selection. In Table 7, estimates were obtained by comparing percent age compositions from the commercial fishery and research surveys. The values obtained from averaging cohort F's (Table 6) were thought to best represent the current fishery.

Yield per recruit

Using partial selection values shown in Table 6 and average weights from the 1979 commercial fishery, yield per recruit values were determined (Table 8). The $F_{0.1}$ value of 0.20 and F_{max} of 0.30 were similar to these used in previous assessments.

Fishing mortality

Catch at age data from 1965 to 1979 along with average weight and partial selection values as shown in Table 8 were used to obtain a series of cohort runs over a range of Terminal F's. The relationship of cohort biomass (age 3+) at different terminal F's with standard C.P.U.E. for the period 1965-1978 is shown in Table 9. Although the relationship showed little variation over the range of Terminal F's shown, it was decided that a Terminal F of 0.22 was the best estimate with regard to the 1979 fishery. A cohort run using a terminal F in 1979 of 0.22 is shown in Table 10.

Recruitment and catch projections

Estimates of recruitment at age 3 in 1979, 80 and 81 were obtained (Table 11) from regressions of survey mean numbers per tow of ages 2 and 3 by year class against cohort numbers at age 3 ($F_t=0.22$). Using regression values obtained, with the 1973 value for 2 year olds excluded, estimated recruitment at age 3 in 1979, 80 and 81 were 26.96, 32.46, and 103.32 millions respectively. The geometric mean of recruitment over the ten year period 1968-77 (53.73 million) was used in projections beyond 1981. The results of these projections are shown in Table 12. Because the calculated value for recruitment of the 1976 year class was used in the projections a new partial selection value of 0.027 was obtained for 3 year olds as opposed to that of 0.0920 used in the cohort. The projected catch in 1981 at $F_{0.1}$ is approximately 32.7 thousand tons.

Table 1 Cod landings (metric tons) by Can(N) in Subdivision 3Ps by month and gear.

Months	OT	TRAP	GN	LT	HL	OTHER	TOTAL
January	805		37	495			1337
February	219		22	660	3		904
March	745		45	1177	3	1	1971
April	162	2	116	1094	12	9	1395
May	18	384	441	1065	198	7	2113
June	3	1544	1581	1353	1113	12	5606
July	5	100	1213	1154	723	34	3229
August	34		174	2796	729	63	3796
September	32	1	20	1686	201	85	2025
October	45		85	1357	117	30	1634
November	48		45	1176	14	19	1302
December	8		16	281			305
Total	2124	2031	3795	14294	3113	260	25617

Table 2 Cod length and age sampling data for 3Ps obtained by Can (N) in 1979 by gear and month.

Gear	Months	No. of samples	No. measured	No. aged
OT	January	3	1265	217
	March	1	737	
GN	April	2	379	976
LT	March	6	2640	
	April	11	5090	
	May	5	1692	
Trap	June	4	1456	696
GN	June	2	366	
	July	2	493	
LT	June	9	2415	
	July	3	1020	
	August	3	1194	
HL	June	1	337	
	July	1	249	
	August	1	323	
LT	October	4	1308	458
	November	5	1361	

Table 3. Age compositions for cod in Subdivision 3Ps in 1979.

Age	OT*	Can(N) Trap	GN	LT	HL	Total Can(N)	France	Can(M)	Grand Total
2				2		2			2
3		45		31	34	110	24		134
4	82	996	12	624	368	2082	159	29	2270
5	924	1670	247	3351	1624	7816	1015	321	9152
6	448	96	649	2023	462	3678	869	156	4703
7	120	11	532	1088	143	1894	403	42	2339
8	22	3	132	390	39	586	179	8	773
9	15		46	125	10	196	51	5	252
10			14	48	2	64	10		74
11			11	35	2	48			48
12			1	18		19			19
13			1	10		11			11
14			1	9		10			10
15			1	6		7			7
16				5		5			5
17				3		3			3
18				4		4			4
19				2		2			2
20									
Total	1611	2821	1647	7774	2684	16,537	2710	561	19,808
Ave. Wt.	1.48	0.72	2.30	1.84	1.16	1.55	1.44	1.48	1.53
Landings	2384	2031	3795	14,294	3113	25,617	3900	830	30,347

*Includes landings by DS, ScS, PrS, and MwT.

Table 4 Cod biomass (metric tons) from stratified random cruises in Subdivision 3Ps

Depth Range	Strata	Stratum Area	1972	1973	1974	1975	1976	1977	1978	1979	1980	
0-30	314	974	0	-	1328	-	2357	249	0	-	432	
	320	1320	-	729	-	-	1335	-	-	-	2946	
TOTAL			0	729	1328	-	3692	249	0	-	3378	
31-50	308	112	-	181	279	205	193	311	38	125	240	
	312	272	210	-	243	335	456	1047	343	151	-	
	315	827	1480	0	592	-	1747	1550	-	1836	235	
	321	1189	1917	0	-	-	1742	-	2037	-	1880	
	325	944	-	-	-	-	2	-	180	820	28	
	326	166	-	-	-	-	-	-	0	2	3	
TOTAL			3607	181	1114	540	4140	2908	2598	2934	2386	
51-100	307	395	2918	6133	3919	884	1127	2097	3222	4105	1763	
	311	317	3885	590	2432	763	627	411	154	1106	3792	
	317	193	101	286	589	164	551	491	-	368	536	
	319	984	4604	662	478	481	3102	2493	-	10637	1652	
	322	1567	-	-	-	-	5183	-	491	14	2599	
	323	696	736	-	-	-	368	63	1652	-	775	
	324	494	-	-	-	-	8	-	-	29	0	
TOTAL			12244	7671	7418	2292	10966	5555	5519	16259	11117	
101-150	306	419	-	-	376	719	214	161	416	710	457	
	309	296	662	975	479	311	178	192	103	1558	863	
	310	170	1008	191	377	2183	-	0	154	119	0	
	313	165	371	29	144	242	142	41	50	1036	127	
	316	189	271	937	63	58	77	17	-	65	61	
	318	123	173	11	4	0	0	6	-	36	790	
	TOTAL			2485	2143	1443	3513	611	417	723	3524	2298
151-200	705	195	-	-	66	0	0	60	1	91	674	
	706	476	-	-	23	-	-	76	-	356	827	
	707	93	-	-	5	0	0	228	-	326	190	
	715	132	-	-	-	1	1	31	142	352	499	
	716	539	-	-	-	-	-	92	781	303	248	
TOTAL			-	-	94	1	1	487	924	1428	2438	
201-300	708	117	-	-	-	0	-	11	-	177	4633	
	711	961	-	-	-	-	-	-	-	-	1113	
	712	973	-	-	-	-	-	-	-	9077	282	
	713	950	-	-	-	0	-	-	-	-	0	
	714	1195	-	-	-	-	-	-	-	-	0	
TOTAL			-	-	-	0	-	11	-	9254	6028	
<u>Total Area per Depth Range</u>												
0-30		2294									-	3378
31-50		3510									2934	2386
51-100		4646									16259	11117
101-150		1362									3524	2298
151-200		1435									1428	2438
201-300		4196									9254	6028
TOTAL											32599	27645

Table 5. Mean number of cod per tow from research trips in Subdivision 3Ps.

Age	1972	1973	1974	1975	1976	1977	1978	1979	1980
1	0.04	0.05	1.09	0.50	0.22	0.01	0.00	1.30	0.16
2	1.00	1.93	3.30	1.01	3.11	0.23	0.47	.54	4.57
3	1.76	2.45	3.29	2.82	2.02	3.70	0.73	.80	1.39
4	3.46	3.33	2.36	2.52	3.70	3.29	2.66	8.34	0.98
5	2.31	1.44	3.19	1.50	2.25	3.10	1.14	24.61	3.33
6	1.56	0.21	2.97	1.39	1.03	0.93	0.82	5.17	2.94
7	2.19	0.27	0.82	1.25	0.62	0.25	0.59	1.16	0.54
8	1.40	0.09	0.64	0.46	0.59	0.20	0.41	0.56	0.50
9	0.66	0.13	0.52	0.31	0.14	0.30	0.24	0.20	0.14
10	0.42	0.05	0.26	0.18	0.11	0.10	0.23	0.16	0.13
11	0.18	0.01	0.08	0.07	0.08	0.02	0.08	0.04	0.10
12	0.11	0.02	0.06	0.02	0.08	0.04	0.03	0.02	0.11
13+	0.64	0.04	0.15	0.07	0.08	0.10	0.15	0.04	0.10
Total	15.74	10.02	18.73	12.12	14.05	12.29	7.54	42.94	14.99

Table 6 Estimation of partial selection at age for cod in 3Ps based on cohort Average F^S (ages 6-8) for the period 1974-76.

AGE	1974	1975	1976	Avg. 74-76	P.S.
3	.063	.037	.126	.075	.092
4	.403	.266	.668	.446	.549
5	.716	.493	.956	.722	.889
6	.581	.856	1.003	.813	1.000
7	1.244	1.424	1.228	1.299	1.000
8	1.1747	.7198	.7695	.888	
9	2.4026	1.588	.5382	1.510	
10					
11					
12					
Ave F(6-8)	.7194	1.0496	.5797		

Table 7. Estimation of partial selection at age for cod in 3Ps.

Age	Survey	Commercial	% Survey	% Commercial	% Commercial/Survey	P.S.
3	611	134	1.95	.68	.3487	.084
4	6,356	2,270	20.86	11.47	.5499	.132
5	18,764	9,152	59.87	46.26	.7727	.185
6	3,941	4,703	12.57	23.77	1.8910	.453
7	887	2,339	2.83	11.82	4.1767	1.000
8	429	773	1.37	3.91	2.8540	.683
9	153	252	.49	1.27	2.5918	.620
10	126	74	.40	.37	.9250	.222
11	28	48	.09	.24	2.6667	.638
12	13	19	.04	.10	2.5000	.599

SUMMARY OF YIELD PER RECRUIT CALCULATED FROM
 PARTIAL RECRUITMENT AND AVERAGE WEIGHT AT AGE
 OVER AGES 3 TO 12

F	Y/R(KG)
.001	.0090
.050	.3582
.100	.5735
.150	.6978
.200	.7645
.250	.7953
.300	.8041
.350	.7998
.400	.7881
.450	.7725
.500	.7552
.550	.7375
.600	.7202
.650	.7037
.700	.6883
.750	.6739
.800	.6606
.850	.6484
.900	.6371
.950	.6268
1.000	.6173
1.050	.6086
1.100	.6005
1.150	.5931
1.200	.5863
1.250	.5799
1.300	.5740
1.350	.5685
1.400	.5634
1.450	.5586
1.500	.5542
1.550	.5500
1.600	.5461
1.650	.5424
1.700	.5389
1.750	.5356
1.800	.5325
1.850	.5296
1.900	.5268
1.950	.5242
2.000	.5217

AGE MEAN WEIGHT PROPORTION RECRUITED
 (Gms)

3	410.00	.092
4	650.00	.549
5	1010.00	.889
6	1650.00	1.000
7	2550.00	1.000
8	3680.00	1.000
9	4300.00	1.000
10	6490.00	1.000
11	7000.00	1.000
12	8200.00	1.000

NATURAL MORTALITY RATE IS .200

Table 9 Relationship of cohort biomass with standard CPUE from cohort runs at a range of terminal FS.

Popⁿ Biomass (Age 3+) at F_t

Year	CPUE	0.20	.22	.24	.26	.28
1965	.850	20667	20667	20667	20667	20667
66	.895	21675	21675	21675	21675	21675
67	.683	20935	20935	20935	20935	20935
68	.924	21954	21954	21954	21954	21954
69	.893	22319	22319	22319	22319	22319
70	.755	21561	21558	21556	21554	21553
71	.671	19858	19850	19843	19837	19832
72	.582	16598	16581	16567	16556	16546
73	.488	15459	15421	15389	15362	15338
74	.360	13592	13500	13422	13357	13301
75	.387	12517	12281	12103	11944	11808
76	.522	12897	12434	12048	11722	11442
77	.435	16307	15401	14646	14008	13461
78	.580	18036	16775	15725	14837	14077
79	.648	19409	17796	16452	15316	14343
80	.606					
Predicted 1979 Biomass		18266	18012	17836	17687	17559
r		.916	.9234	.9228	.9184	.9125
m		16731	17578	18275	18868	19376
Int		7384	6622	5994	5461	5003
T		7.917	8.335	8.2941	8.0397	7.726
DF		12	12	12	12	12

Table 10 - Cohort analyses 3Fs cod - 1965 - 79 - at Ft= 0.22

COD 3FS 1965-79																
NATURAL MORTALITY= 0.20																
PARTIAL RECRUITMENT MULTIPLIER																
0.0920 0.5490 0.8890 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000																
ASSUMED FISHING MORTALITY FOR LAST AGES																
0.4700 0.7600 0.5100 0.5200 0.7100 0.5800 0.6900 0.5000 0.5700 0.7200 1.0500 0.5800 0.4500 0.5300 0.2200																
ESTIMATED POPULATION																
AGE	YEAR	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
3		8305.	8386.	10013.	7352.	5516.	3538.	5764.	3354.	3236.	4749.	6973.	7391.	9134.	2708.	716.
4		5553.	6590.	6780.	7938.	5916.	4446.	2828.	4458.	2680.	2559.	3734.	5543.	5679.	7395.	2197.
5		2214.	3674.	4160.	4564.	5359.	4201.	2906.	1733.	3203.	1769.	1597.	2394.	3440.	3791.	5665.
6		1664.	1286.	1827.	2238.	2547.	3340.	2271.	1604.	1003.	1582.	878.	819.	1244.	2055.	2616.
7		626.	1035.	636.	917.	1303.	1436.	1851.	1201.	992.	460.	861.	308.	410.	721.	1303.
8		629.	382.	384.	308.	428.	655.	599.	772.	567.	459.	159.	174.	135.	251.	429.
9		392.	329.	169.	192.	134.	191.	314.	207.	393.	265.	159.	65.	97.	74.	139.
10		225.	211.	103.	84.	107.	38.	90.	141.	95.	141.	36.	22.	41.	55.	39.
11		134.	91.	78.	56.	31.	23.	12.	25.	74.	32.	25.	21.	13.	22.	28.
12		20.	80.	27.	30.	26.	20.	2.	3.	3.	42.	8.	5.	15.	5.	11.
KNOWN CATCHES																
AGE	YEAR	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
3		231.	95.	287.	114.	77.	76.	288.	73.	100.	170.	184.	411.	92.	22.	13.
4		964.	1366.	1091.	1260.	710.	811.	644.	494.	470.	550.	733.	1214.	949.	431.	227.
5		580.	1306.	1290.	1314.	1158.	1292.	857.	459.	1150.	630.	540.	792.	841.	539.	915.
6		361.	462.	639.	585.	718.	976.	727.	355.	400.	480.	454.	288.	326.	420.	470.
7		325.	512.	235.	357.	455.	637.	822.	460.	390.	240.	587.	130.	94.	179.	234.
8		206.	159.	136.	131.	176.	246.	313.	264.	220.	240.	72.	50.	40.	73.	77.
9		122.	183.	60.	55.	79.	73.	128.	83.	200.	200.	120.	14.	27.	24.	25.
10		103.	104.	32.	42.	72.	21.	54.	46.	50.	100.	10.	5.	12.	19.	7.
11		33.	52.	38.	22.	6.	18.	8.	20.	20.	20.	17.	2.	6.	8.	5.
12		7.	39.	10.	11.	12.	8.	1.	1.	1.	20.	5.	2.	5.	2.	2.

Table 10 (cont'd)

ESTIMATE FISHING MORTALITY		1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
AGE	YEAR															
3		0.0312	0.0126	0.0322	0.0173	0.0155	0.0240	0.0568	0.0243	0.0348	0.0404	0.0296	0.0634	0.0112	0.0090	0.0
4		0.2130	0.2602	0.1958	0.1929	0.1423	0.2251	0.2899	0.1306	0.2154	0.2712	0.2445	0.2771	0.2042	0.0666	0.0
5		0.3418	0.4989	0.4197	0.3830	0.2729	0.4153	0.3943	0.3463	0.5055	0.5002	0.4678	0.4551	0.3150	0.1709	0.0
6		0.2742	0.5050	0.4888	0.3409	0.3733	0.3900	0.4367	0.2805	0.5808	0.4084	0.8470	0.4920	0.3446	0.2560	0.0
7		0.5706	0.7909	0.5245	0.5624	0.4875	0.6739	0.6748	0.5503	0.5699	0.8606	1.4004	0.6276	0.2922	0.3205	0.0
8		0.4493	0.6156	0.4960	0.6340	0.6061	0.5359	0.8610	0.4748	0.5597	0.8613	0.6932	0.3828	0.3977	0.3884	0.0
9		0.4216	0.9557	0.4978	0.3815	1.0555	0.5484	0.5989	0.5839	0.8262	1.7894	1.7979	0.2712	0.3676	0.4430	0.0
10		0.7056	0.7897	0.4183	0.8021	1.3576	0.9371	1.0787	0.4463	0.8759	1.5349	0.3631	0.2962	0.3947	0.4810	0.0
11		0.3178	0.9999	0.7695	0.5728	0.2416	2.1332	1.2817	2.1034	0.3548	1.1535	1.4103	0.1131	0.7036	0.5009	0.0
12		0.4700	0.7600	0.5100	0.5200	0.7100	0.5800	0.6900	0.5000	0.5700	0.7200	1.0500	0.5800	0.4500	0.5300	0.2200
TOTAL F	AGES 4 TO 10	0.2953	0.4076	0.3199	0.2941	0.2687	0.3759	0.4475	0.2693	0.4405	0.4664	0.4692	0.3502	0.2604	0.1391	
POPULATION WTS AND NUS		1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
WT		20667.	21675.	20935.	21954.	22319.	21558.	19850.	16581.	15421.	13500.	12291.	12434.	15401.	16775.	17796.
NU		19961.	22065.	24177.	23679.	21367.	17889.	16638.	13499.	12246.	12059.	14432.	16742.	20207.	17078.	13142.
POPULATION WTS AND NDS AGE 6 TO 12		1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
WT		11416.	10242.	8222.	9171.	10800.	12974.	12713.	10558.	9117.	8103.	5392.	3382.	4490.	7029.	10353.
NU		3890.	3415.	3225.	3825.	4576.	5703.	5140.	3954.	3127.	2982.	2127.	1413.	1954.	3184.	4565.

Table 11. Relationship of survey mean No's per tow with cohort biomass at age 3. $F_t=0.22$

Year Class	2		3	Cohort Numbers at age 3	
78	4.57				
77	.54		1.39		
76	.47		.80		
75	.23		.73	2708	
74	3.11		3.70	9134	
73	1.01		2.02	7391	
72	3.30		2.82	6973	
71	1.93		3.29	4749	
70	1.00		2.45	3236	
69			1.76	3354	
		(excl. 1973)			
r^2	.54	.86	.44		
Slope	1508	1872	1641		
Int.	3040	1777	1423		
				Ave.	
	<u>Predicted Numbers at age 3</u>			<u>All points (excl. 1973)</u>	
78	9932	10332		9932	10332
77	3854	2788	3704	3779	3246
76	3749	2657	2736	3242	2696

Table 12.

CATCH PROJECTION FOR 1979 USING POPULATION ESTIMATES FROM COHORT WITH TERMINAL F OF .220

AGE	POPULATION NUMBERS (000S)	POPULATION WEIGHT (MT)	FISHING MORTALITY	CATCH NUMBERS (000S)	CATCH WEIGHT (MT)	RESIDUAL NUMBERS (000S)	RESIDUAL WEIGHT (MT)
3	26960.	11054.	.006	145.	59.	21942.	8996.
4	21970.	14281.	.121	2270.	1476.	15941.	10362.
5	56650.	57217.	.196	9151.	9242.	38142.	38523.
6	26160.	43164.	.220	4699.	7754.	17188.	28361.
7	13030.	33226.	.220	2341.	5969.	8561.	21831.
8	4290.	15787.	.220	771.	2836.	2819.	10373.
9	1390.	5977.	.220	250.	1074.	913.	3927.
10	390.	2531.	.220	70.	455.	256.	1663.
11	280.	1960.	.220	50.	352.	184.	1288.
12	110.	902.	.220	20.	162.	72.	593.
TOTAL	151230.	186098.		19766.	29379.	106019.	125917.

CATCH PROJECTION FOR 1980 USING POPULATION ESTIMATES FROM COHORT WITH TERMINAL F OF .220

AGE	POPULATION NUMBERS (000S)	POPULATION WEIGHT (MT)	FISHING MORTALITY	CATCH NUMBERS (000S)	CATCH WEIGHT (MT)	RESIDUAL NUMBERS (000S)	RESIDUAL WEIGHT (MT)
3	32460.	13309.	.005	146.	60.	26444.	10842.
4	21942.	14262.	.101	1915.	1245.	16238.	10555.
5	15941.	16100.	.164	2187.	2209.	11081.	11192.
6	38142.	62934.	.184	5830.	9619.	25978.	42864.
7	17188.	43830.	.184	2627.	6699.	11707.	29852.
8	8561.	31506.	.184	1309.	4815.	5831.	21458.
9	2819.	12121.	.184	431.	1853.	1920.	8255.
10	913.	5927.	.184	140.	906.	622.	4037.
11	256.	1794.	.184	39.	274.	175.	1222.
12	256.	2101.	.184	39.	321.	175.	1431.
TOTAL	138479.	203884.		14661.	28000.	100170.	141708.

Table 12 continued

CATCH PROJECTION FOR 1981 USING POPULATION ESTIMATES FROM COHORT WITH TERMINAL F OF .220

AGE	POPULATION NUMBERS (000S)	POPULATION WEIGHT (MT)	FISHING MORTALITY	CATCH NUMBERS (000S)	CATCH WEIGHT (MT)	RESIDUAL NUMBERS (000S)	RESIDUAL WEIGHT (MT)
3	103320.	42361.	.005	504.	207.	84136.	34496.
4	26444.	17189.	.110	2497.	1623.	19399.	12610.
5	16238.	16401.	.178	2404.	2428.	11129.	11240.
6	11081.	18284.	.200	1827.	3014.	7428.	12256.
7	25978.	66244.	.200	4282.	10920.	17414.	44404.
8	11707.	43081.	.200	1930.	7101.	7847.	28878.
9	5831.	25073.	.200	961.	4133.	3909.	16807.
10	1920.	12460.	.200	316.	2054.	1287.	8352.
11	622.	4354.	.200	103.	718.	417.	2919.
12	349.	2862.	.200	58.	472.	234.	1919.
TOTAL	203490.	248309.		14882.	32670.	153199.	173881.

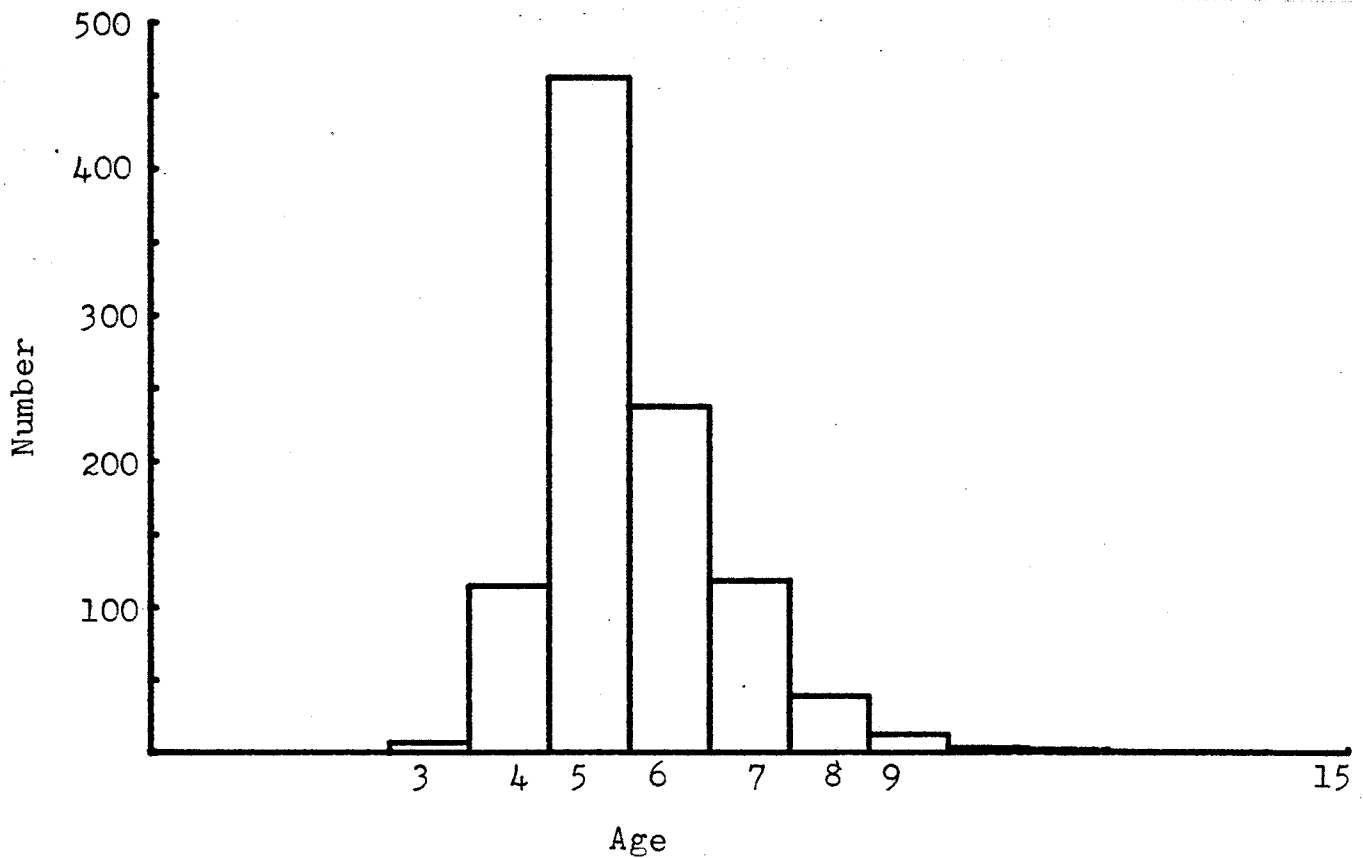
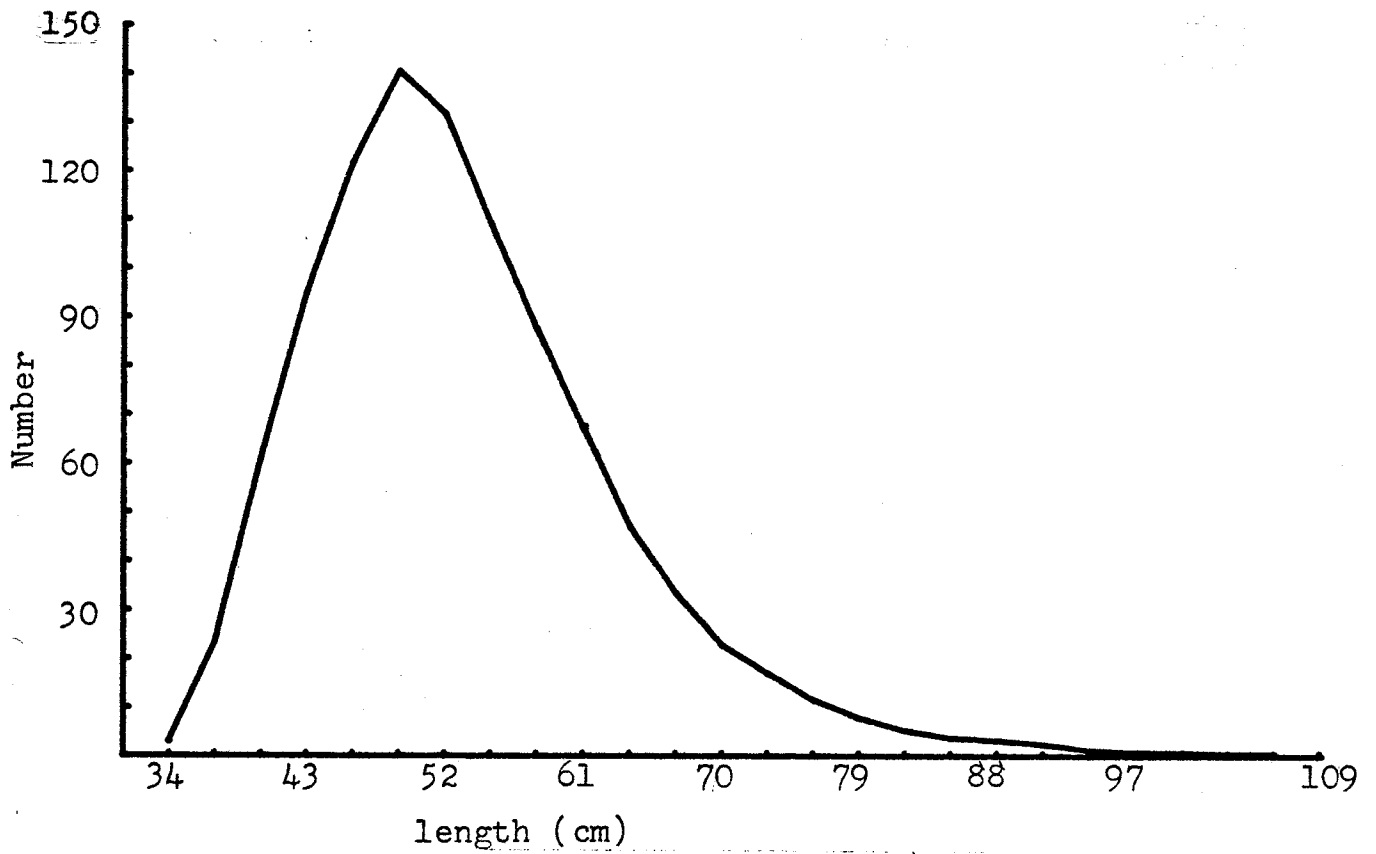


Figure 1. Per mille length (a) and age (b) compositions from the commercial fishery in 3Ps in 1979

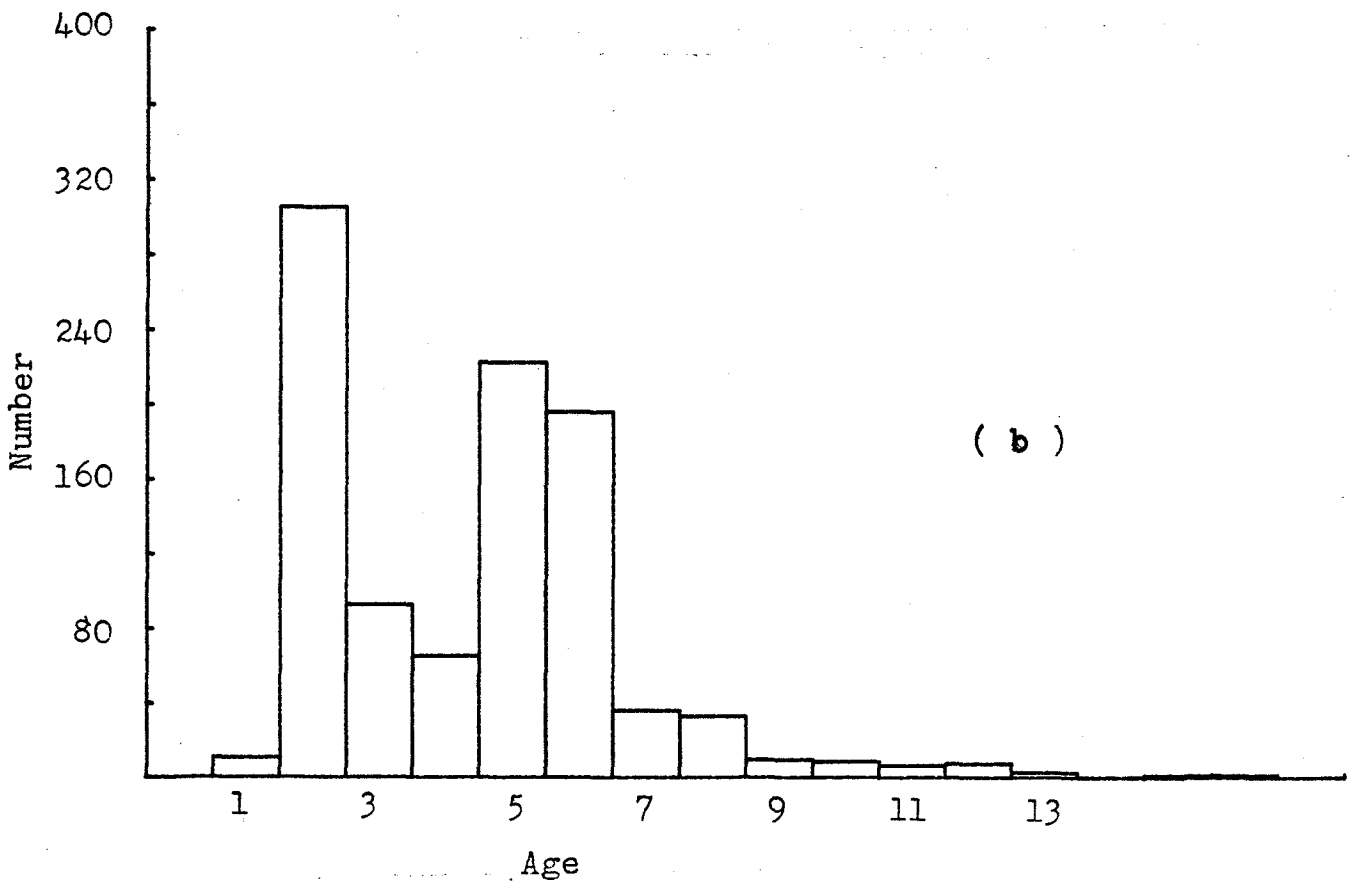
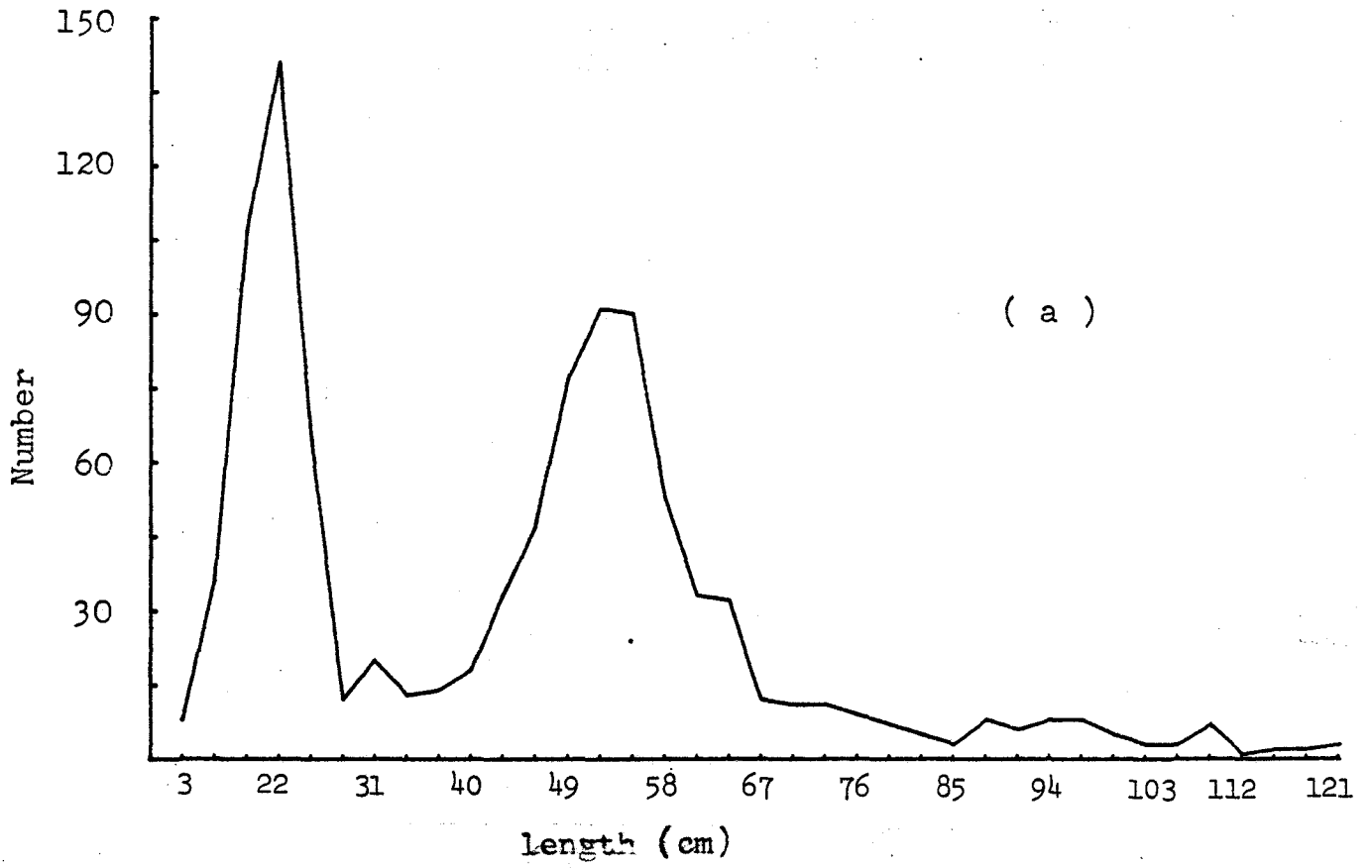


Figure 2. Per mille length (a) and age (b) compositions from a research survey in 3Ps in March 1980

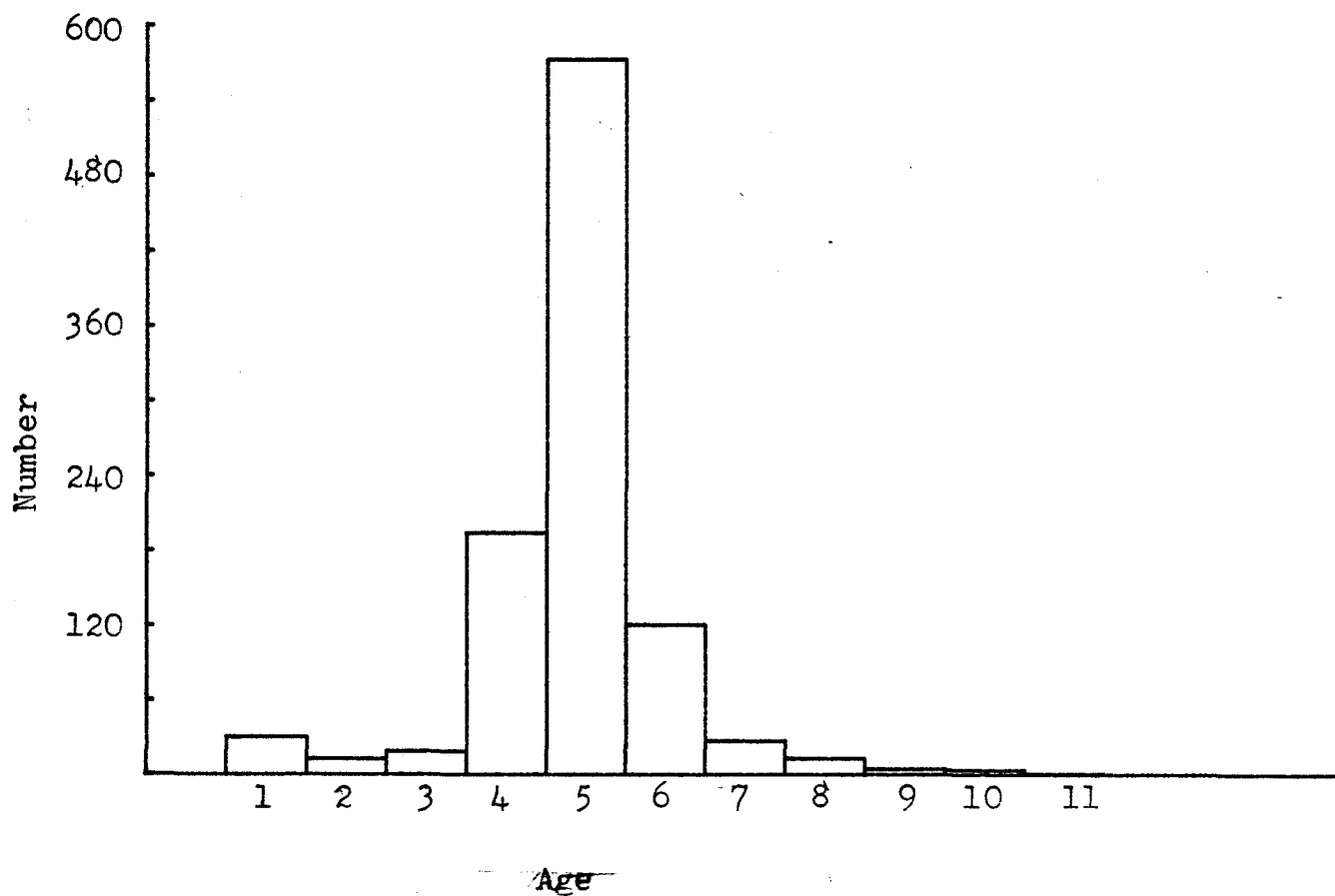


Fig 3 - Per mille age composition from a research survey in 3Ps in March 1979