Assessment of Pollock (*Pollachius virens*)
in Divisions 4VWX and Subdivision 5Zc for 1992

by

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Abstract

The 1992 fishery for 4VWX5Zc pollock landed 34,291 t, a shortfall of about 9,000 t from the TAC and about 5,000 t less than in 1991. The majority of the landings were made in 4X with landings in this area having remained relatively stable above 20,000 t over the past eight years. Landings in 4V, however, have declined by about 10,000 t since 1989. The foreign bycatch of pollock, managed under the domestic silver hake allocations, increased to 2,000 t due mostly to increased Cuban landings. Research surveys conducted from 1970-1992 indicate an increase in the age 4-9 abundance during the early 1980's with subsequent estimates being highly variable. The 1992 age 4-9 estimate is the lowest since 1983.

The sequential population analysis (SPA) was calibrated using the July RV index in ADAPT. The accepted formulation in which abundance of one age was estimated assumed more structure than in previous years and made use of partial recruitment values and catch data to estimate abundance of other ages. The fully recruited F for 1992 was 0.56, nearly twice $F_{0.1}$. Recruitment for the 1979-1988 period has been average or above with the 1988 year-class appearing to be particularly strong. Early signals also suggest the 1989 year-class to be large. Stock size (age 2+) was low in the early 1970's, peaked during the mid-1980's and has declined since. Spawning stock biomass (age 4+) has declined since the mid-1980's and so has the abundance of age 7+ fish.

Commercial catch rates are at their lowest point in a 5 year time series. As well, industry reported a lack of availability or abundance of larger pollock although comments from fishermen noted large numbers of small pollock. Evidence indicates the stock now consists predominantly of small pollock such that future yields will depend very much on the strength of incoming year-classes.

Résumé

En 1992, les débarquements de goberge provenant de 4VWX5Zc se sont chiffrés à 34 291 t, soit 9 000 t de moins que le TPA et 5 000 t de moins qu'en 1991. La majorité des débarquements provenaient de 4X, zone où ils sont demeurés stables et supérieurs à 20 000 t au cours des huit dernières années. Les débarquements de 4V ont toutefois reculé d'environ 10 000 t depuis 1989. Les prises accidentelles étrangères de goberge, dont la gestion s'inscrit dans celle des allocations de merlu argenté canadien, ont augmenté à 2 000 t, en raison surtout de la hausse des débarquements des navires cubains. Les relevés de recherche réalisés de 1970 à 1992 révèlent une augmentation de l'abondance des poissons de 4 à 9 ans au début des années 1980, les estimations des années subséquentes étant très variables. L'estimation de l'abondance des poissons de 4 à 9 ans en 1992 est la plus basse depuis 1983.

L'analyse séquentielle de population (ASP) a été calibrée au moyen de l'indice du relevé de recherche de juillet et de la méthode ADAPT. La formule acceptée d'évaluation de l'abondance d'une classe d'âge était fondée sur l'hypothèse d'une meilleure structure par rapport aux années antérieures et faisait appel aux valeurs de recrutement partiel et aux données sur les prises pour l'estimation de l'abondance des autres classes d'âge. La valeur F des âges pleinements recrutés pour 1992 était de 0,56, soit deux fois $F_{0.1}$. Pour la période 1979-1988, le recrutement a été égal ou supérieur à la moyenne, la classe d'âge de 1988 semblant particulièrement forte. Les premiers indices donnent à penser que la classe d'âge de 1989 est imposante. La grosseur du stock (âge 2+) était faible au début des années 1970, a atteint un sommet vers le milieu des années 1980 et a diminué depuis. La biomasse du stock de géniteurs (âge 4+) a régressé depuis le milieu des années 1980, comme d'ailleurs l'abondance des poissons d'âge 7+.

Les taux de prises commerciales sont à leur plus bas niveau d'une série chronologique de cinq ans. L'industrie a signalé une faible disponibilité ou abondance de grosses goberges, mais les pêcheurs faisaient état de grandes quantités de petites goberges. Il apparaît que le stock se compose maintenant essentiellement de petites goberges, aussi le rendement futur dépendra-t-il beaucoup de la force des nouvelles classes d'âge.

Introduction

Description of the Fishery

The 1992 pollock landings (34,293 t) were significantly below the TAC of 43,000 tonnes, and represent the third consecutive year in which substantial shortfalls in pollock landings below the 43,000 t TAC have been reported (Table 1; Figs. 1 and 2). Canadian landings consistently account for the majority of the catch. Catches by foreign fleets have been primarily incidental with the major share taken by Russian and Cuban trawlers fishing for silver hake and other groundfish, or by the USA fishing on the northeast peak of Georges Bank (Table 1). Since the extension of jurisdiction in 1977, catches by foreign vessels other than the USA have generally averaged less than 2000 t. With the definition of the international boundary, the ICJ line (Fig. 3) in 1984, no USA catches have been reported. However, USA landings in the Gulf of Maine and Georges Bank have continually dropped from a high of 24,000 t in 1986 to about 7,000 t in 1992 (Mayo and Figuerido 1993).

The pollock fishery is prosecuted mainly in 4X and 5Zc with a smaller portion taken in 4VW (Fig. 2). For example, in 1992, 70% of pollock were taken in 4X and 5Zc. 1992 landings of 9,173 t in 4VW are lower than 1991 landings (11,579 t) and indicate a marked decrease compared to the 1985-1990 annual landings which were in the 15,000-20,000 t range (Table 2). The domination of the 4VW pollock fishery by 4V catches during 1985-1990 has changed, such that 4W pollock landings in 1991 and 1992 were double to triple those in 4V. The fishery in 4VW is dominated by large offshore vessels greater than 100 ft. using mobile gear, whereas in 4X and 5Zc the fishery is dominated by inshore vessels less than 65 ft. using both mobile and fixed gear.

Seasonal breakdowns (Table 3) indicate a year round fishery, although with a greater proportion of landings occurring during May-August especially in 4X and 5Zc. Small mesh landings by the USSR (1,006 t) remained at about the 1991 level, high compared to the 1981-1987 period. The overall small mesh landings (2,102 t) show an increase, due to increased Cuban landings which have approximately doubled for the second consecutive year (Table 1).

The Canadian catch is broken down by gear, area and season in Table 4. The large trawler tonnage class (TC) 4+ landings remained close to the level observed in 1990 and 1991 but low compared to the 1985-1989 period. A 40% increase in 4X and 5Zc landings for otter trawlers TC 1-3 has occurred since 1990. The increase could be partly due to the Vessel Replacement Program. This program has inshore boats (TC 1-3) fishing offshore allocations (TC 4+), with an especially high incidence of this occurring possibly in the latter part of the year when operators of large otter trawlers (e.g., Sea Freeze) realize they may not catch their enterprise allocation by year end. In 1992, 4,160 t of pollock were captured in the Vessel Replacement Program (M. Etter, pers. comm.) which indicates that the TC 4+ fleet had difficulty in filling their allocations.

Since 1982, the pollock fishery has been regulated by quotas on four gear sectors: 1) fixed gear; (2) mobile gear greater than 100 ft; (3) mobile gear less than 65 ft; and, (4) mobile gear 65-100 ft. In 1988 mobile gear and fixed gear less than 65 ft were further divided: a) mobile gear and fixed gear less than 45 ft; and, b) mobile gear and fixed gear 45-65 ft. In 1991, management initiatives included the introduction of Individual Transfer Quotas (ITQ) (cod haddock pollock 4VWX). Mobile gear <65 ft is now divided into two categories or fleets; (1) mobile gear <65 ft ITQ fishery and (2) mobile gear <45 ft generalists. The non ITQ fleet sector continues to be managed using licence conditions and trip limits. For further details on the history of management measures affecting the 4VWX5Zc pollock fishery refer to Annand and Beanlands (1992).

Quota allocations and associated catch for 1992 are presented in Table 5. The shortfall in 1992 Canadian allocations (from quota reports) amounted to 11,872 t (28% of TAC). The mobile gear sector >100 ft and 65-100 ft had a combined shortfall of 7,081 t. Mobile gear <65 ft ITQ fleet had a shortfall of 1,625 t. Fixed gears (<45 ft and 45-65 ft) had a combined shortfall of 3,196 t. The Vessel Replacement Program has confounded reporting of landings such that it is no longer possible to record an exact correspondence between quota allocations and landings data.

Catch at Age

The catch at age prior to 1992 was taken from Annand and Beanlands (1992). Catch and mean weight at age were estimated by making adjustments for the duplicate reporting of foreign fleet domestic allocations. In 1992, this amounted to 235 t in 4X and 963 t in 4W. Catch and mean weight at age for 1992 landings were estimated using samples from the commercial fisheries. Sampling for 1992 is shown in Table 6. Sampling was somewhat low for gillnetters and small otter trawlers TC 1-3, and greater sampling could have occurred for the otter trawlers TC4+ (4VW). Seasonal age length keys were generated separately for the otter trawlers TC4+ in 4VW and 4X+5. Annual keys were generated for small trawlers TC1-3 (4VWX+5) and fixed gears (4VWX+5). Length-weight parameters were obtained from analysis of the 1992 summer groundfish survey collections. Input data for generating the six keys used for the Canadian catch at age are given in Table 7. These keys accounted for 32,191 t or 94% of the entire catch, the difference consisting of the foreign by-catch. The age composition of the small mesh catch was based on pollock length frequencies from IOP data for the USSR and Cuban fisheries and the 4VW age-length key of July RV survey. Weights at age were from the July RV survey. The total combined catch at age reflects the total landings (34,293 t of pollock in 4VWX and 5Zc). The total catch at age is given in Table 8 along with the Canadian catch at age and the small mesh and foreign catch-at-age matrices. As in most years five or fewer year-classes contributed significantly to the annual landings.

Catch at age for 1992 was dominated by the 1985-1989 year-classes (ages 3-7) accounting for 93% of the catch in number (Table 8). The 1989 year-class at age 3 comprised 14% of the catch. The 1988 year-class at age 4 was 35% of the catch; the greatest proportion by numbers

of any year-class in 1992. These are the highest observed values at these ages since 1982 and 1983, respectively. The small mesh catch at age contributed 97% of age 2 fish and 43% of age 3 fish to the total catch at age, respectively. Since the mid-1980's, weight at age has declined, with 1992 however showing a slight increase (Table 9).

Abundance Indices

Commercial Catch Rates

Commercial catch rates are not used for calibration purposes, however mobile gear catch rates were investigated by Hanke (1993). A multiplicative model, using the ZIFF (Zonal Interchange File Format) data base, was used to standardize catch rates by NAFO division, tonnage class, month and year (1987-1992). Data used in the analyses were aggregated to the trip level and confined to vessels in which pollock comprised >50% of the catch. Results indicate a steady decline in catch rates since 1989.

Research Surveys

Three vessels have been involved in the summer stratified random surveys of the Scotian Shelf (Figure 4) since 1970. After analysis of comparative fishing experiments, pollock catches were found to be the same between the different research vessels and hence no conversion factors were applied. The mean number per tow and estimated total numbers at age from these surveys for strata 40-95 are in Tables 10, 11, and 12 and ages 4-9 and 1-3 abundance are plotted in Figure 5.

The research surveys from 1970-1992 indicate an increase in the age 4-9 abundance during the early 1980's with subsequent estimates being highly variable. The 1992 age 4-9 estimate was the lowest since 1983. The 1987 and 1990 survey numbers appear to be anomalously high especially for ages 4-5 and 2-3, respectively (Table 12). The 1989 year class was the 4th and 5th highest in the two years it was present in the 22 year survey. The 1988 year-class also appears to be above average, attaining the 7th highest value at age 4 y in the time series. In general, however, the survey exhibits pronounced year effects making it difficult to estimate year class strengths and short-term changes in abundance. Distribution maps (Figure 6) indicate that very few pollock were caught in the 4VW portion of the survey. Pollock ages 7-13 were not abundant in any area.

Sequential Population Analysis

Estimation of Parameters

The accepted ADAPT formulation estimated seven parameters (age 8 population numbers and survey K's age 4-9) (Table 13) (Gavaris 1988). Several other ADAPT formulations were investigated but were not accepted. Rejected ADAPT formulations in which several age classes (e.g., ages 4-9 y) were estimated resulted in high coefficient of variations (60-80%) on parameter

estimates. Moreover, estimates of age-specific fishing mortality varied widely in these rejected formulations. The accepted formulation in which abundance of one age was estimated assumed more structure and made use of partial recruitment values and catch data to estimate abundance of other ages. PR was estimated for the 1988-1991 period from the ratio of F's at younger ages to fully recruited F's (ages 7-9). The 1988-1991 period was used to estimate PR to reflect more recent fishing patterns. Natural mortality was assumed to be constant at 0.2 for all ages and years. Corrections for bias were made on all estimated ages. Because only a short time series (2 y) exists for the 1989 year-class, and because strong year effects occur in the survey, it was considered prudent to record its size as the geometric mean.

Assessment Results

The ADAPT summary table is given in Table 14. Age 8 population numbers were estimated as having a coefficient of variation (CV) of 33%. The CV's ranged from 26-34% for ages 3-12 and bias ranged from 3-4%. The CV's on survey K's were 16%. Log residuals (Table 15) were reviewed and yearly patterns observed. Fishing mortality at fully recruited age 8 was 0.56 in 1992. F's at ages 6-11 ranged from 0.51-0.56 in 1992. The fishing mortality matrix, beginning of year numbers and biomass and midyear biomass are presented in Tables 16-19. In 1992, the fully recruited fishing mortality of 0.56 was nearly twice the $F_{0.1}$ target level (Fig. 7).

The 1979 (76 million) year-class at age 2 is the largest observed in the 1974-1992 period (Fig. 8). The 1980-1985 year-classes are all near the long-term geometric mean of 28 million. The 1988 year-class was estimated to be the second largest at 50 million.

Stock size (age 2+) was low in the early 1970's peaked during the mid-1980's and has declined since (Fig. 9). The abundance of age 7+ fish has declined in recent years. Spawning stock biomass and population numbers (age 4+) have declined since the mid-1980's (Figs. 10 and 11).

Prognosis:

Catch projections were made for 1994 using the following data:

| Age | Weight[a] (kg) | | | |
	1993 beginning number ('000) bias corrected pop. numbers	Beginning of Year	Mean of Year	PR[b]
2	28000[c]	0.33	0.53	0.004
3	12277	0.78	1.14	0.065
4	16686[d]	1.45	1.80	0.345
5	21789	2.11	2.46	0.652
6	7008	2.71	3.08	0.915
7	2401	3.30	3.67	1.000
8	1356	3.85	4.07	1.000
9	525	4.41	4.85	1.000
10	290	4.97	5.16	1.000
11	221	5.32	6.19	1.000
12	101	6.96		1.000

a 1989-1992 average
b 1988-1991 average
c Geometric Mean (GM) recruitment (74-92) is 28 million
d set 1989 year-class to GM for catch projections

The 1993 TAC of 43,000 t, as prescribed in the multi-year plan, was reduced at the beginning of the year to 35,000 t, and later in the year reduced further to 21,000 t ($F_{0.1}$). A 1993 TAC of 35,000 t would have implied a fishing mortality of 0.54 in 1993 (Table 20). Setting the 1993 TAC at $F_{0.1}$ (F=0.30) implies a 1993 catch of 21,000 t and a $F_{0.1}$ catch of 23,586 t in 1994. Beginning of year spawning stock biomass and total biomass based on these catch projections are given in Table 20 and Fig. 12.

A source of concern for this stock is the drop in catch in 1989-1992 to below the TAC with both large and TC 1-3 mobile gear and fixed gear failing to take their allocations. Commercial catch rates, although not used in the calibration, are at their lowest point in a 5 year time series (Hanke 1993). As well, industry reported a lack of availability or abundance of larger pollock although comments from fishermen noted large numbers of small pollock. The 1988 and 1989 year-classes (the latter set to the geometric mean for projections) will comprise the majority of the catch in 1994 (4 and 5-year-olds). Subsequent size estimates of these year classes will have a strong effect on advice of future pollock yields.

Acknowledgements:

References:

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Table 1a. Pollock landings (t round fresh) by country for divs. 4VWX and Subdiv. 5Zc, 1974-1977.

Year	Canada	Fed. Rep. Germany	German Dem. Rep.	Japan	Spain	USSR	United Kingdom	U.S.A.	Other	Total
1974	24975	149	–	40	1500	2301	47	435	14	29461
1975	26548	236	95	–	708	2004	–	403	124	30118
1976	23565	994	24	–	303	1466	–	443	385	27180
1977	24653	368	–	1	–	182	–	325	53	25582

Table 1b. Pollock landings (t round fresh) by country for divs. 4VWX and Subdiv. 5Zc, 1978-1992.

Year	Canada	Japan	France		Cuba	USSR	U.S.A.	Other	Total
			St. Pierre	& Mainland					
1978	26801	110	15	18	141	502	451	–	28038
1979	29967	19	8	15	50	1025	391	7	31482
1980	35986	81	19	80	32	950	443	–	37591
1981	40270	15	17	73	–	358	918	–	41651
1982	38029	3	30	14	84	297	840	–	39297
**1983	32749	6	22		261	226	1324	–	34588
1984	33465	1	46		123	97	1691	1	35424
1985	43300	17	77		66	336	–	–	43796
1986	43249	51	77		387	564	–	4	44332
1987	45330	82	28		343	314	–	–	46097
1988	41831	1	–		225	1054	–	–	43111
*1989	41112	1	–		99	1782	–	–	42994
*1990	36178	–	–		261	1040	–	–	37479
*1991	37798	38	–		459	1177	–	–	39472
*1992	32191	72	9		1015	1006	–	–	34293

* - Provisional catch statistics
** - From 1983 on, French catches are combined

Table 2. Pollock landings (t, round fresh) for divisions 4VWX
          and Subdivision 5Zc.

Year	4V	4W	4X	5Y	5Zc	Total 4VW	Total 4X+5Zc	Total
1974	307	4740	19731	680	4003	5047	24414	29461
1975	799	5697	17977	420	5225	6496	23622	30118
1976	1102	3424	19164	57	3433	4526	22654	27180
1977	1347	6082	14381	237	3535	7429	18153	25582
1978	2931	4910	14997	341	4859	7841	20197	28038
1979	4877	4963	18219	573	2850	9840	21642	31482
1980	3893	7511	20110	530	5547	11404	26187	37591
1981	2316	15678	18689	713	4255	17994	23657	41651
1982	2939	9373	20771	926	5288	12312	26985	39297
1983	5491	5787	17603	1079	4628	11278	23310	34588
1984	5474	6043	18926	2091	2890	11517	23907	35424
1985	12085	3262	26685	853	911	15347	28449	43796
1986	15250	4046	22845	654	1537	19296	25036	44332
1987	12820	4425	26756	-	2096	17245	28852	46097
1988	11871	4240	24596	-	2404	16111	27000	43111
**1989	12027	3863	23283	530	1409	*17772	25222	*42994
**1990	8150	4044	21903	346	1735	*13495	23984	*37479
**1991	4131	7448	25533	465	1718	*11756	27716	*39472
**1992	2203	6970	20737	443	3036	*9173	24216	*34293

    * - Includes catch where division is unknown.
   ** - Data from DFO Statistics Branch, provisional data for
        countries other than Canada.

Table 3. Pollock landings (t round fresh) by season and country for NAFO divs. 4VWX and Subdiv. 5Zc.

Canada (Maritimes & Newfoundland)

Year	4VW				4X + 5Zc			
	Jan-Apr	May-Aug	Sept-Dec	Total	Jan-Apr	May-Aug	Sept-Dec	Total
1974	713	1257	807	2777	1643	11738	8817	22198
1975	1223	1005	1854	4082	1836	9866	10764	22466
1976	425	845	1186	2456	2078	12167	6864	21109
1977	931	1428	4748	7107	6010	5880	5656	17546
1978	3875	2696	510	7081	5835	7484	6401	19720
1979	1406	5477	1927	8810	4558	10023	6576	21157
1980	2493	4301	3633	10427	6353	13188	6018	25559
1981	4056	2437	11055	17548	5792	7170	9760	22722
1982	3030	4082	4774	11886	3096	14664	8383	26143
1983	2029	7099	1644	10772	4879	14212	2886	21977
1984	2288	4744	4217	11249	2820	13900	5496	22216
1985	3861	5031	5959	14851	6589	15673	6187	28449
1986	5522	8157	4534	18213	5859	14091	5086	25036
1987	6177	5521	4780	16478	5766	16496	6590	28852
1988	4744	5807	4397	14948	3761	15710	7412	26883
*1989	4050	7538	4302	15890	6743	12471	6008	25222
*1990	4752	4529	2913	12194	3126	13839	7019	23984
*1991	4391	2282	3994	10667	6668	13719	6744	27131
*1992	3303	3118	2528	7685	4564	13854	5420	23603

* - Data from DFO Statistics Branch

USSR

Year	4VW					4X + 5Zc				
	Jan-Apr	May-Aug	Sept-Oct	UK Mon.	Total	Jan-Apr	May-Aug	Sept-Dec	UK Mon.	Total
1974	194	903	628	–	1725	11	512	53	–	576
1975	471	981	221	–	1673	58	149	124	–	331
1976	555	488	291	–	1334	10	58	64	–	132
1977	17	82	–	–	99	39	44	–	–	83
1978	9	459	8	–	476	–	26	–	–	26
1979	4	928	–	–	932	6	87	–	–	93
1980	122	715	–	–	837	–	113	–	–	113
1981	45	311	–	–	356	2	–	–	–	2
1982	–	297	–	–	297	–	–	–	–	–
1983	16	204	–	–	220	–	6	–	–	6
1984	–	97	–	–	97	–	–	–	–	–
1985	–	336	–	–	336	–	–	–	–	–
1986	–	564	–	–	564	–	–	–	–	–
1987	–	314	–	–	314	–	–	–	–	–
1988	96	958	–	–	1054	–	–	–	–	–
**1989	605	1177	–	–	1782	–	–	–	–	–
**1990	342	698	–	–	1040	–	–	–	–	–
**1991	151	640	2	–	793	–	384	–	–	384
**1992	519	350	–	–	868	2	135	–	–	136

** - Provisional data

Table 3. (Continued)

Other Foreign Countries

Year	4VW					4X + 5Zc				
	Jan-Apr	May-Aug	Sept-Oct	UK Mon.	Total	Jan-Apr	May-Aug	Sept-Dec	UK Mon.	Total
1974	176	196	173	–	545	746	605	289	–	1640
1975	421	57	263	–	741	145	253	427	–	825
1976	254	318	162	2	736	288	237	888	–	1413
1977	10	194	19	–	223	168	304	52	–	524
1978	36	153	95	–	284	200	111	140	–	451
1979	22	22	54	–	98	118	136	138	–	392
1980	101	38	1	–	140	272	128	115	–	515
1981	90	–	–	–	90	410	269	254	–	933
1982	23	106	–	–	129	365	221	256	–	842
1983	18	268	–	–	268	358	497	472	–	1327
1984	87	83	1	–	171	387	528	776	–	1691
1985	82	70	8	–	160	–	–	–	–	–
1986	204	291	24	–	519	–	–	–	–	–
1987	110	311	32	–	453	–	–	–	–	–
1988	4	222	–	–	226	–	–	–	–	–
**1989	99	1	–	–	100	–	–	–	–	–
**1990	153	108	–	–	261	–	–	–	–	–
**1991	209	169	–	1	379	–	118	–	–	118
**1992	259	361	–	1	620	12	464	–	–	476

** – Provisional data

Table 4. Nominal landings of pollock in NAFO divs. 4VW and 4X and Subdiv. 5Zc for Canada (Maritimes, Quebec and Newfoundland).

OTTER TRAWLERS -- Tonnage Classes 4+

Year	4VW				4X + 5Zc			
	Jan-Apr	May-Aug	Sept-Dec	Total	Jan-Apr	May-Aug	Sept-Dec	Total
1970	1523	212	138	1873	686	1865	1581	4132
1971	629	63	208	900	919	3473	2073	6465
1972	417	90	545	1052	1461	5800	4138	11399
1973	726	276	2173	3175	3259	4227	3239	10725
1974	707	1113	628	2448	1057	6350	5964	13371
1975	1222	926	1776	3924	1042	5699	5361	12102
1976	424	737	1081	2242	877	5418	2746	9041
1977	912	1358	4545	6815	4846	1522	2661	9029
1978	3558	2107	377	6042	4676	3383	2411	10470
1979	1368	5194	1715	8277	3487	3421	1004	7912
1980	2448	3949	3412	9809	4321	3409	2411	10141
1981	3980	1382	9017	14379	4280	558	4956	9794
1982	2919	3084	4123	10126	1628	3917	3665	9210
1983	1879	6144	1032	9055	2890	2652	396	5938
1984	2155	3416	3559	9130	729	1633	564	2926
1985	3628	4339	5502	13469	581	835	879	2295
*1986	4861	6499	3957	15317	1326	939	235	2500
*1987	5609	4178	3998	13785	2435	2518	2408	7361
*1988	3951	3588	4244	11783	755	3301	2951	7007
*1989	3006	4933	3669	11608	1498	2489	2596	6583
*1990	4154	2832	1836	8822	1654	1835	1268	4757
*1991	3851	1533	2487	7871	1513	2607	1496	5616
*1992	2157	1794	999	4950	1330	2163	1280	4743

* - Provisional

Table 4. (Continued)

OTTER TRAWLERS -- Tonnage Classes 1-3

Year	4VW				4X + 5Zc			
	Jan-Apr	May-Aug	Sept-Dec	Total	Jan-Apr	May-Aug	Sept-Dec	Total
1970	8	0	0	8	336	2042	483	2861
1971	4	0	0	4	245	1708	717	2670
1972	0	9	1	10	537	2035	902	3474
1973	0	0	2	2	1922	6762	618	9302
1974	0	39	40	79	562	3398	591	4551
1975	0	0	0	0	745	2610	836	4191
1976	0	0	0	0	1039	2844	715	4598
1977	0	2	0	2	896	2224	808	3928
1978	9	23	2	34	955	2187	961	4103
1979	0	8	2	10	869	4043	1170	6082
1980	2	137	18	157	1523	4033	823	6379
1981	32	302	44	378	957	3178	1547	5682
1982	58	220	93	371	713	4775	1734	7222
1983	84	155	23	262	1403	6829	855	9087
1984	119	598	252	969	1847	8492	3015	13354
1985	197	151	89	437	5408	8564	1386	15358
*1986	379	804	44	1227	3797	4801	594	9192
*1987	504	311	73	888	2747	5859	483	9089
*1988	556	708	13	1277	2739	6196	244	9179
*1989	934	1296	60	2290	4533	2366	48	6947
*1990	403	594	492	1489	533	3985	1996	6514
*1991	317	72	641	1030	4334	5164	2086	11584
*1992	220	149	968	1337	2645	6406	1377	10428

* - Provisional

Table 4. (Continued)

GILLNET, LONGLINE and MISCELLANEOUS Gears -- all tonnage classes

Year	4VW				4X + 5Zc			
	Jan-Apr	May-Aug	Sept-Dec	Total	Jan-Apr	May-Aug	Sept-Dec	Total
1970	0	46	224	270	53	893	663	1609
1971	0	118	72	190	5	979	544	1528
1972	0	137	170	307	8	927	845	1780
1973	6	101	139	246	9	2196	1335	3540
1974	6	105	139	250	24	1990	2262	4276
1975	1	79	78	158	49	1557	4567	6173
1976	1	108	105	214	162	3908	3403	7473
1977	19	68	203	290	268	2134	2188	4590
1978	308	566	131	1005	204	1914	3029	5147
1979	38	275	210	523	202	2559	4402	7163
1980	43	215	203	461	509	5746	2784	9039
1981	44	753	1994	2791	555	3434	3257	7246
1982	53	778	558	1389	755	5972	2984	9711
1983	66	800	589	1455	586	4731	1635	6952
1984	14	730	406	1150	244	3775	1917	5936
1985	36	541	368	945	600	6274	3922	10796
*1986	264	732	403	1399	716	8422	4202	13340
*1987	69	1022	709	1800	589	8100	3696	12385
*1988	80	1339	340	1759	260	6223	4230	10713
*1989	110	1309	573	1992	712	7616	3364	11692
*1990	196	1104	584	1884	939	8018	3755	12712
*1991	223	677	865	1765	822	5948	3162	9932
*1992	123	715	561	1399	613	5056	2763	8432

* - Provisional

Table 5. Allocations and Percent Taken for Pollock in 1992.

Year	Fleet	Alloc. (t) (Qutoa Rpts.)	Reported Catch (t) (Quota Rpts.)	Percent Taken (%)
1992	All Vessels	43,000	31,128	72%
	Fixed Gear <45'	12,070	8,934	74%
	Fixed Gear 45-65'	315	255	81%
	Mobile Gear >100'	19,047	12,175	64%
	Mobile Gear 65-100'	1,728	1,519	88%
	Mobile Gear <65' ITQ Fishery	9,840	8,215	84%
	Mobile Gear <45' Generalists	0	30	–

Table 6. Canadian commercial samples available for pollock in divs. 4VW and in Div. 4X and Subdiv. 5Zc by gear and season for 1992.

Area	OTB 4+				OTB TC, 1-3				GN				LL & Others			
	Jan-Apr	May-Aug	Sept-Dec	Total	Jan-Apr	May-Aug	Sept-Dec	Total	Jan-Apr	May-Aug	Sept-Dec	Total	Jan-Apr	May-Aug	Sept-Dec	Total
4VW	13	11	3	27	0	1	0	1	0	4	2	6	-	1	-	1
4X+5Zc	5	10	3	18	9	12	5	26	2	5	5	12	-	3	2	5

Table 7. Grouping of catch by gears and time period for estimation of removals-at-age for 199L. OTB trawls are primarily stern bottom trawls, but there are some side trawls; GN are gillnets, LL are longlines, and Others are primarily inshore fisheries.

Period	Tonnage Class	Gear	No. of Samples	Area	Number Aged	Number Measured	Catch (t)	Weight-Length Relationship		Cruise	Date
								a	b		
Jan-Dec	TC 1-6	GN, LL, Other	24	4VWX+5	708	4965	9831	0.0171	2.92708	Needler 173/174	June/July 1992
Jan-Dec	TC 1-3	OTB	27	4VWX+5	842	6355	11765	0.0171	2.92708	Needler 173/174	June/July 1992
Jan-Apr	TC 4+	OTB	13	4VW	353	2979	2660	0.0142	2.92992	Needler 173/174	June/July 1992
May-Aug	TC 4+	OTB	11	4VW	261	2303	2254	0.0142	2.92992	Needler 173/174	June/July 1992
Sept-Dec	TC 4+	OTB	3	4VW	62	737	999	0.0142	2.92992	Needler 173/174	June/July 1992
Jan-Apr	TC 4+	OTB	5	4X+5	138	1085	1306	0.0171	2.92708	Needler 173/174	June/July 1992
May-Aug	TC 4+	OTB	10	4X+5	142	1834	2392	0.0171	2.92708	Needler 173/174	June/July 1992
Sep-Dec	TC 4+	OTB	3	4X+5	70	599	1280	0.0171	2.92708	Needler 173/174	June/July 1992

Table 8.   Catch at age (numbers in thousands).

Total Catch at Age

	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
1	0	0	0	0	0	8	0	10	0	1
2	197	175	178	36	23	98	171	871	134	56
3	5603	1058	1361	1476	835	2763	291	1334	4018	1999
4	2662	4023	1974	2873	3119	5786	1864	673	1589	9514
5	2356	2090	3649	1785	3084	3482	5306	2044	563	1256
6	1088	1904	1089	2181	1276	1705	3169	4019	1873	238
7	317	835	1089	732	1167	528	1075	2432	2295	524
8	164	196	207	417	257	249	277	713	1069	835
9	80	55	36	108	143	47	168	208	389	428
10	83	57	14	19	17	15	32	148	172	163
11	74	35	18	25	19	14	9	31	87	50
12	40	31	49	80	18	0	2	24	22	58

	1984	1985	1986	1987	1988	1989	1990	1991	1992
1	1	1	1	0	1	0	8	0	0
2	87	37	60	10	27	71	51	300	30
3	803	493	635	467	683	585	1226	1427	2066
4	3493	2190	3062	2259	2669	4371	2139	3696	5070
5	7155	4160	3562	4908	3290	3952	3996	3159	3380
6	639	6183	3595	3538	3390	2378	2549	3944	1763
7	92	1105	3306	2404	1860	1977	1551	1681	1106
8	217	131	299	1736	1181	886	851	782	433
9	210	139	82	177	1005	675	545	349	239
10	92	230	117	39	43	402	243	288	182
11	18	85	171	48	19	15	88	192	84
12	23	59	116	98	97	14	34	203	52

Table 8 (Cont'd)   Canadian Catch at Age

	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
1	0	0	0	0	0	8	0	0	0	0
2	185	167	126	36	23	98	128	42	132	54
3	4784	986	1207	1433	786	2752	244	1333	3516	1857
4	2364	3567	1738	2855	3070	5582	1733	672	1584	9309
5	2125	1852	3170	1760	3022	3341	5035	2043	563	1248
6	954	1660	939	2128	1222	1645	3113	4019	1872	237
7	273	795	1001	710	1142	495	1047	2432	2294	523
8	144	132	194	395	246	248	269	712	1067	833
9	64	45	35	90	134	47	165	207	389	428
10	51	56	12	19	17	15	32	148	172	163
11	33	34	16	25	19	14	9	31	87	50
12	10	30	42	80	18	0	2	24	22	58

	1984	1985	1986	1987	1988	1989	1990	1991	1992
1	0	0	0	0	0	0	0	0	0
2	22	24	4	8	27	44	6	16	1
3	720	477	317	428	618	495	1018	688	1136
4	3491	2179	2868	2231	2493	3691	1940	3213	4208
5	7152	4126	3519	4859	3235	3772	3674	3043	3183
6	639	6178	3575	3489	3345	2335	2484	3885	1646
7	91	1102	3291	2372	1784	1911	1531	1666	1061
8	215	126	298	1672	1146	847	835	772	416
9	207	134	82	175	991	650	535	337	232
10	148	221	113	35	43	382	243	285	176
11	31	78	165	44	17	12	86	188	81
12	24	57	113	95	93	10	28	202	50

Table 8 (Cont'd)

Foreign Catch at Age

	1974	1975	1976	1977-1992
1	0	0	0	0
2	12	8	17	0
3	291	67	121	0
4	162	228	160	0
5	152	87	237	0
6	77	78	64	0
7	20	23	42	0
8	9	4	14	0
9	6	2	2	0
10	3	1	2	0
11	3	1	2	0
12	1	1	8	0

Small Mesh Gear Catch at Age

	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
1	0	0	0	0	0	0	0	10	0	0	1	1
2	0	0	35	0	0	0	43	829	2	2	65	13
3	528	6	33	43	49	11	47	1	502	142	83	16
4	136	229	77	18	49	104	131	1	5	205	2	11
5	79	151	242	25	62	141	271	1	0	8	3	34
6	57	166	86	53	54	60	56	0	1	1	0	5
7	24	17	46	22	25	33	28	0	1	1	1	3
8	10	60	0	22	11	1	8	1	2	2	2	5
9	10	9	0	18	9	0	3	1	0	0	3	5
10	29	0	0	0	0	0	0	0	0	0	0	9
11	38	0	0	0	0	0	0	0	0	0	0	7
12	29	0	0	0	0	0	0	0	0	0	2	2

	1986	1987	1988	1989	1990	1991	1992
1	1	0	1	0	8	0	0
2	56	2	0	27	45	284	29
3	318	39	65	90	208	739	887
4	194	28	176	680	199	483	757
5	43	49	55	180	322	116	127
6	20	49	45	43	65	59	80
7	15	32	76	66	20	15	22
8	1	64	35	39	16	10	8
9	0	2	14	25	10	12	2
10	4	4	0	20	0	3	2
11	6	4	2	3	2	4	1
12	3	3	4	4	6	1	1

Table 9. Mean Weights at Age (kg)

Total Weight at Age

	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
1	.00	.00	.00	.00	.00	.19	.00	.00	.00	.63
2	.82	.86	.59	.79	1.14	.77	1.03	.68	.76	.83
3	1.38	1.26	1.21	1.10	1.23	1.18	1.68	1.74	1.19	1.25
4	1.94	1.95	1.92	1.52	1.80	1.55	2.08	2.54	2.69	1.66
5	3.00	3.06	2.81	2.48	2.60	2.62	2.77	2.91	3.51	3.12
6	4.09	3.81	3.71	3.50	3.90	3.40	3.46	3.34	4.18	4.12
7	5.08	5.06	4.67	4.52	4.59	4.34	4.12	4.32	4.45	4.83
8	6.16	6.52	5.64	5.47	6.02	5.55	5.58	5.93	5.19	5.08
9	6.68	7.49	7.02	6.62	6.91	6.61	6.50	6.90	6.12	5.84
10	7.39	7.49	7.80	7.25	7.37	7.14	9.07	7.77	7.64	6.48
11	8.58	8.22	8.76	10.02	8.38	8.79	8.40	7.54	8.00	8.00
12	10.03	9.59	9.11	11.30	10.03	.00	11.65	9.22	8.65	8.72

	1984	1985	1986	1987	1988	1989	1990	1991	1992
1	.36	.00	.10	.00	.00	.00	.25	.14	.00
2	.73	.74	.35	.64	1.17	.67	.49	.47	.47
3	1.64	1.49	1.13	1.32	1.37	1.23	1.35	.95	1.04
4	2.36	1.96	2.00	1.96	1.88	1.77	2.03	1.69	1.69
5	2.67	2.73	2.52	2.50	2.64	2.48	2.55	2.29	2.52
6	3.84	3.12	3.29	2.94	3.21	3.25	2.95	2.79	3.33
7	5.41	3.42	3.61	3.71	3.51	3.80	3.83	3.34	3.72
8	5.97	4.39	4.20	4.03	4.23	4.10	4.11	3.84	4.25
9	5.90	6.10	5.66	4.55	4.41	4.81	4.92	4.65	5.00
10	6.32	5.86	6.09	6.26	5.26	5.16	5.10	4.77	5.63
11	7.69	6.17	6.11	6.15	7.18	7.77	5.94	5.08	5.95
12	8.53	7.52	6.68	7.57	8.46	7.39	7.22	5.62	6.35

Table 9 (Cont'd)   Canadian Weight at Age

	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
1	.00	.00	.00	.00	.00	.19	.00	.00	.00	.00
2	.83	.86	.63	.79	1.14	.77	1.12	1.01	.76	.84
3	1.43	1.27	1.23	1.11	1.26	1.18	1.77	1.74	1.24	1.25
4	1.98	1.99	1.94	1.52	1.81	1.54	2.10	2.54	2.70	1.67
5	3.02	3.10	2.80	2.48	2.59	2.63	2.80	2.91	3.51	3.13
6	4.05	3.87	3.73	3.49	3.88	3.38	3.47	3.34	4.18	4.11
7	5.03	5.07	4.65	4.50	4.59	4.33	4.14	4.32	4.45	4.83
8	6.06	6.51	5.62	5.45	6.00	5.54	5.56	5.93	5.19	5.08
9	6.62	7.47	7.04	6.55	6.84	6.61	6.51	6.90	6.12	5.84
10	7.22	7.69	7.71	7.25	7.37	7.14	9.07	7.77	7.64	6.48
11	8.12	8.47	8.67	10.02	8.38	8.79	8.40	7.54	8.00	8.00
12	9.37	9.89	9.19	11.30	10.03	.00	11.65	9.22	8.65	8.72

	1984	1985	1986	1987	1988	1989	1990	1991	1992
1	.00	.00	.00	.00	.00	.00	.00	.00	.00
2	1.46	.94	.83	.72	1.17	.83	.76	.48	.84
3	1.68	1.52	1.39	1.37	1.46	1.26	1.45	1.12	1.30
4	2.36	1.96	2.02	1.97	1.92	1.88	2.05	1.75	1.77
5	2.67	2.74	2.52	2.51	2.64	2.51	2.55	2.31	2.55
6	3.84	3.12	3.29	2.95	3.22	3.26	2.96	2.80	3.39
7	5.41	3.43	3.61	3.72	3.51	3.83	3.84	3.34	3.75
8	5.97	4.39	4.20	4.04	4.23	4.12	4.12	3.83	4.27
9	5.90	6.13	5.66	4.55	4.41	4.84	4.94	4.65	5.00
10	6.34	5.89	6.09	6.32	5.26	5.19	5.10	4.75	5.64
11	7.69	6.19	6.11	6.27	8.03	8.66	5.94	5.07	5.96
12	8.76	7.56	6.86	7.62	8.52	7.44	7.39	5.61	6.34

Table 9 (Cont'd)

Foreign Weight at Age

	1974	1975	1976	1977-92
1	.00	.00	.00	.00
2	.59	.84	.63	.00
3	1.24	1.13	1.04	.00
4	1.81	1.68	1.88	.00
5	2.89	2.32	2.83	.00
6	3.97	3.25	3.52	.00
7	5.23	4.33	4.83	.00
8	6.70	5.13	5.90	.00
9	6.72	5.13	6.70	.00
10	7.00	.00	8.26	.00
11	8.43	.00	9.46	.00
12	13.00	.00	8.68	.00

Small Mesh Gear Weight at Age

	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
1	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
2	.00	.00	.00	.00	.00	.00	.77	.66	.62	.43
3	1.02	1.11	.92	.74	.83	1.23	1.25	1.52	.84	1.15
4	1.47	1.74	1.45	1.65	1.66	1.81	1.86	1.74	2.15	1.28
5	2.71	3.04	2.91	2.80	2.88	2.49	2.19	2.96	.00	2.52
6	4.90	3.47	3.68	3.90	4.32	3.93	2.72	3.63	3.54	4.38
7	5.50	5.62	5.13	4.99	4.45	4.48	3.14	4.28	4.97	4.62
8	7.01	6.64	.00	5.90	6.45	5.98	6.32	5.41	6.30	4.35
9	7.01	8.00	.00	6.92	8.01	.00	6.37	7.36	8.82	5.03
10	7.73	.00	.00	.00	.00	.00	.00	8.87	7.43	7.08
11	8.99	.00	.00	.00	.00	.00	.00	.00	.00	7.61
12	10.20	.00	.00	.00	.00	.00	.00	.00	8.50	8.39

	1984	1985	1986	1987	1988	1989	1990	1991	1992
1	.36	.00	.00	.00	.00	.00	.25	.14	.00
2	.48	.37	.32	.32	.26	.42	.45	.47	.46
3	1.29	.62	.87	.79	.50	1.08	.86	.79	.70
4	2.50	1.39	1.68	1.40	1.22	1.19	1.85	1.29	1.23
5	2.82	2.35	2.48	1.92	2.39	2.04	2.59	1.85	1.90
6	3.77	2.92	3.24	2.65	2.70	2.82	2.80	2.69	2.16
7	4.97	3.04	3.20	2.94	3.36	3.08	3.68	3.40	2.77
8	5.60	4.29	3.85	3.61	4.33	3.69	3.77	3.89	3.46
9	5.87	5.40	.00	4.78	4.30	3.99	4.32	4.54	4.31
10	5.96	5.35	6.14	5.74	.00	4.45	5.74	6.02	4.60
11	7.25	5.94	6.04	4.84	.00	4.19	6.12	5.86	5.85
12	6.19	6.46	.00	5.96	7.04	7.24	6.45	8.25	6.80

Table 10.   Mean number/tow for 4VWX + 5 Pollock in Canadian summer bottom trawl surveys (strata 40-95)[1].

Stratum	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	All
40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.26	.41	45.11	.34	.51	3.09	2.83	0	2.5
41	0	0	0	0	0	0	.31	0	0	1.46	.65	1.30	.29	1.03	.21	37.43	9.14	14.10	3.89	4.32	.78	3.57
42	0	0	0	0	0	0	0	0	0	0	0	0	0	.34	0	.16	.33	0	.39	.22	.83	.11
43	0	0	0	0	0	0	0	0	0	0	.21	.23	0	0	0	0	0	0	0	0	0	.09
44	0	0	0	0	0	.17	0	0	0	0	0	0	0	.26	.83	.34	0	0	0	.26	.12	1.33
45	.19	0	0	0	0	0	0	0	0	0	0	0	0	21.63	.17	5.85	0	0	0	0	0	1.9
46	0	0	0	0	0	.34	0	0	0	0	.97	16.47	0	3.09	.69	0	.97	13.35	2.07	.34	2.31	.14
47	0	.37	0	.44	0	0	0	.61	0	0	.51	.26	0	0	0	0	0	.66	0	0	0	0
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.47
49	0	0	0	0	0	0	0	4.08	0	0	0	0	5.35	0	.52	0	0	0	0	0	0	2.48
50	0	0	0	.36	0	0	0	1.56	0	15.10	1.09	0	0	0	.34	.34	0	0	32.73	0	.65	42.58
51	0	0	0	0	.55	.49	3.13	25.93	0	2.92	571.50	0	0	96.76	1.09	133.02	22.13	6.09	21.23	0	9.26	9.76
52	.46	0	0	0	0	.55	.49	3.60	0	0	5.05	3.60	113.75	6.69	60.03	.34	.55	.52	.65	7.29	1.49	1.21
53	0	0	0	0	0	.34	0	0	0	0	0	0	0	0	.34	0	.58	0	0	3.83	20.42	.15
54	.34	0	0	0	0	0	.39	0	0	0	0	0	0	1.05	0	0	0	0	0	0	1.46	.60
55	0	0	0	0	0	0	0	0	0	.29	1.42	.26	0	0	.13	.12	0	.15	.68	8.36	1.12	1.54
56	0	.18	0	0	0	.34	0	0	0	0	0	.16	2.97	1.94	.17	.70	4.73	.35	1.40	19.19	.28	.02
57	0	0	0	0	0	0		0	0	0	.49	0	0	0	0	0	0	0	0	0	0	.18
58	0	0	0	0	0	0	0	0	0	0	0	2.27	0	0	.21	0	1.03	0	.20	0	0	2.43
59	0	.58	0	0	.20	.63	.24	0	0	0	0	.58	17.06	2.34	10.47	3.94	9.43	.78	0	0	4.86	48.37
60	.83	4.12	0	5.07	0	.97	14.72	2.89	353.50	.97	6.55	29.17	36.66	12.40	8.92	337.21	10.49	40.88	111.02	35.08	4.37	3.10
61	0	.51	0	20.26	0	2.78	0	0	0	0	2.76	1.46	1.61	5.06	3.78	11.67	3.28	3.28	3.09	4.52	.97	8.92
62	0	0	5.10	2.73	.51	0	3.82	1.22	55.19	6.87	.78	0	1.29	60.12	14.78	3.98	6.85	2.80	13.68	1.51	6.08	2.94
63	0	0	0	3.31	6.13	1.17	0	5.83	.51	5.41	.31	4.86	0	1.46	2.57	6.69	.55	8.23	5.14	4.09	5.58	5.09
64	.19	0	0	0	.32	1.79	3.52	.97	0	0	0	41.22	.62	2.96	.28	4.57	1.58	23.77	1.37	6.00	17.78	3.28
65	0	0	25.03	1.17	2.33	1.95	.41	.21	0	.85	.15	.51	1.29	2.72	.19	5.65	1.88	3.31	.82	13.27	7.11	.30
66	0	0	0	0	0	0	0	0	0	0	0	0	0	3.24	.39	.55	0	2.19	0	0	0	48.26
70	.38	27.47	2.40	.49	96.62	18.47	74.79	9.30	1.09	16.40	0	42.41	6.56	60.82	19.56	72.06	74.27	9.07	364.41	41.63	75.35	8.79
71	0	.55	0	0	0	6.35	3.04	0	4.86	1.37	0	.97	1.63	27.79	4.63	108.57	6.85	1.03	4.03	6.02	6.81	22.48
72	.82	1.09	2.57	0	2.13	1.74	.46	.34	16.42	5.83	.49	5.47	1.75	377.22	6.18	3.60	8.51	14.41	.98	2.07	19.93	.22
73	0	0	0	0	0	.55	0	0	.38	0	0	0	0	.49	2.13	.51	0	0	0	0	.49	.14
74	0	0	0	0	0	0	0	0	.52	0	0	0	0	0	1.88	.55	0	0	0	0	0	.15
75	0	0	0	0	0	0	0	0	0	0	0	0	.51	0	1.03	0	0	1.03	0	0	.49	29.63
76	0	9.24	8.07	7.70	2.19	20.79	1.75	0	1.17	0	0	6.03	50.95	0	26.74	1.68	35.97	4.31	439.15	2.44	4.13	1.45
77	.44	1.84	0	0	0	0	0	.58	0	0	0	1.03	0	0	0	23.50	0	0	.22	.56	2.29	2.75
78	.88	.97	0	1.09	0	0	1.75	1.72	0	0	0	0	0	3.89	.36	0	4.12	0	20.78	0	22.21	3.24
80	.19	.46	0	0	.23	34.81	.55	0	.97	0	.51	1.46	0	1.84	3.25	14.67	.22	1.42	1.35	2.99	3.11	7.42
81	0	6.00	1.30	0	.29	0	2.11	0	2.42	1.46	1.80	2.73	.26	.46	8.14	.68	2.36	.73	104.49	18.36	2.17	5.91
82	.46	0	0	0	.32	.73	1.02	13.64	1.35	4.04	1.41	1.00	.88	.49	1.03	4.25	3.62	38.11	2.98	34.58	14.25	3.63
83	2.43	0	0	0	1.95	.49	0	.58	.78	0	.52	.51	1.54	.49	0	1.64	1.03	0	12.43	49.97	1.85	5.33
84	1.25	1.78	1.34	1.58	21.52	2.38	.49	9.82	.25	16.54	.26	0	3.43	3.56	2.40	4.72	14.68	.74	5.60	9.39	10.21	28.83
85	7.00	83.38	2.17	0	1.99	127.10	1.59	19.79	32.42	3.57	58.78	1.70	23.70	13.35	46.03	14.24	127.16	23.64	6.56	9.28	2.04	10.16
90	0	0	3.98	1.19	8.17	.78	8.61	3.28	1.35	15.75	2.60	8.20	0	90.55	2.94	.23	1.98	1.56	17.39	43.42	1.29	9.98
91	25.14	5.64	1.13	.65	2.52	1.53	0	46.01	1.92	.53	.60	1.88	3.09	6.06	26.08	64.80	3.65	6.57	3.70	4.23	3.89	2.90
92	4.37	1.63	3.19	2.02	2.10	3.68	2.27	0	0	.29	11.08	1.03	.36	.65	8.43	3.47	5.93	.51	2.06	1.23	6.54	3.17
93	0	1.54	0	.46	.58	1.16	0	.69	1.32	0	4.25	1.94	0	46.94	.65	4.12	0	.34	.92	.92	.65	.31
94	0	0	.42	.46	2.17	0	0	1.03	.51	0	0	0	.55	.49	0	0	0	0	0	.94	0	.60
95	2.02	0	1.54	.70	0	0	0	1.06	1.21	2.92	0	.67	0	.92	0	0	0	1.64	0	0	0	.58

1.   Survey vessels: 1970 - 1981 A.T. Cameron
                       1982   Lady Hammond
                       1983 - 1988 Alfred Needler

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Table 11. Stratified average numbers per tow in Canadian summer bottom trawl surveys (strata 40-95).

Age	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
1	.007	.000	.000	.000	.007	.000	.000	.000	.000	.000	.012	.007	.000	.100	.035	.007	.051	.000	.020	.013	.152	.020	0
2	1.815	.733	.019	.389	.042	.009	.029	.261	.007	.000	1.142	.159	.196	.119	.471	1.579	.606	.591	.029	.055	9.763	1.077	.247
3	.445	.607	.013	.477	.941	.018	.219	.770	.147	.109	1.257	.175	2.787	.916	.229	4.819	.653	2.447	.599	.139	7.494	1.138	1.426
4	.270	.168	.146	2.150	.230	.324	.667	.985	.607	.631	3.327	.051	.266	1.702	.702	3.565	.965	3.683	1.155	.848	3.161	1.020	1.582
5	.197	.039	.321	.818	.279	.279	1.242	2.029	.941	.799	5.282	.505	.118	.196	2.013	3.479	1.008	5.840	2.196	.965	5.230	1.333	1.040
6	.179	.018	.140	.082	.130	.374	.313	1.415	.351	.581	1.403	.505	.368	.048	.307	2.910	1.383	2.300	1.954	.893	1.963	1.475	.717
7	.120	.032	.037	.050	.152	.059	.540	.184	.330	.238	.797	.352	.252	.090	.211	.440	1.015	1.674	1.825	1.125	.524	.437	.244
8	.066	.011	.068	.047	.086	.092	.197	.308	.102	.169	.248	.242	.148	.262	.458	.124	.073	1.369	1.010	.540	.344	.462	.097
9	.025	.007	.049	.059	.066	.036	.043	.108	.048	.010	.097	.109	.130	.166	.691	.224	.011	.052	.584	.311	.215	.202	.044
10	.000	.022	.024	.002	.037	.008	.044	.052	.022	.036	.058	.076	.072	.056	.428	.348	.103	.118	.040	.114	.066	.064	.035
11	.036	.000	.012	.020	.087	.009	.015	.030	.000	.000	.000	.028	.012	.059	.071	.117	.136	.089	.043	.028	.031	.035	.012
12+	.007	.000	.026	.011	.031	.000	.048	.012	.023	.000	.000	.013	.049	.020	.157	.112	.089	.352	.164	.051	.122	.010	.029
UK	.000	.000	.004	.014	.000	.000	.011	.004	.017	.023	.029	.046	.034	.027	.044	.003	.007	.030	.000	.013	.000	.000	.000
TOTAL	3.174	1.638	.860	4.118	2.087	1.209	3.367	6.158	2.595	2.606	13.650	2.267	4.433	3.763	5.816	17.729	6.101	18.546	9.621	5.094	29.065	7.273	5.473
4+	.900	.297	.823	3.238	1.097	1.182	3.108	5.123	2.424	2.465	11.211	1.880	1.417	2.600	5.038	11.320	4.783	15.478	8.972	4.875	11.656	5.038	3.800
5+	.630	.129	.678	1.088	.867	.858	2.442	4.138	1.817	1.833	7.884	1.829	1.150	.898	4.336	7.755	3.818	11.795	7.817	4.027	8.495	4.018	2.218
6+	.433	.090	.357	.270	.588	.579	1.200	2.109	.876	1.034	2.603	1.324	1.032	.702	2.323	4.276	2.810	5.955	5.621	3.062	3.265	2.685	1.178

Table 12.　　　　　　　Stratified total numbers at age (x 10^{-3}) in Canadian summer bottom trawl surveys (strata 40-95).

Year

Age	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
1	0	0	0	30	0	0	0	0	0	49	29	0	426	148	30	216	0	86	55	645	83	0
2	3109	82	1649	179	37	122	1108	29	0	4842	673	832	504	1989	6694	2570	2504	122	231	41392	4568	1047
3	2573	55	2021	3989	77	928	3266	610	462	5328	744	11816	3884	966	20433	2770	10375	2541	588	31771	4824	6046
4	713	618	9117	975	1375	2826	4177	2525	2676	14106	215	1129	7218	2965	15116	4090	15614	4896	3597	13403	4324	6707
5	165	1361	3467	1183	1182	5264	8604	3915	3389	22393	2142	502	830	8509	14751	4273	24762	9311	4090	22173	5653	4411
6	76	595	347	549	1587	1328	5999	1459	2462	5947	2140	1558	203	1297	12336	5865	9752	8285	3784	8323	6253	3038
7	135	157	213	643	252	2289	779	1372	1007	3378	1491	1070	383	892	1865	4304	7099	7738	4768	2221	1850	1036
8	46	288	197	365	389	836	1308	424	715	1052	1028	628	1113	1934	527	309	5802	4284	2290	1457	1959	411
9	31	209	248	278	151	183	458	198	44	412	461	553	703	2920	951	47	221	2477	1319	911	858	188
10	95	100	10	158	35	188	219	91	155	245	321	306	239	1811	1475	438	502	169	484	280	269	147
11	0	52	83	368	40	62	129	0	0	0	121	50	250	301	497	575	379	184	119	130	147	51
12+	0	111	48	131	0	203	49	98	0	0	54	208	86	662	477	377	1490	696	218	516	42	122
UK	0	17	59	0	0	45	15	71	99	122	195	143	116	186	15	31	129	0	55	0	0	0
TOTAL	6943	3646	17459	8848	5125	14275	26110	10793	11047	57875	9612	18796	15954	24578	75167	25866	78630	40789	21597	123222	30830	23204
4+	1261	3491	13730	4651	5010	13179	21721	10083	10450	47534	7972	6006	11024	21290	47996	20279	65622	38039	20668	49414	21355	16111
5+	548	2873	4613	3676	3636	10353	17544	7558	7773	33428	7756	4877	3806	18324	32879	16189	50008	33143	17072	36011	17031	9404
6+	383	1512	1147	2493	2454	5089	8940	3642	4384	11035	5615	4375	2976	9815	18129	11915	25246	23832	12982	13838	11378	4993

Table 13.

Parameters for the ADAPT formulation

- Year class estimates
    N_i, 1993   i=8

- Calibration constants for July RV numbers

    K_i i=4-9

Framework: assumptions and structure imposed

- Natural mortality = 0.20
- Error in catch at age assumed negligible
- No intercepts
- Partial recruitment for ages 3-6 in 1992 was the average from 1988-1991, age 7 and 9-12 assumed to be fully recruited.

Age	3	4	5	6	7	8	9	10	11	12
PR	.065	.345	.652	.915	1	1	1	1	1	1

Input

- Number at age 2= 28 million (1974-92 geometric mean)
- $C_{i,t}$ i=2 to 11   t=1974-1992
- $RV_{i,t}$ i=4 to 9   t=1974-1992

Objective Function

    Minimize $\Sigma_{i,t}$ $(lnRV_{i,t}-lnK_iN_{i,t})^2$

Summary

- Number of Observations= 114
- Number of Parameters= 7

Table 14.   Final parameter estimates and significant statistics for age 4-9
numbers and 4-9 slopes from ADAPT.

Estimated parameters and standard errors
Approximate statistics assuming linearity near solution

Orthogonality offset...........0.000652
Mean square residuals..........0.485440

	Par. Est.	Std. err	Rel. Err	Bias %
		Population Numbers		
Age				
2	28000	0	0	0
3	12529	3242	0.26	0.03
4	17238	4696	0.27	0.03
5	22288	6333	0.28	0.03
6	7190	2216	0.31	0.04
7	2471	815	0.33	0.04
8	1397	467	0.33	0.04
9	541	182	0.34	0.04
10	299	101	0.34	0.04
11	227	77	0.34	0.04
12	104	35	0.34	0.04
		Summer Survey K's		
Age				
4	262.5	43.0	0.16	0.01
5	569.3	92.5	0.16	0.01
6	683.0	110.7	0.16	0.01
7	848.7	137.6	0.16	0.01
8	1256.0	203.8	0.16	0.01
9	1176.0	190.8	0.16	0.01

Table 15. Log Residuals (beginning of year) between observed RV and predicted RV by age and year.

	1974	1975	1976	1977	1978	1979	1980	1981	1982
4	-0.81	-1.02	0.26	0.19	-0.69	-0.88	1.81	-1.09	-0.45
5	-1.11	-0.78	0.11	1.11	-0.16	-0.74	0.98	-0.37	-0.45
6	-1.02	-0.37	-0.11	0.78	-0.23	-0.17	0.17	-0.93	-0.23
7	0.32	-1.27	0.63	-0.09	-0.10	-0.09	0.56	-0.77	-1.07
8	0.11	0.18	0.64	0.71	-0.10	-0.26	0.12	-0.38	-1.17
9	0.35	0.14	0.56	0.91	0.06	-1.36	-0.25	-0.10	-0.13

	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
4	-0.33	-0.70	1.14	-0.24	1.42	0.21	-0.28	1.49	0.03	-0.06
5	-1.03	-0.41	0.55	-0.52	1.20	0.55	-0.30	1.28	0.30	-0.22
6	-0.87	-0.21	0.34	-0.03	0.66	0.56	0.07	0.91	0.47	0.21
7	-0.87	0.96	0.43	-0.19	0.59	0.94	0.54	0.03	-0.03	-0.51
8	-0.60	1.00	0.42	-0.68	0.43	0.38	0.02	-0.24	0.32	-0.89
9	-0.08	1.13	0.91	-1.29	-0.12	0.42	-0.04	-0.17	0.07	-1.02

Parameter Correlation Matrix

	1	2	3	4	5	6	7
1	1.00	-0.25	-0.20	-0.17	-0.17	-0.17	-0.17
2	-0.25	1.00	0.05	0.04	0.04	0.04	0.04
3	-0.20	0.05	1.00	0.03	0.03	0.03	0.03
4	-0.17	0.04	0.03	1.00	0.03	0.03	0.03
5	-0.17	0.04	0.03	0.03	1.00	0.03	0.03
6	-0.17	0.04	0.03	0.03	0.03	1.00	0.03
7	-0.17	0.04	0.03	0.03	0.03	0.03	1.00

Table 16. Fishing mortality matrix for divs. 4VWX5Zc pollock.

Fishing Mortality (Bias Adjusted)

	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
2	0.01	0.01	0.01	0.00	0.00	0.02	0.01	0.01	0.00	0.00	0.00	0.00
3	0.25	0.09	0.07	0.06	0.02	0.21	0.08	0.14	0.07	0.06	0.03	0.02
4	0.34	0.29	0.24	0.22	0.16	0.24	0.21	0.29	0.24	0.26	0.15	0.11
5	0.38	0.49	0.46	0.36	0.39	0.27	0.36	0.38	0.42	0.30	0.31	0.27
6	0.49	0.60	0.51	0.56	0.48	0.38	0.42	0.52	0.73	0.31	0.25	0.49
7	0.57	0.91	0.85	0.80	0.68	0.37	0.45	0.67	0.64	0.46	0.19	0.89
8	0.65	0.87	0.60	0.98	0.74	0.30	0.34	0.61	0.71	0.50	0.35	0.45
9	0.46	0.48	0.38	0.75	1.18	0.28	0.33	0.45	0.81	0.71	0.22	0.39
10	0.70	0.71	0.21	0.35	0.24	0.35	0.32	0.56	0.87	1.02	0.32	0.41
11	0.60	0.75	0.52	0.73	0.72	0.33	0.36	0.58	0.77	0.68	0.27	0.54

	1986	1987	1988	1989	1990	1991	1992
2	0.00	0.00	0.00	0.00	0.00	0.01	0.00
3	0.03	0.02	0.03	0.04	0.06	0.04	0.11
4	0.15	0.15	0.18	0.25	0.19	0.24	0.19
5	0.27	0.38	0.35	0.42	0.38	0.46	0.36
6	0.39	0.48	0.50	0.46	0.54	0.81	0.51
7	0.52	0.50	0.50	0.61	0.62	0.86	0.56
8	0.64	0.58	0.49	0.48	0.59	0.76	0.56
9	0.57	1.03	0.82	0.59	0.61	0.51	0.56
10	0.69	0.59	0.76	0.97	0.43	0.79	0.56
11	0.61	0.68	0.65	0.67	0.57	0.74	0.56

Table 17. Beginning of year population numbers for div. 4VWX5Zc.

Population Numbers (in thousands) (Bias Adjusted)

	1974	1975	1976	1977	1978	1979	1980	1981	1982
2	16786	26158	37155	45939	19836	4936	14361	76048	44194
3	27820	13565	21258	30259	37579	16219	3952	11604	61475
4	10237	17708	10148	16173	23438	30011	10779	2972	8293
5	8317	5973	10857	6523	10642	16367	19336	7139	1825
6	3085	4677	2999	5588	3725	5923	10249	11030	3995
7	806	1542	2107	1470	2601	1895	3307	5524	5394
8	378	373	506	740	541	1074	1074	1734	2323
9	240	161	128	227	228	211	654	628	775
10	183	124	82	72	88	57	130	383	326
11	180	74	50	54	42	56	33	77	179
12	0	81	29	24	21	17	33	19	36
2+	68032	70436	85320	107069	98742	76765	63908	117159	128815
3+	51246	44278	48165	61130	78906	71830	49547	41111	84620
4+	23426	30713	26907	30871	41327	55610	45595	29507	23146
5+	13189	13006	16759	14698	17889	25599	34816	26535	14852

	1983	1984	1985	1986	1987	1988	1989	1990
2	34797	36989	27132	28093	33713	21569	30231	50044
3	36062	28439	30205	22181	22947	27593	17635	24687
4	46696	27716	22557	24284	17585	18365	21973	13909
5	5352	29623	19531	16487	17111	12354	12621	14035
6	984	3245	17779	12226	10275	9569	7137	6757
7	1576	590	2079	8962	6757	5211	4767	3692
8	2339	816	400	702	4346	3357	2584	2114
9	934	1160	471	209	304	1987	1680	1314
10	282	377	759	260	97	89	718	765
11	112	83	225	414	107	44	34	224
12	68	46	52	108	184	44	19	14
2+	129204	129085	121192	113925	113427	100182	99398	117554
3+	94406	92096	94059	85832	79714	78613	69167	67510
4+	58344	63657	63854	63651	56767	51020	51532	42823
5+	11648	35941	41297	39367	39182	32655	29559	28914

	1991	1992	1993
2	28000	15028	28000
3	40926	22664	12277
4	19102	32216	16686
5	9452	12295	21789
6	7875	4881	7008
7	3226	2879	2401
8	1619	1120	1356
9	961	618	525
10	582	471	290
11	406	216	221
12	104	159	101
2+	112267	92548	90654
3+	84254	77519	62654
4+	43328	54855	50377
5+	24225	22639	33691

Table 18. Beginning of year population biomass for divs. 4VWX5Zc.

Population Biomass (in tonnes) (Bias Adjusted)

	1974	1975	1976	1977	1978	1979	1980	1981
2	11104	18965	16054	29085	22227	2573	11381	39091
3	29594	13788	21685	24376	37043	18812	4495	15534
4	16751	29048	15785	21934	32980	41438	16887	6140
5	20065	14553	25415	14233	21156	35542	40066	17563
6	10807	15814	10106	17524	11586	17611	30859	33550
7	3672	7014	8887	6021	10426	7797	12376	21357
8	2114	2145	2706	3739	2824	5419	5283	8571
9	1540	1095	867	1387	1403	1328	3925	3898
10	1284	879	627	514	614	402	1008	2722
11	1432	579	405	479	324	454	256	639
12	0	746	249	232	244	149	320	172
2+	98363	104627	102787	119523	140827	131525	126856	149239
3+	87259	85662	86733	90438	118600	128952	115475	110148
4+	57665	71874	65047	66061	81557	110140	110981	94614
5+	40914	42826	49263	44128	48577	68702	94094	88474

	1982	1983	1984	1985	1986	1987	1988	1989
2	26190	20547	18900	16248	5063	14747	24613	14269
3	55300	35149	33180	31502	20283	15597	25837	21155
4	17942	65631	47604	40443	41921	26171	28930	34217
5	5448	15505	62364	49575	36641	38262	28101	27251
6	13935	3743	11234	51314	36642	27968	27107	20907
7	20795	7082	2787	7534	30076	23608	16741	16648
8	10997	11122	4383	1948	2662	16576	13299	9801
9	4666	5144	6348	2845	1041	1331	8377	7578
10	2370	1775	2292	4465	1586	576	436	3423
11	1415	875	586	1407	2475	656	294	218
12	244	554	380	434	656	1147	274	144
2+	159302	167126	190058	207715	179044	166639	174010	155612
3+	133112	146579	171158	191467	173981	151892	149397	141343
4+	77812	111430	137978	159965	153698	136295	123560	120187
5+	59870	45800	90374	119522	111777	110124	94630	85971

	1990	1991	1992	1993
2	17611	8851	4748	9182
3	23478	27923	15845	9545
4	21978	28853	40821	24238
5	29817	20380	25374	46078
6	18276	21005	13477	19001
7	13026	10125	9275	7913
8	8354	6210	4220	5224
9	5900	4200	2709	2319
10	3788	2821	2409	1441
11	1239	2068	1152	1174
12	135	660	805	703
2+	143602	133097	120835	126819
3+	125991	124246	116087	117636
4+	102513	96323	100241	108091
5+	80535	67470	59421	83853

Table 19. Mid-year population biomass for divs. 4VWX5Zc pollock.

Population Biomass (in tonnes) (Mid-Year Bias Adjusted)

	1974	1975	1976	1977	1978	1979	1980	1981
2	12397	20316	19817	32879	20483	3408	13322	46582
3	30891	14835	22506	29373	41393	15711	5777	17150
4	15355	27308	15749	20087	35444	37640	18375	5974
5	18971	13210	22291	12385	20939	34244	40986	15760
6	9100	12280	7957	13671	10561	15261	26451	26315
7	2853	4706	6100	4202	7923	6274	10038	15962
8	1567	1494	1964	2379	2109	4697	4637	7060
9	1175	878	684	971	854	1105	3291	3180
10	891	611	524	401	523	315	921	2086
11	1061	394	313	354	227	385	213	405
2+	94260	96033	97905	116704	140457	119040	124012	140476
3+	81863	75717	78088	83825	119975	115632	110690	93894
4+	50973	60882	55582	54452	78581	99921	104913	76744
5+	35618	33573	39833	34364	43137	62281	86537	70770

	1982	1983	1984	1985	1986	1987	1988	1989
2	30393	26154	24442	18184	8902	19553	22857	18335
3	63959	39633	41631	40434	22367	27153	33807	19309
4	18065	62273	55189	37953	40978	29039	28789	31344
5	4779	13139	61942	42573	33106	32442	25102	23276
6	10872	3175	10057	40157	30344	21929	22121	16987
7	16270	5578	2645	4338	23023	18033	13145	12398
8	7912	8539	3750	1291	1999	12147	10248	7698
9	2983	3587	5578	2168	824	797	5497	5594
10	1531	1054	1863	3335	1051	419	301	2187
11	920	595	509	982	1731	438	212	177
2+	157684	163728	207606	191416	164326	161950	162079	137304
3+	127291	137574	183164	173231	155424	142398	139222	118969
4+	63332	97941	141533	132797	133057	115245	105415	99660
5+	45267	35668	86343	94844	92079	86205	76625	68316

	1990	1991	1992
2	22213	11865	6395
3	29397	34578	20304
4	23421	26110	45062
5	27183	15839	23702
6	14088	13852	11639
7	9632	6649	7526
8	6010	3992	3338
9	4423	3194	2168
10	2890	1763	1859
11	927	1338	901
2+	140184	119179	122892
3+	117972	107315	116497
4+	88575	72737	96193
5+	65154	46627	51131

Table 20.   Projections for 4VWX5Zc pollock.

Weight at age (mid-year)

	1993	1994
2	0.53	0.53
3	1.14	1.14
4	1.80	1.80
5	2.46	2.46
6	3.08	3.08
7	3.67	3.67
8	4.07	4.07
9	4.85	4.85
10	5.16	5.16
11	6.19	6.19

Weight at age (beginning of year)

	1993	1994	1995
2	0.33	0.33	0.33
3	0.78	0.78	0.78
4	1.45	1.45	1.45
5	2.11	2.11	2.11
6	2.71	2.71	2.71
7	3.30	3.30	3.30
8	3.85	3.85	3.85
9	4.41	4.41	4.41
10	4.97	4.97	4.97
11	5.32	5.32	5.32
12	6.96	6.96	6.96

Population Numbers

	1993	1994	1995
2	28000	28000	28000
3	12277	22897	22897
4	16686	9857	18384
5	21789	12317	7277
6	7008	14666	8293
7	2401	4359	9125
8	1356	1455	2644
9	525	822	883
10	290	318	499
11	221	176	193
12	101	134	107
2+	90654	95002	98301
3+	62654	67002	70301
4+	50377	44105	47404
5+	33691	34247	29020

Population Biomass (beginning of year)

	1993	1994	1995
2	9182	9182	9182
3	9545	17802	17802
4	24238	24238	24238
5	46078	26407	15389
6	19001	39763	22483
7	7913	14368	30079
8	5224	5606	10183
9	2319	3631	3897
10	1441	1583	2480
11	1174	935	1027
12	703	932	742
2+	126819	134166	139968
3+	117636	124983	130786
4+	108091	107181	112984
5+	83853	92863	86279

Population Numbers (mid-year)

	1993	1994
2	25363	25363
3	11023	20558
4	14391	8502
5	17993	10172
6	5579	11677
7	1889	3430
8	1067	1145
9	413	647
10	228	251
11	174	138
2+	78120	81884
3+	52757	56521
4+	41734	35963
5+	27343	27461

Population Biomass (mid-year)

	1993	1994
2	13316	13316
3	12594	23488
4	25832	15261
5	44263	25024
6	17184	35966
7	6937	12597
8	4349	4667
9	2002	3135
10	1178	1294
11	1074	855
2+	128728	135604
3+	115412	122288
4+	102818	98801
5+	76986	83540

Table 20 (Cont'd).

Fishing Mortality			Catch Numbers at Age			Catch Biomass at Age		
	1993	1994		1993	1994		1993	1994
2	0.00	0.00	2	30	30	2	16	16
3	0.02	0.02	3	215	215	3	246	458
4	0.10	0.10	4	1491	880	4	2677	1580
5	0.20	0.20	5	3524	1990	5	8670	4895
6	0.27	0.27	6	1534	3205	6	4723	9873
7	0.30	0.30	7	567	1029	7	2084	3779
8	0.30	0.30	8	321	344	8	1306	1400
9	0.30	0.30	9	124	194	9	601	941
10	0.30	0.30	10	69	75	10	354	388
11	0.30	0.30	11	52	41	11	323	257
			2+	7928	8190	2+	21000	23586
			3+	7897	8159	3+	20984	23570
			4+	7682	7759	4+	20738	23112
			5+	6191	6879	5+	18061	215321

Summary of Catch Projections for 4VWX5Zc

				Beginning of Year Biomass			
		Catch(t)		1994		1995	
OPTION	1993 F	1993	1994	SSB(t) 4+	Total Biomass(t) 2+	SSB(t) 4+	Total Biomass(t) 2+
Assuming 35,000 t is caught in 1993[1]	0.54	35,000	20,324	93,440	120,407	102,717	129,702
F0.1	0.30	21,000	23,586	107,181	134,166	112,984	139,968

[1] Multi-year management plan adjusted from 43,000 t to 35,000 t and assume 1994 TAC is set to F0.1.

Fig. 1   **Nominal Landings for all Countries of Divs. 4VWX and Subdiv. 5Zc Pollock**
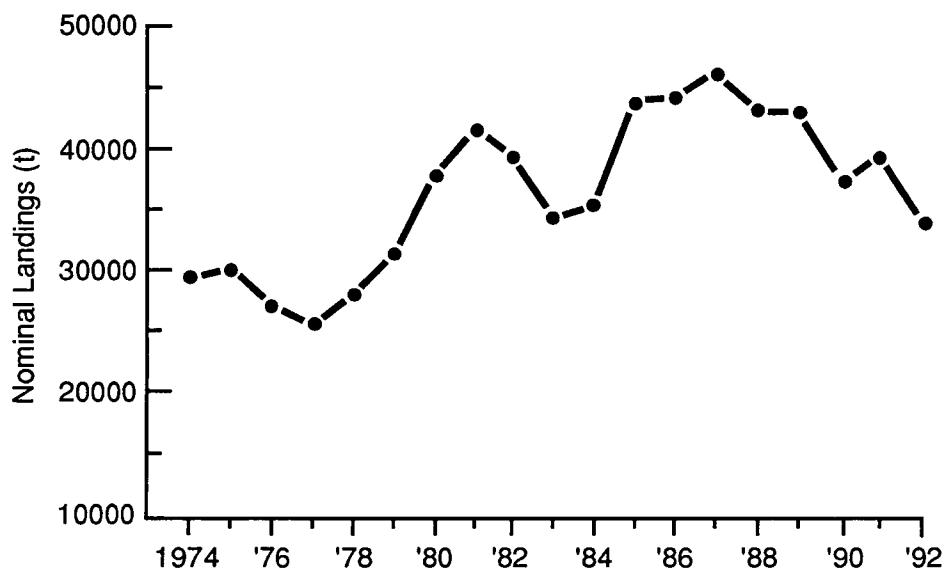
Fig. 2   **Nominal Landings, by Area, for all Countries of Divs. 4VWX and Subdiv. 5Zc Pollock**
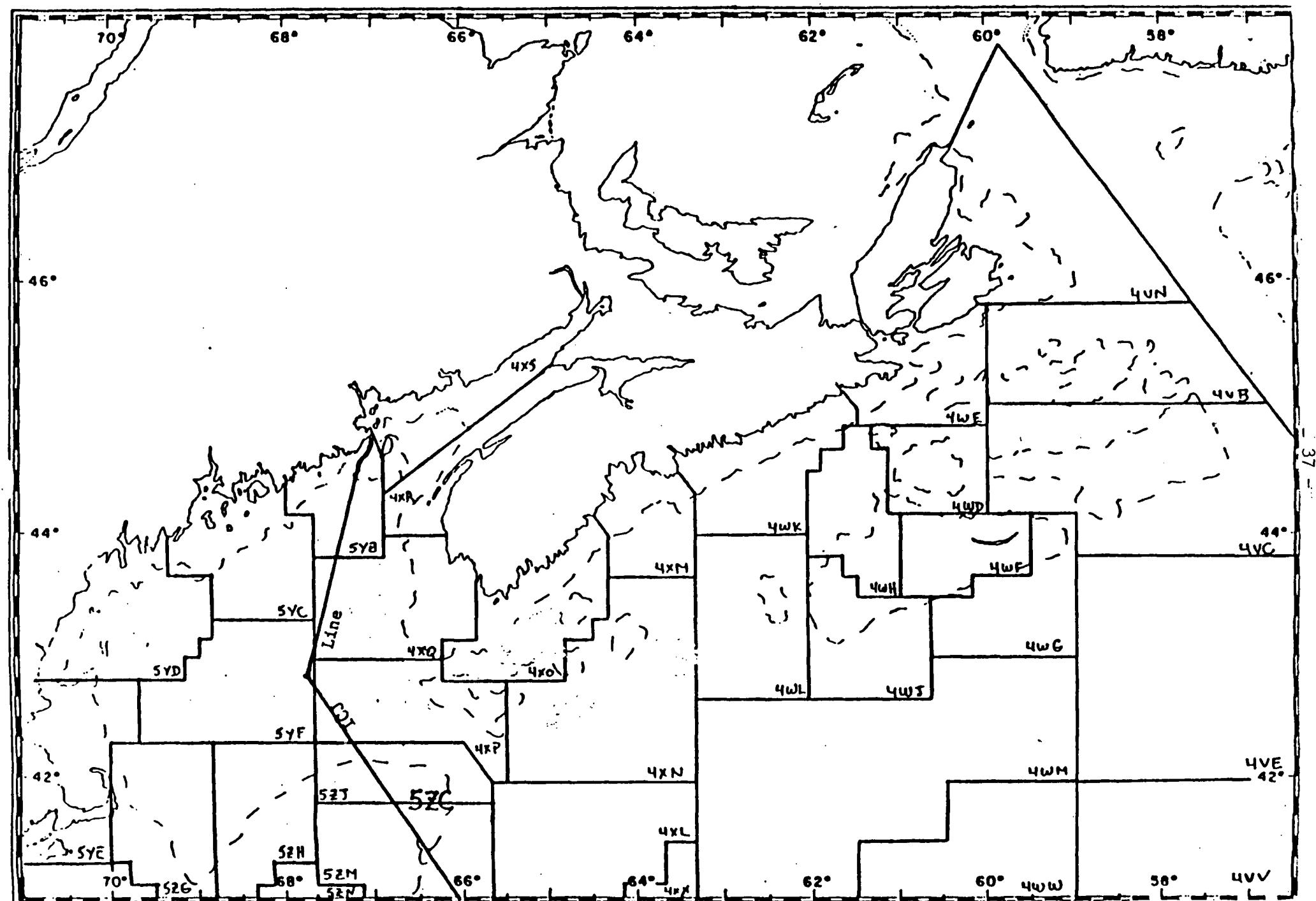
Fig. 3. Diagram of ICJ line which now defines the boundary for the new management unit for 4VWX5 pollock.
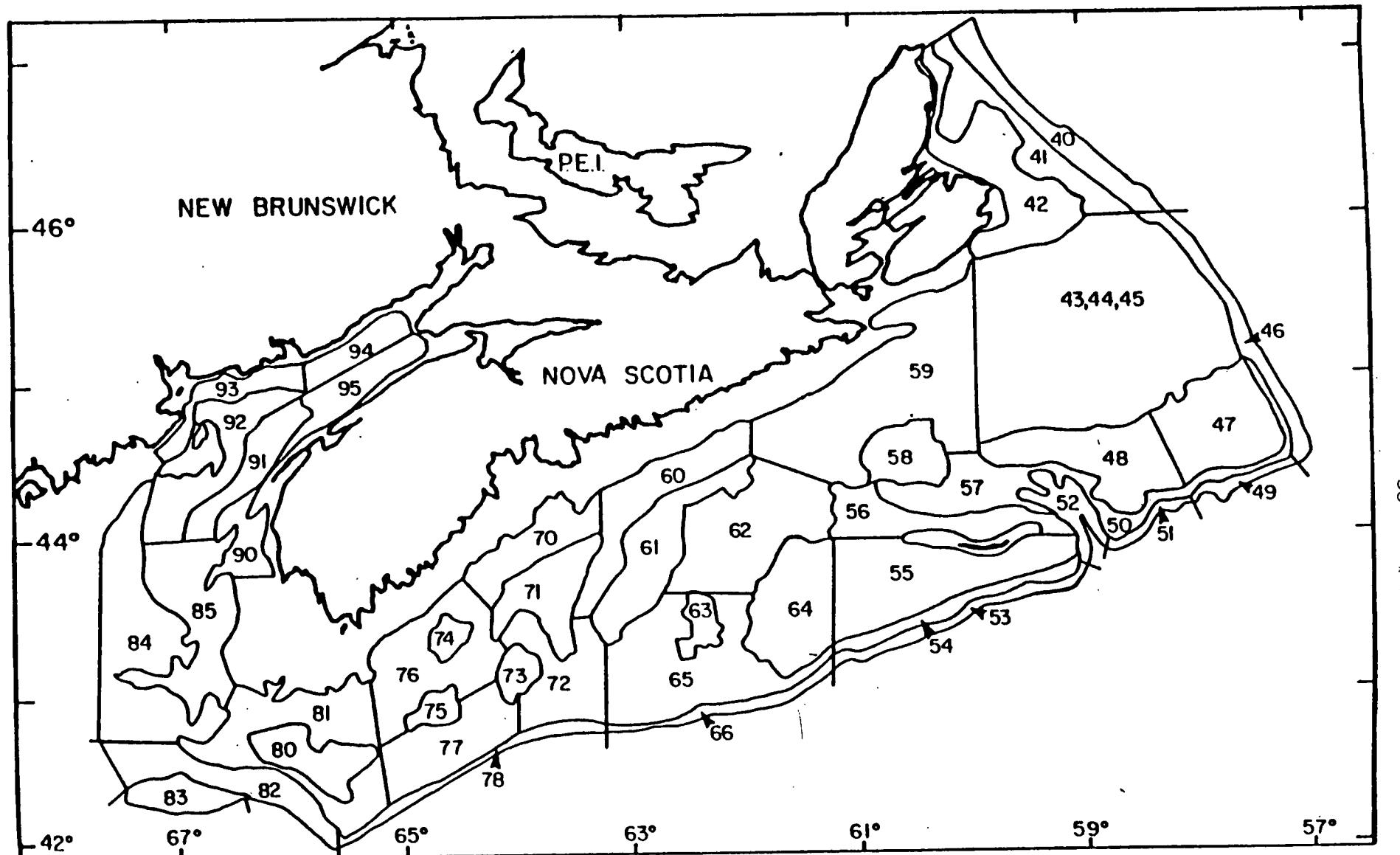
Figure 4 . Stratification used for Canadian RV bottom trawl surveys (divs. 4VWX and Sudiv. 5Zc).

Fig. 5   **July RV Stratified Numbers (age 4-9 and 1-3) for Divs. 4VWX5 Pollock**

AGE 0-3

AGE 4-6
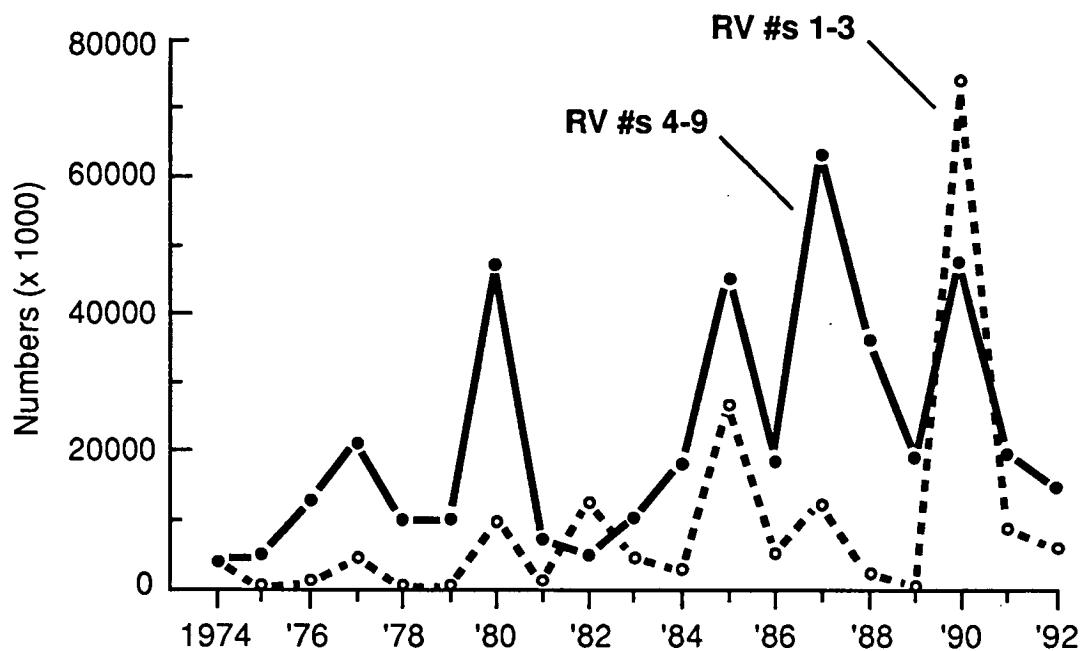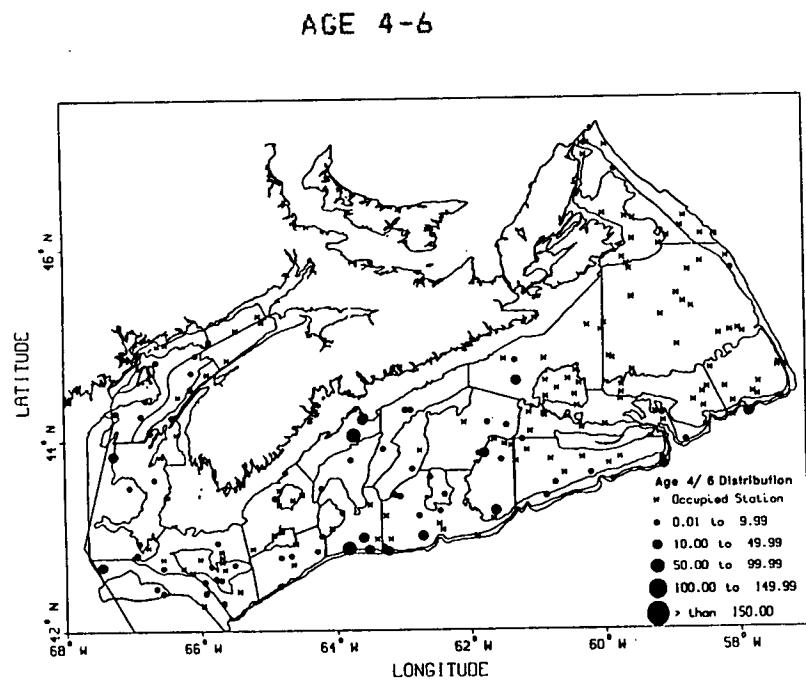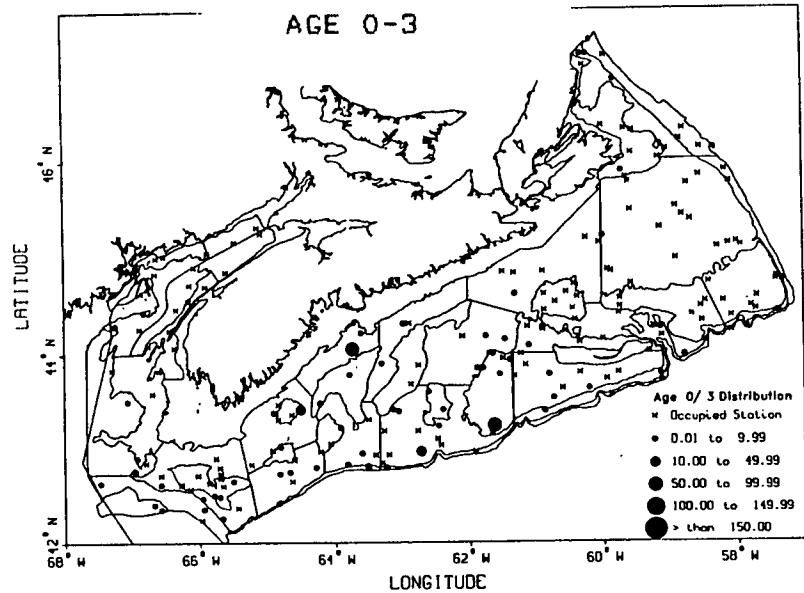
Fig. 6.

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AGE 7-13

Fig. 7 **Fully Recruited F's for Pollock (Ages 7 - 11) in Divs. 4VWX and 5Zc**

Fig. 8 **Recruitment Series for Age 2 Pollock in Divs. 4VWX and 5Zc**
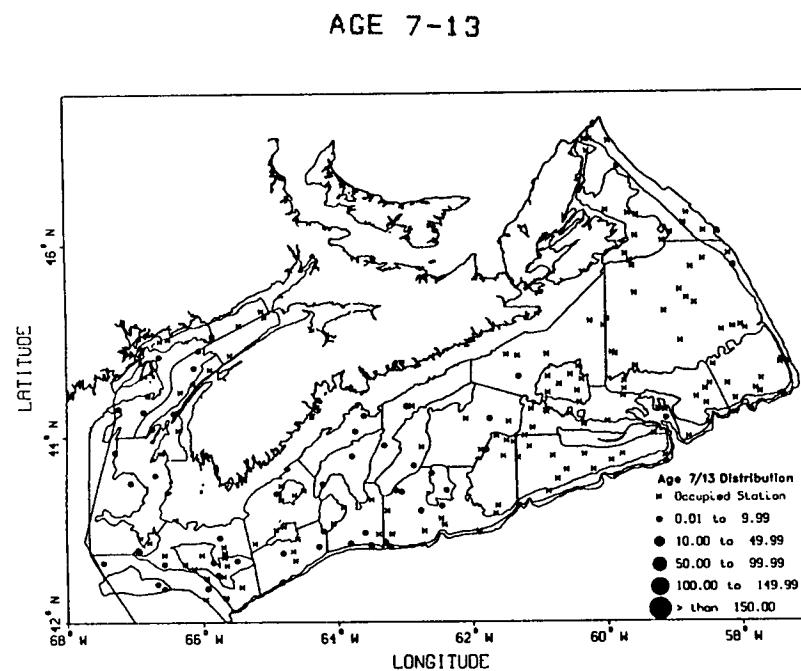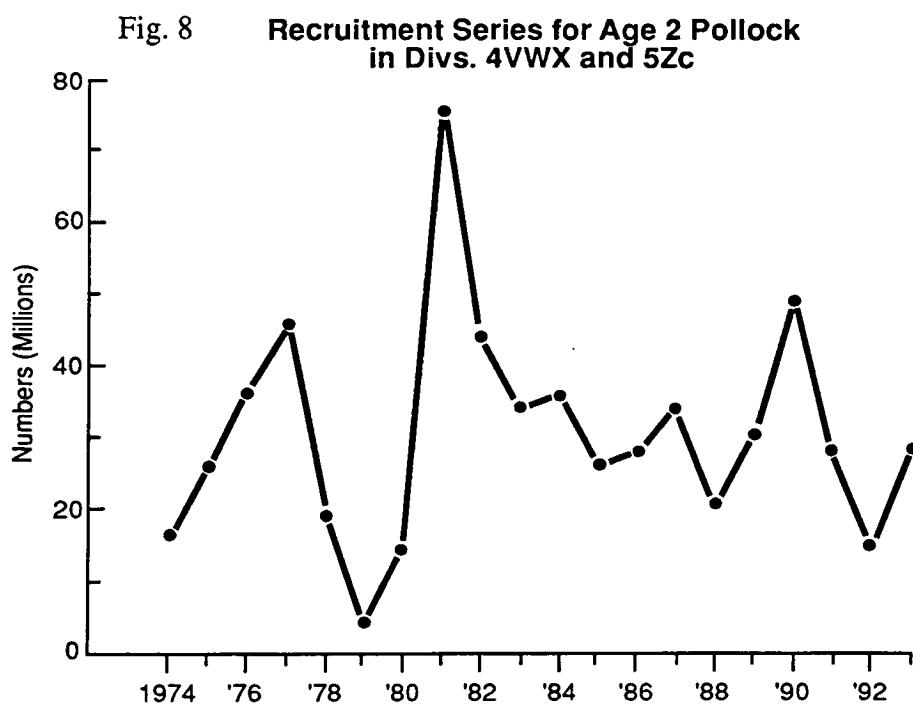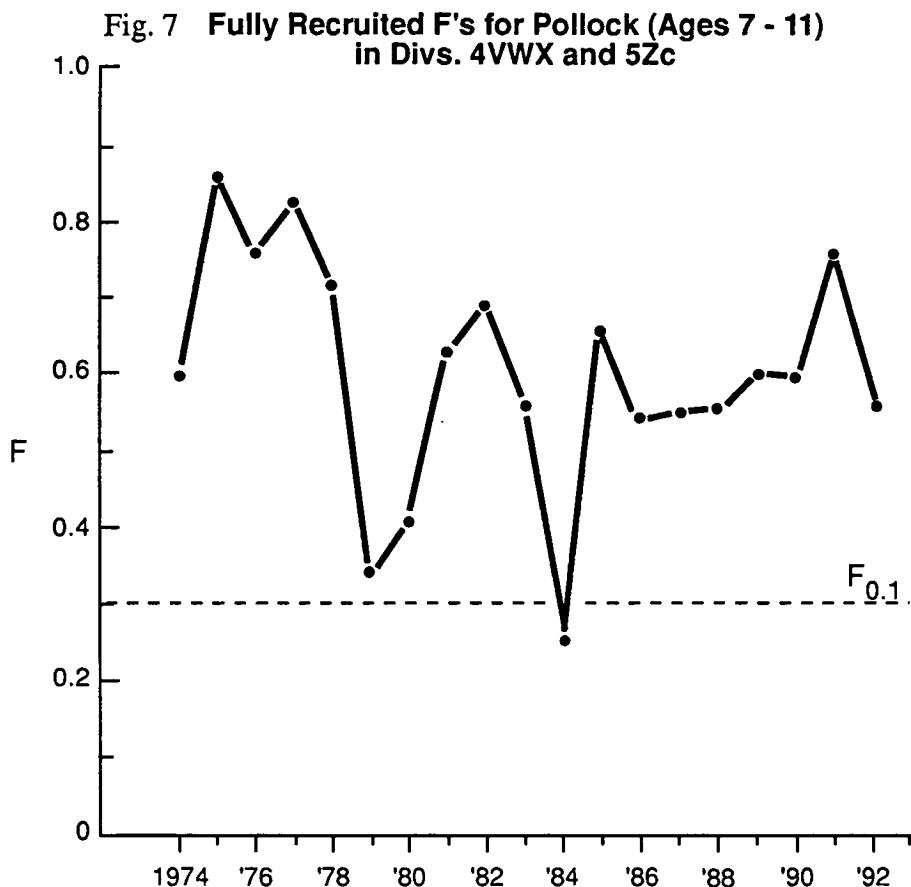
Fig. 9   Beginning of Year Age 2+ Biomass for Pollock
in Divs. 4VWX and 5Zc
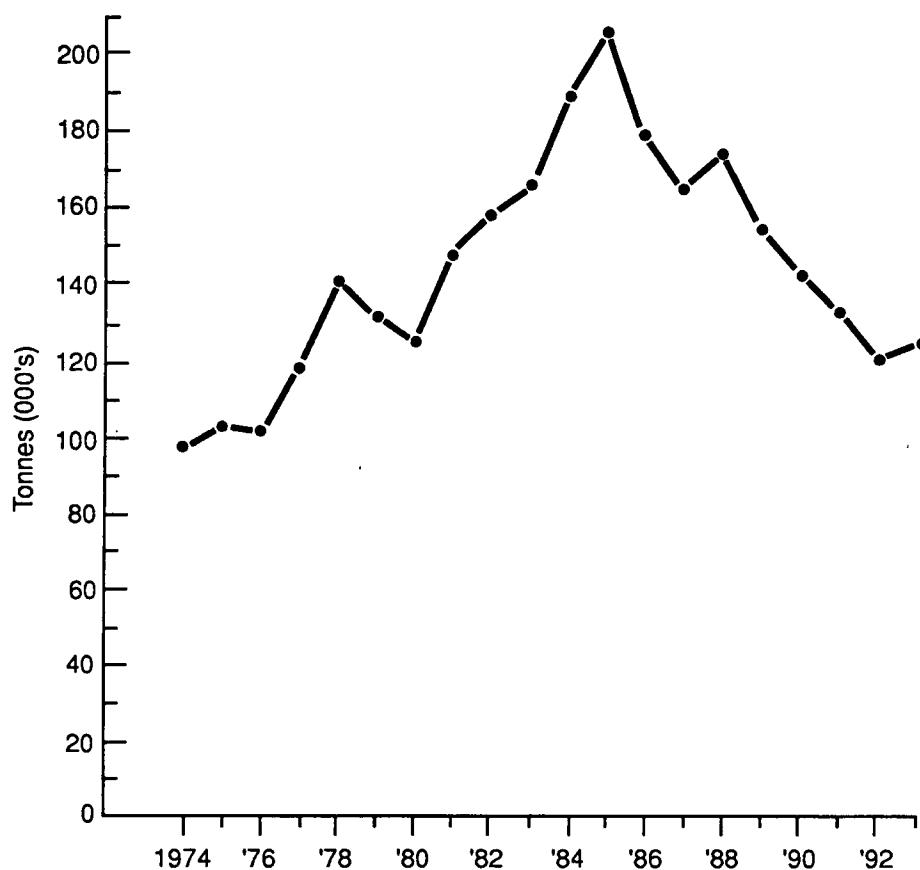
Fig. 10   **Spawning Stock Biomass (Age 4+) for Pollock in Divs. 4VWX and 5Zc**
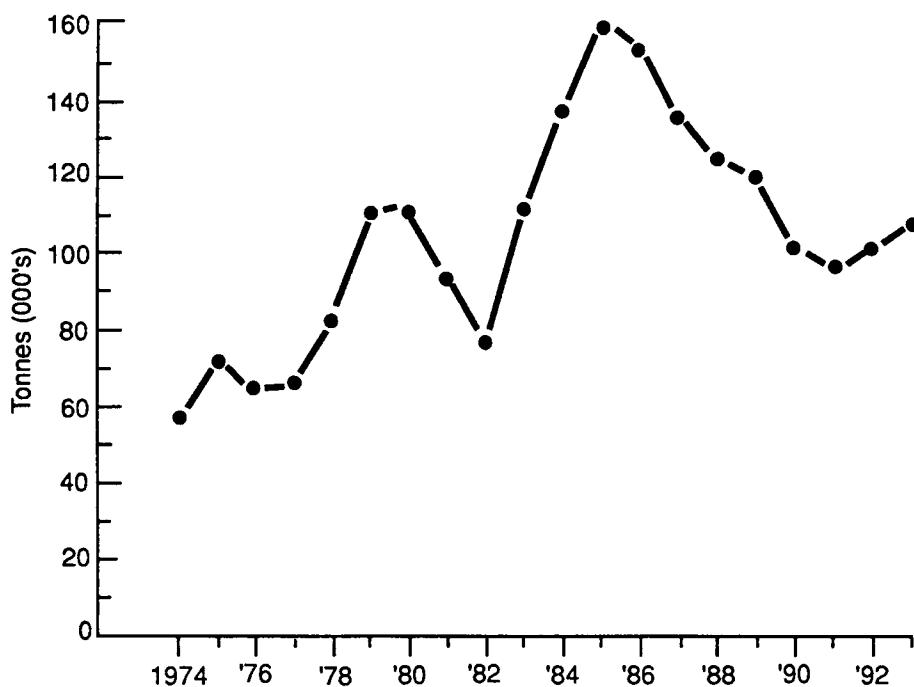
Fig. 11   **Population Numbers (Ages 4-12) for Divs. 4VWX and 5Zc**
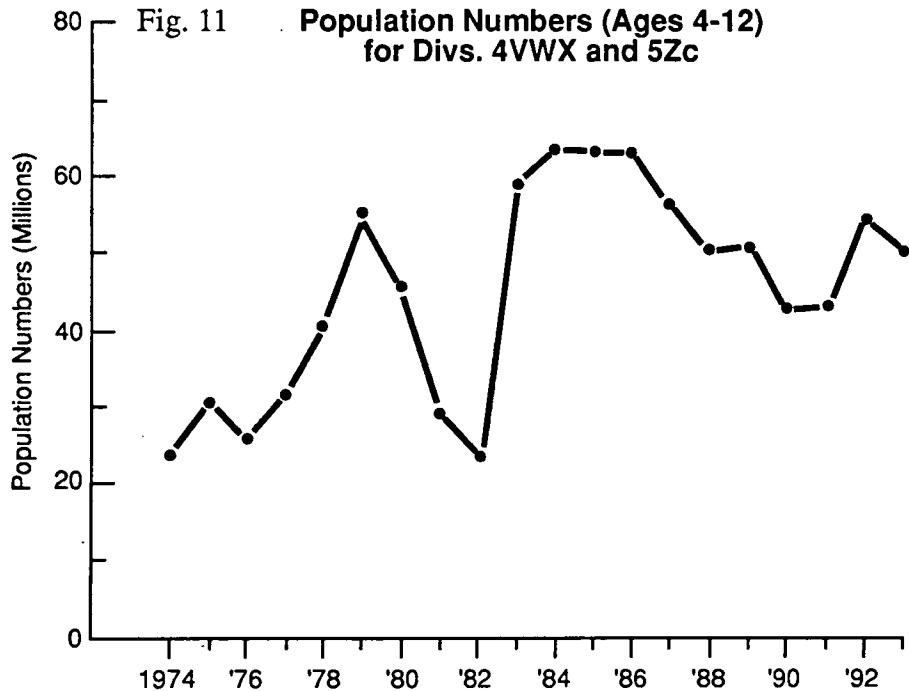
Fig. 12   Projected 4VWX 5Zc Pollock Yield for 1994
And Beginning of Year Biomass in 1995
for a Range of Fishing Mortalities