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The 1997 Assessment of Pollock (*Pollachius virens*) in NAFO Divisions 4VWX and Subdivision 5Zc

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Abstract

Landings of pollock in the management unit 4VWX5Zc were 9,280 t in 1996, compared with a TAC of 10,000 t. Most gear sectors were unable to catch their allocations. Most fishermen report that pollock were abundant in 1996 and the first half of 1997, in some cases limiting fisheries for cod or haddock. However, some expressed concern that landings are becoming increasingly concentrated in the western portion of NAFO Div. 4X.

The stock status evaluation was based on an analytical assessment employing landings statistics, sampling for size and age composition of the commercial catch and trends in commercial fishery catch rate. The abundance index series was expanded to include more fishery components than in previous assessments. Initial VPA results indicate that if the TAC of 15,000 t is taken in 1997, the resulting fully recruited fishing mortality will be about 0.23. The beginning of year age 5+ biomass will increase from 71,338 t in 1997 to 85,639 t in 1998. The $F_{0.1}$ catch in 1998 is 24,698 t. An alternative VPA attempted to adjust for apparent trends in catchability for younger ages in recent years by downweighting the corresponding age-specific abundance indices. In that scenario, the resulting fully recruited fishing mortality will be about 0.27. The beginning of year age 5+ biomass will increase slightly from 65,411 t in 1997 to 66,373 t in 1998. The $F_{0.1}$ catch in 1998 is 20,212 t. Some of the more important sources of the uncertainty include the large management unit, and the schooling semi-pelagic nature of the resource which make traditional approaches to groundfish stock assessment difficult.

Résumé

Les débarquements de goberge de l'unité de gestion 4VWX5Zc ont atteint 9 280 t en 1996; le quota était fixé à 10 000 t. La plupart des secteurs d'engins n'ont pas été en mesure d'atteindre leurs allocations. La majorité des pêcheurs ont signalé que la goberge était abondante en 1996 et au cours de la première demie de 1997 et que cela avait même parfois limité la pêche de la morue et de l'aiglefin. Certains se sont cependant inquiétés du fait que les débarquements étaient de plus en plus concentrés dans la partie ouest de la div. 4X de l'OPANO.

L'évaluation de l'état du stock a reposé sur une analyse des statistiques des débarquements, d'un échantillonnage pour la détermination de la composition par tailles et âges des captures commerciales et des allures du taux de capture. La série des indices d'abondance a été élargie pour englober plus de composantes des pêches que précédemment. Les résultats provisoires de l'APV montrent que si le TAC de 15 000 t était atteint en 1997, la mortalité par pêche du plein recrutement s'élèverait à 0,23 environ. La biomasse de début d'année des 5+ augmenterait pour passer de 71 338, en 1997, à 85 639, en 1998. Le niveau de capture $F_{0,1}$ s'élèverait à 24 698 t pour 1998. Une autre APV a été réalisée afin de corriger les tendances apparentes de la vulnérabilité à la pêche des poissons des âges plus jeunes au cours des dernières années, de par une pondération à la baisse des indices d'abondance correspondants spécifiques à l'âge. Selon cette approche, la mortalité par pêche de plein recrutement s'élève à 0,27 environ. Ainsi, la biomasse des 5+ en début d'année augmenterait légèrement, de 65 411 t, en 1997, à 66 373 t, en 1998. Le niveau de capture $F_{0,1}$ serait de 20 212 en 1998. On compte, parmi les plus importantes sources d'incertitude, la grande étendue de l'unité de gestion et la tendance de ces poissons à former des bancs semi-pélagiques qui compliquent l'application des méthodes traditionnelles de l'évaluation des stocks.

Introduction

Management Unit

The management unit for the pollock resource in Maritime waters includes NAFO Divs. 4VWX and Subdiv. 5Zc. The convention for the Canadian management unit was established following a review in 1989 (Annand et al. 1989), which involved examination of results of egg and larval surveys, meristic and morphometric studies, and tagging work. Prior to this, the convention for the management unit was NAFO Divs. 4VWX and Subarea 5.

History and Description of the Fishery

Landings and TACs since 1974 are shown on Fig. 1 and Table 1. Landings from 1974 to 1980 averaged about 28,000 t, rose through the early 1980s to 45,000 t in 1987. Since then, landings have sharply decreased. The TAC rarely constrained overall fishery landings, although for a period of five consecutive years in the late 1980s, the TAC was either met or exceeded. The 1996 total allowable catch (TAC) for 4VWX5Zc pollock was 10,000 t. Overall landings (9,280 t) are less than the quota, and are the lowest recorded since 1974 (Fig. 1, Table 1).

The 1996 landings continue the recent trend of comparatively small contributions to total landings in the eastern portion (4VW) of the management unit (Table 2, Figs. 2 and 3). However, management measures have had considerable impact on the fishery in the 4VW component in recent years. For example, the cod management unit in 4VsW has been closed since September 1993, thus restricting opportunities for pollock fishing on the eastern Shelf. Further dissagregation of landings by area (Fig. 4) indicate that landings in 4X have declined since 1991. While landings from 4V were significant through the late 1980s', they have dropped markedly until 1993, when they recovered slightly. In general, 4VW landings have now declined to levels comparable to those seen in the mid 1970s (Table 2). Landings from 5Zc (Georges Bank) have peaked in 1993, but declined thereafter.

The spatial distribution of the pollock fisheries for 1996 is summarized in Figs 5 and 6, which show the distribution of landings of TC 1-3 and 4+ trawlers, respectively. The smaller trawlers largely fish in 4X, with key areas being German Bank, Georges Bank and the lower Bay of Fundy. The larger trawlers are more generally distributed throughout the management unit, with significant landings made from the edge of the Scotian Shelf in 4Vs and Georges Bank. For all pollock fisheries within 4X, the spatial distribution of landings has changed (Fig. 7), with western 4X (4Xq,r and s) now contributing a greater proportion of landings than does eastern 4X (4X m,n,o and p).

Table 3 shows landings information aggregated into trimester and gear categories[1]. A variety of fishing gear is used, including primarily mobile gear (otter trawls) and fixed gear (gill

[1] Mobile gear included bottom otter trawls (side and stern), midwater trawls (side and stern), bottom pair trawl, midwater pair trawl, shrimp trawl, and Danish and Scottish Seine. Fixed gear included gillnet (set or fixed), longline, jigger, troller lines, mechanized squid jigger, handline (baited),trap, pot, weir and miscellaneous.

nets, handlines and in recent years, longlines). As indicated in Fig. 8, there have been significant changes in the relative importance of gear types over time. The relative contribution of larger draggers has been much diminished, whereas the contribution of smaller draggers and fixed gear has been steadily increasing. A significant change in the catch composition by gear was the reduction in the landings by gill nets from 3,132 t in 1995 to 1,671 t in 1996.

The monthly distribution of landings by gear sector over the past ten years is shown on Table 4. A change in fishing behaviour is noted for the smaller trawlers in the early 1990s, with a reduction in the proportion of landings taken in the first few months of the year compared with 1987 and 1988 for example. The fixed gear component of the fishery has also been late starting relative to previous years, but removals during the first quarter are usually small.

The fishing activity relative to quota is shown for 6 major gear sectors in Table 5. The quotas and catch to date were obtained from the the Preliminary Final Canadian Atlantic Quota Report (December 31, 1996). Four of the six gear sectors caught at least 90% of their allocation. In the 1997 fishery, 10,114 t had been taken by Sept. 24, compared with a TAC of 15, 000 t.

A further development of note in the domestic fishery has been the expansion of the redfish fishery on the Scotian Shelf in 1996. This fishery uses smaller mesh size (90-100 mm) than the rest of the domestic otter trawl fishery resulting in smaller fish being caught. Landings of pollock in the redfish fishery were 297 t.

Landings of pollock in the foreign silver hake fishery increased in 1996 to 135 t from 58 t in 1995. This fishery uses a net with a grate where bars are 40 mm, thus only smaller pollock are retained. This fishery was prosecuted by Cuba (129 t) and Russia (6 t).

During consultations with industry in August and September of 1997, generally favourable comments were received with regard to resource abundance (Table 6). However, some fishermen expressed concern that fishing activity is becoming more concentrated in the western portion of 4X. Another significant observation is that the catch seems to be comprised of relatively small fish. In western 4X, fishermen have noted that the quota balance between pollock and cod and haddock causes difficulty for the fishery for cod and haddock, because pollock are so abundant that the cod and haddock fishery are restricted unduly.

Catch at Length and Age

Results of age determination testing done in 1996/97 are summarized in Appendix I. The performance of the age reader was considered acceptable in all tests, including more difficult material from the eastern Scotian Shelf. This represents an improvement over last year's results. Overall, there has been no recent trend in mean weight or length at age (see text table on following page), but over the longer term, there does appear to be a slight downward trend in some ages in commercial weight at age information (Fig. 9). The marked change in age 10 weight at age is probably due to lack of fish at this age.

	Mean Weight			Mean Length		
AGE	1994	1995	1996	1994	1995	1996
2	0.864	0.611	0.378	41.92	37.295	29.88
3	1.283	1.065	1.02	47.817	45.289	43.39
4	1.541	1.646	1.657	50.683	52.365	52.1
5	1.902	2.082	2.122	54.149	56.557	56.52
6	3.064	2.577	2.678	63.893	60.433	60.95
7	3.779	3.635	3.175	68.616	68.006	64.32
8	4.177	4.349	4.561	70.96	72.356	72.38
9	4.74	4.663	4.942	73.923	73.914	74.2
10	5.588	4.884	7.443	78.157	74.399	85.58

The catch at age was developed using the approach established in Neilson and Perley (1994). In addition to adding the 1996 data, we also revised 1985 to 1988, giving a span of twelve years in the catch at age which was revised using the new approach. An error in last year's catch at age was also detected: when the small-mesh gear component in 1991 to 1993 was added to the Canadian catch at age, ages were offset by one year. Since the small mesh gear component of landings has been small (less than 3% of total landings), the impact on the catch at age was slight, but it did result in changes to the catch at age for those years, particularly at younger ages.

A total of 68 samples were collected for length frequencies and of these, 49 also included otoliths. The distribution of sampling with respect to landings by area and gear type is indicated in Table 7. Overall, most gear/area combinations were sampled adequately, although coverage was not as complete as in 1995. For example, no samples were obtained from the Bay of Fundy (4Xr and 4Xs), although that area contributed more than 10% of the landings.

Landings with neither CFV number nor tonnage class recorded accounted for 9 t in 1996, and all came from 4X5 and were from otter trawlers. For the purposes of constructing the catch at age, it was assumed such landings could be attributed to the small mobile gear category (OTB TC 1-3).

Landings from the vessels participating in the small mesh gear silver hake fishery were attributed to the foreign small mesh gear fishery for the purpose of constructing the catch at age. An age-length key derived in combination from the 1997 survey and commercial samples was applied to the length-frequency samples available from the Observer Program.

Landings of pollock from redfish directed trips were attributed to the redfish fishery for the purpose of constructing a catch at age. These vessels employed mesh size of 90 to 100 mm and there were sufficient samples from this fishery (4VW and 4X) to enable us to construct the catch at age. The foreign small mesh gear catch at age and the redfish catch at age were combined to contruct the small mesh gear catch at age.

As in the past assessment, length-weight parameters were calculated as the average a and b parameter values over the past five years. Since we do not have recent spring or fall surveys, we used the summer values for the 1st and 3rd trimesters as well.

The resulting catch at age and weight at age appear in Tables 8 and 9, respectively. The 1996 catch composition is shown in Fig. 10, both with respect to the predicted age composition and the ten-year average age composition. Two features of the 1996 age distribution are noteworthy. First, the observed abundance of age-7 fish (1989 year class) is much lower than predicted. Second, the observed abundance of age-4 fish (1992 year class) is higher than expected and higher than the ten-year average. The moderately strong 1992 year class was first detected last year (Fig. 11) and continues to be significant in the landings (Fig. 12).

The absence of age-7 fish may be partially attributable to much decreased landings by the gillnet fleet in 1996 compared with 1995 (Fig. 13, landings in 1996 were 1,671 t compared with 3,132 t in 1995). The absence of sampling in the Bay of Fundy may have also contributed, since based on limited sampling, that area contributes slightly larger fish than more easterly portions of the management unit (Fig. 14) for the same gear type. Also, the predicted composition of age 7 fish in 1996 (33%) would be higher than any other year in the time series (Table 10). This may have been unrealistic, particular given evidence of a strong incoming yearclass (age 4, Fig. 12). In the past, a strong recruiting yearclass tends to dominate landings and mask the influence of older less abundant yearclasses. An extreme example of this effect is given in Fig. 15, which demonstrates the impact of the very abundant 1979 year class when it first recruited to the fishery. However, when the 1979 year class was at age 7, the year class was still evident in many of gear sectors, unlike the current situation (Fig. 16). Finally, it is noted that 439 t of pollock were taken in the Newfoundland 3Ps pollock fishery (over four times the quota), and apparently these were considered to be "large commercial" size. The origin of these fish was unknown, but was suggested to be from the 4VWX5Zc stock (Anon, 1996, 1997). In summary, it is possible to identify some aspects of the 1996 fishery which contributed to the difference between observed and expected age composition, but it is unknown whether these factors fully account for the deviations.

Distribution and Abundance

Research Surveys

Fig. 17 shows the distribution of sets where pollock were caught in 1997 compared with the past ten years. Inspection of the plots indicates that there has not been a dramatic shift in the distribution of pollock in 1996 compared with the ten years before. Fig. 18 shows similar information for the ten year block 1977-1986, and it is possible to draw the same conclusion.

The overall trend in catch per tow is shown in Fig. 19, and has decreased from 1996 to 1997. Regarding abundance trends from the survey, results for pollock are typically highly variable. As noted in previous assessments, it is difficult to track cohorts from year to year, as the survey shows pronounced interannual variation. Given such observations, we elected not to include the survey information in the VPA.

The length composition of the landings from the 1996 and 1997 surveys are compared with previous years in Fig. 20. In 1996, the survey caught above average numbers of fish at a mode of about 30 cm, consistent with observations from the small mesh gear component of the commercial catch at age. A mode at about 35 cm was evident in 1997. However, comparatively few larger fish were observed in the recent surveys.

As noted earlier, fishermen had expressed concern that landings have increasingly come from the western portion of 4X. To determine whether this shift in the pattern of landings has resulted from a change in resource distribution, we examined the survey catch distribution in eastern and western 4X. As indicated in Fig. 21, there does not appear to be indications of a change in resource distribution from the available survey information.

Industry Survey

A collaborative survey with ITQ vessels has been ongoing for the past three years. While it is too early to use the information as an index of abundance, it provides important information on distribution and the catches can be compared qualitatively. The catch rates experienced by the ITQ vessels participating in the 1997 survey are shown on Fig. 22, and are standardized for tow duration only. Pollock catches were distributed generally throughout the 4X area, with many of the larger catches made in the lower Bay of Fundy.

Commercial Catch Rates

Given the observations made in past years that the research vessel series required further development before it could be employed as a reliable index of abundance, the stock assessments completed for the last two years have focussed on commercial fishery catch rates for TC5 mobile gear as an index of abundance for the stock. However, the TC 5 landings have been declining (Table 2), and the proportion of the landings covered by the index has become small. Moreover, TC 5 landings cover a small geographic area within the management unit (Fig. 6).

To address these concerns and following recommendations from last year's review of this assessment, we adopted a new approach to the catch rate analyses. Catch and effort data from the International Observer Program (IOP) were included[2] for tonnage classes 4+. For the smaller tonnage classes, data from ZIFF were used. The data for 1989 were omitted from the analyses for mobile gear TC 1-3 since this was the year when a combined cod-haddock-pollock quota was attempted for areas 4X5 (Mohn et al. 1990), and anomolously high pollock catch rates were observed.

[2] Four ORACLE IOP tables were used to generate catch rate data: TRIVES, GEA,CAT and SETNO tables. To extract the appropriate data, these tables were linked to each other by the trip number which is the key field for all tables. Gear is then keyed to set number by the gear code and set number is keyed to the catch by the set number, yielding an output file file with pollock dat selected for area, gear type, tonnage class, main species caught (MSPEC= pollock)

We selected trips which had directed pollock catches (when pollock landings were equal to or greater than 50% of the total landings by weight) and where effort and catch are both greater than zero and grouped to the sub-trip level from 1982 to 1996. Factors in the catch rate standardization included vessel, year, month, tonnage class, NAFO unit area and mesh type (square vs diamond). In instances prior to and including 1993 where the mesh type field was blank, it was assumed to be diamond. In 1994, all such records were deleted. In 1995, if the mesh type field was blank, it was assumed to be square mesh. We included NAFO unit areas 4Vn, 4Vs, 4Wg, 4Wh, 4Wk, 4Wl, 4Xm, 4Xo, 4Xp, 4Xq, 4Xr, 4Xs and 5Zj only in the analyses, as other areas did not have sufficient data to warrant inclusion. Even though area 5Yb was consider to have sufficient data, we excluded it, since there is thought to be landings incorrectly attributed to that area.

In the initial analyses, all main effects were found to be significant and gave patterns in catch rates rates which were expected and intuitive (ie. increasing catch rate with increasing tonnage class, seasonal patterns in catch rates which were consistent with previously published results (Hanke 1994), Fig. 23.). Two tonnage classes had relatively few observations of catch and effort (TC 1 and 6), and they were omitted from the final run. Also, catch rates during the May through October period were judged sufficiently similar to be combined into one level for the analysis of seasonal effects on catch rates. The results of the multiplicative analyses is shown in Appendix II. As with previous analyses of catch rates, the amount of variation in observed catch rate explained by the model was comparatively low (17%). We examined the impacts of including terms in the model which attempted to account for possible interaction between TC and area, and TC and month, but such terms did not appreciably increase the overall fit of the model. We therefore elected to retain the main effects model only.

The resultant catch rate series is shown in Fig. 24. The highest catch rate observed was in 1986, and was supported by the very strong 1979 year class. Since then, catch rates have declined gradually, but with an increase in the last two years.

To obtain the age-disaggregated catch rates, we first constructed the catch at age for otter trawlers using the the same method of aggregation that was used for the Canadian catch at age. The OTB TC 1-3 and OTB TC4+ were aggregated by area and by trimester and then combined to create one catch at age table. The age-disaggregated catch rates shown in Table 11 were obtained by dividing the catch at age by standardized effort.

We also used a multiplicative approach to examine whether there was evidence of changes in resource distribution in eastern and western 4X. Catch rate series for otter trawlers in the eastern and western components are shown in Fig. 25, and show general concurrence. Such concurrence is inconsistent with the possibility that the resource distribution had shifted in favour of the western component.

Sequential Population Analyses:

Estimation of Stock Parameters

The adaptive framework of Gavaris (1988) was used to calibrate the sequential population analysis with the commercial catch rate data shown in Table 11, using the following model formulation:

$C_{a,y}$ = catch	a= 2 to 12, y = 1974 to 1996
$I_{a,y}$ = OTB catch rates	a= 3 to 9, y = 1982 to 1996

where a is age, and y is year. The model provided estimates of the abundances of ages 4 to 12.

The OTB catch rate index was considered a midyear index and compared with midyear population abundance. The statistical error in the survey size sample data was assumed to be independent and identically distributed and the error in the catch at age was assumed negligible. Natural mortality, M, was assumed constant at all ages and equal to 0.2. The fishing mortality rate, F, for the oldest age (12) was taken as the arithmetic average of ages 7, 8, 9 and 10.

Based on a yield per recruit analysis documented in Neilson and Perley (1996), the $F_{0.1}$ fishing mortality was taken to be 0.30. The partial recruitment vector used for catch and population projections is shown below, and is the same as used last year.

Age	**Partial Recruitment**
2	0.01
3	0.10
4	0.40
5	0.80
6	0.90
7	1.00
8	1.00
9	1.00
10	1.00
11	1.00
12	1.00

Assessment Results

Age by age plots showing the relationship between the population and the index along with residuals are provided in Fig. 26, and model diagnostics are provided in Appendix III. For each cohort, the terminal population abundance estimates from ADAPT were adjusted for bias and used to construct the history of stock status (Tables 12,13). Fig. 27 shows the trend in biomass and recruitment from the assessment, and indicates that biomass decreased as the weak 1977 year class passed through, then increased rapidly with the record 1979 year class. Since then, biomass has declined and recruitment has followed a gradually declining trend as well. The 1989 and 1992

year-classes appear slightly stronger than the recent recruitment levels. Fig. 28 shows the trend in fishing mortality, and indicates that recent management measures have been successful in bringing down below the target level.

To assess the stability of the estimates of year-class as more data become available, we completed a retrospective analysis. Since there is considerable interest in assessing the certainty of the estimate of the apparently strong 1992 year-class, we show age-4 estimates. The results are shown on Fig. 29, and indicate that for most years, the estimates are stable. However, for the 1989 and 1990 year-classes, there has been substantial decline in the estimates of those year-classes as more data become available.

To further examine the reliability of the assessment model, we calculated the partial F matrix for the otter trawl fishery (Table 14). When the partial F's are standardized for the mean of ages 5, 6, and 7, there appears to be a trend of increasing F's for younger ages in recent years (see highlighted block of ages 3 and 4, in years 1992-1996). This is of concern, since the VPA is indicating that the 1992 year-class is relatively strong and projections indicate that it will contribute significantly to the landings in 1997 and 1998. If q has increased for younger ages through that period, the estimates of year-class size may be biased upwards.

To investigate the impact of the possible change in q, we downweighted the catch rate index by the mean standardized partial F from 1985 to 1991 by age and year. The model diagnostics for this VPA are given in Appendix IV and the results appear in Tables 12 and 13, and Figs. 30 and 31. The recovery of population biomass is truncated under this scenario, but the trends in exploitation rate are only very slightly different.

Prognosis

If the TAC of 16,500 t is taken in 1997, resulting fully recruited mortality, 5+ biomass and $F_{0.1}$ catch in 1998 are shown in the text table below, for the adjusted and unadjusted catch rate scenarios described above.

Scenario	**5+ Biomass in 1998**	**Fully Recruited F (1997)**	**1998 $F_{0.1}$ Catch**
Unadjusted Catch Rates	85,639 t	0.21	24,698 t
Adjusted Catch Rates	66,373 t	0.24	20,212 t

The relationship between 5+ biomass and yield with varying exploitation rates is shown in Fig. 32 (unadjusted scenario).

The probabilities of various yield levels exceeding the target fishing mortality is provided in Fig. 33.

Management Issues

From the analyses presented here of commercial fishery catch rates, the concentration of the pollock fishery in western 4X does not appear to be related to a reduction in the geographic range of the stock. However, this is at odds with reports from fishermen that the resource has become more scarce is eastern 4X. This issue remains unresolved and a source of concern. The increased concentration of the fishery on younger ages is also a feature which could be a danger signal.

Therefore, despite the overall positive outlook for this resource based on the assessment and reports from the fishery, there are negative indicators which warrant a continued cautious approach to the exploitation of this resource.

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Table 1. Pollock landings[1] (t round fresh) by country for NAFO Divs. 4VWX and Subdiv. 5Zc
(Source: Neilson and Perley, DFO ZIFF & IOP Data)

	Canada	Japan	France[2]	Fed. Rep. Germany	German Dem. Rep.	Cuba	USSR (Russia)	USA	Spain	Other	Total
1974	24975	40		149			2301	435	1500	61	29461
1975	26548			236	95		2004	403	708	124	30118
1976	23565			994	24		1466	443	303	385	27180
1977	24653	1		368			182	325		53	25582
1978	26801	110	33			141	502	451			28038
1979	29967	19	23			50	1025	391		7	31482
1980	35986	81	99			32	950	443			37591
1981	40270	15	90				358	918			41651
1982	38029	3	44			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	37931	38				459	1177				39605
1992	32002	72	9			1015	1006				34104
1993	20253					644	176				21073
1994	15240					10					15250
1995	9781					58					9839
1996	9145					129	6				9280

[1] Data from 1993 to 1996 are provisional.
[2] Includes mainland France and St. Pierre and Miquelon

Table 2. Pollock landings (t) by season and country for NAFO divs. 4VWX and Subdiv. 5Zc.

Canada (Maritimes & Newfoundland)

	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	4711	2144	3896	10751	6781	13746	6653	27180
1992	3153	2369	2586	8108	4566	13814	5514	23894
1993	809	1215	391	2415	4285	9433	4121	17839
1994	752	974	427	2152	1789	7923	3376	13088
1995	430	649	613	1692	1131	4271	2643	8045
1996	657	512	258	1427	1161	3952	2576	7689

USSR

	4VW				4X + 5Zc			
	Jan-Apr	May-Aug	Sept-Dec	Total	Jan-Apr	May-Aug	Sept-Dec	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				0
1983	16	204		220		6		6
1984		97		97				0
1985		336		336				0
1986		564		564				0
1987		314		314				0
1988	96	958		1054				0
1989	605	1177		1782				0
1990	342	698		1040				0
1991	151	640	2	793		384		384
1992	519	350		869	2	135		137
1993	21	125		146		30		30
1994	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0
1996	6							

Table 2(cont.) Pollock landings (t) by season and country for NAFO divs. 4VWX and Subdiv. 5Zc.

Other Foreign Countries

	4VW					4X + 5Zc				
	Jan-Apr	May-Aug	Sept-Dec	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			286	358	497	472		1327
1984	87	83	1		171	387	528	776		1691
1985	82	70	8		160					0
1986	204	291	24		519					0
1987	110	311	32		453					0
1988	4	222			226					0
1989	99	1			100					0
1990	153	108			261					0
1991	209	169		1	379		118			118
1992	259	361		1	621	12	464			476
1993	33	213			246	4	343			347
1994		9			9		1			1
1995	11	43			54	1	3			4
1996	11	111					8			

Table 3. Nominal landings of pollock in NAFO Divs. 4VWX and Subdiv. 5Zc for Canada(Maritimes, Quebec and Newfoundland)

Otter Trawlers -- Tonnage Classes 4+

	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	5599	4168	3962	13729	2433	2520	2408	7361
1988	4091	3748	4050	11889	754	3312	2943	7009
1989	3006	4933	3669	11608	1498	2489	2596	6583
1990	4154	2832	1836	8822	1654	1835	1268	4757
1991	4172	1393	2352	7917	1580	2638	1401	5619
1992	2794	1499	1025	5318	1306	2275	1288	4869
1993	718	311	224	1253	2629	651	1457	4737
1994	701	458	174	1333	177	757	860	1794
1995	384	463	417	1264	215	400	391	1006
1996	486	134	195	815	437	754	930	2121

Otter Trawlers -- Tonnage Classes 1 - 3

	4VW				4X + 5Zc			
	Jan-Apr	May-Aug	Sept-Dec	Total	Jan-Apr	May-Aug	Sept-Dec	Total
1970	8			8	336	2042	483	2861
1971	4			4	245	1708	717	2670
1972		9	1	10	537	2035	902	3474
1973			2	2	1922	6762	618	9302
1974		39	40	79	562	3398	591	4551
1975				0	745	2610	836	4191
1976				0	1039	2844	715	4598
1977		2		2	896	2224	808	3928
1978	9	23	2	34	955	2187	961	4103
1979		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	500	311	65	876	2742	5859	479	9080
1988	575	717	15	1307	2750	6193	239	9182
1989	934	1296	60	2290	4533	2366	48	6947
1990	403	594	492	1489	533	3985	1996	6514
1991	319	80	642	1041	4379	5151	2049	11579
1992	236	149	997	1382	2645	6409	1378	10432
1993	29	100	8	137	1367	4290	1132	6789
1994	28	72	17	117	1378	2823	1079	5280
1995	31	26	8	65	701	2016	809	3526
1996	46	36	12	94	719	1439	1145	3303

Table 3.(Cont.) Nominal landings of pollock in NAFO Divs. 4VWX and Subdiv. 5Zc for Canada(Maritimes, Quebec and Newfoundland)

GILLNET, LONGLINE and MISCELLANEOUS Gears -- all tonnage classes

	4VW				4X + 5Zc			
	Jan-Apr	May-Aug	Sept-Dec	Total	Jan-Apr	May-Aug	Sept-Dec	Total
1970		46	224	270	53	893	663	1609
1971		118	72	190	5	979	544	1528
1972		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	78	1042	753	1873	591	8117	3703	12411
1988	78	1342	332	1752	257	6205	4230	10692
1989	110	1309	573	1992	712	7616	3364	11692
1990	196	1104	584	1884	939	8018	3755	12712
1991	221	671	902	1794	822	5958	3202	9982
1992	123	722	564	1409	616	5130	2849	8595
1993	62	804	159	1025	289	4492	1532	6313
1994	23	443	237	703	234	4343	1436	6013
1995	7	159	188	354	216	1854	1443	3513
1996	125	343	51	519	6	1758	501	2265

Table 4. Nominal monthly landings of pollock in NAFO Divs 4VWX and Subdiv. 5Zc for Canada(Maritimes,) Quebec and Newfoundland

		GN	LL	Misc	OTB		Grand Total
Year	Month	Fixed Gear	Fixed Gear	All	Large Mobile	Small Mobile	
1987	1	183	25	1	1781	1214	3204
	2	100	8	0	1906	897	2911
	3	164	10	17	2144	962	3297
	4	109	52	0	2201	169	2531
	5	284	283	54	1015	3810	5446
	6	972	852	46	2171	2121	6162
	7	1864	1084	10	2000	144	5102
	8	2955	755	0	1502	95	5307
	9	2047	436	37	829	373	3722
	10	1000	277	11	3367	105	4760
	11	376	49	2	1181	53	1661
	12	176	45	0	993	13	1227
1987 Total		10230	3876	178	21090	9956	45330
1988	1	57	20	4	970	1164	2215
	2	40	18	27	939	640	1664
	3	46	3	3	1728	526	2306
	4	49	22	46	1208	995	2320
	5	133	338	80	1016	1555	3122
	6	885	624	180	3038	1838	6565
	7	1882	690	23	1996	3279	7870
	8	2143	550	19	1010	238	3960
	9	2088	318	0	2095	150	4651
	10	1414	184	11	1637	54	3300
	11	444	42	1	866	37	1390
	12	52	8	0	2395	13	2469
1988 Total		9233	2817	394	18898	10489	41832
1989	1	7	9	51	899	735	1702
	2	1	16	53	1056	1756	2882
	3	182	5	29	1476	1117	2809
	4	385	15	67	1058	1887	3413
	5	546	263	14	1191	1292	3305
	6	1233	514	27	1794	2243	5810
	7	2494	577	17	2529	101	5718
	8	2706	532	5	1847	33	5123
	9	1962	433	5	1662	16	4078
	10	801	218	2	1175	58	2254
	11	395	69	0	2422	4	2891
	12	55	19	2	774	30	880
1989 Total		10768	2670	271	17881	9272	40864
1990	1	55	17	8	837	342	1260
	2	45	13	20	1349	357	1784
	3	491	38	13	2690	157	3389
	4	321	82	32	959	157	1550
	5	717	209	47	896	424	2292
	6	1202	626	14	1334	1163	4339
	7	2440	728	74	1349	2094	6685
	8	2272	777	5	1105	897	5056
	9	2060	493	28	992	478	4051
	10	976	253	32	759	843	2863
	11	333	38	13	407	836	1627
	12	82	10	29	993	338	1452
1990 Total		10993	3285	314	13668	8088	36348

Table 4. (Cont.) Nominal monthly landings of pollock in NAFO Divs 4VWX and Subdiv. 5Zc for Canada(Maritimes,) Quebec and Newfoundland

		GN	LL	Misc	OTB		Grand Total
Year	Month	Fixed Gear	Fixed Gear	All	Large Mobile	Small Mobile	
1991	1	39	46	82	1030	766	1965
	2	66	17	60	1617	1074	2834
	3	249	4	1	1337	647	2237
	4	394	20	64	1800	2211	4489
	5	501	138	8	1710	1270	3627
	6	860	535	10	869	1833	4107
	7	1457	918	1	698	1560	4634
	8	1474	725	1	754	568	3522
	9	1430	457	36	193	781	2897
	10	1161	326	7	448	728	2670
	11	460	55	14	1463	827	2819
	12	148	11	0	1649	355	2163
1991 Total		8238	3253	284	13569	12620	37964
1992	1	80	23	6	1268	604	1982
	2	114	21	12	1012	455	1615
	3	96	10	0	768	738	1612
	4	337	33	5	1059	1082	2517
	5	369	109	39	1488	2657	4662
	6	588	635	3	1208	1084	3518
	7	1168	996	0	644	1600	4408
	8	1094	848	3	434	1215	3594
	9	1093	642	0	195	556	2486
	10	661	423	20	807	507	2418
	11	353	102		1091	783	2329
	12	89	28	1	220	529	866
1992 Total		6044	3870	89	10193	11813	32009
1993	1	4	4	0	1144	167	1319
	2	59	11	0	867	78	1015
	3	102	13	1	858	407	1381
	4	117	30	10	482	744	1382
	5	305	123	21	243	1048	1740
	6	829	589	13	624	1262	3317
	7	953	952	5	20	1429	3359
	8	752	753	2	75	660	2243
	9	603	448		89	381	1521
	10	305	236	0	42	148	731
	11	8	74	0	863	338	1282
	12	0	17	1	686	274	977
1993 Total		4037	3250	53	5993	6936	20267
1994	1	0	8	0	495	83	585
	2	7	5	32	242	371	657
	3	5	2	14	65	413	500
	4	136	47	2	76	539	800
	5	201	127	5	93	529	955
	6	632	765	167	263	698	2525
	7	821	918	9	602	1219	3568
	8	622	528	11	253	454	1868
	9	526	440	14	18	276	1274
	10	252	256	1	328	313	1149
	11	53	130	3	284	286	756
	12	8	16	0	387	238	650
1994 Total		3264	3242	256	3105	5420	15288

Table 4.(Cont.) Nominal monthly landings of pollock in NAFO Divs 4VWX and Subdiv. 5Zc for Canada(Maritimes,) Quebec and Newfoundland

		GN	LL	Misc	OTB		Grand Total
Year	Month	Fixed Gear	Fixed Gear	All	Large Mobile	Small Mobile	
1995	1		12	0	283	91	387
	2		0	0	224	119	343
	3		1		49	180	229
	4	201	8	1	40	350	599
	5	15	60	0	121	232	428
	6	744	148	2	265	940	2099
	7	640	287	4	348	600	1880
	8	56	62	1	129	270	519
	9	1298	122	0	87	248	1756
	10	133	53	0	105	250	541
	11	41	11	0	423	231	706
	12	5	3	0	194	92	294
1995 Total		3133	768	8	2268	3605	9781
1996	1		2	5	200	168	375
	2		0	101	95	155	352
	3			5	338	211	554
	4	0	18	0	289	230	537
	5	161	64	35	158	335	754
	6	171	227	3	231	385	1018
	7	484	269	0	399	415	1567
	8	490	197	0	122	343	1151
	9	159	83	0	138	284	664
	10	117	68	3	190	325	701
	11	52	16	0	287	322	677
	12	44	10	0	515	227	795
1996 Total		1678	954	152	2962	3399	9145

Table 5. 1996 fishing activity by gear sector, 4VWX and 5Zc

Gear Sector	Quota	Catch	% of Quota
Fixed <45'	2807	2589	92
Fixed 45-64'	73	46	63
Mobile <65' (ITQ)	2274	2115	93
Mobile <65' (Generalists)	14	11	79
Mobile 65'-100'	1277	1244	97
Vessels >100'	3555	3189	90

Table 6. Comments om pollock stock health received from fishermen during consultation held in August and September, 1997

Sector	Area Fished	Comments
<65' ITQ	4X (western, lower Bay of Fundy)	"Quota is about right"
	4X (western, lower Bay of Fundy)	"Not a problem catching pollock quota could go up" Pollock smaller in 1997 than 1996.
	4X (western, lower Bay of Fundy)	"Pollock quota could go up. Abundance has been increasing past two years" (3 skippers)
	4X (western, lower Bay of Fundy)	"Pollock not abundant on Seal Island grounds, but German Bank good" Concern over small size.
65-100' Dragger	Shelfwide (especially McKenzie Spot, Starvation Point, Sambro Bank, more recently moving towards mouth of Bay of Fundy)	"Not in agreement with increased pollock quota in 1996"
>100' Draggers	Shelfwide	Not much coverage, but pollock appeared less abundant in eastern 4X (LaHave, Roseway)
Generalist Dragger	Upper Bay of Fundy	"Even with my low powered dragger, I am catching pollock. This is unusual and indicates pollock are abundant"
Longline 45-65'	4X	"Pollock seem plentiful"
Longline 45-65'	5Zc, western 4X	Pollock were abundant, traditional areas producing pollock, lots of 20-30 lb fish (five skippers)
		According to a representative, concerns about pollock TAC being too low.
Gillnets	Eastern Bay of Fundy	"pollock plentiful, interfering with white hake fishery"
	Western Bay of Fundy	"Problem staying within allowable catch of pollock" (two skippers)
		"Best fishing since 1987 reported "
Handline	Cape Sable Area	"Can't stay away from pollock, good range of lengths, more broadly distributed than expected. Abundance has been increasing last two years" (3 skippers)
	Eastern Bay of Fundy Area	"Pollock are abundant" (representatives of fishermen's organizations"
	Eastern 4X	Representatives of fishermen's organizations reported mixed findings.

Table 7. Summary of commercial fishery sampling for 4VWX5Zc pollock in 1996 and how the sampling data was used in constructing the catch at age.

Area	4VW			4X5		
Trimester	TR1	TR2	TR3	TR1	TR2	TR3
No. of Samples	2	3	2	10	21	11
No. Aged	55	81	46	336	568	284
Landings (t)	857	538	262	1161	3952	2576

Gear	Tonnage Class	Trimester	Area	a	b	Number of Samples	Number Measured	Landings(t)	ALK Used
OTB	small mobile	TR1	4VW	0.0000101	3.02824	*	0	46	4VWTR1
	Large mobile	TR1				3	600	486	
	small mobile	TR2				*	0	39	4VWTR2
	Large mobile	TR2				****	0	157	
	small mobile	TR3				4	942	12	4VWTR3
	Large mobile	TR3				****	0	199	
	small mobile	TR1	4X5	0.00000937	3.04927	9	2211	719	4XTR1
	Large mobile	TR1				4	864	437	
	small mobile	TR2				9	1983	1439	4XTR2
	Large mobile	TR2				7	1842	754	
	small mobile	TR3				7	1554	1145	4XTR3
	Large mobile	TR3				4	901	930	
GN		TR1,2,3	4VW	0.0000101	3.02824	*****	0	135	4VW**
		TR1,2,3	4X5	0.00000937	3.04927	7	1592	1543	4X**
LL		TR1,2,3	4VW	0.0000101	3.02824	3	704	237	4VW**
		TR1,2,3	4X5	0.00000937	3.04927	10	843	716	4X**
Misc		TR1,2,3	4VWX	0.00001043	3.04151	***	0	152	4VWX**

* Used samples from TR3
** Combination of all samples by area to construct the ALK
*** Used all samples
**** Used samples from TR1
*****Used misc gear sample

Table 8. Catch at age(numbers in thousands), revised method of aggregation.

Total Catch at Age

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

	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
1	1	1	1	-	1	-	8	-	-	-	-	-	-
2	87	19	59	15	11	61	49	329	53	58	50	32	95
3	803	459	705	411	648	670	803	1763	2895	923	273	467	430
4	3493	2028	2889	1986	2563	4104	1777	3054	5265	3784	693	795	1366
5	7155	3830	3550	4326	3170	3832	3598	2890	3168	2954	2184	1256	1117
6	639	5022	3440	3577	3158	2424	2727	3486	1933	1337	1396	1236	793
7	92	1162	2790	2587	1884	2170	1563	1607	1058	506	709	401	446
8	217	150	342	1744	1156	970	986	803	435	275	338	96	84
9	210	179	94	247	1006	702	641	402	308	101	172	37	21
10	92	233	109	44	53	434	308	291	169	37	44	17	4
11	18	126	150	48	20	31	120	142	67	21	18	5	1
12	23	41	68	47	32	14	47	88	54	13	7	1	1

Canadian Catch at Age

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

	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1987-1996
1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	22	6	3	13	11	34	4	45	24	56	50	23	20	28
3	720	443	387	372	583	580	595	1024	2008	901	272	407	265	701
4	3491	2017	2695	1958	2387	3424	1578	2571	4508	3521	691	781	1271	2269
5	7152	3796	3507	4277	3115	3652	3276	2774	3041	2824	2179	1251	1067	2746
6	639	5017	3420	3528	3113	2381	2662	3427	1853	1282	1395	1235	769	2165
7	91	1159	2775	2555	1808	2104	1543	1592	1036	498	709	401	437	1268
8	215	145	341	1680	1121	931	970	793	427	271	338	96	83	671
9	207	174	94	245	992	677	631	390	306	100	172	37	21	357
10	148	224	105	40	53	414	308	288	167	37	44	17	4	137
11	31	119	144	44	18	28	118	138	66	21	18	5	1	46
12	24	39	65	44	28	10	41	87	53	13	7	1	1	29

Foreign Catch at Age

	1974	1975	1976	1977-1996
1	-	-	-	-
2	12	8	17	-
3	291	67	121	-
4	162	228	160	-
5	152	87	237	-
6	77	78	64	-
7	20	23	42	-
8	9	4	14	-
9	5	2	2	-
10	3	1	2	-
11	3	1	2	-
12	1	1	8	-

Table 8(cont.) Catch at age(in thousands), revised method of aggregation.

Small Mesh Gear Catch at Age

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

	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
1	1	1	1	-	1	-	8	-	-	-	-		
2	65	13	56	2	-	27	45	284	29	2	-	9	75
3	83	16	318	39	65	90	208	739	887	22	1	60	165
4	2	11	194	28	176	680	199	483	757	263	2	14	95
5	3	34	43	49	55	180	322	116	127	130	5	5	50
6	-	5	20	49	45	43	65	59	80	55	1	1	24
7	1	3	15	32	76	66	20	15	22	8	-		9
8	2	5	1	64	35	39	16	10	8	4	-		1
9	3	5	-	2	14	25	10	12	2	1	-		
10	-	9	4	4	-	20	-	3	2	-	-		
11	0	7	6	4	2	3	2	4	1	-	-		
12	2	2	3	3	4	4	6	1	1	-	-		

Table 9. Mean weight at age (kg) for pollock in 4VWX5Zc.

Total Weight at Age

	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
1	-	-	-	-	-	0.19	-	-	-	0.83
2	0.82	0.86	0.59	0.79	1.14	0.77	1.03	0.68	0.76	0.83
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	2.09	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	6.18	6.52	5.84	5.47	6.02	5.55	5.58	5.93	5.19	5.08
9	6.68	7.48	7.02	6.82	6.91	6.61	6.50	6.90	6.12	5.84
10	7.38	7.48	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	-	11.65	9.22	8.65	8.72

	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
1	0.38	0.00	0.00	0.00	0.00	0.00	0.25	0.14	0.00	0.00	-		
2	0.73	0.59	0.35	0.92	1.19	0.60	0.48	0.53	0.75	0.97	0.87	0.61	0.38
3	1.64	1.58	1.18	1.44	1.31	1.23	1.30	1.09	1.08	1.19	1.28	1.07	1.02
4	2.36	2.22	2.12	2.04	1.96	1.71	2.04	1.93	1.62	1.54	1.54	1.65	1.66
5	2.67	3.02	2.73	2.60	2.71	2.43	2.58	2.63	2.41	2.17	1.90	2.08	2.12
6	3.84	3.39	3.48	3.07	3.29	3.16	2.98	3.07	3.03	2.95	3.05	2.58	2.66
7	5.41	3.72	3.85	3.70	3.60	3.69	3.78	3.42	3.49	3.33	3.78	3.64	3.18
8	5.97	4.85	4.41	4.05	4.39	4.03	4.21	4.16	4.18	3.88	4.18	4.35	4.58
9	5.90	6.61	6.00	4.45	4.61	4.68	4.97	4.63	4.96	4.70	4.74	4.66	4.94
10	6.32	6.55	6.60	6.25	5.74	4.79	5.24	5.00	5.80	5.35	5.59	4.88	7.44
11	7.69	7.25	6.76	6.48	7.53	6.41	6.06	5.77	5.86	5.97	6.00	5.51	9.64
12	8.53	8.81	6.89	7.17	8.51	7.25	7.10	5.90	6.43	6.81	6.18	7.57	6.83

Canadian Weight at Age

	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
1	-	-	-	-	-	0.19	-	-	-	-
2	0.83	0.86	0.63	0.79	1.14	0.77	1.12	1.01	0.76	0.84
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	5.82	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	-	11.65	9.22	8.65	8.72

	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
1	-					-	-	-	-	-	-		
2	1.46	1.08	0.91	1.01	1.19	0.75	0.82	0.88	1.10	0.99	0.87	0.73	1.02
3	1.68	1.61	1.43	1.51	1.40	1.26	1.45	1.30	1.28	1.20	1.29	1.14	1.34
4	2.36	2.22	2.15	2.05	2.01	1.82	2.06	2.06	1.69	1.58	1.54	1.66	1.69
5	2.67	3.03	2.73	2.60	2.72	2.45	2.55	2.67	2.43	2.19	1.90	2.09	2.14
6	3.84	3.39	3.48	3.07	3.30	3.17	2.97	3.08	3.06	2.97	3.07	2.58	2.69
7	5.41	3.72	3.86	3.71	3.61	3.71	3.78	3.42	3.51	3.33	3.78	3.64	3.20
8	5.97	4.87	4.42	4.07	4.39	4.05	4.22	4.16	4.20	3.88	4.18	4.35	4.58
9	5.90	6.64	6.00	4.44	4.62	4.71	4.98	4.63	4.96	4.70	4.74	4.88	4.96
10	6.34	6.60	6.62	6.31	5.74	4.81	5.24	4.99	5.61	5.35	5.59	4.88	7.44
11	7.69	7.33	6.78	6.63	8.36	6.64	6.05	5.77	5.88	5.97	6.00	5.51	9.64
12	8.76	8.93	7.00	7.26	8.72	7.25	7.19	5.87	6.42	6.81	6.18	7.57	6.83

Foreign Fishery Weight at Age

	1974	1975	1976	1977-96
1	-	-	-	-
2	0.59	0.64	0.63	-
3	1.24	1.13	1.04	-
4	1.81	1.68	1.88	-
5	2.89	2.32	2.83	-
6	3.97	3.25	3.52	-
7	5.23	4.33	4.83	-
8	6.70	5.13	5.90	-
9	6.72	5.13	6.70	-
10	7.00	-	8.26	-
11	8.43	-	9.46	-
12	13.00	-	8.66	-

Table 9.(Cont.) Mean weight at age (kg) for pollock in 4VWX5Zc.

Small Mesh Gear Weight at Age

	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
1	-	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	0.77	0.66	0.62	0.43
3	1.02	1.11	0.92	0.74	0.83	1.23	1.25	1.52	0.84	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	-	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	-	5.90	6.45	5.98	6.32	5.41	6.30	4.35
9	7.01	8.00	-	6.92	8.01	-	6.37	7.36	8.82	5.03
10	7.73	-	-	-	-	-	-	8.87	7.43	7.08
11	8.99	-	-	-	-	-	-	-	-	7.61
12	10.20	-	-	-	-	-	-	-	8.50	8.39

	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
1	0.36	-	-	-	-	-	0.25	0.14	-	-			
2	0.48	0.37	0.32	0.32	0.26	0.42	0.45	0.47	0.46	0.50	0.36	0.29	0.21
3	1.29	0.62	0.87	0.79	0.50	1.08	0.86	0.79	0.70	1.00	0.60	0.58	0.51
4	2.50	1.39	1.68	1.40	1.22	1.19	1.85	1.29	1.23	1.35	0.76	0.80	1.26
5	2.82	2.35	2.48	1.92	2.39	2.04	2.59	1.85	1.90	1.93	1.24	1.22	1.79
6	3.77	2.92	3.24	2.65	2.70	2.82	2.80	2.69	2.16	2.59	1.67	1.94	2.17
7	4.97	3.04	3.20	2.94	3.36	3.08	3.68	3.40	2.77	3.35	-		2.29
8	5.60	4.29	3.85	3.61	4.33	3.69	3.77	3.89	3.46	3.95	-		2.83
9	5.87	5.40	-	4.78	4.30	3.99	4.32	4.54	4.31	5.10	-		3.08
10	5.96	5.35	6.14	5.74	-	4.45	5.74	6.02	4.60	6.10	-		
11	7.25	5.94	6.04	4.84	-	4.19	6.12	5.86	5.85	6.80	-		
12	6.19	6.46	-	5.96	7.04	7.24	6.45	8.25	6.80	7.80	-		

Table 10. Proportional Catch at Age for pollock in NAFO Divs.4VWX5Zc using the revised method of aggregation.

	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
1	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.08	0.00	0.01
2	1.56	1.67	1.84	0.37	0.23	0.67	1.38	1.38	1.10	0.37
3	44.24	10.12	14.08	15.17	8.39	18.80	2.35	2.35	32.90	13.22
4	21.02	38.46	20.43	29.52	31.32	39.37	15.08	15.06	13.01	62.91
5	18.60	19.98	37.76	18.34	30.97	23.70	42.91	42.88	4.61	8.31
6	8.59	18.20	11.27	22.41	12.81	11.60	25.63	25.61	15.34	1.57
7	2.50	7.98	11.27	7.52	11.72	3.59	8.69	8.69	18.79	3.47
8	1.30	1.87	2.14	4.28	2.58	1.69	2.24	2.24	8.75	5.52
9	0.63	0.53	0.37	1.11	1.44	0.32	1.36	1.36	3.19	2.83
10	0.66	0.54	0.14	0.20	0.17	0.10	0.26	0.26	1.41	1.08
11	0.58	0.33	0.19	0.26	0.19	0.10	0.07	0.07	0.71	0.33
12	0.32	0.30	0.51	0.82	0.18	0.00	0.02	0.02	0.18	0.38

	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	Average, 1985-1995
1	0.01	0.01	0.01	0.00	0.01	0.00	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.04
2	0.68	0.14	0.42	0.10	0.08	0.40	0.39	2.21	0.34	0.58	0.85	0.74	2.18	0.79
3	6.26	3.46	4.97	2.73	4.73	4.35	6.36	11.87	18.79	9.22	4.64	10.75	9.87	8.33
4	27.23	15.31	20.35	13.21	18.71	26.63	14.07	20.56	34.18	37.81	11.78	18.31	31.34	22.66
5	55.77	28.91	25.01	28.78	23.14	24.86	28.49	19.45	20.56	29.51	37.12	28.92	25.63	26.65
6	4.98	37.90	24.23	23.80	23.05	15.73	21.60	23.47	12.55	13.36	23.73	28.46	18.20	20.39
7	0.72	8.77	19.65	17.21	13.75	14.08	12.38	10.82	6.87	5.06	12.05	9.23	10.23	11.17
8	1.69	1.13	2.41	11.60	8.44	6.29	7.81	5.41	2.82	2.75	5.74	2.21	1.93	5.50
9	1.64	1.35	0.66	1.64	7.34	4.55	5.08	2.71	2.00	1.01	2.92	0.85	0.48	2.86
10	0.72	1.76	0.77	0.29	0.39	2.82	2.44	1.96	1.10	0.37	0.75	0.39	0.09	1.06
11	0.14	0.95	1.06	0.32	0.15	0.20	0.95	0.96	0.43	0.21	0.31	0.12	0.02	0.37
12	0.18	0.31	0.48	0.31	0.23	0.09	0.37	0.59	0.35	0.13	0.12	0.02	0.02	0.22

Table 11. Age disaggregated catch rates for otter trawlers fishing pollock in 4VWX5Zc. Stronger than average year classes (1979, 1989, 1992) are indicated in grey, and a weak year class (1977) is shown in black.

	1982	1983	1984	1985	1986	1987	1988	1989
3	0.1324	0.0901	0.0308	0.0195	0.0198	0.0164	0.0206	0.0231
4	0.0521	0.4247	0.1342	0.0810	0.1183	0.0769	0.0729	0.1219
5	0.0167	0.0387	0.2779	0.1389	0.1568	0.1497	0.0882	0.1126
6	0.0482	0.0054	0.0212	0.1890	0.1484	0.1203	0.0876	0.0651
7	0.0554	0.0153	0.0026	0.0445	0.1248	0.0787	0.0509	0.0559
8	0.0249	0.0269	0.0065	0.0051	0.0155	0.0521	0.0290	0.0250
9	0.0098	0.0140	0.0067	0.0053	0.0034	0.0081	0.0253	0.0173

	1990	1991	1992	1993	1994	1995	1996
3	0.0248	0.0252	0.0564	0.0336	0.0155	0.0421	0.0309
4	0.0586	0.0595	0.1210	0.1344	0.0363	0.0711	0.1397
5	0.1034	0.0563	0.0675	0.1021	0.1120	0.0999	0.1011
6	0.0785	0.0654	0.0355	0.0367	0.0588	0.0879	0.0608
7	0.0402	0.0296	0.0187	0.0134	0.0216	0.0192	0.0313
8	0.0271	0.0138	0.0075	0.0078	0.0075	0.0042	0.0046
9	0.0151	0.0070	0.0054	0.0026	0.0028	0.0020	0.0009

Table 12a. Estimated beginning of year population numbers (000s), bias adjusted, pollock in 4VWX5Zc. UNADUSTED SCENARIO.

	2	3	4	5	6	7	8	9	10	11	12	13
1974	17249	28114	10221	8431	2958	828	422	504	347	175	134	0
1975	26403	13944	17977	5977	4787	1447	394	199	340	209	77	73
1976	37807	21459	10462	11101	3021	2215	443	148	113	227	140	35
1977	44940	30793	16341	6789	5817	1498	842	178	89	80	170	70
1978	20138	36762	23879	10793	3955	2809	573	318	50	55	43	68
1979	5147	16467	29344	16740	6068	2094	1256	240	132	25	28	19
1980	15652	4125	10995	18819	10574	3437	1240	805	154	95	8	23
1981	71800	12660	3115	7324	10644	5813	1850	766	508	97	70	5
1982	42818	57998	9163	1945	4161	5116	2585	876	441	283	52	35
1983	34452	34936	43860	6071	1087	1733	2138	1160	370	207	154	23
1984	34693	28157	26799	27354	3841	676	949	1003	566	157	124	74
1985	25688	28325	22328	18794	15969	2570	471	582	633	381	112	81
1986	26180	21014	22776	16452	11942	8569	1066	251	316	309	199	55
1987	28555	21381	16569	16044	10277	6689	4514	566	121	161	119	102
1988	17707	23365	17134	11776	9251	5208	3161	2134	243	60	89	56
1989	18619	14487	18545	11720	6794	4743	2577	1553	849	151	31	44
1990	23693	15189	11257	11493	6159	3391	1945	1241	644	309	96	13
1991	28866	19354	11711	7616	6182	2606	1380	714	445	252	145	36
1992	16874	23336	14256	6845	3648	1961	708	416	227	106	80	41
1993	16685	13767	16497	6956	2775	1265	663	194	70	37	28	18
1994	34646	13608	10439	10105	3054	1079	583	297	68	24	12	11
1995	24754	28321	10895	7921	6309	1254	256	177	90	17	4	3
1996	28104	20238	22765	8203	5354	4054	667	123	111	59	9	2
1997	28000	22924	16181	17406	5709	3670	2917	470	82	88	47	7

Table 12b. Estimated beginning of year population numbers (000s), bias adjusted, pollock in 4VWX5Zc. DOWNWEIGHTED SCENARIO.

	2	3	4	5	6	7	8	9	10	11	12	13
1974	17249	28114	10221	8431	2958	828	422	504	347	175	134	0
1975	26403	13944	17977	5977	4787	1447	394	199	340	209	77	73
1976	37806	21459	10462	11101	3021	2215	443	148	113	227	140	35
1977	44940	30793	16341	6789	5817	1498	842	178	89	80	170	70
1978	20138	36761	23879	10793	3955	2809	573	318	50	55	43	68
1979	5147	16467	29344	16740	6068	2094	1256	240	132	25	28	19
1980	15652	4125	10995	18819	10574	3437	1240	805	154	95	8	23
1981	71800	12660	3115	7324	10644	5813	1850	766	508	97	70	5
1982	42818	57998	9163	1945	4161	5116	2585	876	441	283	52	35
1983	34452	34935	43860	6071	1087	1733	2138	1160	370	207	154	23
1984	34692	28156	26799	27354	3841	676	949	1003	566	157	124	74
1985	25687	28325	22327	18794	15968	2570	471	582	633	381	112	81
1986	26174	21014	22776	16451	11942	8569	1066	251	316	309	199	55
1987	28556	21376	16568	16044	10277	6689	4514	566	121	161	119	102
1988	17707	23366	17130	11775	9251	5208	3161	2134	243	60	89	56
1989	18616	14488	18545	11717	6794	4743	2576	1552	849	151	31	44
1990	23569	15187	11257	11494	6157	3390	1945	1241	644	309	96	13
1991	26762	19252	11709	7616	6182	2604	1380	714	445	252	145	36
1992	18110	21614	14173	6843	3648	1961	706	416	227	106	80	41
1993	20206	14780	15088	6888	2774	1265	664	192	70	37	28	18
1994	25987	16491	11268	8953	2999	1078	583	297	67	24	11	11
1995	12048	21231	13255	8600	5367	1209	255	177	91	16	4	3
1996	28104	9836	16961	10135	5910	3283	630	123	111	59	9	2
1997	28000	22924	7665	12654	7291	4124	2286	440	82	88	47	6

Table 13a. Estimated fishing mortality, bias adjusted, pollock in 4VWX5Zc. UNADUSTED SCENARIO.

	2	3	4	5	6	7	8	9	10	11	12
1974	0.013	0.247	0.337	0.366	0.515	0.542	0.553	0.192	0.305	0.622	0.398
1975	0.007	0.087	0.282	0.482	0.57	0.984	0.781	0.361	0.203	0.203	0.582
1976	0.005	0.072	0.232	0.446	0.502	0.767	0.713	0.311	0.146	0.091	0.484
1977	0.001	0.054	0.215	0.34	0.528	0.761	0.775	1.075	0.268	0.417	0.72
1978	0.001	0.025	0.155	0.376	0.436	0.605	0.672	0.675	0.47	0.47	0.605
1979	0.021	0.204	0.244	0.259	0.368	0.324	0.246	0.243	0.133	0.913	0
1980	0.012	0.081	0.206	0.37	0.398	0.42	0.281	0.261	0.259	0.11	0.305
1981	0.013	0.123	0.271	0.365	0.533	0.611	0.547	0.353	0.385	0.43	0.474
1982	0.003	0.079	0.212	0.382	0.676	0.672	0.601	0.663	0.557	0.411	0.623
1983	0.002	0.065	0.272	0.258	0.275	0.402	0.557	0.517	0.656	0.309	0.533
1984	0.003	0.032	0.155	0.338	0.202	0.162	0.289	0.261	0.197	0.135	0.227
1985	0.001	0.018	0.105	0.253	0.422	0.68	0.429	0.411	0.516	0.45	0.509
1986	0.002	0.038	0.15	0.271	0.38	0.441	0.433	0.528	0.475	0.752	0.469
1987	0.001	0.021	0.141	0.351	0.48	0.55	0.549	0.647	0.506	0.396	0.563
1988	0.001	0.031	0.18	0.35	0.468	0.504	0.511	0.721	0.274	0.456	0.503
1989	0.004	0.052	0.278	0.443	0.495	0.691	0.531	0.68	0.812	0.256	0.679
1990	0.002	0.06	0.191	0.42	0.66	0.699	0.803	0.826	0.737	0.554	0.766
1991	0.013	0.106	0.337	0.536	0.948	1.103	0.998	0.946	1.23	0.945	1.07
1992	0.003	0.147	0.518	0.703	0.859	0.884	1.097	1.588	1.616	1.145	1.295
1993	0.004	0.077	0.29	0.623	0.745	0.575	0.603	0.839	0.863	0.962	0.716
1994	0.002	0.022	0.076	0.271	0.69	1.24	0.993	0.99	1.19	1.632	1.072
1995	0.001	0.018	0.084	0.192	0.242	0.431	0.529	0.261	0.232	0.388	0.336
1996	0.004	0.024	0.068	0.162	0.178	0.129	0.149	0.207	0.04	0.019	0.124

Table 13b. Estimated fishing mortality, bias adjusted, pollock in 4VWX5Zc. DOWNWEIGHTED SCENARIO.

	2	3	4	5	6	7	8	9	10	11	12
1974	0.013	0.247	0.337	0.366	0.515	0.542	0.553	0.192	0.305	0.622	0.398
1975	0.007	0.087	0.282	0.482	0.57	0.984	0.781	0.361	0.203	0.203	0.582
1976	0.005	0.072	0.232	0.446	0.502	0.767	0.713	0.311	0.146	0.091	0.484
1977	0.001	0.054	0.215	0.34	0.528	0.761	0.775	1.075	0.268	0.417	0.72
1978	0.001	0.025	0.155	0.376	0.436	0.605	0.672	0.675	0.47	0.47	0.605
1979	0.021	0.204	0.244	0.259	0.368	0.324	0.246	0.243	0.133	0.913	0
1980	0.012	0.081	0.206	0.37	0.398	0.42	0.281	0.261	0.259	0.11	0.305
1981	0.013	0.123	0.271	0.365	0.533	0.611	0.547	0.353	0.385	0.43	0.474
1982	0.003	0.079	0.212	0.382	0.676	0.672	0.601	0.663	0.557	0.411	0.623
1983	0.002	0.065	0.272	0.258	0.275	0.402	0.557	0.517	0.656	0.309	0.533
1984	0.003	0.032	0.155	0.338	0.202	0.162	0.289	0.261	0.197	0.135	0.227
1985	0.001	0.018	0.105	0.253	0.422	0.68	0.43	0.411	0.516	0.45	0.509
1986	0.002	0.038	0.15	0.271	0.38	0.441	0.433	0.528	0.475	0.752	0.469
1987	0.001	0.021	0.141	0.351	0.48	0.55	0.549	0.647	0.506	0.396	0.563
1988	0.001	0.031	0.18	0.35	0.468	0.504	0.511	0.721	0.274	0.456	0.503
1989	0.004	0.052	0.278	0.443	0.495	0.691	0.531	0.68	0.813	0.256	0.679
1990	0.002	0.06	0.191	0.42	0.66	0.699	0.803	0.826	0.737	0.554	0.766
1991	0.014	0.106	0.337	0.536	0.948	1.105	0.999	0.947	1.231	0.945	1.07
1992	0.003	0.159	0.521	0.703	0.859	0.884	1.101	1.59	1.618	1.147	1.297
1993	0.003	0.071	0.322	0.632	0.745	0.575	0.603	0.848	0.865	0.966	0.719
1994	0.002	0.018	0.07	0.312	0.709	1.242	0.993	0.989	1.226	1.647	1.084
1995	0.003	0.025	0.068	0.175	0.291	0.451	0.531	0.261	0.231	0.413	0.343
1996	0.004	0.049	0.093	0.129	0.16	0.162	0.159	0.208	0.04	0.019	0.134

Table 14. Partial F for otter trawler fleet fishing 4VWX5Zc pollock (top table), the lower half of the table represents the partial Fs standardized by the mean of the values at ages 6, 7 and 8. The block of values outlined in grey appear to represent an anomolous increase in partial Fs for those ages.

	2	3	4	5	6	7	8	9	10	11	12
1985	.00033	.01588	.08690	.19009	.32913	.53968	.30371	.25034	.31995	.24575	.21867
1986	.00008	.01676	.09637	.18779	.25716	.30933	.30766	.29770	.33119	.51637	.32416
1987	.00085	.01807	.11799	.26252	.34876	.36155	.35422	.46013	.25028	.23252	.16770
1988	.00102	.02657	.13780	.26216	.34966	.36650	.34565	.48871	.17304	.14583	.16984
1989	.00216	.04385	.20240	.31919	.32592	.43657	.33557	.41168	.48832	.09084	.14550
1990	.00016	.04274	.14521	.27840	.43806	.41412	.50900	.44844	.40918	.25392	.22817
1991	.00170	.05471	.23703	.37705	.64288	.73305	.62142	.59537	.76505	.57898	.71739
1992	.00113	.09546	.39669	.49907	.52615	.52221	.62794	.93321	.86059	.59813	.59954
1993	.00269	.05531	.20317	.42475	.40287	.30000	.33549	.43196	.53646	.54971	.38554
1994	.00184	.01902	.06065	.21194	.44336	.57715	.33492	.24750	.18932	.36267	.30629
1995	.00066	.01430	.06614	.13437	.15154	.18164	.20389	.12697	.13647	.31040	.33600
1996	.00080	.01390	.05599	.11810	.10994	.07296	.06570	.07068	.00509	.00442	.01290

	2	3	4	5	6	7	8	9	10	11	12
1985	.0008	.0406	.2224	.4864	.8421	1.3808	.7771	.6405	.8186	.6288	.5595
1986	.0003	.0575	.3307	.6445	.8826	1.0616	1.0558	1.0217	1.1366	1.7721	1.1125
1987	.0024	.0509	.3325	.7398	.9829	1.0189	.9982	1.2967	.7053	.6553	.4726
1988	.0029	.0751	.3893	.7407	.9879	1.0355	.9766	1.3808	.4889	.4120	.4799
1989	.0059	.1198	.5530	.8720	.8904	1.1928	.9168	1.1248	1.3341	.2482	.3975
1990	.0004	.0942	.3200	.6136	.9655	.9127	1.1218	.9883	.9018	.5596	.5029
1991	.0026	.0822	.3560	.5663	.9656	1.1010	.9334	.8942	1.1491	.8696	1.0775
1992	.0020	.1708	.7099	.8932	.9416	.9346	1.1238	1.6701	1.5402	1.0705	1.0730
1993	.0078	.1598	.5870	1.2272	1.1640	.8668	.9693	1.2480	1.5499	1.5882	1.1139
1994	.0041	.0421	.1342	.4691	.9813	1.2774	.7413	.5478	.4190	.8027	.6779
1995	.0037	.0799	.3695	.7506	.8465	1.0146	1.1389	.7093	.7623	1.7338	1.8768
1996	.0096	.1678	.6757	1.4252	1.3267	.8804	.7929	.8529	.0614	.0534	.1557

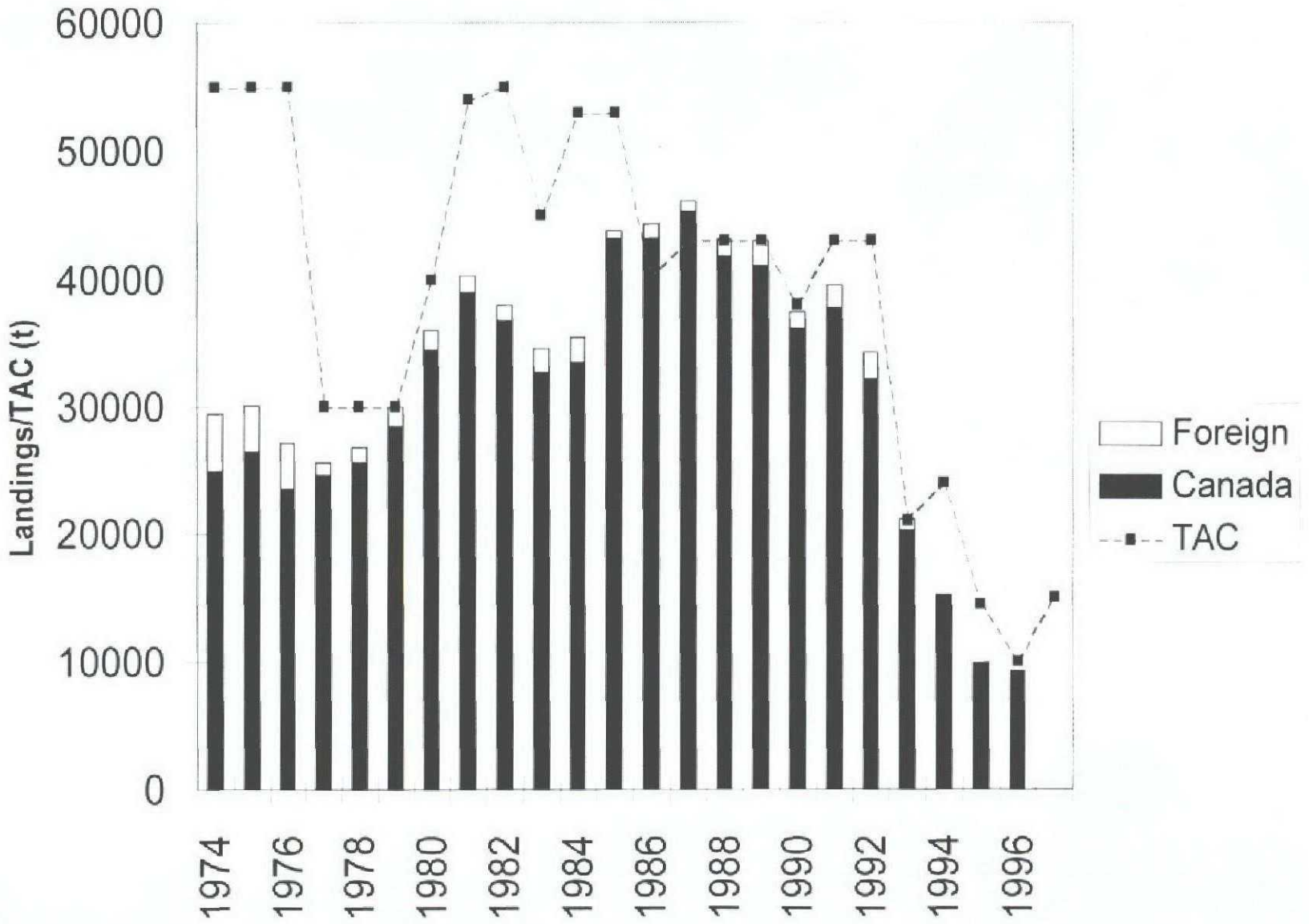


Fig. 1. Landings of 4VWX5Zc pollock by Canada and Foreign countries, shown with respect to the TAC

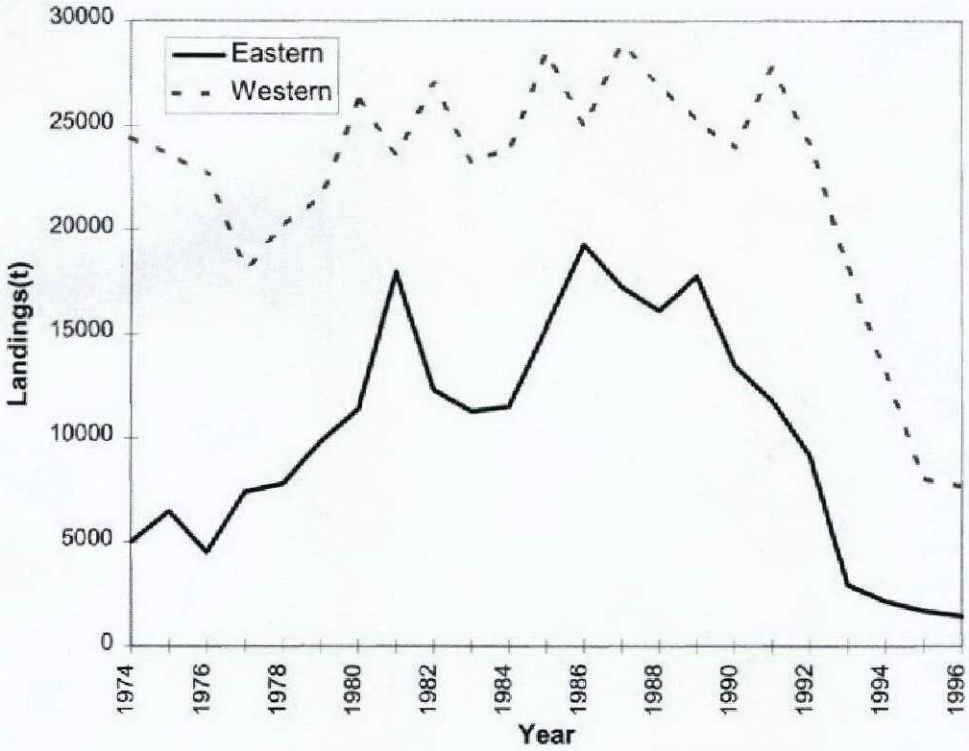


Fig.2. Landings of 4VWX5Zc pollock, split into eastern and western halves of the management unit

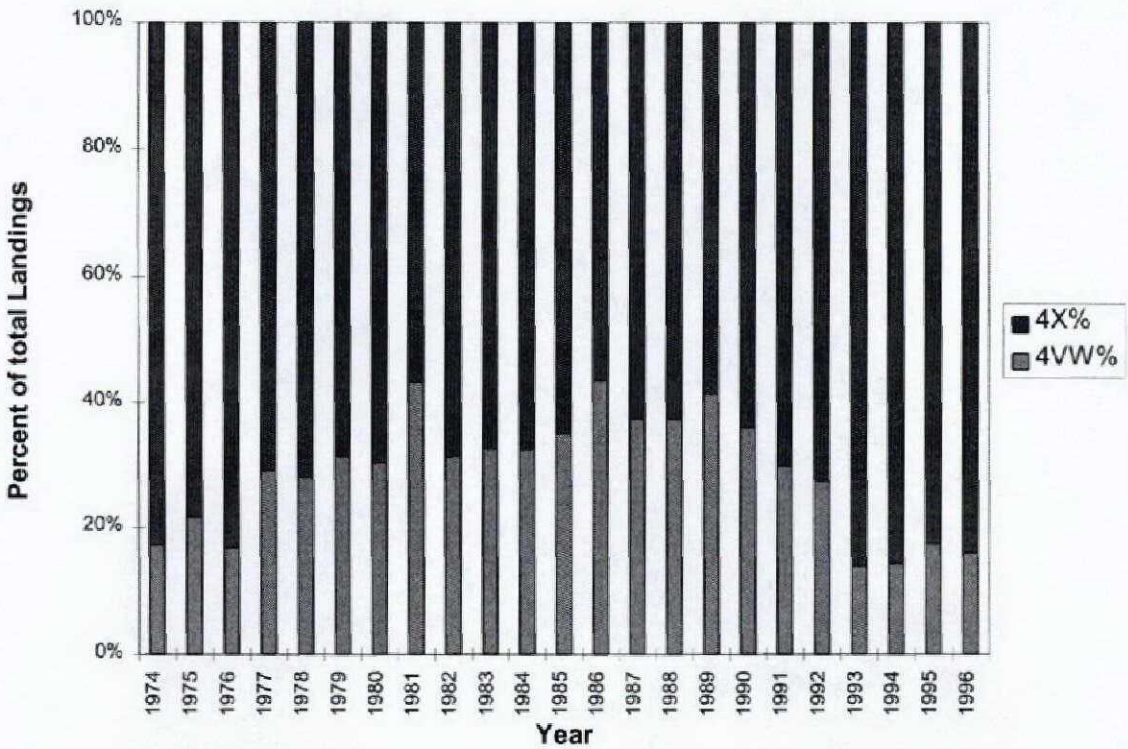


Fig. 3. Landings of 4VWX5Zc pollock, split into eastern and western halves of the management unit by proportion

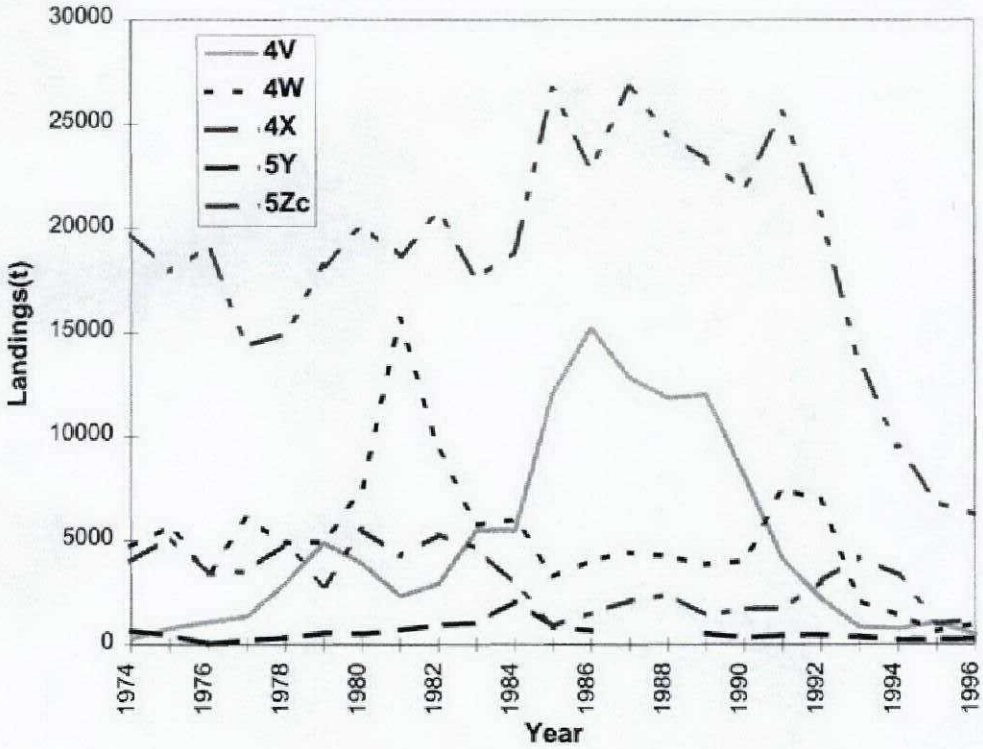


Fig. 4. Landings of 4VWX5Zc pollock by NAFO subdivision

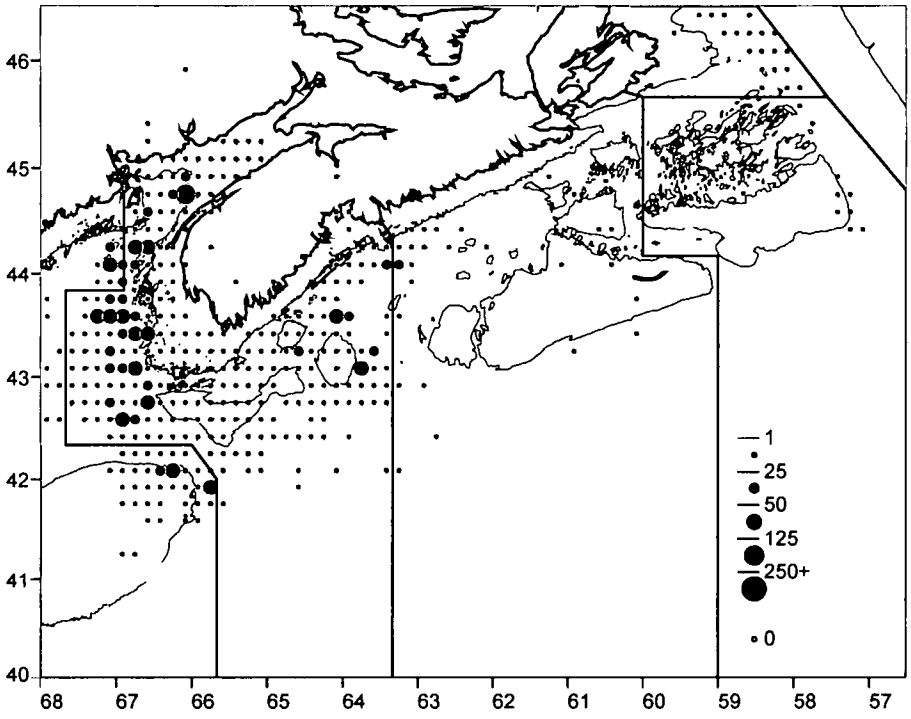


Fig. 5 Distribution of pollock catches by OT 1-3 vessels in NAFO Div. 4VWX5Zc for 1996

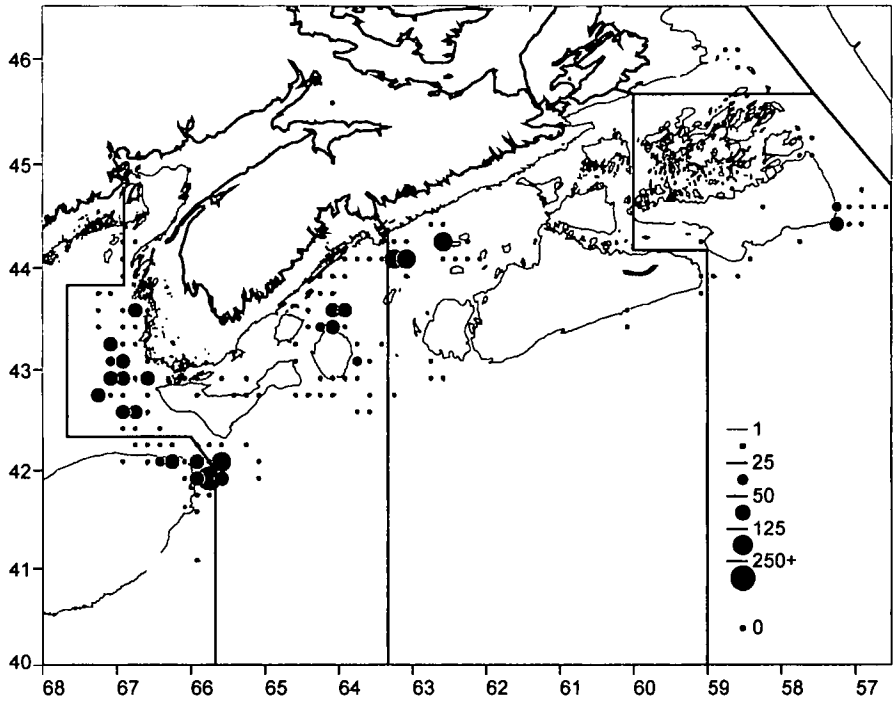


Fig. 6 Distribution of pollock catches by OT 4+ vessels in NAFO Div. 4VWX5Zc for 1996

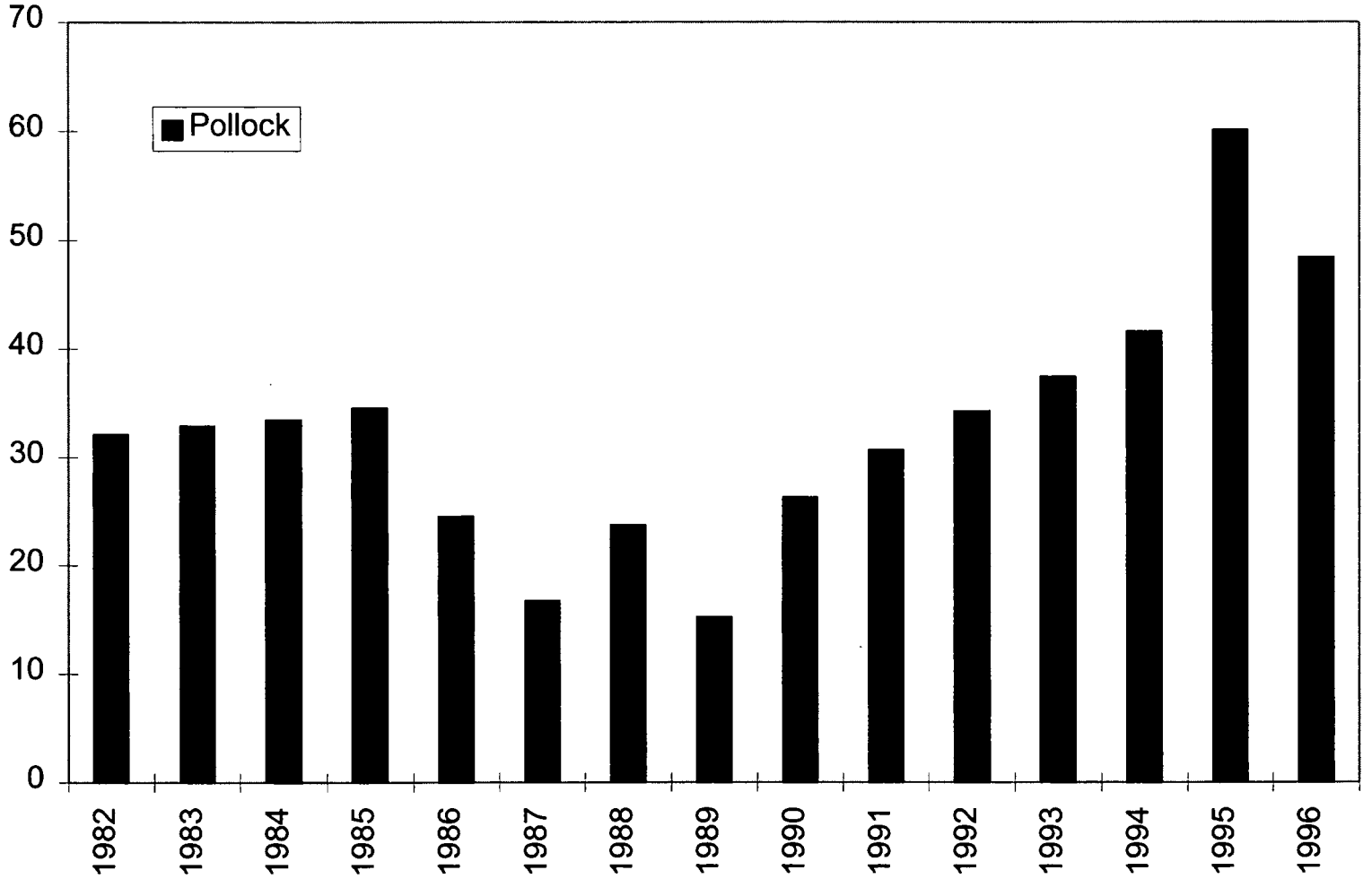


Fig. 7. Proportion pollock from western 4X (4Xq, r and s) in relation to total 4X landings.

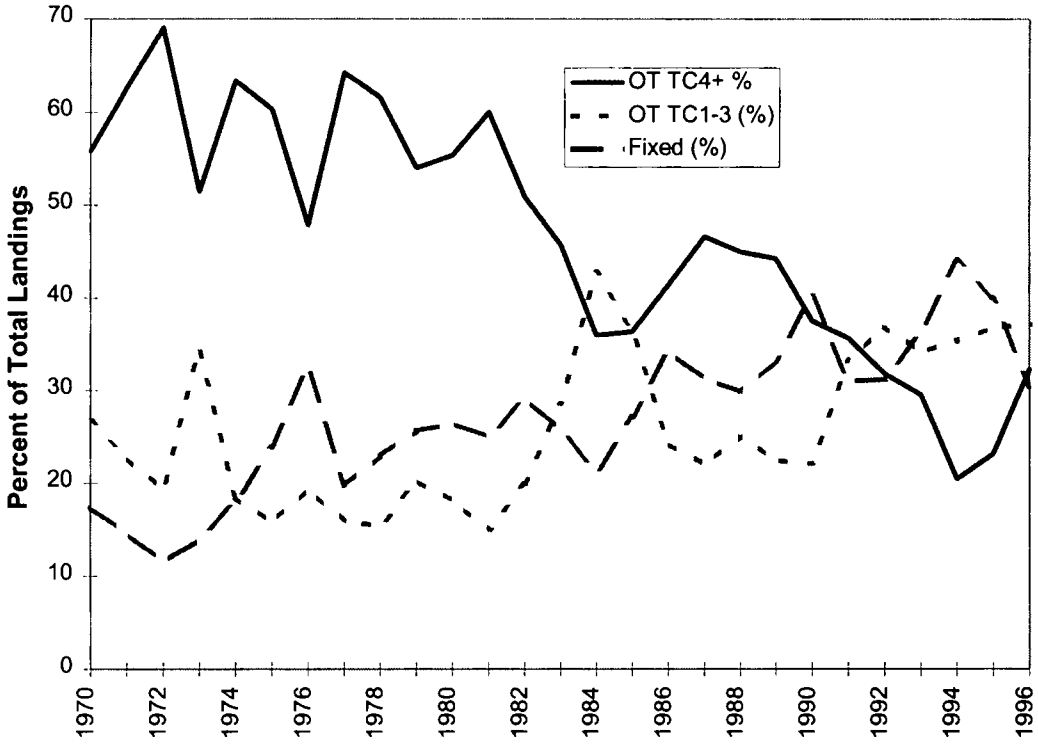


Fig. 8. Landings of 4VWX5Zc pollock by major gear type.

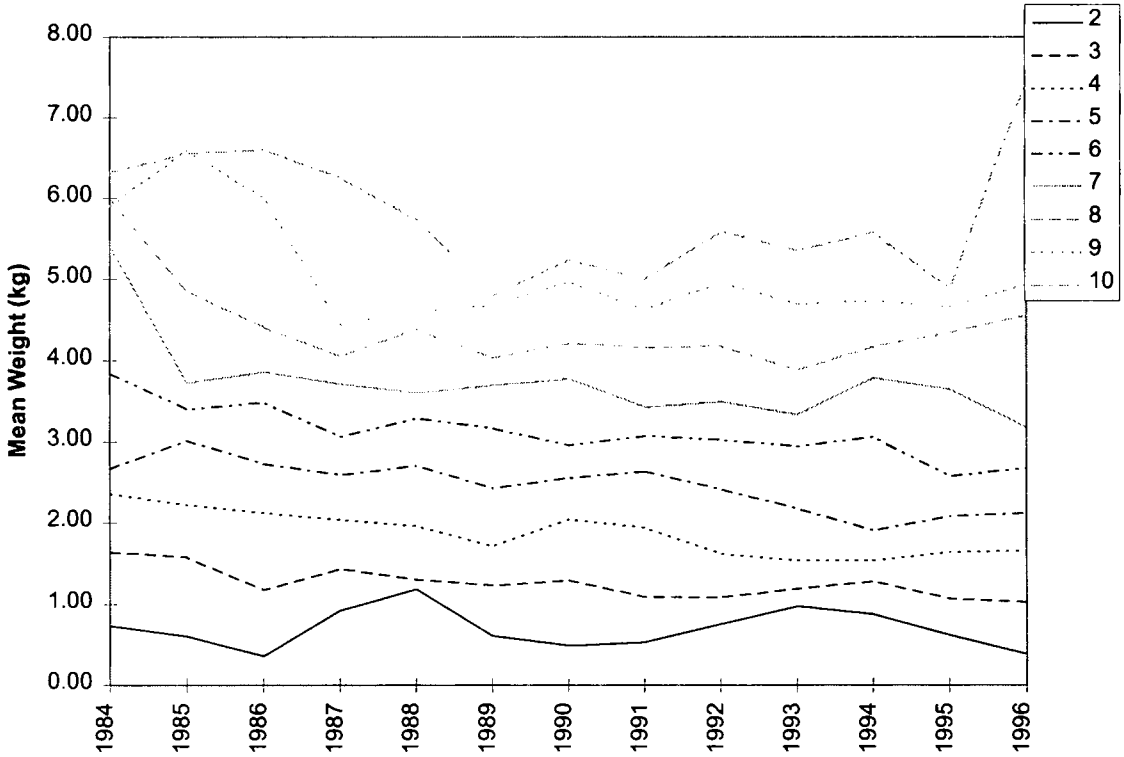


Fig . 9 Trend in mean weight at age from the 4VWX5Zc pollock fishery, 1984 to 1996

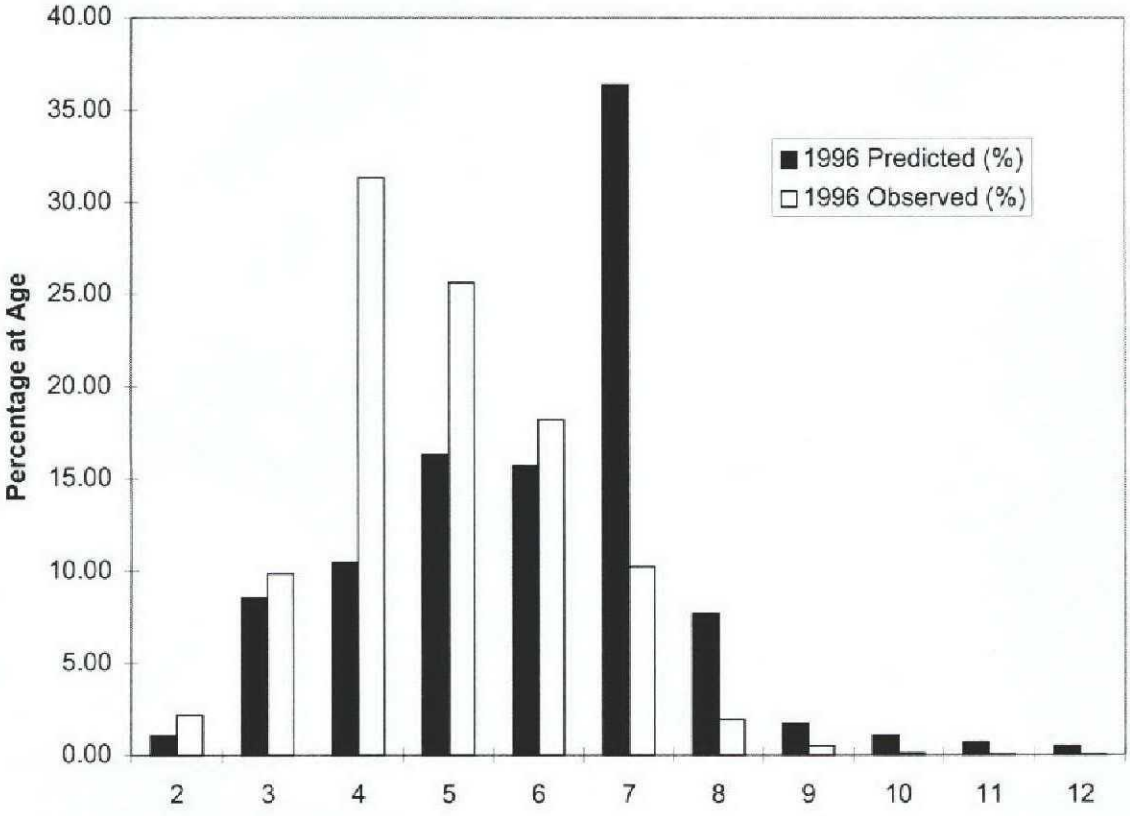


Fig. 10. Comparison of observed and expected catch composition by age, pollock in 4VWX5Zc, 1996.

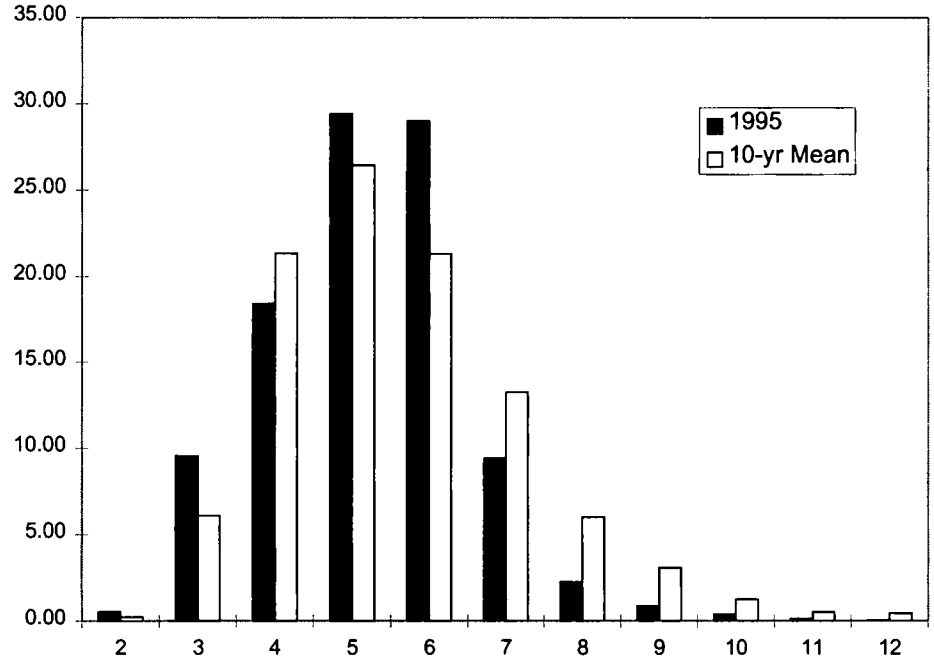


Fig. 11. Observed age composition in 1995 (percent) compared with the 10-year mean. Pollock in 4VWX5Zc.

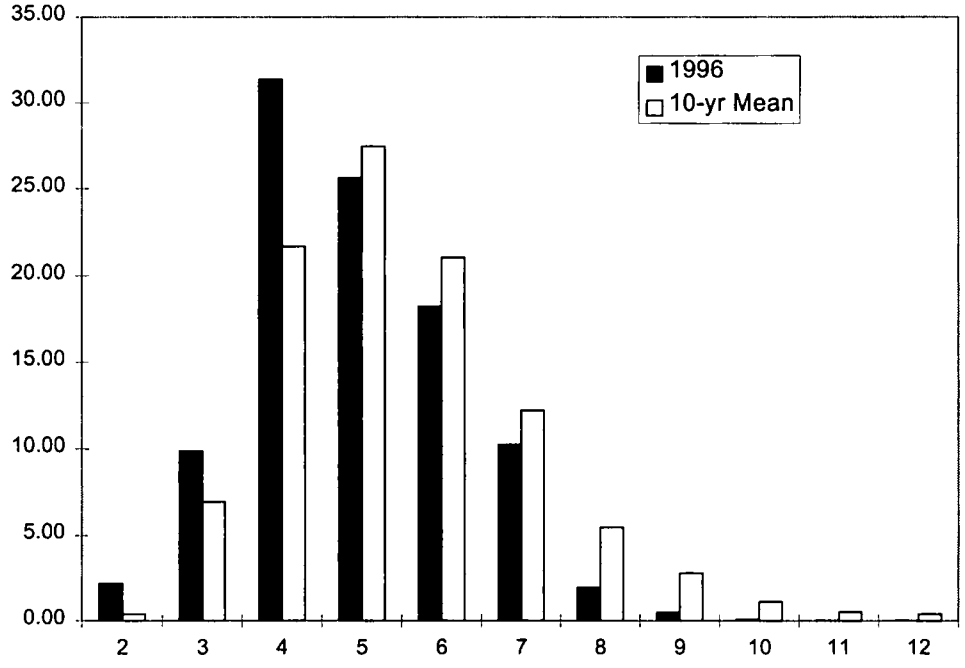


Fig. 12. Observed age composition in 1996 (percent) compared with the 10-year mean. Pollock in 4VWX5Zc.

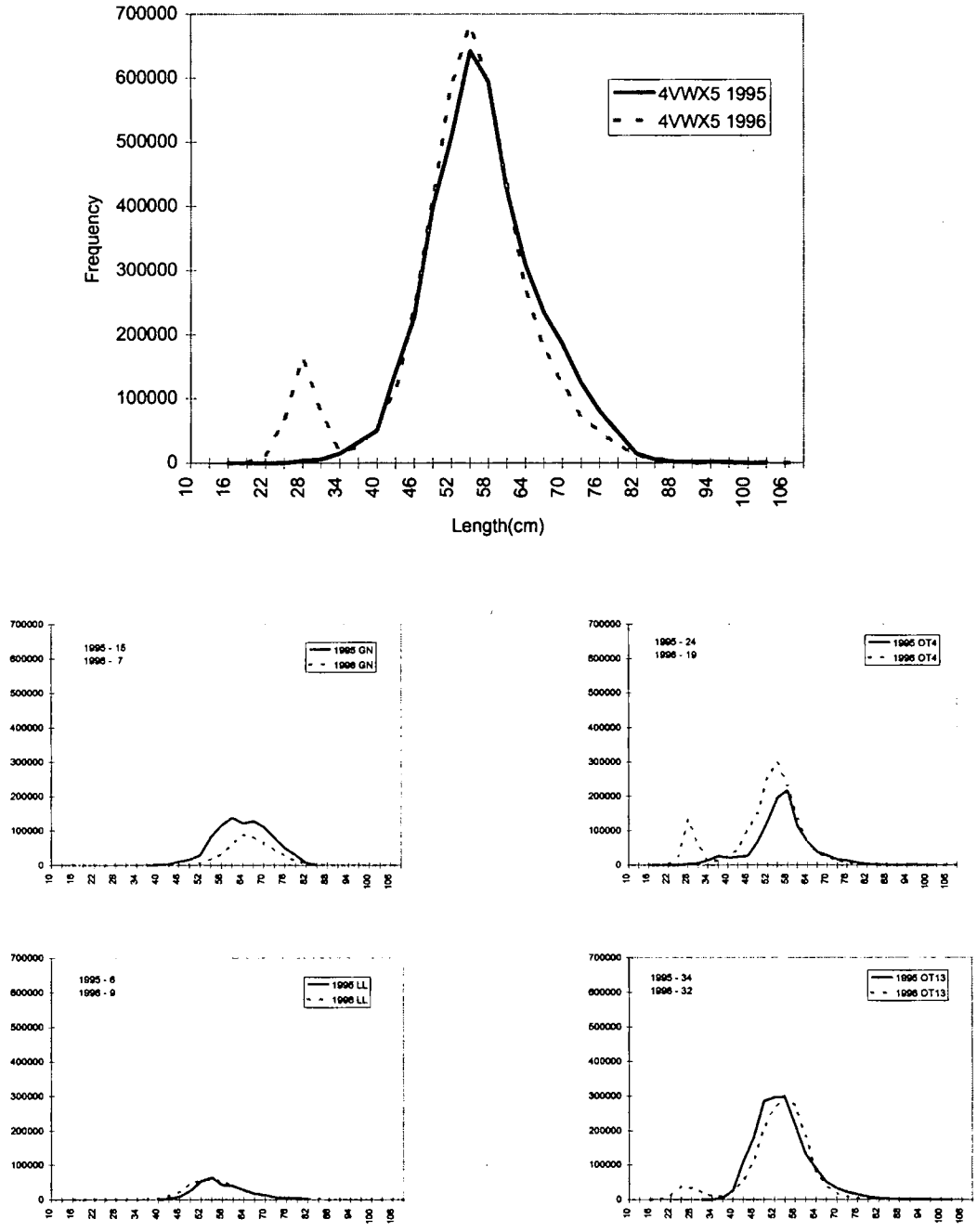


Fig. 13. Comparison of length composition of pollock landings in 1995 and 1996, both for the total fishery and for various major gear sectors.

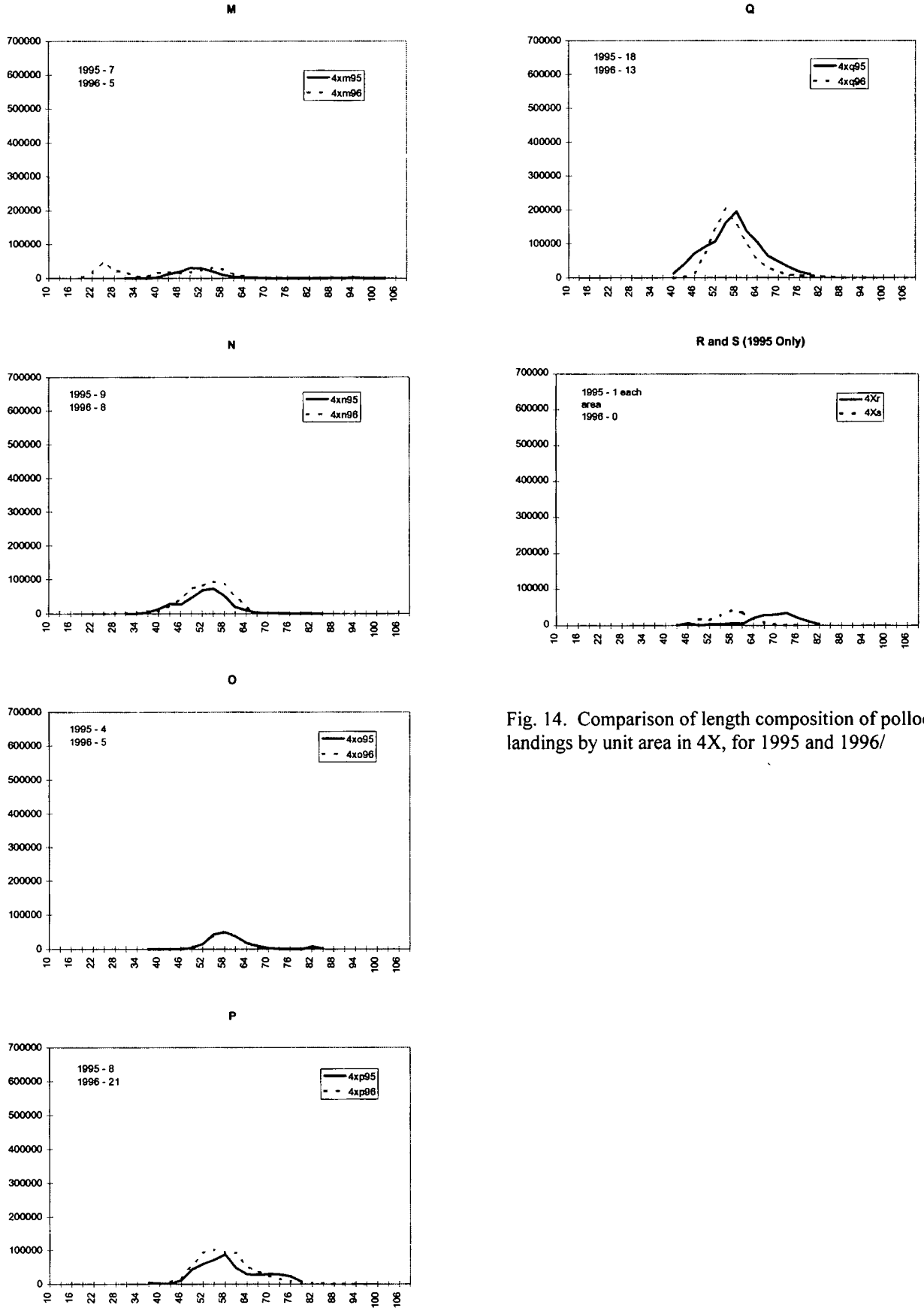


Fig. 14. Comparison of length composition of pollock landings by unit area in 4X, for 1995 and 1996/

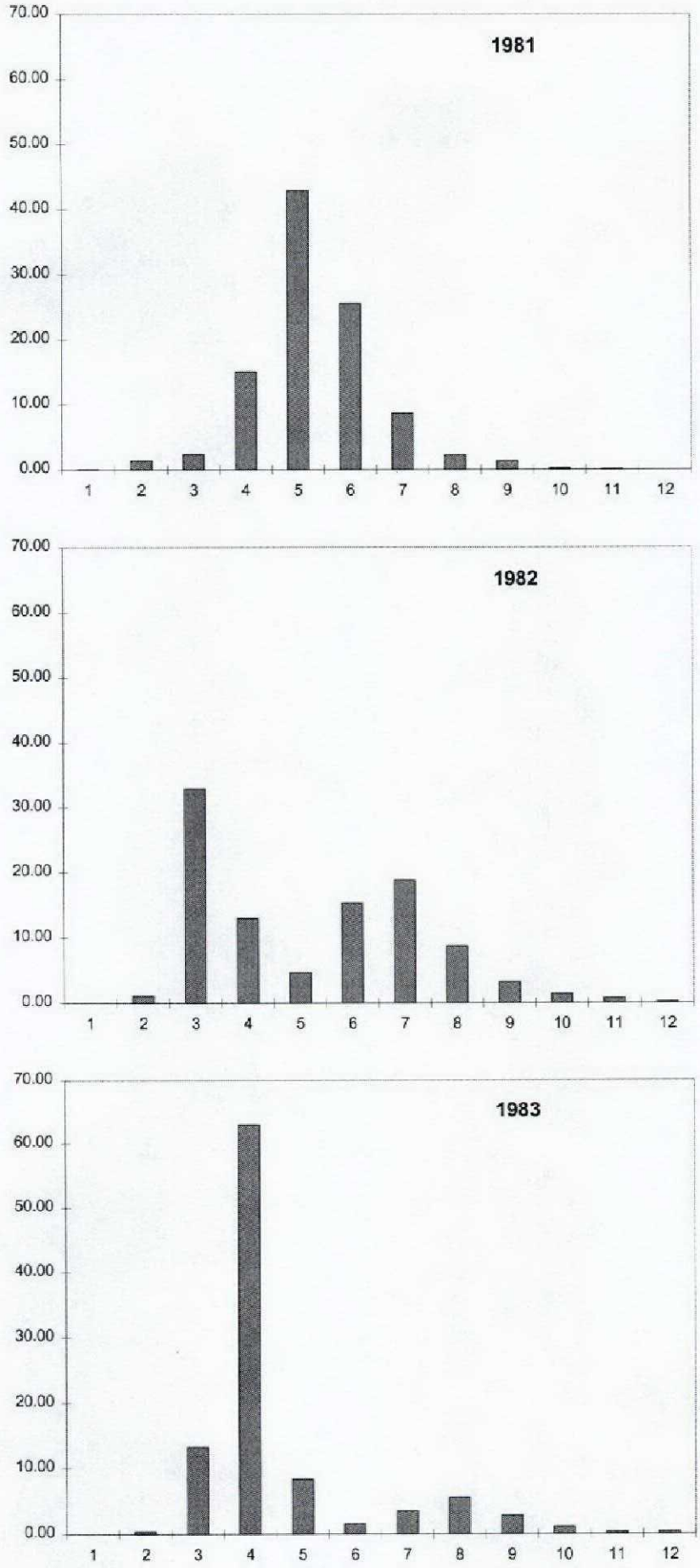
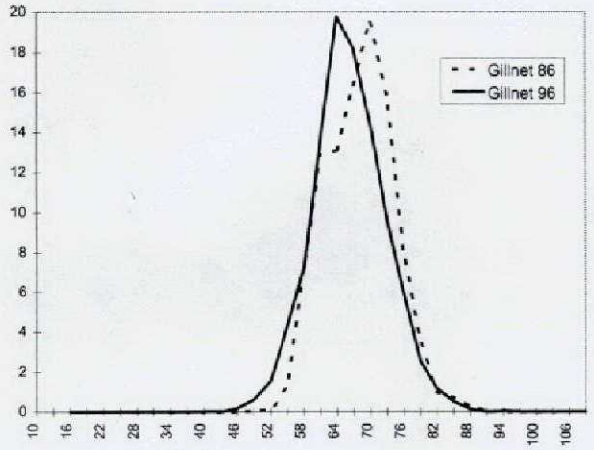
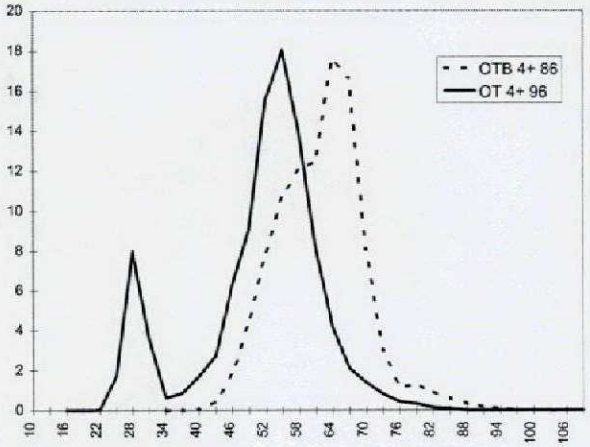
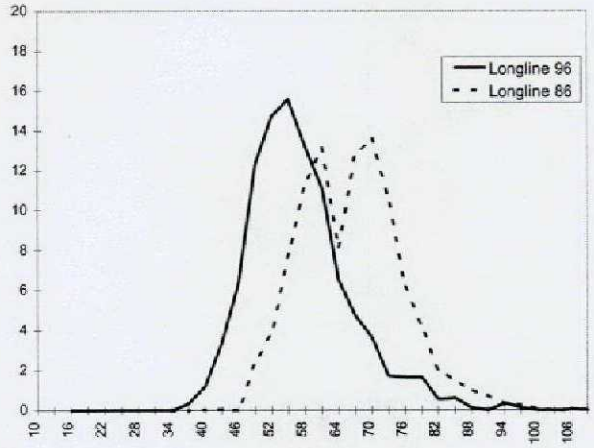


Fig. 15. Changes in pollock percent age composition with the recruitment of the strong 1979 year class.







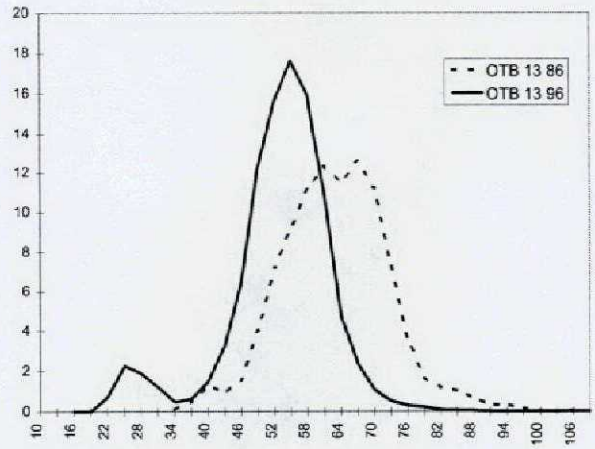


Fig. 16. Length composition (percent) of the 1986 pollock fishery contrasted with the 1996 fishery, by major gear category. The length at age 7 in 1986 is shown as the dashed line.

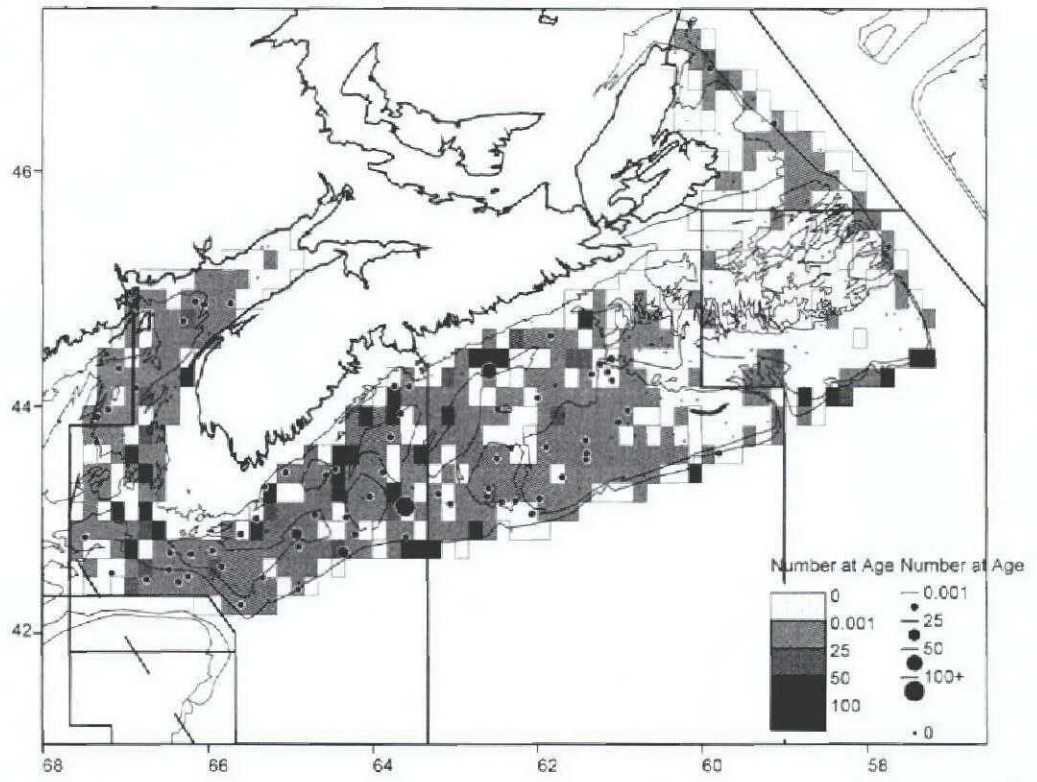


Fig. 17. 1997 R.V. survey distribution compared with the average survey distribution from 1987 – 1996

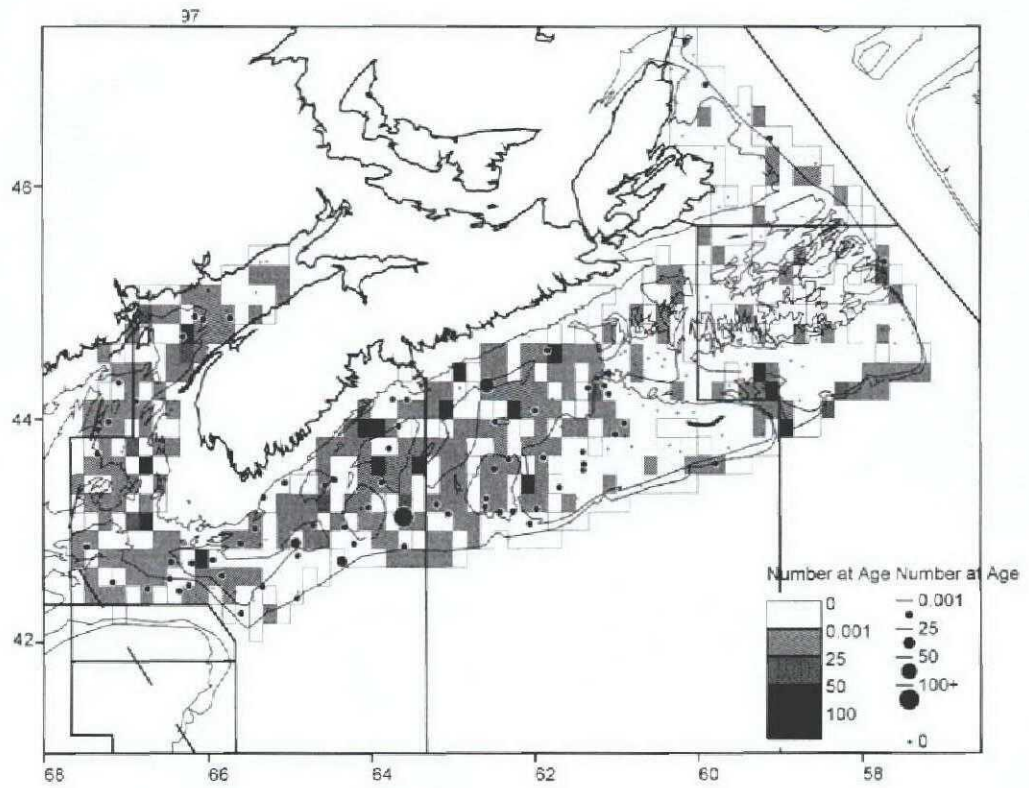


Fig. 18. 1997 R.V. survey distribution compared with the average survey distribution from 1977 - 1986

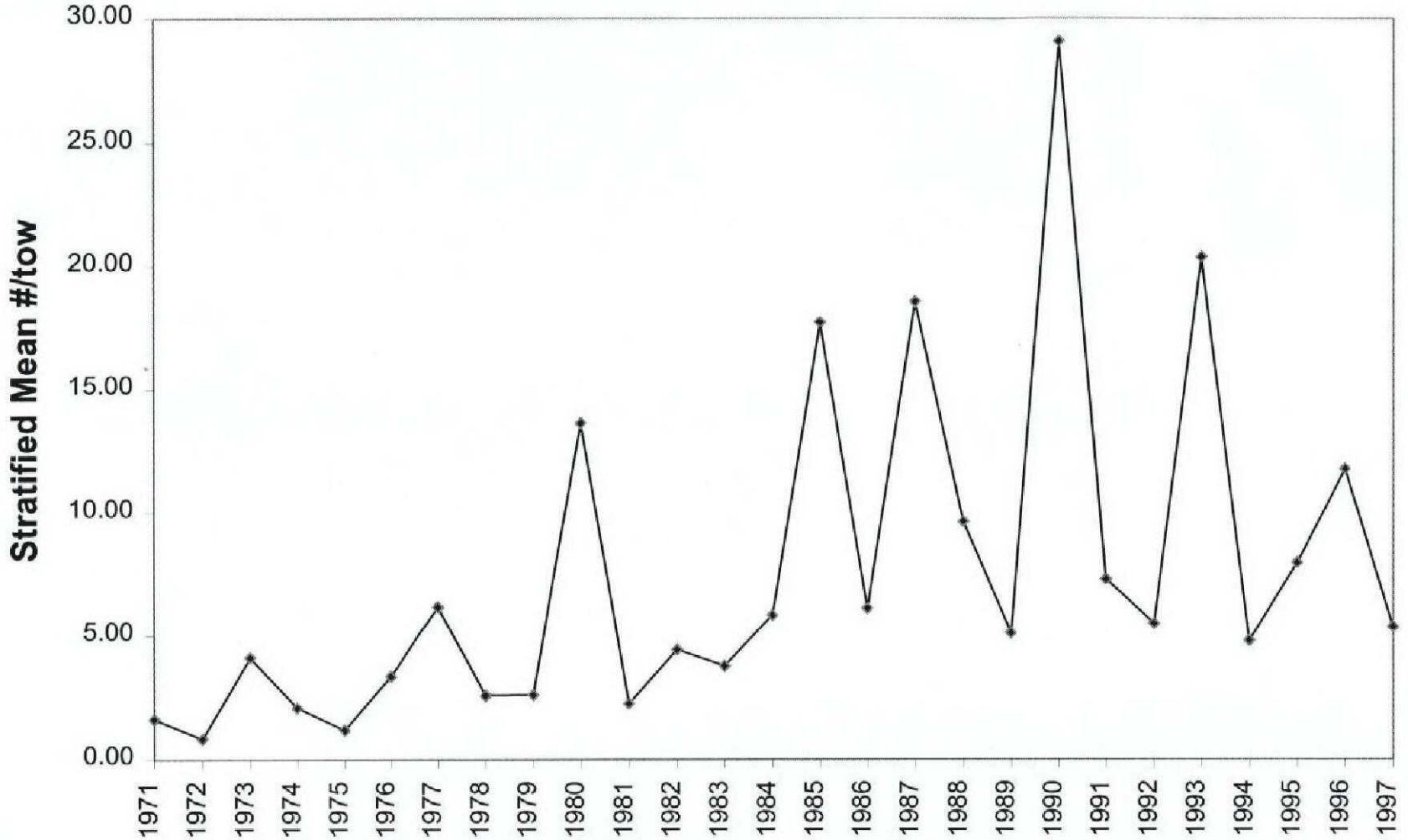


Fig. 19. Pollock catch per tow from summer RV surveys, 4VWX. Strata included were 440-495.

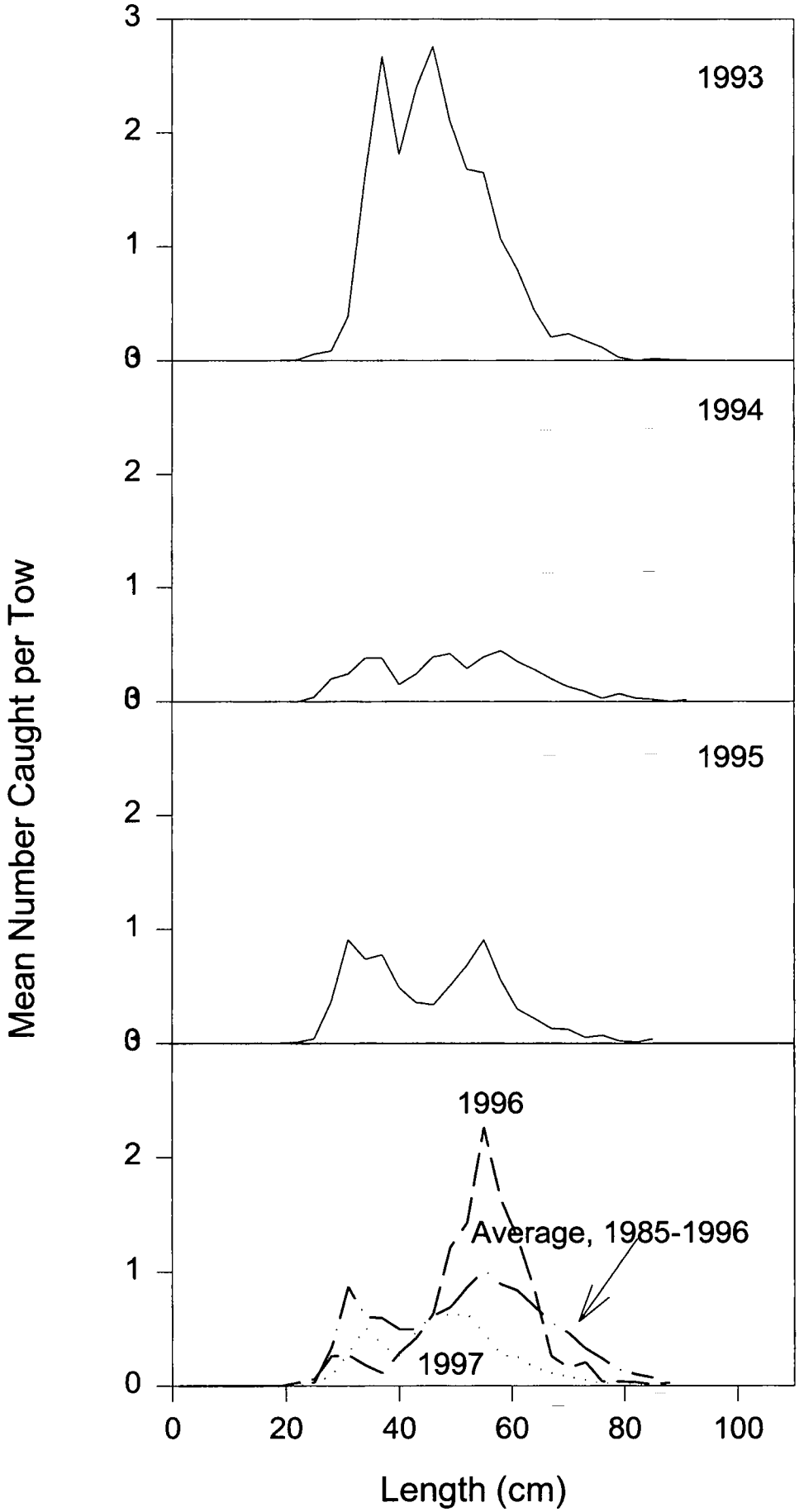


Fig. 20. Pollock length frequency distributions from summer groundfish surveys, 1992-1997.

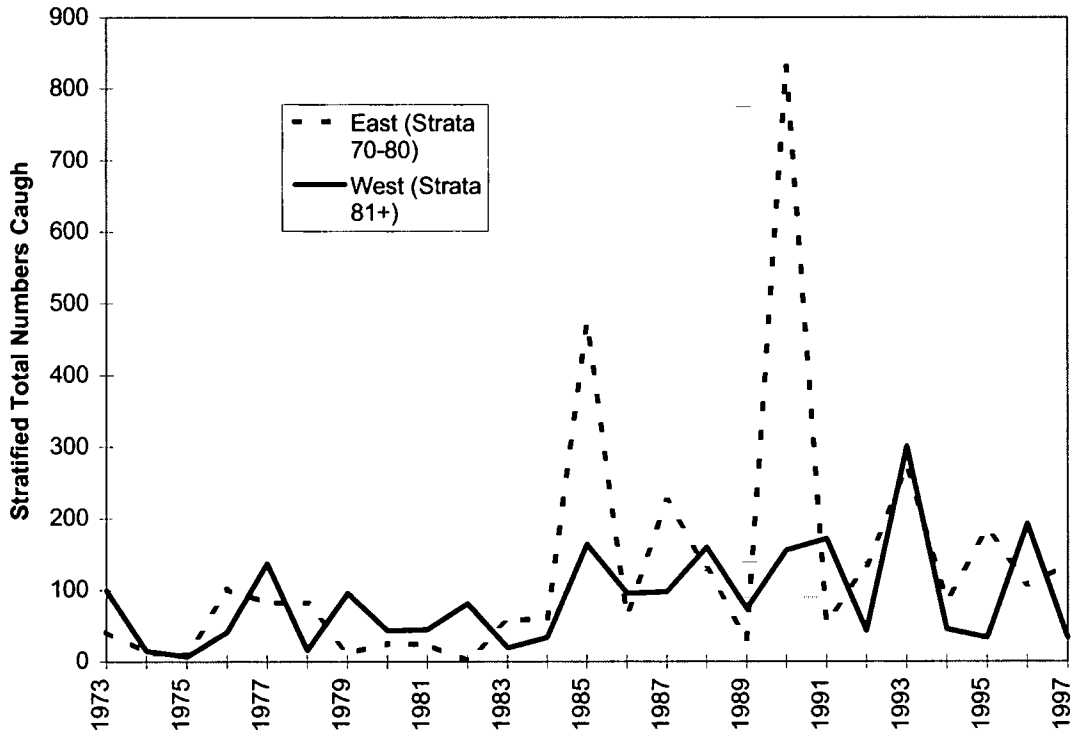


Fig. 21. Stratified numbers caught in the eastern and western portion of 4X from RV surveys.

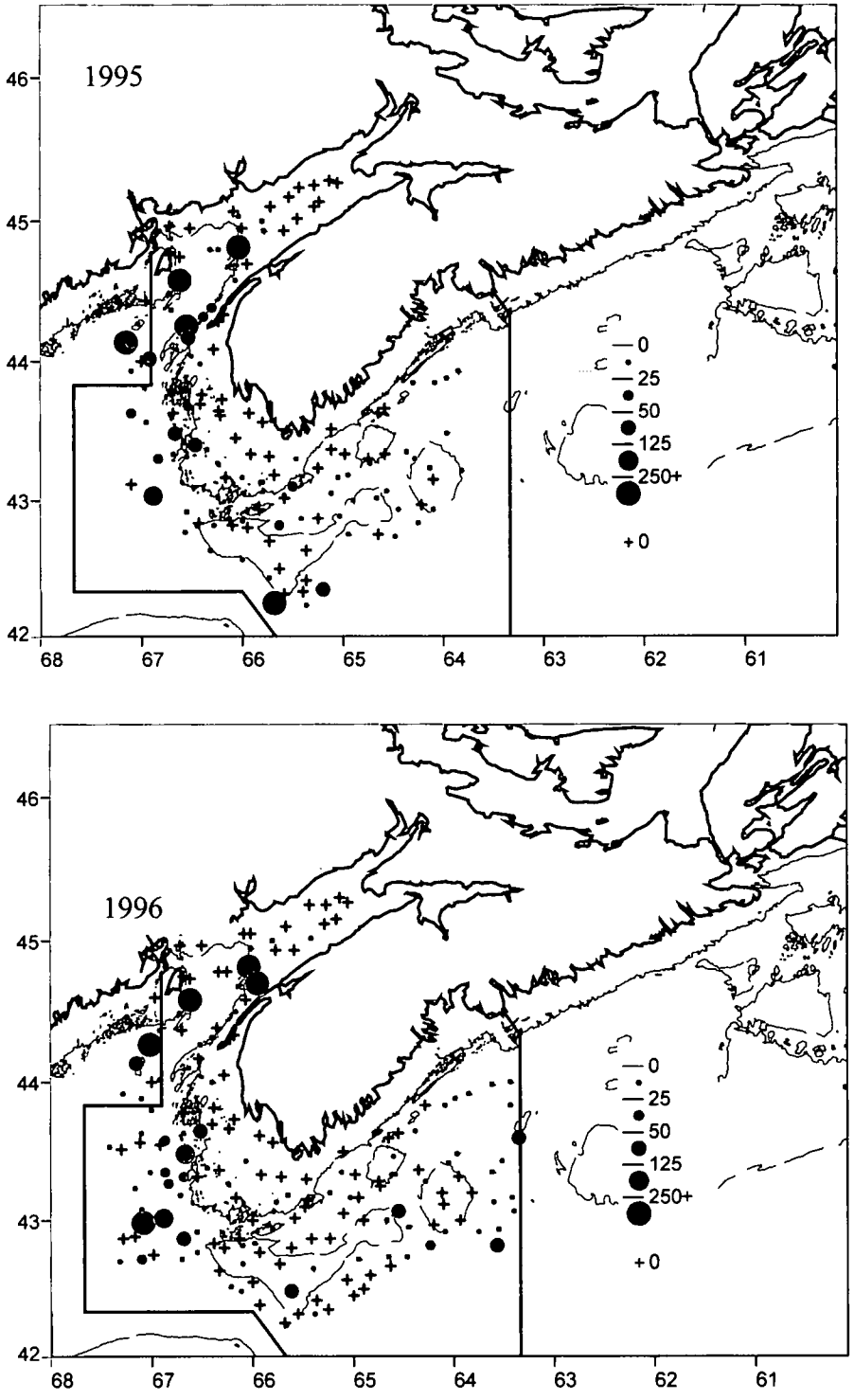


Fig. 22. ITQ survey distribution of pollock(weight in kg.) 1995 and 1996

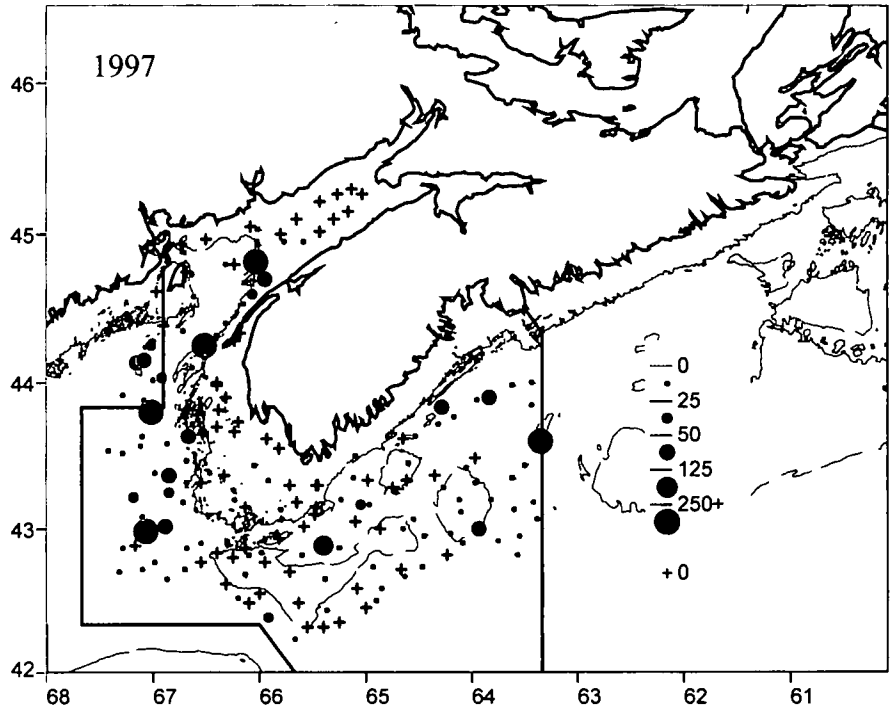


Fig 22(cont) ITQ survey distribution of pollock(weight in kg) 1997

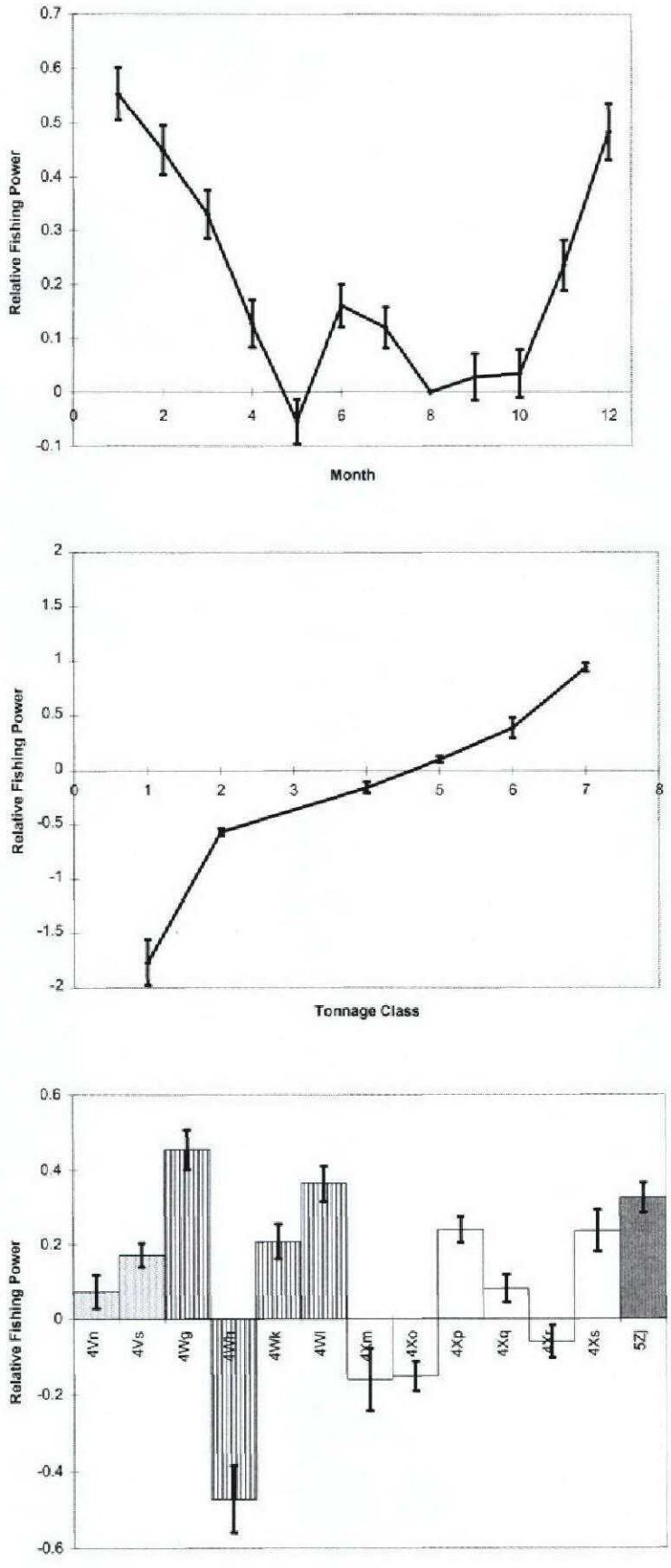


Fig. 23. Standardized catch rate analyses for 4VWX5Zc pollock, showing the effect of month, tonnage class and unit area on relative fishing power. All main effects shown were significant.

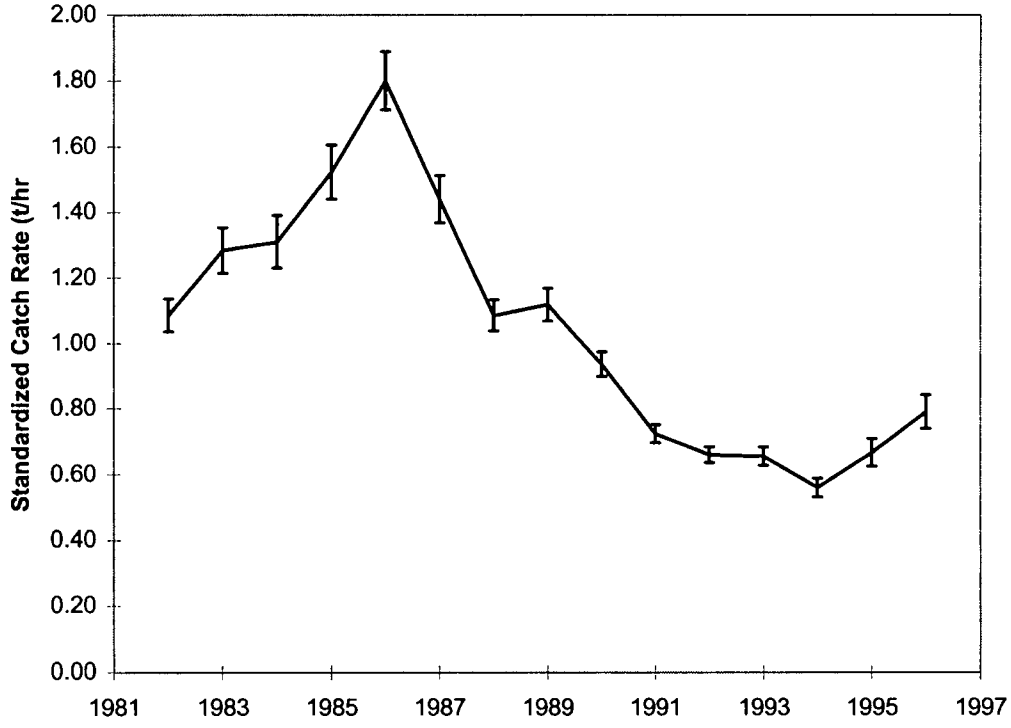


Fig. 24. Standardized catch rate series for otter trawlers fishing pollock in 4VWX5Zc, 1982 to 1996. The error bars represent +/- one standard error.

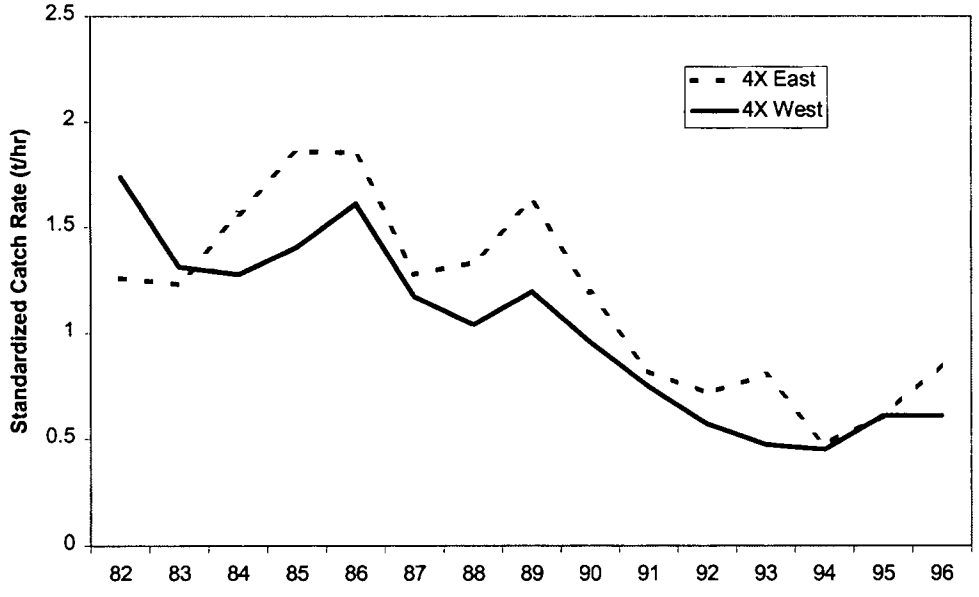


Fig. 25. Standardized catch rates for otter trawlers fishing in eastern 4X (4X m,n,o and p) compared with those fishing in western 4X (4Xq, r and s).

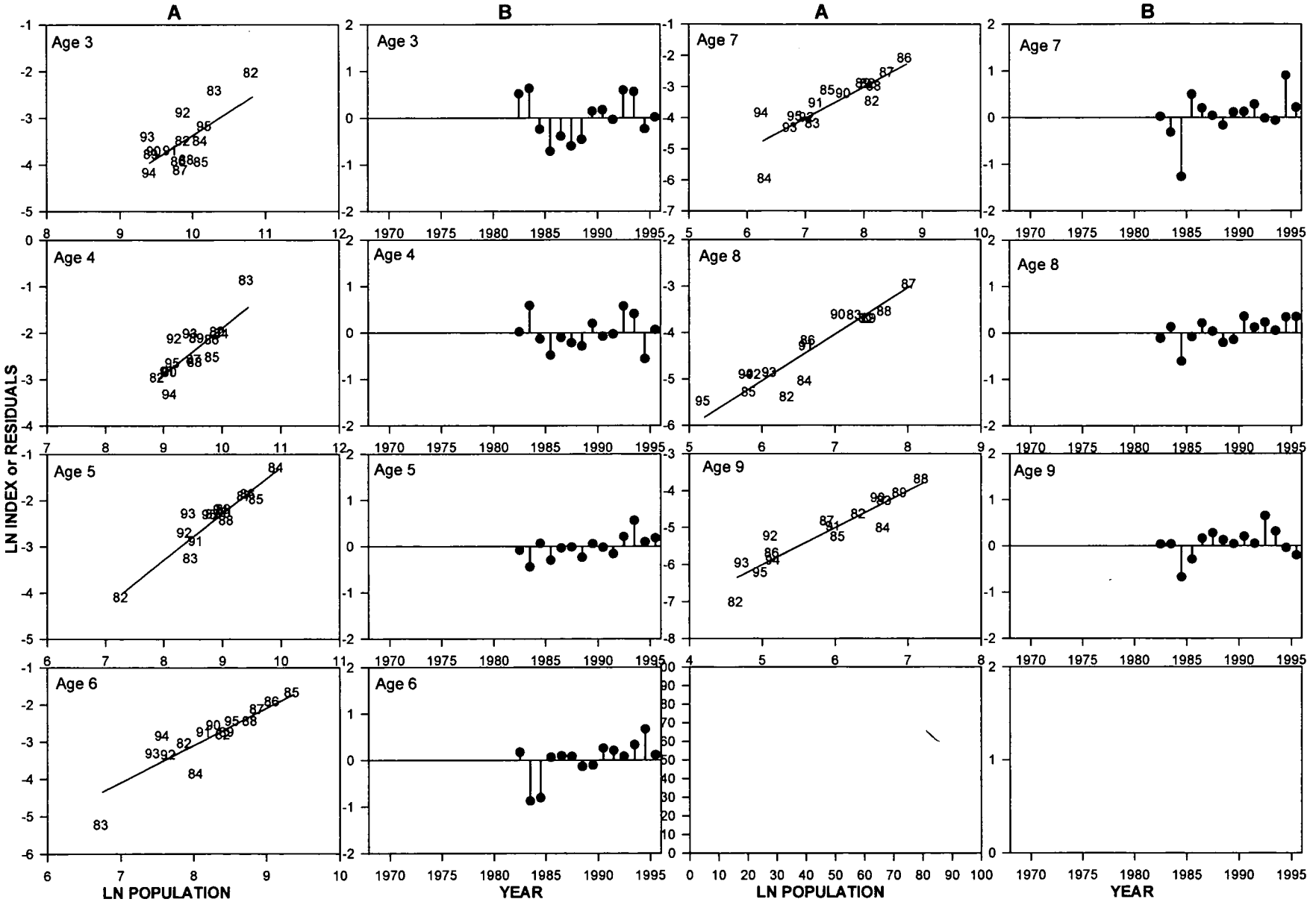


Fig. 26 a. Age by age plots of A) the observed and predicted ln abundance index versus ln population numbers, and B) residuals. Pollock in 4VWX5Zc.

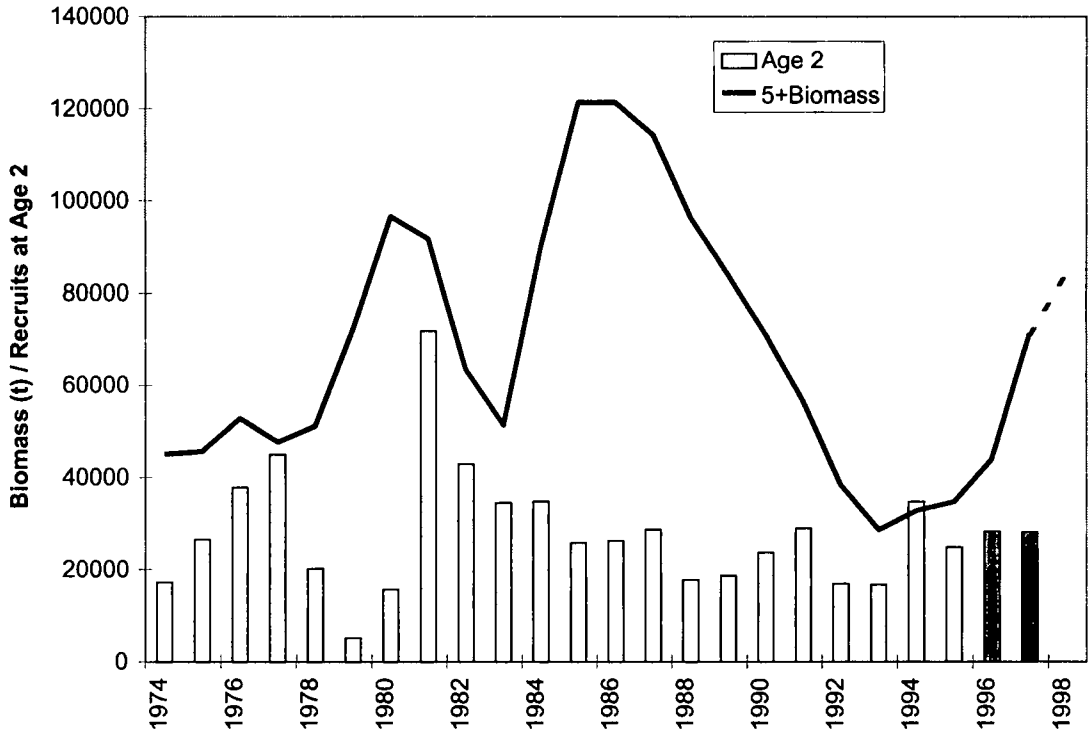


Fig. 27. Beginning of year biomass (ages 5+) and recruitment at age 2 for pollock in 4VWX5Zc. Unadjusted scenario. Gray recruitment bars indicate that recruitment was set at geometric mean.

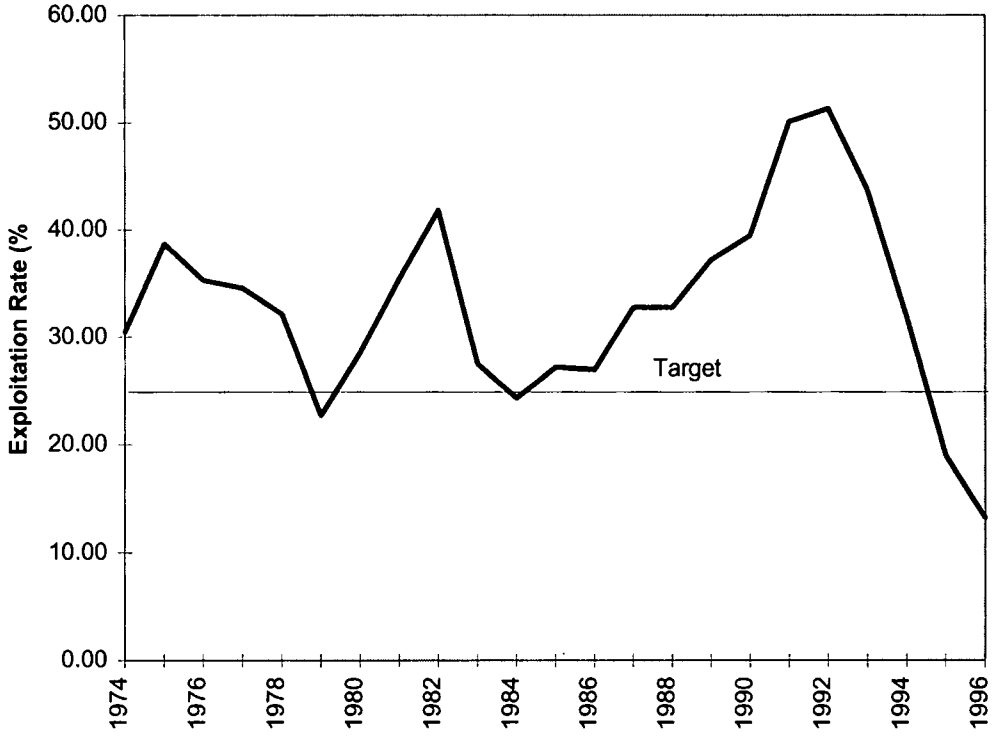


Fig. 28. Exploitation rates for pollock in 4VWX5Zc, shown with respect to the target fishing level. Unadjusted scenario.

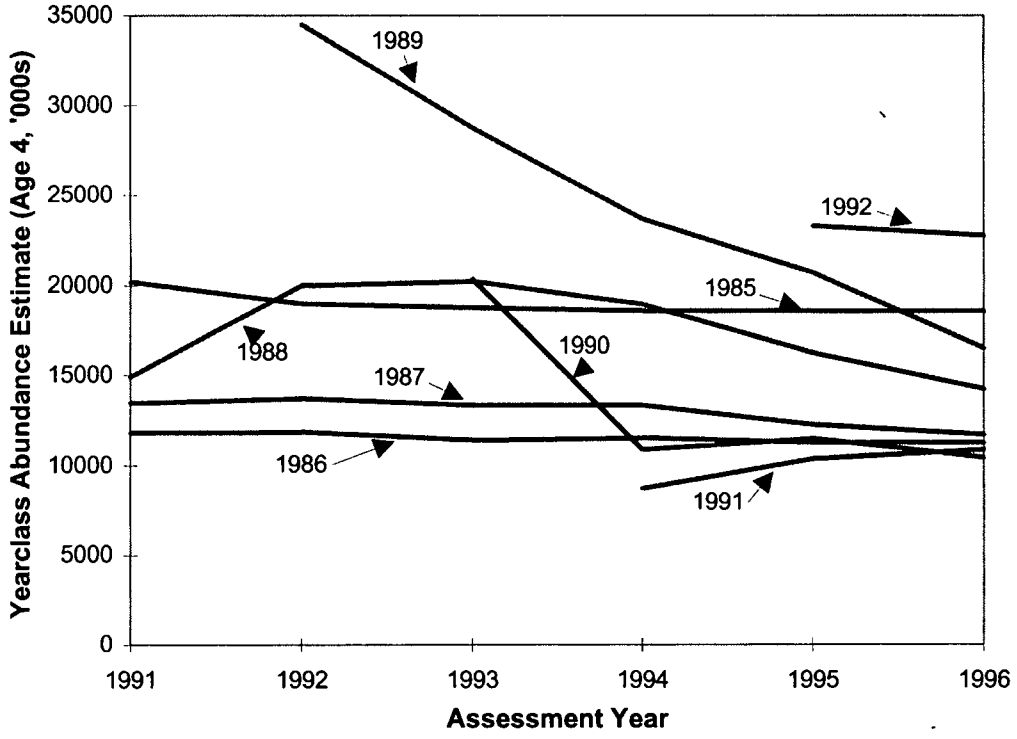


Fig. 29. Retrospective analyses for unadjusted scenario, pollock in 4VWX5Zc. Age 4 estimates are shown.

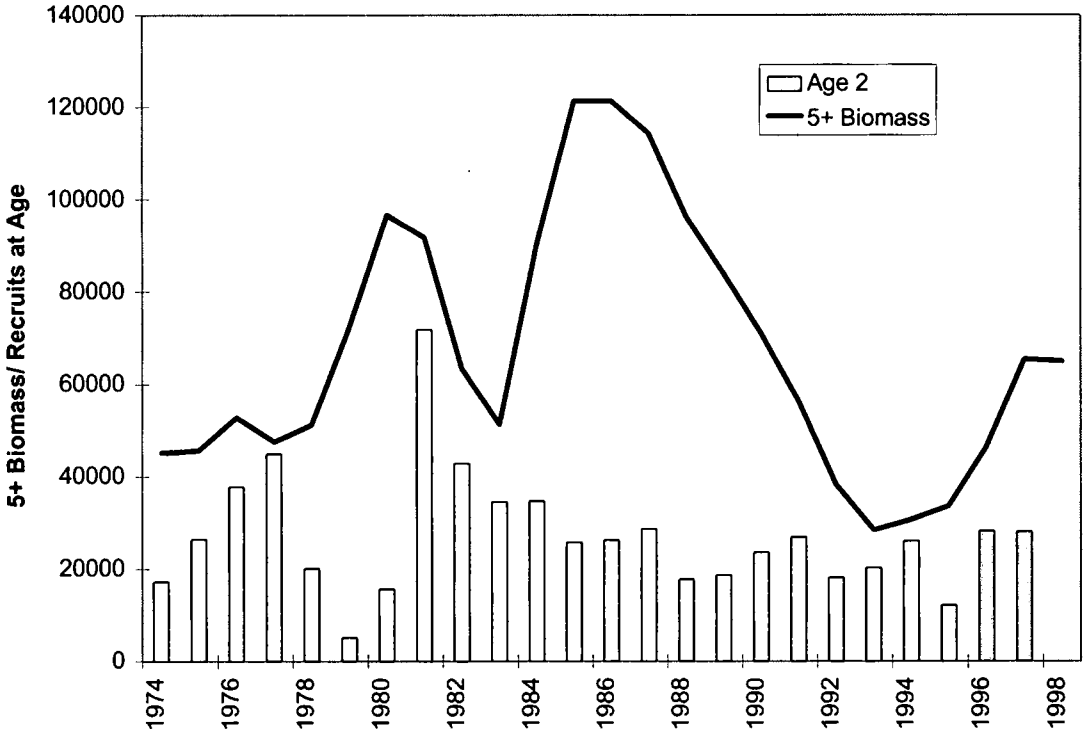


Fig. 30. Beginning of year biomass (ages 5+) and recruitment at age 2 for pollock in 4VWX5Zc. Adjusted scenario. Grey recruitment bars indicate that recruitment was set at geometric mean.

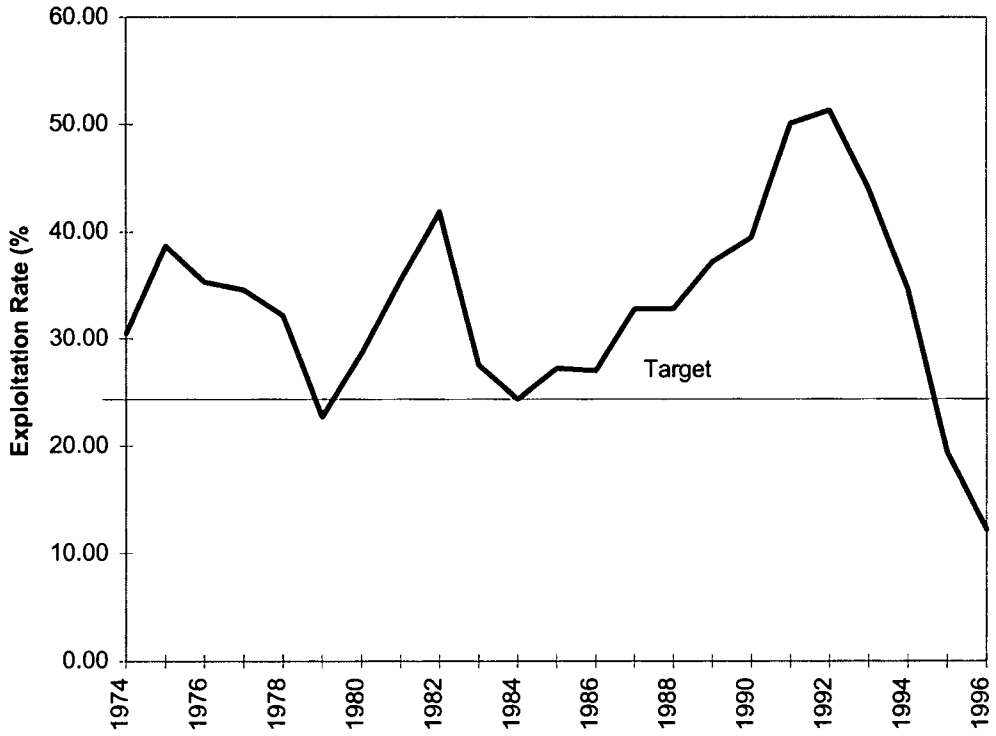


Fig. 31. Exploitation rates for pollock in 4VWX5Zc, shown with respect to the target fishing level. Downweighted scenario.

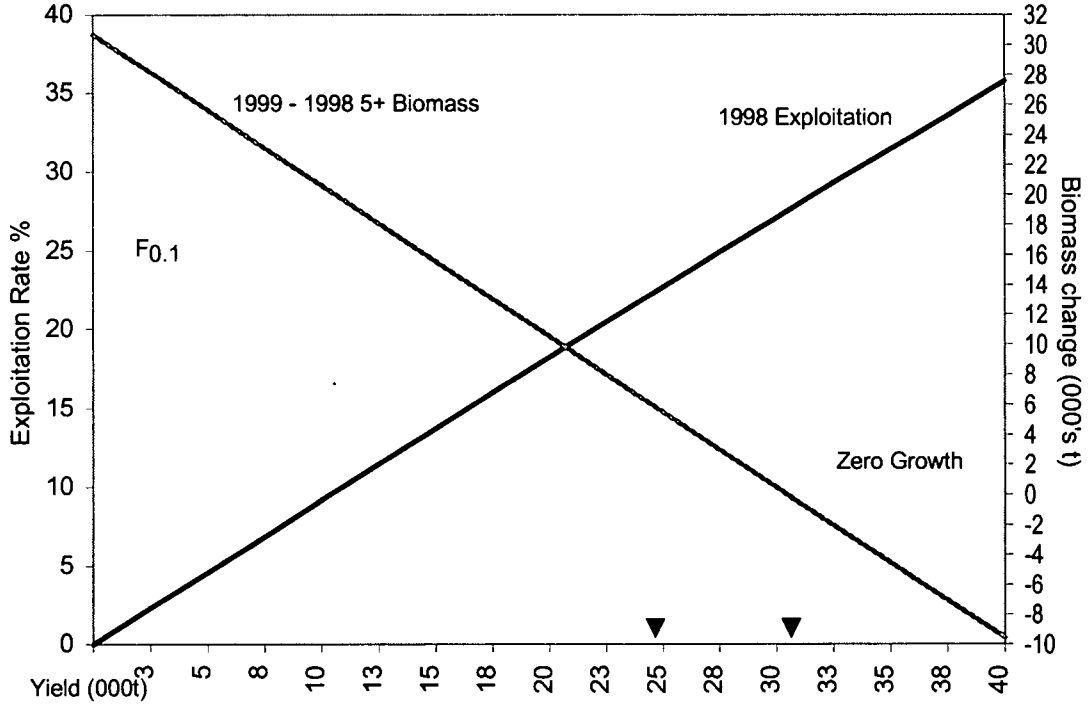


Fig. 32. Implications of various yields in 1998 to growth in population biomass from 1998 to 1999, and resulting exploitation rate in 1998. Levels corresponding to $F_{0.1}$ and zero population biomass growth are highlighted.

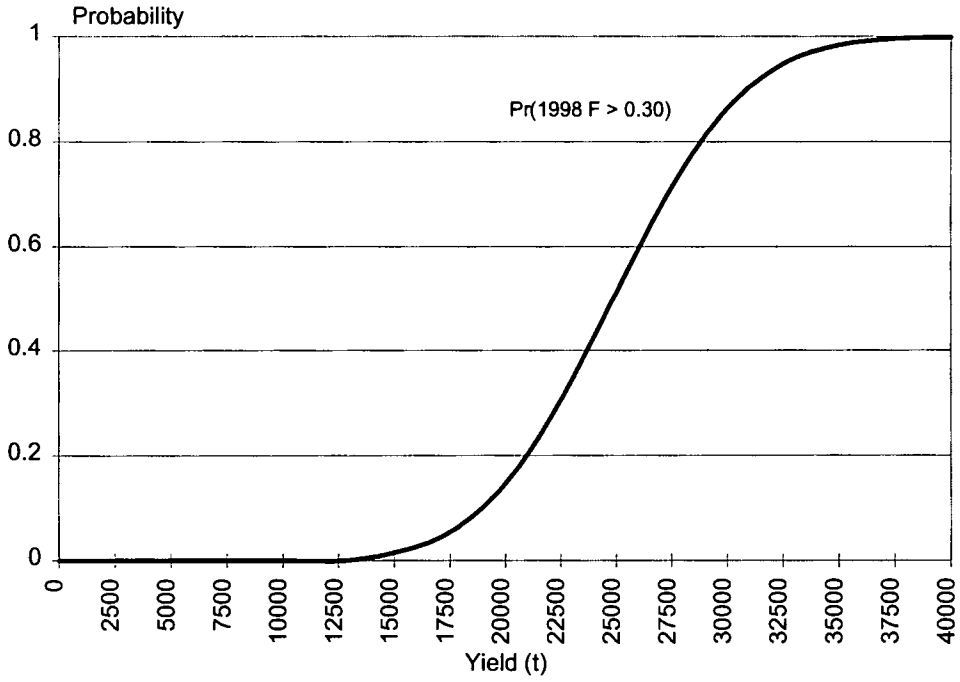


Fig.33. Probabilities of various yield levels exceeding the target fishing mortality

Appendix I

Precision Of Aging For 4VWX5Zc Pollock

To maintain and monitor the consistency in the age interpretation of pollock between the previous ager and the current ager, a stringent regime of testing was followed. Reference samples were examined until an acceptable confidence level was achieved. A series of aging tests was then done. When acceptable results were achieved, production aging was then done. During production aging, testing was also done after every 500 otoliths to ensure standards were maintained. The question of a possible problem with 4V samples was also addressed even though there was only one sample from that area for this assessment. Examples of the variety of tests completed are shown .

Example 1.

Random Test Of Current Ager Against Previous Ager (three samples)

	Samples	940053	940242	940203										
Count of H	Cecil													
Harry	2	3	4	5	6	7	8	9	10	11	12	13	(blank)	Grand Tot
2	4	0	0	0	0	0	0	0	0	0	0	0	0	4
3	0	4	0	0	0	0	0	0	0	0	0	0	0	4
4	0	0	10	1	0	0	0	0	0	0	0	0	0	11
5	0	0	0	22	0	0	0	0	0	0	0	0	0	22
6	0	0	0	1	20	1	0	0	0	0	0	0	0	22
7	0	0	0	0	1	17	1	0	0	0	0	0	0	19
8	0	0	0	0	0	1	8	0	0	0	0	0	0	9
9	0	0	0	0	0	0	0	6	0	0	0	0	0	6
10	0	0	0	0	0	0	0	0	3	0	1	0	0	4
11	0	0	0	0	0	0	0	0	1	1	0	0	0	2
12	0	0	0	0	0	0	0	0	0	0	0	1	0	1
13	0	0	0	0	0	0	0	0	0	0	0	1	0	1
(blank)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Tot	4	4	10	24	21	19	9	6	4	1	1	2	0	105
% agree	0.914286													
sum of diff	2													
> 0	5													
< 0	4													

A selection of 100 otoliths which were aged by the previous ager were chosen and re-aged by the current ager. The results of this test showed good agreement with the previous age reader with no apparent bias.

Example 2

Random Select Covering All Quarters

Count of Harr	Cecil													
Harry	2	3	4	5	6	7	8	9	10	11	12	13	14	Grand Total
2	6	1	0	0	0	0	0	0	0	0	0	0	0	7
3	0	10	0	0	0	0	0	0	0	0	0	0	0	10
4	0	1	12	0	0	0	0	0	0	0	0	0	0	13
5	0	0	0	13	1	0	0	0	0	0	0	0	0	14
6	0	0	0	0	10	1	0	0	0	0	0	0	0	11
7	0	0	0	0	1	8	0	0	0	0	0	0	0	9
8	0	0	0	0	0	0	5	1	0	0	0	0	0	6
9	0	0	0	0	0	0	1	5	0	0	0	0	0	6
10	0	0	0	0	0	0	0	0	4	2	0	0	0	6
11	0	0	0	0	0	0	0	0	1	3	1	0	0	5
12	0	0	0	0	0	0	0	0	0	2	0	0	0	2
13	0	0	0	0	0	0	0	0	0	0	1	1	1	3
Grand Total	6	12	12	13	12	9	6	6	5	7	2	1	1	92
% Agree	84													
Sum Of Di	1													
> 0	8													
< 0	7													

This test was a random selection of otoliths using a computer program designed to select from all the otoliths collected during a given year on random basis, stratified for length and quarter of the year.

Example 3.

Reexamination of otoliths collected during RV survey.

count of	Cecil		1993 Survey	Random selection									
Harry	1	2	3	4	5	6	7	8	9	10	11	12	Grand Total
1	1												1
2		27											27
3		2	12										14
4			1	29	1								31
5				1	13								14
6						6							6
7							1						1
8								2					2
9													
10													
11													
12													
Grand Total	1	29	13	30	14	6	1	2					96
	% Agree	95											
	sum of diff	3											
	> 0	1											
	< 0	4											

This was a random selection of otolith from a research survey which was aged by the previous ager. It was chosen because survey samples differ somewhat from commercial samples mainly because smaller fish are sampled. This comparison is important because interpretation of the larger fish caught in the commercial fish is based on how the smaller, age 1,2 and 3 year old fish are interpreted. Although the sum of the differences indicated a slight bias, there was very high agreeement in the age determinations.

Example 4.

Self test of random samples

Count of	Cecil 2nd		Samples 960009, 960101, 960138										
Cecil 1st	1	2	3	4	5	6	7	8	9	10	11	12	Grand total
1													
2		1											1
3			5										5
4				30	1								31
5				2	26	1							29
6						19							19
7							6	1					7
8							1	3					4
9								2					2
10													
11													
12													
Grand Total		1	5	32	27	20	7	6					98

% Agree	92
Sum of Diff	2
> 0	5
< 0	3

This test was a random selection of otolith previously aged by the current ager. The purpose of this test was to check the ability of the current reader to duplicate his own results. The test showed good agreement with no apparent bias. Random tests like this example are done throughout production aging as monitors to keep all production age interpretations consistent. If a problem were to appear, production aging would immediately be halted until the problem was rectified, then samples aged prior to the test would be reaged and production continued.

Example 5.

Test on 4Vs samples

Count Of	Cecil		4Vsc Samples 930123, 930141, 930149												
Harry	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Grand Total
1															
2															
3			1												1
4				13											13
5					15	1									16
6					2	6									8
7						4	11	1							16
8							1	19							20
9								7	1						8
10								2	7						9
11										6	2				8
12											1	1			2
13												3			3
14														1	1
Grand Total			1	13	17	11	12	20	9	8	6	3	4	1	105

% Agree	86
Sum of Diff	3
> 0	9
< 0	6

This is an example of tests which were done specifically on 4Vs samples. As reported in last years assessment, otoliths from from 4V proved difficult to age and more work was required to obtain acceptable results. .The results are now more comparable to those of the previous age reader.

Appendix II

REGRESSION OF MULTIPLICATIVE MODEL

MULTIPLE R..... 0.409
MULTIPLE R SQUARED..... 0.167

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DF	SUMS OF SQUARES	MEAN SQUARES	F-VALUE
INTERCEPT	1	1.285E4	1.285E4	
REGRESSION	38	9.182E3	2.416E2	133.894
Year	14	2.042E3	1.458E2	80.805
Tonnage Class	4	2.337E3	5.843E2	323.761
Month	6	5.891E2	9.819E1	54.408
Area	13	5.621E2	4.324E1	23.959
Mesh Type	1	1.995E1	1.995E1	11.056
RESIDUALS	25369	4.578E4	1.805E0	
TOTAL	25408	6.781E4		

REGRESSION COEFFICIENTS

CATEGORY	VARIABLE	COEFFICIENT	STD. ERROR	NO. OBS.
88	INTERCEPT	-0.818	0.046	25408
3				
13				
4Xn				
D				
Yr 82	1	0.167	0.057	921
83	2	0.188	0.064	629
84	3	0.338	0.058	862
85	4	0.504	0.051	1216
86	5	0.281	0.052	1145
87	6	-0.001	0.046	1841
89	7	0.029	0.046	1904
90	8	-0.150	0.041	2923
91	9	-0.406	0.041	3565
92	10	-0.499	0.044	2694
93	11	-0.507	0.046	2308
94	12	-0.664	0.052	1686
95	13	-0.488	0.064	946
96	14	-0.318	0.064	1036
TC 5	15	0.118	0.029	12633
4	16	-0.128	0.052	908
7	17	0.951	0.041	2407
2	18	-0.560	0.030	3253
Mo 1	19	0.505	0.039	1521
2	20	0.397	0.036	1705
3	21	0.276	0.034	1967
4	22	0.053	0.033	2018
11	23	0.170	0.036	1702
12	24	0.422	0.043	1179
4Wh	25	-0.456	0.087	266
4Wl	26	0.352	0.049	1054
4Xp	27	0.239	0.035	2829
5Zj	28	0.346	0.040	1963
4Vs	29	0.162	0.033	4663
4Xm	30	-0.164	0.081	301

4Wg	31		0.445	0.053	837	
		4Wk	32	0.206	0.046	1202
		4Xq	33	0.111	0.036	2659
		4Xo	34	-0.146	0.039	1873
		4Vn	35	0.066	0.044	1513
		4Xr	36	-0.053	0.044	1627
		4Xs	37	0.256	0.055	848
		Mesh S	38	-0.139	0.042	3211

PREDICTED CATCH RATE

	LN TRANSFORM		RETRANSFORMED			
YEAR	MEAN	S.E.	MEAN	S.E.	CATCH	EFFORT
82	-0.8178	0.0021	1.087	0.050	6308	5802
83	-0.6510	0.0029	1.284	0.069	5459	4252
84	-0.6299	0.0037	1.311	0.080	8722	6654
85	-0.4802	0.0029	1.523	0.082	10890	7150
86	-0.3134	0.0024	1.800	0.089	8917	4954
87	-0.5365	0.0025	1.440	0.072	8456	5872
88	-0.8189	0.0018	1.086	0.047	6655	6128
89	-0.7889	0.0020	1.119	0.050	5947	5314
90	-0.9676	0.0016	0.936	0.038	8896	9503
91	-1.2240	0.0014	0.724	0.027	13744	18971
92	-1.3168	0.0014	0.660	0.024	11141	16873
93	-1.3250	0.0019	0.655	0.028	7983	12192
94	-1.4818	0.0027	0.559	0.029	4551	8134
95	-1.3058	0.0041	0.667	0.043	3244	4866
96	-1.1361	0.0042	0.790	0.051	3187	4035

APPENDIX III

This run had TAC of 15,000 t in 1997 and should be considered FINAL.

13/10/97 6:10 PM

ADAPT_W Ver. 1.1

Workspace size = 6000000

Catch

	2	3	4	5	6	7	8	9	10	11	12
1974.00	197	5603	2662	2356	1088	317	164	80	83	74	40
1975.00	175	1058	4023	2090	1904	835	196	55	57	35	31
1976.00	178	1361	1974	3649	1089	1089	207	36	14	18	49
1977.00	36	1476	2873	1785	2181	732	417	108	19	25	80
1978.00	23	835	3119	3084	1276	1167	257	143	17	19	18
1979.00	98	2763	5786	3482	1705	528	249	47	15	14	0
1980.00	171	291	1864	5306	3169	1075	277	168	32	9	2
1981.00	871	1334	673	2044	4019	2432	713	208	148	31	24
1982.00	134	4018	1589	563	1873	2295	1069	389	172	87	22
1983.00	56	1999	9514	1256	238	524	835	428	163	50	58
1984.00	87	803	3493	7155	639	92	217	210	92	18	23
1985.00	19	459	2028	3830	5022	1162	150	179	233	126	41
1986.00	59	705	2889	3550	3440	2790	342	94	109	150	68
1987.00	15	411	1986	4326	3577	2587	1744	247	44	48	47
1988.00	11	648	2563	3170	3158	1884	1156	1006	53	20	32
1989.00	61	670	4104	3832	2424	2170	970	702	434	31	14
1990.00	49	803	1777	3598	2727	1563	986	641	308	120	47
1991.00	329	1763	3054	2890	3486	1607	803	402	291	142	88
1992.00	53	2895	5265	3168	1933	1058	435	308	169	67	54
1993.00	58	923	3784	2954	1337	506	275	101	37	21	13
1994.00	50	273	693	2184	1396	709	338	172	44	18	7
1995.00	32	467	795	1256	1236	401	96	37	17	5	1
1996.00	95	430	1366	1117	793	446	84	21	4	1	1
1997.00											

OTB CPUE

	3	4	5	6	7	8	9
1982.50	0.13	0.05	0.02	0.05	0.06	0.02	0.01
1983.50	0.09	0.42	0.04	0.01	0.02	0.03	0.01

1984.50	0.03	0.13	0.28	0.02	0.00	0.01	0.01
1985.50	0.02	0.08	0.14	0.19	0.04	0.01	0.01
1986.50	0.02	0.12	0.16	0.15	0.12	0.02	0.00
1987.50	0.02	0.08	0.15	0.12	0.08	0.05	0.01
1988.50	0.02	0.07	0.09	0.09	0.05	0.03	0.03
1989.50	0.02	0.12	0.11	0.07	0.06	0.03	0.02
1990.50	0.02	0.06	0.10	0.08	0.04	0.03	0.02
1991.50	0.03	0.06	0.06	0.07	0.03	0.01	0.01
1992.50	0.06	0.12	0.07	0.04	0.02	0.01	0.01
1993.50	0.03	0.13	0.10	0.04	0.01	0.01	0.00
1994.50	0.02	0.04	0.11	0.06	0.02	0.01	0.00
1995.50	0.04	0.07	0.10	0.09	0.02	0.00	0.00
1996.50	0.03	0.14	0.10	0.06	0.03	0.00	0.00

Ages for which abundance will be estimated
4 5 6 7 8 9 10 11 12
Initial values
13000 11000 10000 3000 1200 500 200 80 30
Ages for which abundance will be calculated using PR

PR for these yearclasses in the previous time period

Estimated ages used in the PR calculations

PR for these estimated yearclasses in the previous time period

Ages assigned a fixed value
2 3
Assigned abundance for these ages
28000 22924
Ages being averaged for oldest age F
7 8 9 10
PR multiplier for oldest age F
1
Natural mortality
0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2

LAMBDA	1.00000Ey2
RSS	1.75021E1
NPHI	1.75021E1

Parameters

9.47270E0	9.30565E0	9.21034E0	8.00637E0	7.09008E0	6.21461E0	5.29832E0	4.38203E0	3.40120E0

LAMBDA 1.00000Eý3
RSS 1.39365E1
NPHI 1.39365E1

Parameters
9.77347E0 9.81012E0 8.68749E0 8.22982E0 7.98315E0 6.19639E0 4.63859E0 4.54609E0 4.09548E0

LAMBDA 1.00000Eý4
RSS 1.38981E1
NPHI 1.38981E1

Parameters
9.78261E0 9.81211E0 8.68623E0 8.23956E0 8.00851E0 6.20024E0 4.49334E0 4.54015E0 3.99526E0

LAMBDA 1.00000Eý5
RSS 1.38969E1
NPHI 1.38969E1

Parameters

9.78260E0 9.81210E0 8.68622E0 8.23961E0 8.01018E0 6.19850E0 4.46487E0 4.53647E0 3.98656E0

LAMBDA 1.00000Eý5
RSS 1.38969E1
NPHI 1.38969E1

Parameters
9.78257E0 9.81207E0 8.68617E0 8.23955E0 8.01009E0 6.19763E0 4.45947E0 4.53563E0 3.98533E0

RELATIVE CHANGE IN RESIDUAL SUM OF SQUARES LESS THAN 0.00001

LAMBDA 1.00000Eý2
RSS 1.38969E1
NPHI 1.38969E1

Parameters
9.78257E0 9.81207E0 8.68617E0 8.23955E0 8.01009E0 6.19763E0 4.45947E0 4.53563E0 3.98533E0 ý1.33704E1
ý1.18972E1 ý1.12896E1 ý1.10975E1 ý1.10214E1 ý1.10381E1 ý1.10063E1

```
LAMBDA        1.00000Eý3
RSS           1.38968E1
NPHI          1.38968E1

Parameters
   9.78256E0      9.81206E0      8.68616E0      8.23953E0      8.01001E0      6.19735E0      4.45844E0      4.53545E0      3.98509E0      ý1.33704E1
ý1.18972E1     ý1.12896E1     ý1.10975E1     ý1.10214E1     ý1.10380E1     ý1.10062E1


RELATIVE CHANGE IN RESIDUAL SUM OF SQUARES LESS THAN 0.00001

...done...

...working...

APPROXIMATE STATISTICS ASSUMING LINEARITY NEAR SOLUTION

ORTHOGONALITY OFFSET.........        0.001068
MEAN SQUARE RESIDUALS .......        0.156144


Estimates for index catchability parameters
   PAR. EST.    STD. ERR.    REL. ERR.      BIAS       REL. BIAS
   ---------    ---------    ---------    ---------    ---------
 ý1.337E1      1.102Eý1    ý8.244Eý3    ý1.840Eý3     1.376Eý4
 ý1.190E1      1.068Eý1    ý8.977Eý3    ý1.581Eý3     1.329Eý4
 ý1.129E1      1.056Eý1    ý9.355Eý3    ý1.355Eý3     1.200Eý4
 ý1.110E1      1.053Eý1    ý9.487Eý3    ý1.431Eý3     1.290Eý4
 ý1.102E1      1.057Eý1    ý9.593Eý3    ý1.774Eý3     1.610Eý4
 ý1.104E1      1.076Eý1    ý9.752Eý3    ý1.269Eý3     1.150Eý4
 ý1.101E1      1.114Eý1    ý1.012Eý2     1.972Eý3    ý1.792Eý4

...still working...

Terminal year-class abundance
   PAR. EST.    STD. ERR.    REL. ERR.      BIAS       REL. BIAS
   ---------    ---------    ---------    ---------    ---------
       28000            0         0.00            0         0.00
       22924            0         0.00            0         0.00
       17722         7349         0.41         1541         0.09
       18253         5591         0.31          846         0.05
        5920         1663         0.28          211         0.04
        3788         1031         0.27          118         0.03
        3011          825         0.27           94         0.03
         491          157         0.32           21         0.04
```

86	30	0.35	4	0.05
93	37	0.40	6	0.06
54	35	0.65	7	0.12
7	1	0.19	0	-0.02
2	0	0.20	0	-0.04
3	1	0.17	0	-0.01
11	1	0.06	0	0.00
18	1	0.03	0	0.00
41	0	0.01	0	0.00
36	0	0.00	0	0.00
13	0	0.00	0	0.00
44	0	0.00	0	0.00
56	0	0.00	0	0.00
102	0	0.00	0	0.00
55	0	0.00	0	0.00
81	0	0.00	0	0.00
74	0	0.00	0	0.00
23	0	0.00	0	0.00
35	0	0.00	0	0.00
5	0	0.00	0	0.00
23	0	0.00	0	0.00
19	0	0.00	0	0.00
68	0	0.00	0	0.00
70	0	0.00	0	0.00
35	0	0.00	0	0.00
73	0	0.00	0	0.00
0	0	1.00	0	1.00

Population Numbers

	2	3	4	5	6	7	8	9	10	11	12	13
1974.00	17249	28114	10221	8431	2958	828	422	504	347	175	134	0
1975.00	26403	13944	17977	5977	4787	1447	394	199	340	209	77	73
1976.00	37807	21459	10462	11101	3021	2215	443	148	113	227	140	35
1977.00	44940	30793	16341	6789	5817	1498	842	178	89	80	170	70
1978.00	20138	36762	23879	10793	3955	2809	573	318	50	55	43	68
1979.00	5147	16467	29344	16740	6068	2094	1256	240	132	25	28	19
1980.00	15652	4125	10995	18819	10574	3437	1240	805	154	95	8	23
1981.00	71800	12660	3115	7324	10644	5813	1850	766	508	97	70	5
1982.00	42818	57998	9163	1945	4161	5116	2585	876	441	283	52	35
1983.00	34452	34936	43860	6071	1087	1733	2138	1160	370	207	154	23
1984.00	34693	28157	26799	27354	3841	676	949	1003	566	157	124	74
1985.00	25688	28325	22328	18794	15969	2570	471	582	633	381	112	81
1986.00	26180	21014	22776	16452	11942	8569	1066	251	316	309	199	55
1987.00	28555	21381	16569	16044	10277	6689	4514	566	121	161	119	102
1988.00	17707	23365	17134	11776	9251	5208	3161	2134	243	60	89	56
1989.00	18619	14487	18545	11720	6794	4743	2577	1553	849	151	31	44
1990.00	23693	15189	11257	11493	6159	3391	1945	1241	644	309	96	13

1991.00	28866	19354	11711	7616	6182	2606	1380	714	445	252	145	36
1992.00	16874	23336	14256	6845	3648	1961	708	416	227	106	80	41
1993.00	16685	13767	16497	6956	2775	1265	663	194	70	37	28	18
1994.00	34646	13608	10439	10105	3054	1079	583	297	68	24	12	11
1995.00	24754	28321	10895	7921	6309	1254	256	177	90	17	4	3
1996.00	28104	20238	22765	8203	5354	4054	667	123	111	59	9	2
1997.00	28000	22924	16181	17406	5709	3670	2917	470	82	88	47	7

Fishing Mortality

	2	3	4	5	6	7	8	9	10	11	12
1974.00	0.013	0.247	0.337	0.366	0.515	0.542	0.553	0.192	0.305	0.622	0.398
1975.00	0.007	0.087	0.282	0.482	0.570	0.984	0.781	0.361	0.203	0.203	0.582
1976.00	0.005	0.072	0.232	0.446	0.502	0.767	0.713	0.311	0.146	0.091	0.484
1977.00	0.001	0.054	0.215	0.340	0.528	0.761	0.775	1.075	0.268	0.417	0.720
1978.00	0.001	0.025	0.155	0.376	0.436	0.605	0.672	0.675	0.470	0.470	0.605
1979.00	0.021	0.204	0.244	0.259	0.368	0.324	0.246	0.243	0.133	0.913	0.000
1980.00	0.012	0.081	0.206	0.370	0.398	0.420	0.281	0.261	0.259	0.110	0.305
1981.00	0.013	0.123	0.271	0.365	0.533	0.611	0.547	0.353	0.385	0.430	0.474
1982.00	0.003	0.079	0.212	0.382	0.676	0.672	0.601	0.663	0.557	0.411	0.623
1983.00	0.002	0.065	0.272	0.258	0.275	0.402	0.557	0.517	0.656	0.309	0.533
1984.00	0.003	0.032	0.155	0.338	0.202	0.162	0.289	0.261	0.197	0.135	0.227
1985.00	0.001	0.018	0.105	0.253	0.422	0.680	0.429	0.411	0.516	0.450	0.509
1986.00	0.002	0.038	0.150	0.271	0.380	0.441	0.433	0.528	0.475	0.752	0.469
1987.00	0.001	0.021	0.141	0.351	0.480	0.550	0.549	0.647	0.506	0.396	0.563
1988.00	0.001	0.031	0.180	0.350	0.468	0.504	0.511	0.721	0.274	0.456	0.503
1989.00	0.004	0.052	0.278	0.443	0.495	0.691	0.531	0.680	0.812	0.256	0.679
1990.00	0.002	0.060	0.191	0.420	0.660	0.699	0.803	0.826	0.737	0.554	0.766
1991.00	0.013	0.106	0.337	0.536	0.948	1.103	0.998	0.946	1.230	0.945	1.070
1992.00	0.003	0.147	0.518	0.703	0.859	0.884	1.097	1.588	1.616	1.145	1.295
1993.00	0.004	0.077	0.290	0.623	0.745	0.575	0.603	0.839	0.863	0.962	0.716
1994.00	0.002	0.022	0.076	0.271	0.690	1.240	0.993	0.990	1.190	1.632	1.072
1995.00	0.001	0.018	0.084	0.192	0.242	0.431	0.529	0.261	0.232	0.388	0.336
1996.00	0.004	0.024	0.068	0.162	0.178	0.129	0.149	0.207	0.040	0.019	0.124

...done...

Work file C:\pollock\assess97\apl\unadjust contents retrieved

Population Numbers

	2	3	4	5	6	7	8	9	10	11	12	13
1997.00	28000	22924	16181	17406	5709	3670	2917	470	82	88	47	7
1998.00	28000	22877	18383	12193	12071	3878	2441	1940	313	55	58	31
1999.00	28000	22856	18176	13349	7853	7544	2352	1481	1177	190	33	35

Fishing Mortality

	2	3	4	5	6	7	8	9	10	11	12
1997.00	0.002	0.021	0.083	0.166	0.187	0.208	0.208	0.208	0.208	0.208	0.208
1998.00	0.003	0.030	0.120	0.240	0.270	0.300	0.300	0.300	0.300	0.300	0.300

PR

	2	3	4	5	6	7	8	9	10	11	12
1997.00	0.01	0.10	0.40	0.80	0.90	1.00	1.00	1.00	1.00	1.00	1.00
1998.00	0.01	0.10	0.40	0.80	0.90	1.00	1.00	1.00	1.00	1.00	1.00

Beg Wt

	2	3	4	5	6	7	8	9	10	11	12	13
1997.00	0.58	0.96	1.38	1.79	2.38	3.18	3.95	4.45	5.27	6.02	6.32	7.37
1998.00	0.63	0.94	1.35	1.84	2.50	3.19	3.87	4.46	5.25	5.92	6.28	7.11
1999.00	0.63	0.94	1.35	1.84	2.50	3.19	3.87	4.46	5.25	5.92	6.28	7.11

Projected Population Biomass

	2	3	4	5	6	7	8	9	10	11	12	13	2+	3+	4+	5+
1997.00	16240	22007	22330	31157	13589	11670	11521	2093	432	528	298	51	131915	115675	93668	71338
1998.00	17640	21504	24817	22435	30177	12371	9448	8654	1642	323	366	223	149601	131961	110457	85639
1999.00	17640	21484	24538	24562	19631	24066	9103	6604	6179	1123	208	251	155391	137751	116266	91728

Projected Catch Numbers

	2	3	4	5	6	7	8	9	10	11	12
1997.00	53	427	1170	2420	884	626	497	80	14	15	8
1998.00	76	613	1888	2367	2600	916	576	458	74	13	14
1999.00											

Avg Wt

	2	3	4	5	6	7	8	9	10	11	12
1997.00	0.72	1.13	1.60	2.14	2.86	3.48	4.23	4.80	5.77	6.60	6.76
1998.00	0.72	1.13	1.60	2.14	2.86	3.48	4.23	4.80	5.77	6.60	6.76

Projected Catch Biomass

	2	3	4	5	6	7	8	9	10	11	12	2+	3+	4+	5+
1997.00	38	482	1872	5179	2530	2177	2103	385	81	99	54	15000	14962	14480	12608
1998.00	55	693	3021	5066	7437	3186	2438	2199	426	85	93	24698	24644	23951	20930
1999.00															

Work file C:\pollock\assess97\apl\unadjfin saved

APPENDIX IV

This run contains the downweighted CPUE indices.

13/10/97 6:57 PM

ADAPT_W Ver. 1.1

Workspace size = 6000000

Catch

	2	3	4	5	6	7	8	9	10	11	12
1974.00	197	5603	2662	2356	1088	317	164	80	83	74	40
1975.00	175	1058	4023	2090	1904	835	196	55	57	35	31
1976.00	178	1361	1974	3649	1089	1089	207	36	14	18	49
1977.00	36	1476	2873	1785	2181	732	417	108	19	25	80
1978.00	23	835	3119	3084	1276	1167	257	143	17	19	18
1979.00	98	2763	5786	3482	1705	528	249	47	15	14	0
1980.00	171	291	1864	5306	3169	1075	277	168	32	9	2
1981.00	871	1334	673	2044	4019	2432	713	208	148	31	24
1982.00	134	4018	1589	563	1873	2295	1069	389	172	87	22
1983.00	56	1999	9514	1256	238	524	835	428	163	50	58
1984.00	87	803	3493	7155	639	92	217	210	92	18	23
1985.00	19	459	2028	3830	5022	1162	150	179	233	126	41
1986.00	59	705	2889	3550	3440	2790	342	94	109	150	68
1987.00	15	411	1986	4326	3577	2587	1744	247	44	48	47
1988.00	11	648	2563	3170	3158	1884	1156	1006	53	20	32
1989.00	61	670	4104	3832	2424	2170	970	702	434	31	14
1990.00	49	803	1777	3598	2727	1563	986	641	308	120	47
1991.00	329	1763	3054	2890	3486	1607	803	402	291	142	88
1992.00	53	2895	5265	3168	1933	1058	435	308	169	67	54
1993.00	58	923	3784	2954	1337	506	275	101	37	21	13
1994.00	50	273	693	2184	1396	709	338	172	44	18	7
1995.00	32	467	795	1256	1236	401	96	37	17	5	1
1996.00	95	430	1366	1117	793	446	84	21	4	1	1
1997.00											

OTB CPUE

	3	4	5	6	7	8	9
1982.50	0.13	0.05	0.02	0.05	0.06	0.02	0.01
1983.50	0.09	0.42	0.04	0.01	0.02	0.03	0.01

1984.50	0.03	0.13	0.28	0.02	0.00	0.01	0.01
1985.50	0.02	0.08	0.14	0.19	0.04	0.01	0.01
1986.50	0.02	0.12	0.16	0.15	0.12	0.02	0.00
1987.50	0.02	0.08	0.15	0.12	0.08	0.05	0.01
1988.50	0.02	0.07	0.09	0.09	0.05	0.03	0.03
1989.50	0.02	0.12	0.11	0.07	0.06	0.03	0.02
1990.50	0.02	0.06	0.10	0.08	0.04	0.03	0.02
1991.50	0.03	0.06	0.06	0.07	0.03	0.01	0.01
1992.50	0.02	0.06	0.07	0.04	0.02	0.01	0.01
1993.50	0.02	0.08	0.10	0.04	0.01	0.01	0.00
1994.50	0.03	0.10	0.11	0.06	0.02	0.01	0.00
1995.50	0.04	0.07	0.10	0.09	0.02	0.00	0.00
1996.50	0.01	0.07	0.10	0.06	0.03	0.00	0.00

Ages for which abundance will be estimated
4 5 6 7 8 9 10 11 12
Initial values
13000 11000 10000 3000 1200 500 200 80 30
Ages for which abundance will be calculated using PR

PR for these yearclasses in the previous time period

Estimated ages used in the PR calculations

PR for these estimated yearclasses in the previous time period

Ages assigned a fixed value
2 3
Assigned abundance for these ages
28000 22924
Ages being averaged for oldest age F
7 8 9 10
PR multiplier for oldest age F
1
Natural mortality
0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2

LAMBDA 1.00000Eý2
RSS 1.50857E1
NPHI 1.50857E1

Parameters
9.47270E0 9.30565E0 9.21034E0 8.00637E0 7.09008E0 6.21461E0 5.29832E0 4.38203E0 3.40120E0

LAMBDA 1.00000Eý3
RSS 1.26385E1
NPHI 1.26385E1

Parameters
9.02504E0 9.48404E0 8.92723E0 8.35399E0 7.79096E0 6.14519E0 4.63778E0 4.54520E0 4.09207E0

LAMBDA 1.00000Eý4
RSS 1.25985E1
NPHI 1.25985E1

Parameters
9.02771E0 9.48976E0 8.92640E0 8.35300E0 7.76941E0 6.13479E0 4.48615E0 4.53544E0 3.98778E0

LAMBDA 1.00000Eý5
RSS 1.25970E1
NPHI 1.25970E1

Parameters
9.02752E0 9.48960E0 8.92612E0 8.35258E0 7.76687E0 6.13001E0 4.45546E0 4.53105E0 3.97809E0

LAMBDA 1.00000Eý5
RSS 1.25969E1
NPHI 1.25969E1

Parameters
9.02747E0 9.48954E0 8.92606E0 8.35247E0 7.76639E0 6.12861E0 4.44953E0 4.53009E0 3.97669E0

RELATIVE CHANGE IN RESIDUAL SUM OF SQUARES LESS THAN 0.00001

LAMBDA 1.00000Eý2
RSS 1.25969E1
NPHI 1.25969E1

Parameters
9.02747E0 9.48954E0 8.92606E0 8.35247E0 7.76639E0 6.12861E0 4.44953E0 4.53009E0 3.97669E0 ý1.34406E1
ý1.19454E1 ý1.12997E1 ý1.10898E1 ý1.10025E1 ý1.10327E1 ý1.10042E1

LAMBDA 1.00000Eý3
RSS 1.25969E1
NPHI 1.25969E1

Parameters

9.02746E0	9.48953E0	8.92604E0	8.35245E0	7.76629E0	6.12826E0	4.44839E0	4.52989E0	3.97642E0	ý1.34406E1
ý1.19453E1	ý1.12997E1	ý1.10898E1	ý1.10024E1	ý1.10326E1	ý1.10041E1				

RELATIVE CHANGE IN RESIDUAL SUM OF SQUARES LESS THAN 0.00001

...done...

...working...

APPROXIMATE STATISTICS ASSUMING LINEARITY NEAR SOLUTION

ORTHOGONALITY OFFSET..... 0.001252
MEAN SQUARE RESIDUALS 0.141539

Estimates for index catchability parameters

PAR. EST.	STD. ERR.	REL. ERR.	BIAS	REL. BIAS
ý1.344E1	1.049Eý1	ý7.806Eý3	ý1.652Eý3	1.229Eý4
ý1.195E1	1.017Eý1	ý8.512Eý3	ý1.410Eý3	1.180Eý4
ý1.130E1	1.004Eý1	ý8.888Eý3	ý1.308Eý3	1.157Eý4
ý1.109E1	1.002Eý1	ý9.033Eý3	ý1.372Eý3	1.237Eý4
ý1.100E1	1.008Eý1	ý9.159Eý3	ý1.590Eý3	1.445Eý4
ý1.103E1	1.025Eý1	ý9.289Eý3	ý1.159Eý3	1.051Eý4
ý1.100E1	1.060Eý1	ý9.636Eý3	1.775Eý3	ý1.613Eý4

...still working...

Terminal year-class abundance

PAR. EST.	STD. ERR.	REL. ERR.	BIAS	REL. BIAS
28000	0	0.00	0	0.00
22924	0	0.00	0	0.00
8329	3327	0.40	664	0.08
13221	3928	0.30	566	0.04
7525	1950	0.26	235	0.03
4241	1073	0.25	117	0.03
2360	652	0.28	73	0.03
459	142	0.31	18	0.04

85	29	0.34	4	0.05
93	35	0.38	5	0.05
53	33	0.63	6	0.11
6	1	0.18	0	-0.02
2	0	0.19	0	-0.03
3	1	0.16	0	-0.01
11	1	0.06	0	0.00
18	1	0.03	0	0.00
41	0	0.00	0	0.00
36	0	0.00	0	0.00
13	0	0.00	0	0.00
44	0	0.00	0	0.00
56	0	0.00	0	0.00
102	0	0.00	0	0.00
55	0	0.00	0	0.00
81	0	0.00	0	0.00
74	0	0.00	0	0.00
23	0	0.00	0	0.00
35	0	0.00	0	0.00
5	0	0.00	0	0.00
23	0	0.00	0	0.00
19	0	0.00	0	0.00
68	0	0.00	0	0.00
70	0	0.00	0	0.00
35	0	0.00	0	0.00
73	0	0.00	0	0.00
0	0	1.00	0	1.00

Population Numbers

	2	3	4	5	6	7	8	9	10	11	12	13
1974.00	17249	28114	10221	8431	2958	828	422	504	347	175	134	0
1975.00	26403	13944	17977	5977	4787	1447	394	199	340	209	77	73
1976.00	37806	21459	10462	11101	3021	2215	443	148	113	227	140	35
1977.00	44940	30793	16341	6789	5817	1498	842	178	89	80	170	70
1978.00	20138	36761	23879	10793	3955	2809	573	318	50	55	43	68
1979.00	5147	16467	29344	16740	6068	2094	1256	240	132	25	28	19
1980.00	15652	4125	10995	18819	10574	3437	1240	805	154	95	8	23
1981.00	71800	12660	3115	7324	10644	5813	1850	766	508	97	70	5
1982.00	42818	57998	9163	1945	4161	5116	2585	876	441	283	52	35
1983.00	34452	34935	43860	6071	1087	1733	2138	1160	370	207	154	23
1984.00	34692	28156	26799	27354	3841	676	949	1003	566	157	124	74
1985.00	25687	28325	22327	18794	15968	2570	471	582	633	381	112	81
1986.00	26174	21014	22776	16451	11942	8569	1066	251	316	309	199	55
1987.00	28556	21376	16568	16044	10277	6689	4514	566	121	161	119	102
1988.00	17707	23366	17130	11775	9251	5208	3161	2134	243	60	89	56
1989.00	18616	14488	18545	11717	6794	4743	2576	1552	849	151	31	44
1990.00	23569	15187	11257	11494	6157	3390	1945	1241	644	309	96	13
1991.00	26762	19252	11709	7616	6182	2604	1380	714	445	252	145	36

1992.00	18110	21614	14173	6843	3648	1961	706	416	227	106	80	41
1993.00	20206	14780	15088	6888	2774	1265	664	192	70	37	28	18
1994.00	25987	16491	11268	8953	2999	1078	583	297	67	24	11	11
1995.00	12048	21231	13255	8600	5367	1209	255	177	91	16	4	3
1996.00	28104	9836	16961	10135	5910	3283	630	123	111	59	9	2
1997.00	28000	22924	7665	12654	7291	4124	2286	440	82	88	47	6

Fishing Mortality

	2	3	4	5	6	7	8	9	10	11	12
1974.00	0.013	0.247	0.337	0.366	0.515	0.542	0.553	0.192	0.305	0.622	0.398
1975.00	0.007	0.087	0.282	0.482	0.570	0.984	0.781	0.361	0.203	0.203	0.582
1976.00	0.005	0.072	0.232	0.446	0.502	0.767	0.713	0.311	0.146	0.091	0.484
1977.00	0.001	0.054	0.215	0.340	0.528	0.761	0.775	1.075	0.268	0.417	0.720
1978.00	0.001	0.025	0.155	0.376	0.436	0.605	0.672	0.675	0.470	0.470	0.605
1979.00	0.021	0.204	0.244	0.259	0.368	0.324	0.246	0.243	0.133	0.913	0.000
1980.00	0.012	0.081	0.206	0.370	0.398	0.420	0.281	0.261	0.259	0.110	0.305
1981.00	0.013	0.123	0.271	0.365	0.533	0.611	0.547	0.353	0.385	0.430	0.474
1982.00	0.003	0.079	0.212	0.382	0.676	0.672	0.601	0.663	0.557	0.411	0.623
1983.00	0.002	0.065	0.272	0.258	0.275	0.402	0.557	0.517	0.656	0.309	0.533
1984.00	0.003	0.032	0.155	0.338	0.202	0.162	0.289	0.261	0.197	0.135	0.227
1985.00	0.001	0.018	0.105	0.253	0.422	0.680	0.430	0.411	0.516	0.450	0.509
1986.00	0.002	0.038	0.150	0.271	0.380	0.441	0.433	0.528	0.475	0.752	0.469
1987.00	0.001	0.021	0.141	0.351	0.480	0.550	0.549	0.647	0.506	0.396	0.563
1988.00	0.001	0.031	0.180	0.350	0.468	0.504	0.511	0.721	0.274	0.456	0.503
1989.00	0.004	0.052	0.278	0.443	0.495	0.691	0.531	0.680	0.813	0.256	0.679
1990.00	0.002	0.060	0.191	0.420	0.660	0.699	0.803	0.826	0.737	0.554	0.766
1991.00	0.014	0.106	0.337	0.536	0.948	1.105	0.999	0.947	1.231	0.945	1.070
1992.00	0.003	0.159	0.521	0.703	0.859	0.884	1.101	1.590	1.618	1.147	1.297
1993.00	0.003	0.071	0.322	0.632	0.745	0.575	0.603	0.848	0.865	0.966	0.719
1994.00	0.002	0.018	0.070	0.312	0.709	1.242	0.993	0.989	1.226	1.647	1.084
1995.00	0.003	0.025	0.068	0.175	0.291	0.451	0.531	0.261	0.231	0.413	0.343
1996.00	0.004	0.049	0.093	0.129	0.160	0.162	0.159	0.208	0.040	0.019	0.134

...done...

Population Numbers

	2	3	4	5	6	7	8	9	10	11	12	13
1997.00	28000	22924	7665	12654	7291	4124	2286	440	82	88	47	6
1998.00	28000	22869	18322	5699	8544	4805	2654	1471	283	53	56	30
1999.00	28000	22856	18170	13304	3670	5340	2915	1609	892	172	32	34

Fishing Mortality

	2	3	4	5	6	7	8	9	10	11	12
1997.00	0.002	0.024	0.096	0.193	0.217	0.241	0.241	0.241	0.241	0.241	0.241
1998.00	0.003	0.030	0.120	0.240	0.270	0.300	0.300	0.300	0.300	0.300	0.300

PR

	2	3	4	5	6	7	8	9	10	11	12
1997.00	0.01	0.10	0.40	0.80	0.90	1.00	1.00	1.00	1.00	1.00	1.00

1998.00	0.01	0.10	0.40	0.80	0.90	1.00	1.00	1.00	1.00	1.00	

Beg Wt

	2	3	4	5	6	7	8	9	10	11	12	13
1997.00	0.58	0.96	1.38	1.79	2.38	3.18	3.95	4.45	5.27	6.02	6.32	7.37
1998.00	0.63	0.94	1.35	1.84	2.50	3.19	3.87	4.46	5.25	5.92	6.28	7.11
1999.00	0.63	0.94	1.35	1.84	2.50	3.19	3.87	4.46	5.25	5.92	6.28	7.11

Projected Population Biomass

	2	3	4	5	6	7	8	9	10	11	12	13	2+	3+	4+	5+
1997.00	16240	22007	10577	22651	17352	13114	9031	1959	430	528	299	46	114235	97995	75988	65411
1998.00	17640	21497	24734	10485	21360	15329	10269	6561	1487	311	354	216	130245	112605	91108	66373
1999.00	17640	21484	24530	24480	9175	17035	11280	7178	4684	1017	200	243	138947	121307	99822	75292

Projected Catch Numbers

	2	3	4	5	6	7	8	9	10	11	12
1997.00	61	495	639	2017	1293	804	445	86	16	17	9
1998.00	76	613	1882	1106	1841	1134	626	347	67	12	13
1999.00											

Avg Wt

	2	3	4	5	6	7	8	9	10	11	12
1997.00	0.72	1.13	1.60	2.14	2.86	3.48	4.23	4.80	5.77	6.60	6.76
1998.00	0.72	1.13	1.60	2.14	2.86	3.48	4.23	4.80	5.77	6.60	6.76

Projected Catch Biomass

	2	3	4	5	6	7	8	9	10	11	12	2+	3+	4+	5+
1997.00	44	559	1023	4317	3698	2796	1884	412	92	113	62	15000	14956	14397	13374
1998.00	55	693	3010	2368	5264	3948	2650	1667	386	82	90	20212	20157	19465	16454
1999.00															

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