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The 1982 Assessment of the Eastern Scotian Shelf (4VsW) Cod Stock Complex

by

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Abstract

The Eastern Scotian Shelf cod stock complex has recovered surprisingly fast from the high exploitation rates it sustained during the first part of the seventies. Preliminary nomimal catches for 1981 are 53,661 mt, continuing the regular increase started in 1978. A standardization of commercial catch rates for Canadian (Maritimes) and Spanish boats in that fishery was performed. That catch rate along with R/V ages 5+ population estimates were used to calibrate ages 5+ COHORT. This indicated a 1981 fully recruited fishing mortality of 0.225. COHORT population estimates at age 4 were adjusted with commercial C.P.U.E. at age 4 while partial recruitment on ages 1 to 3 was adjusted to give year-class sizes at age 1 approximately equal to the long-term geometric mean. Projections at $F_{0.1}$ indicated 1983 catches of 64,000 mt if the 1982 catches are equal to the 50,000 mt TAC.

Résumé

La taille du complexe de stock de morue de l'est du plateau Scotian a augmenté de façon surprenante ces dernières années, compte tenue des hauts taux d'exploitation subis durant la premiere moitié des années soixante-dix. Les captures nominales provisoires pour 1981 sont de 53 661 tm. Les captures continuent donc d'augmenter régulièrement depuis 1978. On a effectué une normalisation des taux de capture des bateaux canadiens (provinces maritimes) et espagnols. Le taux de capture ainsi obtenus et les effectifs de 5 ans et plus tels qu'estimés par les levées scientifiques ont été utilisés pour calibrer les âges pleinement recrutés (5 ans et plus) avec COHORT. Les effectifs à 4 ans ont été ajustés à l'aide des PUE commerciales à 4 ans et le recrutement partiel de 1 a 3 ans a été modifié pour obtenir des classes d'âge à 1 an pour les classes d'âge de 1978 à 1980 approximativement égales à la moyenne géométrique pour la période couverte. Les projections au niveau $F_{0,1}$ indiquent des captures de 64 000 tm en 1983 si les captures en 1982 sont égales au TPA de 50 000 tm.

Introduction

This stock complex appears to have now almost fully recovered from the high exploitation rates of the early to mid-seventies. It appears that regulations to prevent by-catches of young cod in the silver hake fishery have been successful and the recovery has even occurred faster than was anticipated, proving the great resilience of cod stocks.

Nominal Catches

Despite a slow start in the first quarter of 1981, possibly due to unusual ice conditions in the Gulf of St. Lawrence and to a particularly early spring warm-up on the Scotian Shelf, the TAC set for the 4VsW cod fishery has again been overcaught in 1981. Preliminary figures are that nominal catches of 53,661 mt have been made, almost exclusively by Canada (Table 1). This is the highest total nominal catch since 1973 and the highest ever for Canada.

The total nominal catches (Figure 1, Table 1) for 1960 to 1972 have averaged about 62,000 mt, fluctuating between 80,000 mt (1968) and 50,000 mt (1969). Nominal catches declined steadily after 1972 at a rate of almost 10,000 mt/year and reached an historical low of 10,000 mt in 1977. Catches in 4Vs are more variable than in 4W (Figure 1), but on the average, approximately equal amounts were taken in 4Vs and 4W (from 1960 to 1981, 4Vs = 25,062 mt/y and 4W = 26,858 mt/y). Catches in 4W have consistently been higher than in 4Vs from 1973 to 1979 while the reverse holds for the last two years.

As in previous years, otter trawlers (Table 2) took the highest share (69%) of the catch in 1981, the balance being distributed mostly amongst longliners and Danish/Scottish seiners. Seventy percent of the otter trawl catches were made in 4Vs, where they were clearly dominant, while in 4W, the other gears caught more (56% of the total catches in 4W) than otter trawlers. On the average, since 1958, Canadian otter trawlers have taken higher catches than the other Canadian gears in NAFO Division 4W (6679 mt/year compared to 6124 mt/year) but this is mainly caused by higher catches between 1958 and 1965. Since 1966 the other gears have taken a higher proportion of the Canadian catches in 4W (6523 mt/year compared with 5490 mt/year for otter trawls) and have also been less variable than otter trawl catches (CV = 37% and CV = 59%). From 1966 to 1978 the Canadian other gears nominal catches in 4W have averaged 5490 mt/year and have been remarkably stable (CV = 19%).

Removals at Age

The sampling of commercial catches for this stock has improved substantially in recent years (Table 3). Although the total numbers of fish measured and aged in 1981 are marginally down from last year, a better temporal coverage of longliners and Danish/Scottish seiners has been achieved in 1981. The commercial samples were groupd to construct 10 age-

frequency distributions which were used to prorate the nominal catches. Quarterly keys for otter trawlers were applied to the appropriate otter trawl catches. The September-October seine samples were used to prorate the September to December catches while the July sample combined with the September-October ones were used to prorate catches prior to September. Longline samples from the third and fourth quarter were combined separately to prorate the appropriate quarterly catches while the June longline sample was combined with the third quarter samples to prorate earlier catches. The three handline samples were combined and applied to the year's handline catches. These keys accounted for 46,183 mt and the sum of these individual catches-at-age was prorated to the total reported catch of 53,661 mt.

Monthly removals at length in the USSR silver hake fishery were estimated for 1978 to 1981 from length frequencies collected by Canadian observers placed on Soviet boats. Because of doubts on the accuracy of the reported cod by-catch in that fishery (Gray, 1979; Maguire, 1981), the greater of the reported cod catches or of a calculated catch (from by-catch ratios derived from Canadian observers data and reported silver hake catches) was used to calculate USSR cod catches at length. When sample weight had been recorded by the observer, the mean weight of fish in the catch was used to prorate to total catch, otherwise the length-weight relationship derived from data collected during the summer groundfish research vessel survey was used. The research survey age-length keys were used to obtain catch-at-age (Table 4).

Analysis of data collected by Canadian observers on Soviet boats during the silver hake fishery (A.F. Sinclair, pers. comm.) and some ancillary information indicate that the Soviet cod under-reporting factor in the silver hake fishery calculated by Gray (1979) is probably as good an estimate as will ever be obtained. So, Gray's estimates of removals-at-age were used from 1966 to 1978, those from last year's assessment for 1979-1980 were changed to account for the newly calculated removals in the USSR silver hake fishery and using Gray's (1979) and Halliday's (1975) data, the total removals including corrected USSR cod removals-at-age from 1958 to 1965 were calculated. Total removals-at-age for 1958 to 1981 are given in Table 5. The change in age composition of the catches brought by Canada's extension of jurisdiction over fisheries is clearly evident in that table. Prior to 1977 ages 1 to 3 made significant contributions to the numbers caught reflecting the catches of young cod by the USSR and Spain. Since 1977, the proportional contribution of those ages has substantially decreased. For the first time since 1974, the age 4 has contributed more fish to the catch in 1981 than age 5 has. The 1973 to 1977 year-classes contributed about 84% of the numbers caught and the 1978 year-class contributed a further 12% to the numbers caught. In terms of weight caught, the 1973 to 1977 year-class contributed about 85% but the 1978 only 5%. Fish older than age 8 contributed 9% of the catch weight but only 3% of the numbers caught.

Table 6 shows estimates of removals-at-age by the Canadian otter trawlers since 1960. From 1960 to 1977 all otter trawl commercial samples were combined on a yearly basis and applied to the yearly nominal catches by Canadian otter trawlers. The same A and B paramenters of the length-

weight relationship (A = 0.0071 and B = 3.084) were used for all years. For 1978 to 1981, yearly A and B parameters from the summer groundfish research vessel surveys were used. There were enough samples in those years to construct quarterly age-length keys and apply them to quarterly nominal catches. These data were not formally used in any of the calculations presented here. They are given more for future reference and usage. The data could be specially useful if an effort series for Canadian otter trawlers were available.

Weights-at-Age

Weights-at-age for 1966 to 1978 were available from unpublished data sheets (D. Gray, pers. comm.), the 1979-80 from last year's assessment (Maguire, 1981), and the 1981 weights-at-age were calculated from that years's commercial sampling data. The 1966 to 1980 average weights-at-age were used for 1958 to 1965. No substantial changes in average weights-at-age are evident between 1980 and 1981 (Table 7) but weights-at-age in recent years appear to be higher than the 1966 to 1980 averages. Maguire (unpublished data) has found some trends in weight-at-length from the summer groundfish research vessel survey data and it is possible that these changes may be related to stock size.

Stock Size Indices

Research Vessel Surveys:

Table 8 shows the average number of cod caught per set in each stratum of both 4Vs (Table 8a) and 4W (Table 8b) during the summer groundfish research survey. Table 8b shows very high catches per set in strata 58-59 for 1973. These are due to one anomalously large set in each of these strata. Starting with the 1979 assessment of this stock (Gray, 1979) the research vessel population estimates for 1973 have been recalculated excluding these two anomalous sets (Table 9b). The unmodified R.V. population estimates are also given (Table 9a) to show the influence of these two sets. There does not appear to be any such anomalous values in the other years (Table 8).

Generally, cod in 4VsW appear to be fully recruited to the research trawl betweeen ages 3 and 4 (Table 9b). Figure 2 shows the ages 4+, 5+, and 6+ population estimates from the survey since 1970. Age 4+ population estimates increase from 1970 to 1972 then decline until 1974, remain stable in 1975 and increase sharply in 1976 to 1978, remain relatively stable in 1979-1980 and increase to the highest observed value in 1981. Ages 5+ and 6+ population estimates are in general agreement with one another, declining from high values in 1971 to a minimum in 1975, they then increase more or less regularly until 1980 (both have a dip in 1978) with a slight decline in 1981 but still at a level higher than the 1971 value.

Table 9c and 9d suggest that the age of full recruitment to the research trawl is between ages 3 and 4 for both 4Vs and 4W. Figure 3 shows

research survey ages 4 and older population estimates for 4VsW, 4Vs, and 4W. Although catches were higher in 4W for 1970-71 (Fig.1), the survey indicates more age 4 and older fish in 4Vs for those years. It is interesting to note that the peak in 4Vs catches in 1972 is also observed in the survey. From 1972 to 1981 the survey and nominal catches agree in the relative importance of the two areas. The recovery of the 4VsW cod complex appears to have occurred earlier in 4W (Figure 3). Information from the fishing industry is in agreement with that observation. Most of the catches in 1978 and 1979 were made on Middle Ground where fishing was not as good in 1980-81, while most fishing now takes place in 4Vs.

Commercial Catch per Unit Effort

Because of suspected misreporting of catch locations, mainly in 1978, commercial catch rates have not been given much weight in previous assessments, and the sequential population analyses had to be calibrated with the survey data alone (Gray, 1979; Maguire, 1980; 1981). In last year's assessment (Maguire, 1981), a good relationship was found between SPA 5+ biomass and Canadian tonnage class 5 otter trawler catch rates in January-April. The agreement between the commercial catch rate and the survey stock size index was relatively good and appeared to warrant further investigations of commercial catch rates. Because it may be dangerous to rely only on catch rates from one gear type and tonnage class to describe stock size fluctuations, a multiplictive catch rate standardization model (Gavaris 1980) has been applied to catch and effort data for Spanish pair trawlers tonnage classes 4 and 5 and to Canadian (Maritimes based) catch and effort data for longliners (TC 2, 3, 4) and otter trawlers (TC 2, 3, 4, 5). The catch rates (Table 10) are standardized to as Can-M OTB2 TC5 fishing in January in NAFO Subdivision 4Vs. Given an estimate of total catch, the model gives the effort that the standard would have had to exert to capture the entire catch (Table 10). After initial attempts of standardization, an examination of the residuals indicated some unusually high catch rates for Spainish TC 4 pair trawlers and Canadian longliners. Five of these observations, out of a total of 1552 observations, were excluded from the analyses. No weighting factors have been used because they introduced trends in the residuals.

Figure 4 shows the trends in commercial catch rates since 1960. These show a steady decline from 1.17 t/hour in 1969 to 0.523 t/hour in 1975. The catch rates increased steadily (with a small dip in 1980) to reach 1.87 t/hour in 1981, the highest value recorded in that series.

In order to investigate the validity of the commerical catch rates as an index of stock biomass, they were compared with the summer groundfish research vessel survey population biomass estimates (Figure 5a,b). Figure 5a shows a plot of each series (divided by its average for 1970-1981) versus time, while Figure 5b shows the two series plotted one versus the other. Both figures indicate that the two indices appear to be measuring the same thing, both indicating relatively fast stock recovery after 1975 with the highest recorded value observed in 1981.

Figure 5b shows some curvilinearity at both ends . Assuming that the survey biomass estimates are not biased this would indicate that the commercial catch rates have both a ceiling and a floor that they would reach asymptotically. This is probably seeing more in the data than is actually there, but it would not be unreasonable to expect such a relationship. As stock biomass decreases, more and more fishermen leave the fishery while those remaining are the true cod fishermen with, perhaps a better knowledge of fish behaviour which enables them to maintain relatively high catch rates despite low stock sizes. At the other end of the spectrum, the physical capacity of the boat may be reached. There may be some gear saturation, or a reversed phenomenon from the one mentioned at low biomasses may occur. New fishermen are attracted to the cod fisheries but because of their relative inexperience they do not achieve as good a catch rate as other more experienced fishermen and thus the overall catch rate does not increase as much as expected. If such a mechanism were acting, observed catch rates would overestimate stock size at low stock levels and underestimate it at high stock levels. Figure 5a suggests that this hypothesis may not be completely unrealistic. This conclusion is, however, dependent on the assumption of unbiased survey biomass estimates. The conclusion that the standard catch rate and survey are both indices of the same thing appears to hold.

Calibration of Sequential Population Analyses

In SPA, there are more independent parameters to estimate than there are data points, so assumptions have to be made on fishing mortality for the oldest age of each year-class for which a reliable catch number is available. This allows for great flexibility in use of SPA, but it may also lead to spurious correlation if all input F-values can be changed. It is thus necessary to set some guidelines to restrict the subjectivity of the calibration of SPA. There is no reason to believe that the fishing mortality on the oldest age for all years should be different from the average (or some proportion of it) fully recruited F. Consequently, in the COHORT runs made for this analysis, the F on the oldest age was made equal to the average F on ages 7 to 10. An examination of the F matrix presented in Maguire (1981) indicated that, even if a dome shaped partial recruitment vector was used in that analysis, 1979 was the only year for which there was a strong evidence of a dome. Because this fishery is mainly an otter trawl fishery, it is probable that a flat topped (full recruitment at age 5) P.R. vector would be more appropriate. SPA 5+ population numbers (mid-year) were calibrated with the summer groundfish research vessel survey ages 5+ population estimates, and SPA 5+ biomass estimates (beginning of year) with the standard catch rate. These relationships were used because they allowed the changing of only one parameter at a time, the 1981 fully recruited fishing mortality. The goodness of fit (correlation coefficient), the value of the intercept (close to zero) and the proximity of the 1981 value to the regression line were all used in choosing the terminal fishing mortality. In addition, plots of both dependent and independent variables (scaled by dividing each one by the first value of each series) versus time were used.

As in Maguire (1981) the 1970 value was not used in calibrating SPA 5+ numbers (mid-year) with the R.V. 5+ population estimates. Preliminary COHORT runs indicated that the agreement between 5+ biomass and the standard catch rate was much better form 1968 to 1981 than prior to 1968. Since the standard used (OTB2-TC5) really entered the fishery in 1968, it seemed sensible to calibrate SPA with catch rate since 1968 only.

The results of the calibration of SPA with R.V. 5+ population estimates are given in Table 11a. The correlation coefficient increases from r = 0.822 at F_T = .10 to r = 0.884 at F_T = .225 and decreases to r = 0.789 at F_t .40. the correlation coefficients alone do not allow discrimination between F_T = 0.20 and F_T = 0.30 but it seems reasonable to exclude F_T = 0.10 and F_T = 0.40. Previous analyses of these data sets (Scott unpublished) with the program "Survivor" (Rivard, 1980; Doubleday, 1981) have indicated that for ages 5 and older, the cod R.V. population estimates on the Scotian Shelf are approximately half the SPA estimates. This is most closely approximated at F_T = 0.20, however, the standardized SPA 5+ population numbers and standardized R.V. 5+ population estimates (ratios of Table 11a) indicate that F_T = 0.225 would be appropriate if more weight is placed on the 1979-80 values rather than 1981. The plot of R.V. 5+ population numbers and 5+ SPA population estimates is shown in Figure 6.

Table 11b shows the result of SPA 5+ biomass calibration with the standard catch rate. The correlation coefficient decreases from r = 0.881 at F_T = 0.10 to r = 0.653 at F_T = 0.40 and the Y-intercept becomes essentially positive at F_T = 0.25. However, at F_T = 0.25 the standardized SPA 5+ biomass are all much below the standardized standard catch rates (ratios of Table 11b) in recent years (except 1980). The 1981 SPA 5+ biomass ratio is just slightly below the standardized catch rate at F_T = 0.225. F_T = 0.225 appears to give the best overall agreement between SPA and both the survey and standard catch rate. SPA 5+ biomass is plotted against the standard catch rate in Figure 7.

Maguire (1981) found relationships between SPA ages 3 and 4 and year-class size indices from the survey. These were not as evident this year and it is believed that the use of a flat topped P.R. vector may have something to do with the deterioration of these relationships. It is the authors belief that such a P.R. vector is the most appropriate in the current fishery even if a dome shaped P.R. vector may have given a better relationship between SPA and survey year-class sizes. This may be due to the dome shaped P.R. compensating for inaccurate estimates of the catches of young fish in the early to mid seventies.

An index of year-class size was developed by dividing the removals-at-age by the effort index of Table 10 (Table 12). As in the calibration of SPA 5+ biomass with the standard catch rate, only data from 1968 to the present were used. There seemed to be some relationships for ages 2 to 4 until 1977 but the dramatic change in age composition that occured that year destroyed the relationships for ages 2 and 3. The C.P.U.E. at age 4 indicated that the 1977 year-class should be about the size of the highest year-class observed at age 4. COHORT runs with fishing mortality of 0.1, 0.125, and 0.15 on age 4 in 1981 indicated (based on correlation coefficient, intercept and the standardized ratios) that a fishing

mortality on age 4 in 1981 = 0.125 gave the best overall agreement. The P.R. on ages 1 to 3 were adjusted to give year-class sizes at age 1 approximately equal to the long term geometric mean (108 million fish) while still giving P.R. values consistent with values obtained for these ages since 1977. The resulting population at age, biomass and fishing mortality matrixes are given in Tables 13(a)(b) and (c) while the P.R. vector used is shown in Table 14.

Yield-Per-Recruit

This partial recruitment vector and the 1981 average weights-at-age from the fishery (Table 14) were used to calculate Thompson and Bell yield per recruit. Maximum yield per recruit (0.716 kg/recruit) occurred at F_{max} = 0.30 and the yield per recruit at $F_{0.1}$ = 0.17 was 0.67 kg/recruit. This $F_{0.1}$ value is at the lower end of the range of $F_{0.1}$ values calculated for this stock (0.17 - 0.328), the highest value resulting from a dome shaped partial recruitment vector. It is generally agreed that $F_{0.1}$ for cod stocks in the Canadian fishing zone is about 0.20. Since 0.17 is not significantly different from 0.2 it is proposed to set $F_{0.1}$ equal to 0.2 for this cod stock as is the case for most other cod stocks in NAFO Subarea 2-4. This value should be used until significant changes in selectivity or growth are clearly demonstrated.

Projections

Projections to 1983 were made with the above parameters and incoming year-classes set at 100 million fish, slightly below the long term geometric mean (Table 15). Two options are presented:

(1) The 1982 catch is equal to the set quota (50,000 mt) and fishing at $F_{0.1}$ in 1983.

(2) Fishing at $F_{0.1}$ in 1982 and 1983.

The results indicate catches of 64,000 mt if the 1982 catch is 50,000 mt, while fishing at $F_{0.1}$ in 1982 and 1983 would result in catches of 57,000 mt for 1982 and 62,000 mt for 1983.

Discussion

The rapid resurgence of this cod stock complex has been one of the big surprises in the East Coast fisheries. Although some stock recruitment relationships do predict strong year-classes at low spawning stock sizes, it is probable that, in this case, reduced harvesting of immature fish in small mesh fisheries has played a large part in stock recovery and the reduced spawning stock may have little to do with the recovery.

Long term average yield is difficult to estimate for this cod stock complex. Suspected underreporting of cod catches in small mesh fisheries,

and dramatic changes in the exploitation pattern by age diminish the value of historical performance as an index of future yields. Furthermore, poor sampling of commercial catches in the sixties has probably resulted in some smoothing of year-classes. It is probable that the variability in recruitment shown in Table 13 underestimates the actual variability. It does not seem unreasonable, however, to expect yields in the order of 60,000 mt or more for a good part of the 1980's.

This assessment, for the first time since 1978, uses catch and effort statistics from the commercial fishery to calibrate SPA. It is only because of a lack of confidence in commercial data that previous assessments have relied so heavily on research survey data. It now appears that the suspected inaccuracy of commercial statistics is not nearly as severe as previously believed. The agreement between research survey biomass estimates and the standard commercial catch rate (Figure 5) does give some credibility to the commercial statistics. In previous assessments (Gray, 1979; Maguire, 1981) C/E statistics for Canadian Maritimes based tonnage class 5 otter trawlers have been modified to account for a gear change in 1974-75 that allegedly increased the efficiency of that category. Although the data has not been thoroughly analysed, they do not support an increase in efficiency since, during these years, the TC5 catch rates (unmodified) were only slightly higher than the TC4 catch rates while overall the TC5 catch rates are about 40% higher than those of TC4. Correcting the TC5 catch rates made them substantially lower than those of TC4 and this does not appear reasonable. This suggests that the increased efficiency quoted by the fishing industry representatives was significantly overestimated. This could be partly due to some misunderstanding of the catch rate concept.

The consistent trend in both the survey and commercial data between 4Vs and 4W since the early seventies suggest that it could be useful to review the stock structure and population parameters in this area. The multiplicative catch rate standardization model also suggested significant differences between 4Vs and 4W thus supporting the need for a more detailed analysis. This could imply, among other things, reconstruction of catch-at- age matrixes by gear for each area and a close examination of the summer groundfish research vessel survey and SSIP results. The data collected by the International Observer program on both Canadian and foreign boats could also be analysed in detail.

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Table 1. 4VsW cod nominal catches by country and NAFO Divisions

YEAR	CANADA	FRANCE	PORTUGAL	SPAIN	USSR	OTHERS	TOTAL	DIV. 4Vs	DIV. 4W	TAC
1958	17938	4577	1095	14857	0	124	38591	23790	14801	
1959	20069	16378	8384	19999	0	1196	66026	47063	18963	
1960	18389	1018	1720	29391	0	126	50645	27689	22956	
1961	19697	3252	2321	40884	113	42	66309	34237	32072	
1962	17579	2645	341	42146	2383	60	65154	26350	38804	
1963	13144	72	617	44528	9505	307	68173	27566	40607	
1964	14330	1010	0	39690	7133	1094	63257	25496	37761	
1965	23104	536	88	39280	7856	124	70988	36713	34275	
1966	17690	1494	0	43157	5473	356	68170	27136	41007	
1967	18464	77	102	33934	1068	512	54157	26607	27550	
1968	24888	225	0	50418	4865	29	80425	48781	31644	
1969	14188	217	0	32305	2783	664	50157	22309	27848	
1970	11818	420	296	41926	2521	446	57427	28632	28795	
1971	17064	4	18	30864	4506	107	52563	24128	28435	
1972	19987	495	856	28542	4646	7119	61645	36533	25112	
1973	15929	922	849	30883	2918	2569	54070	23401	30669	60500
1974	10700	34	1464	27384	3096	1060	43739	19610	24130	60000
1975	9939	1867	546	15611	3042	1512	32517	11694	20823	60000
1976	9567	697	0	11090	1018	2035	24407	11553	12854	30000
1977	9890	68	0	0	97	335	10390	2873	7517	7000
1978	24642	437	0	57	218	51	25405	10357	15048	7000[1]
1979	39219	18	0	2	683	108	40030	15393	24637	30000
1980[2]	48778	0	2	0	319	65	49164	31399[3]	17381[3]	45000
1981[2]	53051	0	0	0	575	35	53661	32105[3]	20946[3]	50000

[1] By-catch only

[2] Final Maritimes, preliminary Newfoundland.

[3] Canada only

Table 2. Division 4VsW cod: Canadian nominal catches by otter trawls[1] and other gear.

Year	Division 4VS		Division 4W		Totals		
	Trawls	Other Gear	Trawls	Other Gear	Trawls	Other Gear	Totals[4]
1958[2]	4258	2092	4892	5731	9150	7823	16973
1959	4181	1286	7294	7308	11475	8594	20069
1960	1924	750	10228	5488	12152	6238	18390
1961	1135	136	12895	5531	14030	5667	19697
1962	1495	93	11762	4229	13257	4322	17579
1963	1258	34	7779	4063	9037	4097	13134
1964	2059	41	7324	4906	9383	4947	14330
1965	7366	106	10293	5338	17659	5444	23103
1966	6375	156	6614	4545	12989	4701	17690
1967	6729	132	6463	5140	13192	5272	18464
1968	9501	66	8367	6954	17868	7020	24888
1969	3539	51	4424	6174	7963	6225	14188
1970	3054	22	3596	5146	6650	5168	11818
1971	5826	41	4745	6452	10571	6493	17064
1972	9856	119	4732	5280	14588	5399	19987
1973	6397	77	4723	4731	11120	4808	15928
1974	4640	60	1343	4658	5983	4718	10701
1975	1815	72	3556	4496	5371	4568	9939
1976	3496	301	934	4836	4430	5137	9567
1977	2751	54	1873	5212	4624	5266	9890
1978[5]	8695	1662	7303	7745	15998	9407	25405
1979	14853	524	13784	10058	28637	10582	39219
1980[3]	28942	2456	6232	11148	35174	13604	48778
1981[3]	27659	4446	9148	11798	36805	16253	53051

[1] Total of OTB1, OTB2, OTM, OTB.

[2] Does not include catch reported only as 4V which is included in Table 1.

[3] Final Martimes, Preliminary Newfoundland.

[4] Totals may differ from Table 1 due to rounding error.

[5] See Corrigendum

Table 3. Canadian commercial samples for cod caught in 4Vs and 4W for 1979 and 1980 and 1981.[a]

Year	Div.	Gear	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Total	Yearly total all gears
1979	4Vs	OTB-1					262/43	335/37	169/67			612/103	616/99	272/41	2266/390	
		OTB-2					391/40					360/35	626/110		1377/185	
	4W	OTB-1	224/45				1015/129	319/49	645/74	616/71		765/93			3584/461	
		OTB-2					677/69							265/39	942/108	
		SN4							221/32	1164/129	491/58			787/107	2663/326	
		LL				360/53	219/50	870/153	822/129	570/70	306/42		278/62	223/52	3648/611	
		LHP							225/34						225/34	
	4VsW	OTB-1					298/38								298/38	
		OTB-2					805/96					304/58			1109/154	16112/2307
1980	4Vs	OTB-1			3335/238	666/101			267/45	338/38		1756/274	283/34		6645/730	
		OTB-2			956/149	579/106			213/33	345/64	296/36	1735/281	1691/316		5815/985	
		OTB					200/43								200/43	
	4W	OTB-1		333/61	279/49	301/54		232/53		222/38					1367/255	
		OTB-2		556/105	319/46					154/43				573/91	1602/285	
	SN4									642/104		254/36			896/140	
	LL					255/56			380/60	208/48	286/58				1129/222	
	4VsW	OTB-1				301/59						309/42			610/101	
		OTB-2											259/58	355/56	614/114	18878/2875
1981	4Vs	OTB-1			983/139		352/44	481/70	2108/334	310/46					4234/633	
		OTB-2			1411/209	662/124		315/67	1000/137		233/41	864/162			4485/740	
		SNU							253/24						253/24	
		LL							308/64						308/64	
	4W	OTB-1	298/56		607/108	246/38			246/29			193/31			1590/262	
		OTB-2				567/109			233/37						800/146	
		SNU									228/28	505/74			733/102	
		LL						430/51	611/87	1022/177		345/39			2408/354	
		LHP							425/83						425/83	
	4VsW	OTB-2			629/122	605/124									1234/246	16470/2654

[a] The first number is the number of fish measured and the second, the number of fish aged.

Table 4. 4VsW cod catch-at-age in the 1978-81 USSR silver hake fishery.

AGE	YEAR 1978	1979	1980	1981	TOTAL
1	28,669	12,344	29,273	2,734	73,020
2	62,548	45,994	23,826	57,255	189,623
3	151,536	105,752	78,770	275,501	611,559
4	177,662	213,731	68,510	256,294	716,197
5	27,051	181,317	86,631	37,121	332,120
6	3,162	42,341	42,706	22,474	110,683
7	1,026	5,085	15,672	7,232	29,015
8		466	1,010	1,220	2,696
9		129	496		625
TOTAL	451,654	607,159	346,894	659,831	2,065,539
NO. MEASURED	890	2,504	6,508	4,730	14,632

TABLE 5: 4VSW COD REMOVALS-AT-AGE 2/ 5/82

	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
1	0	0	0	45	935	3730	2799	3083	2806	548	2495	1426
2	138	0	0	283	5962	23782	17955	19668	17891	4235	16045	9097
3	2854	2499	7016	3443	6026	16949	14731	18721	17493	6267	17413	7684
4	3534	8887	6118	9588	10335	12267	8930	12497	13973	7989	17783	13724
5	2533	8811	6655	9340	6372	10916	11779	5345	10577	9456	15633	10248
6	3726	6490	4525	6676	7887	5423	4696	6130	4461	4338	8297	6073
7	1610	4384	2811	2885	2744	4875	2874	3135	3256	1467	3482	2144
8	1465	1467	1827	1882	2538	2183	2345	4477	1590	1239	895	510
9	2014	878	290	1212	686	346	1047	2127	856	664	816	237
10	859	1101	133	169	478	134	312	1583	496	647	361	50
11	543	318	122	147	169	121	145	172	666	325	152	95
12	58	251	75	88	75	50	75	91	24	65	211	58
13	51	27	1	66	68	26	50	96	14	16	33	12
14	11	0	15	3	0	0	0	88	0	5	17	7
15	10	0	0	0	5	0	0	163	2	7	1	2
16	53	21	6	0	0	1	11	7	1	2	10	2
1+	19459	35134	29594	35826	44279	80803	67749	77384	74106	37270	83644	51369

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
1	1293	2311	2383	1418	1482	1792	728	2	177	12	29	3
2	8631	15218	17738	12142	8451	9979	4061	24	153	81	151	357
3	8886	12582	14227	14881	12885	9485	3587	386	1004	1629	2028	3610
4	14802	9146	13361	7507	9947	4341	3713	1073	3650	6164	5111	9282
5	13673	8809	9661	9755	7130	4549	4818	1559	4621	9145	7101	6721
6	4539	10262	8780	3823	2766	2594	2412	871	2441	4871	6140	4222
7	1942	5160	3432	2996	944	2627	1426	501	768	1162	2925	2872
8	759	1849	1919	3724	1323	612	611	220	213	371	1065	1685
9	236	496	358	1166	413	497	184	128	112	76	319	455
10	72	114	393	273	369	660	49	35	80	23	88	173
11	137	131	79	299	15	153	22	44	26	10	47	72
12	56	72	2	3	5	126	107	55	28	5	26	38
13	9	98	37	7	0	36	1	11	26	4	4	29
14	12	12	0	5	0	9	4	3	9	1	1	2
15	4	51	1	5	0	9	1	2	4	0	4	4
16	3	17	1	20	0	18	1	7	2	0	8	12
1+	55054	66328	72372	58024	45730	37487	21725	4921	13314	23554	25047	29535

TABLE 6. 4VSW COD CANADIAN OTTER TRAWL CATCH-AT-AGE 2/ 5/82

	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	45	9	0	0	0	0	0	37	679	13	15	0	0	0	9	25	24	177
3	209	39	179	58	510	1144	496	78	352	170	8	320	810	546	831	24	0	66	694	1134	1053	2011
4	628	636	1643	1226	955	2282	2580	1490	2372	1083	618	745	2519	935	1314	327	443	316	2843	4687	3199	5884
5	1496	2038	1408	1790	1792	1819	2455	2974	2742	1309	1282	1245	1659	1782	1002	835	872	720	3538	6690	4822	4277
6	1230	1863	1550	736	585	2208	972	1122	1786	969	633	1048	1582	640	376	601	457	405	1559	3722	4615	2516
7	812	514	579	590	277	678	507	340	804	373	376	700	803	643	86	556	291	256	451	782	2482	1717
8	653	412	473	293	445	514	226	297	263	100	166	408	456	907	158	118	204	131	94	265	972	819
9	128	227	152	56	166	351	117	150	229	56	62	155	84	322	25	94	51	94	41	46	292	163
10	46	20	90	23	68	192	75	131	98	83	22	78	114	74	27	128	17	24	29	20	80	57
11	61	68	40	17	40	72	99	75	69	19	21	34	17	105	0	32	12	33	13	9	40	26
12	26	48	17	7	8	37	9	20	105	7	19	35	1	2	0	23	36	34	6	3	25	7
13	5	7	20	3	14	28	1	5	28	2	4	33	9	4	0	8	0	9	7	3	4	4
14	5	1	0	0	0	11	0	3	9	0	7	18	0	4	0	1	0	2	3	1	1	1
15	0	0	1	0	0	14	0	5	0	0	3	6	1	3	0	1	0	2	1	0	4	1
16	2	3	0	1	8	5	0	1	2	0	1	12	1	9	0	3	0	6	0	0	8	3
1+	5301	5876	6152	4800	4913	9364	7537	6691	8859	4171	3222	4874	8735	5989	3834	2751	2383	2098	9288	17387	17621	17663

TABLE 7: 4VSW COD WEIGHTS-AT-AGE 2/ 5/82

	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
1	0.058	0.058	0.058	0.058	0.058	0.058	0.058	0.058	0.020	0.020	0.020	0.020
2	0.276	0.276	0.276	0.276	0.276	0.276	0.276	0.276	0.150	0.160	0.150	0.140
3	0.565	0.565	0.565	0.565	0.565	0.565	0.565	0.565	0.450	0.470	0.430	0.420
4	0.943	0.943	0.943	0.943	0.943	0.943	0.943	0.943	0.900	0.960	0.870	0.850
5	1.465	1.465	1.465	1.465	1.465	1.465	1.465	1.465	1.490	1.590	1.440	1.410
6	2.097	2.097	2.097	2.097	2.097	2.097	2.097	2.097	2.180	2.330	2.100	2.070
7	2.827	2.827	2.827	2.827	2.827	2.827	2.827	2.827	2.940	3.130	2.820	2.780
8	3.671	3.671	3.671	3.671	3.671	3.671	3.671	3.671	3.720	3.960	3.570	3.520
9	4.335	4.335	4.335	4.335	4.335	4.335	4.335	4.335	4.500	4.790	4.330	4.260
10	5.263	5.263	5.263	5.263	5.263	5.263	5.263	5.263	5.270	5.610	5.060	4.990
11	5.956	5.956	5.956	5.956	5.956	5.956	5.956	5.956	6.000	6.390	5.770	5.680
12	6.845	6.845	6.845	6.845	6.845	6.845	6.845	6.845	6.690	7.120	6.430	6.340
13	7.500	7.500	7.500	7.500	7.500	7.500	7.500	7.500	7.340	7.810	7.050	6.950
14	8.000	8.000	8.000	8.000	8.000	8.000	8.000	8.000	7.930	8.440	7.620	7.510
15	9.025	9.025	9.025	9.025	9.025	9.025	9.025	9.025	8.470	9.010	8.140	8.020
16	10.014	10.014	10.014	10.014	10.014	10.014	10.014	10.014	8.960	9.530	8.610	8.480

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
1	0.020	0.010	0.050	0.080	0.130	0.100	0.100	0.100	0.200	0.000	0.000	0.202
2	0.150	0.110	0.180	0.220	0.330	0.270	0.280	0.280	0.620	0.530	0.570	0.594
3	0.450	0.320	0.440	0.450	0.620	0.530	0.570	0.810	0.950	0.760	0.800	0.803
4	0.910	0.640	0.810	0.790	1.020	0.890	0.960	1.090	1.250	1.060	1.150	1.145
5	1.500	1.070	1.290	1.210	1.530	1.340	1.460	1.670	1.680	1.700	1.600	1.696
6	2.190	1.560	1.850	1.720	2.130	1.870	2.030	2.360	2.470	2.390	2.210	2.107
7	2.940	2.090	2.480	2.280	2.820	2.470	2.660	3.170	3.610	3.130	3.080	3.001
8	3.730	2.650	3.140	2.900	3.580	3.120	3.350	4.580	5.230	3.710	4.310	3.793
9	4.510	3.210	3.830	3.540	4.410	3.810	4.070	4.140	5.590	4.770	5.260	5.334
10	5.280	3.750	4.520	4.220	5.280	4.530	4.800	5.330	6.540	6.840	6.920	6.480
11	6.020	4.280	5.200	4.900	6.190	5.270	5.550	4.650	7.920	7.960	7.560	7.197
12	6.710	4.770	5.870	5.590	7.130	6.010	6.290	4.910	9.210	9.410	10.190	8.550
13	7.360	5.230	6.520	6.280	8.090	6.760	7.020	7.140	10.400	10.630	7.920	8.640
14	7.950	5.650	7.140	6.960	9.050	7.510	7.740	8.590	9.750	10.030	8.130	10.003
15	8.490	6.040	7.730	7.620	10.010	8.240	8.430	10.600	8.680	11.450	14.450	10.117
16	8.980	6.380	8.290	8.270	10.960	8.960	9.100	14.940	12.210	12.510	14.030	14.376

TABLE 8A. 4VS COD AVERAGE NUMBER PER SET SET PER STRATUM IN R.V. SURVEYS 30/ 4/82

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
43	20.370	28.310	17.880	9.140	3.930	14.100	1.170	2.890	4.050	12.320	38.670	39.020
44	26.720	110.650	123.970	20.290	13.430	6.360	14.210	46.690	18.790	25.280	23.760	82.590
45	0.850	81.840	7.110	25.980	2.050	2.750	3.820	17.950	3.330	3.610	60.160	27.080
46	1.540	3.500	2.920	0.780	1.110	1.060	3.680	0.310	0.000	1.900	5.900	12.350
47	36.150	1.890	29.990	38.030	20.450	64.060	69.610	54.940	21.490	52.910	76.220	118.880
48	33.210	3.610	4.520	12.720	4.310	3.270	12.550	51.220	37.690	50.660	6.460	13.290
49	59.680	2.870	0.490	13.130	0.390	0.730	4.830	0.320	0.000	7.110	18.470	0.000
50	1.090	1.520	3.380	14.770	24.960	1.290	4.230	4.740	13.610	2.860	0.000	15.710
51	0.000	1.170	2.140	0.550	0.920	7.400	0.550	0.000	0.000	5.830	1.030	4.080
52	0.000	1.520	1.840	0.380	72.360	17.010	9.040	3.830	1.940	13.070	0.670	8.890

TABLE 8B. 4W COD AVERAGE NUMBER PER SET PER STRATUM IN R.V. SURVEYS. 30/ 4/82

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
53	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.320	0.000	0.000	2.760
54	0.000	0.000	5.830	2.130	0.730	0.620	10.500	2.570	0.650	14.130	4.510	17.270
55	4.600	8.950	21.700	24.250	135.440	38.310	42.500	41.820	45.690	67.530	35.100	55.430
56	15.940	17.340	15.820	42.640	18.080	26.500	38.410	53.300	18.480	190.230	27.610	96.420
57	1.520	1.020	1.380	20.070	178.470	1.640	0.000	2.390	659.530	0.000	99.300	0.510
58	20.200	18.880	105.000	2811.080	10.540	45.210	37.540	100.550	81.540	63.150	186.900	42.740
59	11.360	54.690	3.400	340.640	11.060	7.500	39.150	38.700	9.780	13.220	1.080	19.150
60	4.030	1.750	0.000	1.540	0.000	1.250	0.490	0.000	1.190	0.000	1.110	0.490
61	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.650	0.000	0.000	0.000
62	3.890	1.230	2.920	0.000	0.240	2.420	3.560	0.570	0.000	0.730	0.610	0.000
63	13.130	13.610	18.690	12.590	42.280	14.320	4.230	43.350	3.280	3.750	2.660	4.250
64	31.990	6.260	8.840	89.180	47.350	21.610	29.130	14.330	26.060	37.520	53.920	13.390
65	3.920	3.110	0.190	0.320	1.660	1.170	5.880	0.660	7.290	10.050	2.060	0.290
66	0.000	0.000	0.000	0.000	0.280	0.000	0.000	0.000	0.000	0.000	0.530	0.000

TABLE 9A. 4VSW COD R.V. SURVEYS POPULATION ESTIMATE NOT CORRECTED FOR 1973. 30/ 4/82

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
0	0	0	0	0	0	0	0	0	174	1017	50	74
1	1478	1539	6210	16128	5174	3372	2242	808	3033	1213	690	4589
2	16388	7680	9674	122780	32961	8412	14066	10145	13065	10612	7064	12770
3	5250	35664	11881	104965	19246	13000	16098	26372	31245	16044	18488	18936
4	7714	8027	31536	59948	5623	6171	10187	17059	34205	16595	10260	30753
5	3742	15803	5812	22524	2017	2959	6621	11353	9461	18075	17365	12057
6	1228	5775	5989	1870	2244	675	1264	4893	3490	9053	12099	8570
7	1532	3459	1621	2907	372	867	656	1081	889	2696	4794	4404
8	466	1475	547	901	463	235	1308	878	185	1009	1302	1553
9	104	638	495	431	224	433	0	244	90	411	338	533
10	249	70	153	514	161	23	929	0	79	83	265	650
11	209	137	0	166	63	0	38	161	0	45	93	163
12	101	58	0	0	59	68	0	62	79	5	0	74
13	142	206	0	230	57	0	213	0	0	19	0	12
4+	15487	35648	46153	89491	11283	11431	21216	35731	48478	47991	46516	58769
5+	7773	27621	14617	29543	5660	5260	11029	18672	14273	31396	36256	28016
6+	4031	11818	8805	7019	3643	2301	4408	7319	4812	13321	18891	15959

TABLE 9B. 4VSW COD R.V. SURVEYS POPULATION ESTIMATE CORRECTED FOR 1973. 30/ 4/82

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
0	0	0	0	0	0	0	0	0	174	1017	50	74
1	1478	1539	6210	2295	5174	3372	2242	808	3033	1213	690	4589
2	16388	7680	9674	8779	32961	8412	14066	10145	13065	10612	7064	12770
3	5250	35664	11881	13761	19246	13000	16098	26372	31245	16044	18488	18936
4	7714	8027	31536	10790	5623	6171	10187	17059	34205	16595	10260	30753
5	3742	15803	5812	6798	2017	2959	6621	11353	9461	18075	17365	12057
6	1228	5775	5989	429	2244	675	1264	4893	3490	9053	12099	8570
7	1532	3459	1621	950	372	867	656	1081	889	2696	4794	4404
8	466	1475	547	676	463	235	1308	878	185	1009	1302	1553
9	104	638	495	97	224	433	0	244	90	411	338	533
10	249	70	153	274	161	23	929	0	79	83	265	650
11	209	137	0	166	63	0	38	161	0	45	93	163
12	101	58	0	0	59	68	0	62	79	5	0	74
13	142	206	0	96	57	0	213	0	0	19	0	12
4+	15487	35648	46153	20276	11283	11431	21216	35731	48478	47991	46516	58769
5+	7773	27621	14617	9486	5660	5260	11029	18672	14273	31396	36256	28016
6+	4031	11818	8805	2688	3643	2301	4408	7319	4812	13321	18891	15959

Table 9c. 4VS COD R.V. POPULATION ESTIMATE 28/ 4/82

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
0	0	0	0	0	0	0	0	0	0	0	0	0
1	162	0	181	360	1277	171	185	481	200	289	114	330
2	11992	1638	5189	4317	3450	2989	5736	4365	3137	3107	1415	8325
3	2219	30138	9550	6266	3503	6881	6643	14393	6964	6152	4150	11568
4	5142	4468	29774	3240	1151	2575	2104	8030	5618	6526	4811	23083
5	2730	12129	4365	4835	1112	1805	2019	6014	1151	6218	11017	9346
6	867	4209	5649	242	1658	465	346	2092	280	3366	8426	5312
7	777	2260	1541	736	151	649	294	523	108	1474	2720	2539
8	278	1062	513	262	340	235	1308	604	67	848	955	933
9	25	70	254	27	159	285	0	244	66	297	260	392
10	22	70	153	0	46	23	929	0	26	83	265	582
11	209	0	0	166	43	0	0	161	0	45	93	95
12	0	0	0	0	0	0	0	0	0	5	0	74
0+	24423	56044	57169	20451	12890	16078	19564	36907	17617	28410	34226	62579
1+	24423	56044	57169	20451	12890	16078	19564	36907	17617	28410	34226	62579
2+	24261	56044	56988	20091	11613	15907	19379	36426	17417	28121	34112	62249
3+	12269	54406	51799	15774	8163	12918	13643	32061	14280	25014	32697	53924
4+	10050	24268	42249	9508	4660	6037	7000	17668	7316	18862	28547	42356
5+	4908	19800	12475	6268	3509	3462	4896	9638	1698	12336	23736	19273

Table 9d. 4W COD R.V. POPULATION ESTIMATE 28/ 4/82

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
0	0	0	0	0	0	0	0	0	174	1017	50	74
1	1316	1539	6029	1935	3897	3201	2057	327	2853	924	576	4259
2	4396	6042	4485	4462	29511	5423	8330	5780	9928	7505	5649	4445
3	3031	5526	2331	7495	15743	6119	9455	11979	24281	9892	14338	7368
4	2572	3559	1762	7550	4472	3596	8083	9029	28587	10069	5449	7670
5	1012	3674	1447	1963	905	1154	4602	5339	8310	11857	6348	2711
6	361	1566	340	187	586	210	918	2801	3210	5687	3673	3258
7	755	1199	80	214	221	218	362	558	781	1222	2074	1865
8	188	413	34	414	123	0	0	274	118	161	347	620
9	79	568	241	70	65	148	0	0	24	114	78	141
10	227	0	0	274	115	0	0	0	53	0	0	68
11	0	137	0	0	0	0	38	0	0	0	0	68
12	101	58	0	0	59	68	0	62	0	0	0	0
0+	14038	24281	16749	24564	55697	20137	33845	36149	78319	48448	38582	32547
1+	14038	24281	16749	24564	55697	20137	33845	36149	78145	47431	38532	32473
2+	12722	22742	10720	22629	51800	16936	31788	35822	75292	46507	37956	28214
3+	8326	16700	6235	18167	22289	11513	23458	30042	65364	39002	32307	23769
4+	5295	11174	3904	10672	6546	5394	14003	18063	41083	29110	17969	16401
5+	2723	7615	2142	3122	2074	1798	5920	9034	12496	19041	12520	8731

Table 10 . 4VsW cod catch rate standardization (includes Spanish pair trawls tonnage class 4 - 5, Canadian longliner tonnage class 2 to 4 and Canada-Maritimes otter trawlers tonnage class 2-3-4-5). Standards are January, 4Vs and Can-M OTB 2 tonnage class 5.

PREDICTED CATCH RATE

STANDARDS USED VARIABLE NUMBERS; 0 0 0

YEAR	TOTAL CATCH	PROP.	CATCH RATE MEAN	S.E.	EFFORT
1960	50645	0.599	0.963	0.116	52582
1961	66309	0.622	1.091	0.134	60797
1962	65154	0.655	0.990	0.131	65815
1963	68173	0.644	1.258	0.180	54198
1964	63257	0.566	1.512	0.226	41843
1965	70988	0.654	1.425	0.186	49821
1966	68170	0.697	1.100	0.131	61948
1967	54157	0.771	1.095	0.112	49439
1968	80425	0.728	1.040	0.107	77320
1969	50157	0.704	1.169	0.128	42924
1970	57427	0.733	1.117	0.124	51401
1971	52563	0.670	1.011	0.106	51994
1972	61645	0.573	0.881	0.083	69974
1973	54070	0.653	0.863	0.083	62678
1974	43739	0.679	0.678	0.065	64526
1975	32517	0.581	0.523	0.050	62177
1976	24407	0.589	0.703	0.069	34725
1977	10390	0.270	0.990	0.121	10498
1978	25405	0.577	1.439	0.136	17658
1979	40030	0.629	1.691	0.159	23667
1980	49164	0.561	1.426	0.131	34487
1981	53668	0.634	1.874	0.170	28632

AVERAGE C.V. FOR THE MEAN;0.110

Table 11a. 4VsW Cod. Results of calibration of SPA 5+ numbers (mid-year) with R.V. 5+ population estimates.

Year	R.V. 5+ Population Estimates	Ratio[1]	COHORT	PRED	RATIO[1]	COHORT	PRED	RATIO[1]	COHORT	PRED	RATIO[1]
1971	27,415	1.00	54,180	96,206	1.0	53,335	59,045	1.0	53,240	54,915	1.0
1972	14,617	.53	38,118	48,096	.70	37,377	34,676	.70	37,295	33,184	.70
1973	9,390	.34	30,185	28,447	.56	28,816	24,722	.54	28,664	24,308	.54
1974	5,603	.20	24,509	14,211	.45	22,629	17,511	.42	22,420	17,878	.42
1975	5,260	.19	20,252	12,922	.37	17,466	16,858	.33	17,154	17,295	.32
1976	10,816	.39	20,339	33,807	.38	15,679	27,438	.29	15,158	26,729	.28
1977	18,672	.68	30,047	63,339	.55	21,256	42,397	.40	20,280	40,069	.38
1978	14,273	.52	66,192	46,803	1.22	43,637	34,021	.82	41,133	32,600	.77
1979	31,377	1.14	104,566	111,099	1.93	64,630	66,590	1.21	60,191	61,642	1.13
1980	36,256	1.32	131,564	129,440	2.43	73,061	75,880	1.37	66,555	69,927	1.25
1981	28,004	1.02	162,838	98,420	3.01	81,419	60,167	1.53	72,372	55,915	1.36
r				.822			.881			.884	
B_0				-6851			6842			8364	
B_1				3.7592			1.9042			1.698	
F_T				.10			.20			.225	

[1] Ratios of yearly SPA 5+ population numbers and R.V. 5+ population estimates divided by their respective 1971 values.

Table 11a. 4VsW Cod. (Cont'd)

Year	R.V. 5+ Population Estimates	Ratio[1]	COHORT	PRED	RATIO[1]	COHORT	PRED	RATIO[1]	COHORT	PRED	RATIO[1]
1971	27,415	1.00	53,165	51,610	1.0	53,052	46,654	1.0	52,911	40,461	1.0
1972	14,617	.53	37,229	31,990	.70	37,130	30,200	.70	37,007	27,964	.70
1973	9,390	.34	28,542	23,977	.54	28,359	23,480	.53	28,130	22,860	.53
1974	5,603	.20	22,253	18,171	.42	22,002	18,611	.41	21,689	19,163	.41
1975	5,260	.19	16,905	17,645	.32	16,530	18,170	.31	16,062	18,828	.30
1976	10,816	.39	14,740	26,163	.28	14,113	25,313	.27	13,328	24,253	.25
1977	18,672	.68	19,500	38,207	.37	18,331	35,413	.35	16,873	31,924	.32
1978	14,273	.52	39,130	31,463	.74	36,128	29,758	.68	32,385	27,628	.61
1979	31,377	1.14	56,640	57,684	1.07	51,315	51,747	.97	44,669	44,329	.84
1980	36,256	1.32	61,349	65,164	1.15	53,538	58,020	1.01	43,775	49,093	.83
1981	28,004	1.02	65,135	52,513	1.23	54,279	47,411	1.02	40,709	41,036	.77
r				.882			.865			.789	
B_0				9501			11408			136692	
B_1				1.533			1.2856			.9764	
F_T				.25			.30			.40	

[1] Ratios of yearly SPA 5+ population numbers and R.V. 5+ population estimates divided by their respective 1971 values.

Table 11b. 4VsW Cod. Results of calibration of SPA 5+ biomass with the standard catch rate.

Year	Standard Catch Rate	Ratio[1]	COHORT	PRED	RATIO[1]	COHORT	PRED	RATIO[1]	COHORT	PRED	RATIO[1]
1968	1.040	1.0	124,233	145,570	1.0	123,869	112,705	1.0	123,827	109,060	1.0
1969	1.169	1.12	112,061	181,169	.90	111,314	129,713	.90	111,229	124,006	.90
1970	1.117	1.07	154,171	166,819	1.24	152,410	122,857	1.23	152,213	117,981	1.23
1971	1.011	.97	118,919	137,568	.96	117,337	108,882	.95	117,160	105,700	.95
1972	.881	.85	115,149	101,693	.93	113,076	91,742	.91	112,845	90,638	.91
1973	.863	.83	89,035	96,725	.72	86,118	89,369	.70	85,793	88,552	.69
1974	.678	.65	79,918	45,673	.64	74,823	64,978	.60	74,257	67,118	.60
1975	.523	.50	61,842	2,899	.50	55,466	44,542	.45	54,758	49,159	.44
1976	.703	.68	58,586	52,572	.47	47,687	68,274	.38	46,477	70,014	.38
1977	.990	.95	79,345	131,772	.64	56,978	106,113	.46	54,496	103,267	.44
1978	1.439	1.38	173,205	255,679	1.39	117,198	165,311	.95	110,987	155,288	.90
1979	1.691	1.63	275,323	325,221	2.22	176,419	198,536	1.42	165,451	184,485	1.34
1980	1.426	1.37	364,406	252,091	2.93	212,891	163,597	1.72	196,087	153,782	1.58
1981	1.874	1.80	464,978	375,722	3.74	243,699	222,663	1.97	219,153	205,688	1.77
r				.881			.874			.858	
B_0				-141429			-24412			-11436	
B_1				275961			131844			115861	
F_T				.10			.20			.225	

[1] Ratios of yearly SPA 5+ biomass and standard catch rate divided by their respective 1971 values.

Table 11b. 4VsW Cod. (Cont'd)

Year	Standard Catch Rate	Ratio[1]	COHORT	PRED	RATIO[1]	COHORT	PRED	RATIO[1]	COHORT	PRED	RATIO[1]
1968	1.040	1.0	123,794	106,145	1.0	123,742	101,780	1.0	123,678	96,340	1.0
1969	1.169	1.12	111,162	119,444	.90	111,060	112,609	.90	110,931	104,094	.90
1970	1.117	1.07	152,055	114,083	1.23	151,818	108,244	1.23	151,522	100,969	1.23
1971	1.011	.97	117,019	103,156	.95	116,807	99,345	.94	116,542	94,597	.94
1972	.881	.85	112,660	89,755	.91	112,383	88,431	.91	112,036	86,782	.91
1973	.863	.83	85,533	87,899	.69	85,144	86,920	.69	84,658	85,700	.68
1974	.678	.65	73,804	68,828	.60	73,126	71,389	.59	72,279	74,579	.58
1975	.523	.50	54,191	52,850	.44	53,343	58,377	.43	52,285	65,262	.42
1976	.703	.68	45,510	71,405	.37	44,062	73,488	.36	42,257	76,082	.34
1977	.990	.95	52,512	100,991	.42	49,541	97,582	.40	45,838	93,334	.37
1978	1.439	1.38	106,022	147,277	.86	98,584	135,276	.80	89,319	120,325	.72
1979	1.691	1.63	156,683	173,255	1.27	143,550	156,432	1.16	127,188	135,473	1.03
1980	1.426	1.37	182,656	145,937	1.48	162,536	134,185	1.31	137,470	119,543	1.11
1981	1.874	1.80	199,542	192,120	1.61	170,158	171,795	1.38	133,552	146,474	1.08
r				.837			.783			.653	
B_0				-1065			14470			33823	
B_1				103087			83951			60112	
F_T				.25			.30			.40	

[1] Ratios of yearly SPA 5+ biomass and standard catch rate divided by their respective 1971 values.

TABLE 12: 4VSW COD COMMERCIAL CATCH PER UNIT EFFORT AT AGE (CPUEx1000) 9/ 7/82

	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
1	0	1	14	69	67	62	45	11	32	33	25	44	34	23	23	29	21	0	10	1	1	0
2	0	5	91	439	429	395	289	86	208	212	168	293	253	194	131	160	117	2	9	3	4	12
3	133	57	92	313	352	376	282	127	225	179	173	242	203	237	200	153	103	37	57	69	59	126
4	116	158	157	226	213	251	226	162	230	320	288	176	191	120	154	70	107	102	207	260	148	324
5	127	154	97	201	282	107	171	191	202	239	266	169	138	156	110	73	139	149	262	386	206	235
6	86	110	120	100	112	123	72	68	107	141	88	197	125	61	43	42	69	83	138	206	178	147
7	53	47	42	90	69	63	53	30	45	50	38	99	49	48	15	42	41	48	43	49	85	100
8	35	31	39	40	56	90	26	25	12	12	15	36	27	59	21	10	18	21	12	16	31	59
9	6	20	10	6	25	43	14	13	11	6	5	10	5	19	6	8	5	12	6	3	9	16
10	3	3	7	2	7	32	8	13	5	1	1	2	6	4	6	11	1	3	5	1	3	6
11	2	2	3	2	3	3	11	7	2	2	3	3	1	5	0	2	1	4	1	0	1	3
12	1	1	1	1	2	2	0	1	3	1	1	1	0	0	0	2	3	5	2	0	1	1
13	0	1	1	0	1	2	0	0	0	0	0	2	1	0	0	1	0	1	1	0	0	1
14	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
15	0	0	0	0	0	3	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0

TABLE 13A: 4VSW COD POPULATION ESTIMATES FROM COHORT ANALYSIS ('000 FISH) 9/ 7/82

	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
1	105364	94741	107688	93130	140142	155393	151973	152280	168027	133833	91227	108859	95105	96165	75409	68588	97193	108407	94984	94797	162129	121950	96452	100000
2	92283	86264	77567	98168	76208	113893	123850	121893	121887	135030	109077	72432	87836	76696	76658	59583	54872	78234	87135	77108	77603	132580	99833	78942
3	68831	75430	70627	63507	71930	57000	71729	65154	82000	83604	106721	74787	51071	64104	49023	46713	37796	37278	55023	67665	63109	63398	108474	81600
4	38779	53772	59496	51476	48879	53439	31331	45398	52778	51308	62779	71620	54278	33773	41099	27264	24780	19286	21939	41804	55050	50761	50431	86976
5	23191	28551	35983	43175	33470	30668	32652	17571	25861	30568	34779	35308	46220	31045	19376	21560	15529	11288	11862	14602	33255	41769	35981	36665
6	17918	16695	15403	23439	26898	21637	15232	16075	9550	11602	16471	14329	19635	25469	17447	7122	8825	6263	5126	5352	10545	23046	25923	23034
7	5761	11298	7796	8517	13150	14886	12898	8222	7614	3782	5574	5978	6237	11969	11567	6340	2372	4723	2790	2014	3594	6424	14461	15668
8	4326	3260	5284	3840	4363	8283	7776	7886	3895	3288	1769	1413	2954	3349	5130	6365	2480	1088	1489	986	1196	2248	4208	9193
9	4313	2216	1341	2673	1441	1275	4806	4245	2405	1750	1571	639	695	1732	1069	2464	1842	833	337	667	608	786	1504	2482
10	1756	1709	1020	836	1092	559	731	2988	1551	1195	832	548	308	356	969	551	962	1134	232	109	430	397	575	943
11	969	661	403	715	531	461	336	316	1014	821	393	354	403	187	188	438	204	454	331	146	58	280	304	391
12	125	302	253	220	452	282	268	144	103	227	378	184	204	206	35	83	88	154	233	251	80	24	220	207
13	56	50	20	139	100	302	186	152	36	63	127	119	98	117	104	27	65	67	12	94	156	40	15	157
14	45	0	17	15	54	21	224	107	37	17	37	74	86	72	7	51	16	53	23	9	67	104	29	9
15	63	27	0	0	10	45	17	183	8	31	9	15	55	60	48	6	38	13	35	15	4	47	84	23
16	131	43	22	0	0	4	36	14	3	5	19	6	10	41	3	39	0	31	2	28	10	0	38	66
1+	363911	375019	382922	379850	418720	458146	453956	462626	476769	457123	431762	386666	365196	345361	298132	247191	247061	269305	281544	305637	407894	443852	438535	436355
2+	258547	280279	275233	286720	278578	302753	301983	310346	308742	323290	340536	277807	270091	249177	222724	178604	149867	160898	186560	210850	245765	321902	342083	336355
3+	166264	194014	197666	198552	202370	188860	178133	188454	186855	188260	231458	205374	182255	172481	146065	119021	94996	82664	99425	133742	168162	189322	242250	257413
4+	97433	118584	127039	135045	130440	131861	106404	103300	104854	104656	124737	130587	131184	108377	97042	72308	57200	45385	44402	66077	105053	125924	133776	175813
5+	58654	64812	67543	83569	81561	78422	75073	57902	52076	53348	61958	58967	76906	74603	55943	45044	32420	26099	22463	24273	50003	75164	83345	88837
6+	35463	36261	31560	40393	48091	47755	42421	40331	26215	22780	27180	23659	30687	43558	36567	23485	16890	14812	10601	9671	16748	33395	47363	52172

TABLE 13B; 4VSW COD BIOMASS ESTIMATES ('000 MT) 9/ 7/82

I	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
1	6111	5495	6246	5402	8128	9013	8814	8832	3361	2677	1825	2177	1902	962	3770	5487	12635	10841	9498	9479	32426	7073	5594	20200
2	25470	23809	21409	24334	21033	31434	34183	33642	18283	21605	16362	10141	13175	8437	13799	13108	18108	21123	24398	21590	48114	70267	56905	46912
3	38890	42618	39904	35881	40640	32205	40527	48112	36900	39294	45890	31411	22982	20513	21570	21021	23433	19758	31363	54809	59953	48182	86779	65508
4	36568	50707	56105	48542	46093	50393	29545	42810	47501	49256	54617	60877	49393	21615	33291	21538	25276	17164	21061	45566	68813	53806	57996	99615
5	33975	41828	52716	63252	49033	44928	47835	25742	38532	48603	50081	49784	69329	33218	24995	26087	23759	15126	17319	24386	55869	71007	57570	62189
6	37574	35010	32301	49152	56405	45373	31941	33709	20818	27034	34589	29661	43001	39732	32277	12249	18797	11711	10405	12631	26045	55079	57290	48541
7	16285	31941	22041	24077	37174	42082	36208	23242	22387	11838	15719	16618	18335	25015	28687	14455	6688	11665	7395	6384	12974	20109	44541	47014
8	15879	11966	19396	14096	16015	30407	28547	28949	14488	13021	6316	4974	11019	8874	16109	18459	8878	3393	4990	4516	6253	8339	18139	34869
9	18699	9606	5815	11586	6246	5528	20835	18402	10824	8382	6802	2720	3136	5559	4093	8722	8122	3175	1370	2760	3400	3750	7913	13239
10	9244	8996	5367	4399	5745	2941	3848	15724	8173	6703	4209	2734	1628	1334	4381	2326	5081	5138	1116	582	2812	2713	3979	6109
11	5769	3935	2401	4256	3165	2747	2003	1883	6083	5246	2267	2013	2428	802	978	2146	1264	2392	1839	679	457	2226	2300	2813
12	858	2066	1733	1504	3094	1931	1835	987	691	1619	2431	1167	1370	984	204	462	627	923	1467	1234	734	223	2242	1768
13	423	376	150	1046	752	2267	1393	1137	262	491	898	825	723	610	676	168	525	456	82	672	1623	424	119	1355
14	360	0	133	123	436	164	1791	855	296	140	282	559	686	408	48	358	141	399	176	75	654	1045	237	87
15	571	243	0	0	89	402	152	1655	67	275	74	119	463	361	374	42	376	105	298	158	38	536	1220	232
16	1399	428	221	0	0	36	366	138	23	44	161	55	93	262	23	320	0	276	21	419	127	0	537	942
1+	247984	269022	265936	287650	294050	301853	289824	285820	228688	236226	242521	215835	239665	168687	185275	146947	153709	123643	132798	185940	320293	344780	403361	451394
2+	241873	263527	259690	282248	285921	292840	281010	276988	225327	233549	240697	213658	237763	167725	181504	141460	141074	112803	123299	176461	287867	337706	397767	431194
3+	216403	239718	238282	257914	264888	261406	246827	243346	207044	211945	224335	203517	224587	159289	167706	128352	122967	91680	98902	154871	239753	267439	340862	384282
4+	177513	197100	198378	222033	224248	229201	206300	195234	170144	172651	178445	172106	201605	138775	146136	107331	99533	71922	67538	100062	179800	219257	254083	318773
5+	140945	146393	142273	173491	178154	178808	176755	152424	122644	123395	123827	111229	152213	117160	112845	85793	74257	54758	46477	54496	110987	165451	196087	219158
6+	106970	104565	89557	110239	129121	133880	128920	126682	84111	74792	73746	61445	82883	83942	87850	59706	50498	39632	29159	39111	55118	94444	138517	156969
7+	69397	69556	57256	61087	72716	88507	96979	92973	63293	47758	39157	31784	39883	44209	55573	47456	31701	27921	18754	17479	29073	39364	81227	108428

TABLE 13C; 4VSW COD ESTIMATES OF FISHING MORTALITY 9/ 7/82

	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
1	0.000	0.000	0.000	0.001	0.007	0.027	0.021	0.023	0.019	0.005	0.031	0.015	0.015	0.027	0.036	0.023	0.017	0.018	0.009	0.000	0.001	0.000	0.000	0.000
2	0.002	0.000	0.000	0.004	0.090	0.262	0.175	0.196	0.177	0.035	0.177	0.149	0.115	0.248	0.275	0.255	0.187	0.152	0.053	0.000	0.002	0.001	0.002	0.005
3	0.047	0.037	0.116	0.062	0.097	0.398	0.257	0.278	0.269	0.086	0.199	0.121	0.214	0.245	0.387	0.434	0.473	0.330	0.075	0.006	0.018	0.029	0.021	0.050
4	0.106	0.202	0.121	0.230	0.266	0.293	0.378	0.363	0.346	0.189	0.376	0.238	0.359	0.356	0.445	0.363	0.586	0.286	0.207	0.029	0.076	0.144	0.119	0.125
5	0.129	0.417	0.229	0.273	0.236	0.500	0.509	0.410	0.602	0.418	0.687	0.387	0.396	0.376	0.801	0.693	0.708	0.589	0.596	0.126	0.167	0.277	0.246	0.225
6	0.261	0.561	0.393	0.378	0.392	0.324	0.417	0.547	0.726	0.533	0.814	0.632	0.295	0.589	0.812	0.900	0.425	0.612	0.734	0.198	0.295	0.266	0.303	0.225
7	0.369	0.560	0.508	0.469	0.262	0.449	0.285	0.547	0.640	0.560	1.172	0.505	0.422	0.647	0.397	0.739	0.580	0.954	0.837	0.321	0.269	0.223	0.253	0.225
8	0.469	0.688	0.482	0.780	1.030	0.344	0.405	0.987	0.600	0.539	0.819	0.509	0.334	0.942	0.533	1.040	0.891	0.973	0.604	0.283	0.219	0.201	0.328	0.225
9	0.726	0.576	0.273	0.695	0.747	0.356	0.275	0.807	0.500	0.544	0.653	0.528	0.470	0.381	0.462	0.740	0.285	1.077	0.926	0.239	0.228	0.113	0.267	0.225
10	0.778	1.244	0.156	0.253	0.662	0.308	0.638	0.881	0.436	0.912	0.653	0.106	0.298	0.437	0.594	0.793	0.551	1.030	0.265	0.438	0.230	0.065	0.186	0.225
11	0.966	0.759	0.407	0.258	0.433	0.342	0.647	0.919	1.295	0.575	0.558	0.351	0.471	1.483	0.624	1.405	0.085	0.466	0.076	0.405	0.689	0.040	0.184	0.225
12	0.717	2.517	0.397	0.585	0.203	0.218	0.370	1.196	0.297	0.380	0.959	0.428	0.361	0.488	0.066	0.041	0.065	2.371	0.707	0.277	0.491	0.260	0.139	0.225
13	13.502	0.906	0.057	0.740	1.385	0.100	0.353	1.203	0.568	0.330	0.337	0.119	0.107	2.649	0.502	0.342	0.000	0.890	0.099	0.138	0.204	0.115	0.347	0.225
14	0.315	0.192	12.781	0.242	0.000	0.000	0.000	2.410	0.000	0.406	0.710	0.110	0.167	0.203	0.000	0.114	0.000	0.207	0.217	0.479	0.160	0.010	0.038	0.225
15	0.192	0.000	0.300	0.342	0.815	0.000	0.000	4.053	0.330	0.292	0.131	0.161	0.084	2.863	0.023	12.108	0.000	1.525	0.032	0.160	10.736	0.000	0.053	0.225
16	0.585	0.767	0.355	0.549	0.675	0.364	0.401	0.806	0.544	0.639	0.875	0.412	0.381	0.602	0.497	0.828	0.577	1.008	0.658	0.320	0.237	0.151	0.259	0.225

Table 14. 4VsW cod partial recruitment vector and weights-at-age used in projections to calculate yield per recruit.

Age	P.R.	Weights
1	.000134	.202
2	.002	.594
3	.22	.803
4	.556	1.145
5	1	1.696
6	1	2.107
7	1	3.001
8	1	3.793
9	1	5.334
10	1	6.48
11	1	7.197
12	1	8.55
13	1	8.64
14	1	10.003
15	1	10.117
16	1	14.376

Table 15a. 4VsW cod projections at $F_{0.1}$ to 1983 if the 1982 catches are equal to the 50,000 mt TAC.

Age	YEAR 1981	1982	1983
1	1	0	1
2	212	168	196
3	2898	1756	2114
4	10631	6021	5542
5	11399	15309	13221
6	8898	7255	15049
7	8618	6490	8173
8	6392	5580	6490
9	2427	4605	6209
10	1120	1510	4426
11	516	637	1327
12	324	314	599
13	248	168	251
14	16	147	154
15	43	8	118
16	173	31	9
1+	53913	50000	63878
2+	53912	50000	63877
3+	53700	49831	63682
4+	50802	48076	61568

Table 15b. 4VsW cod projections to 1983 fishing at $F_{0.1}$ in both 1982 and 1983.

Age	YEAR 1981	1982	1983
1	1	1	1
2	212	196	196
3	2898	2036	2112
4	10631	6950	5508
5	11399	17570	13017
6	8898	8327	14633
7	8618	7448	7948
8	6392	6404	6311
9	2427	5285	6038
10	1120	1733	4303
11	516	731	1290
12	324	360	582
13	248	193	244
14	16	169	149
15	43	9	115
16	173	36	9
1+	53913	57447	62456
2+	53912	57446	62455
3+	53700	57251	62260
4+	50802	55216	60148

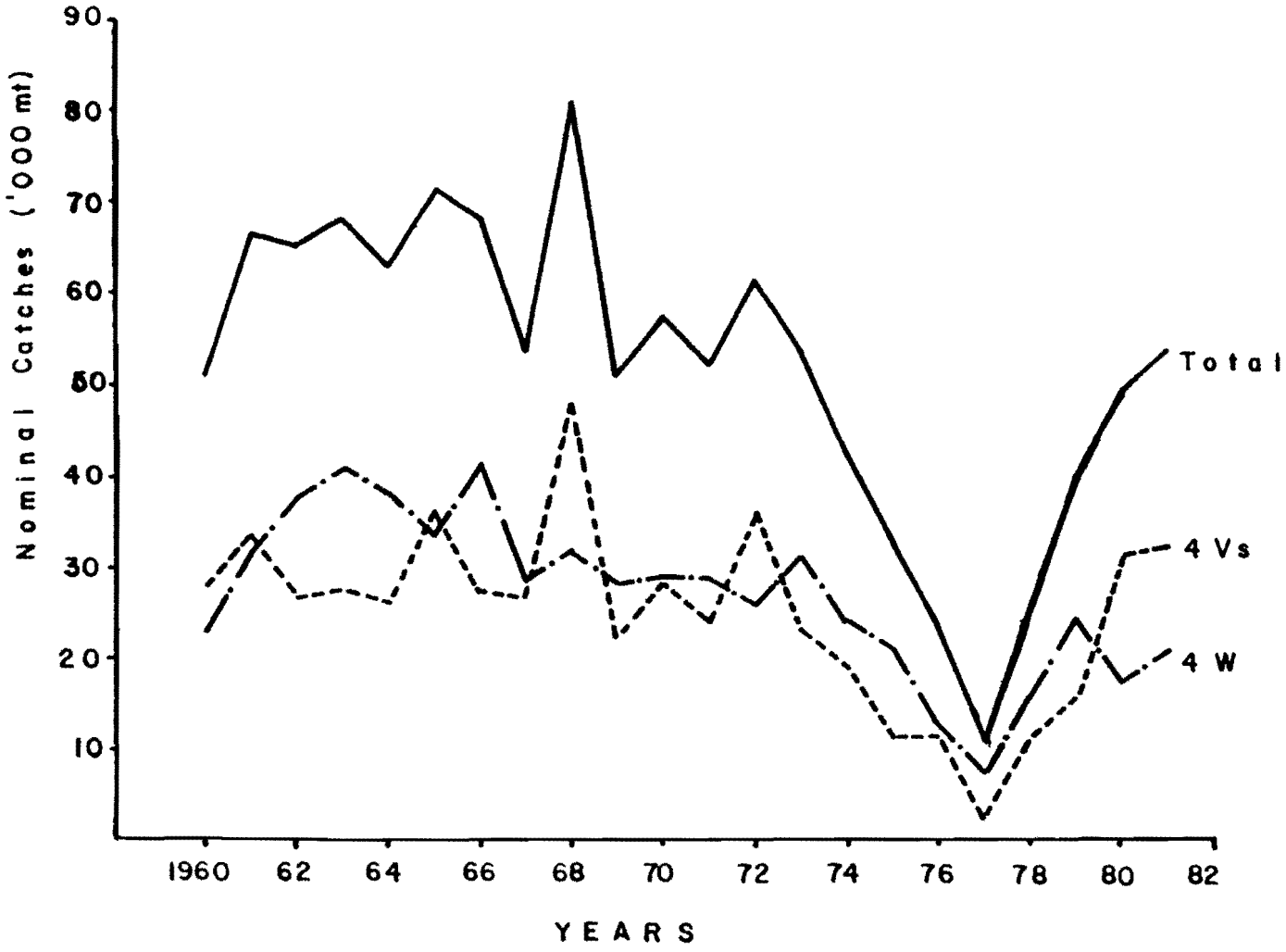

Figure 1. 4VsW cod nominal catches.

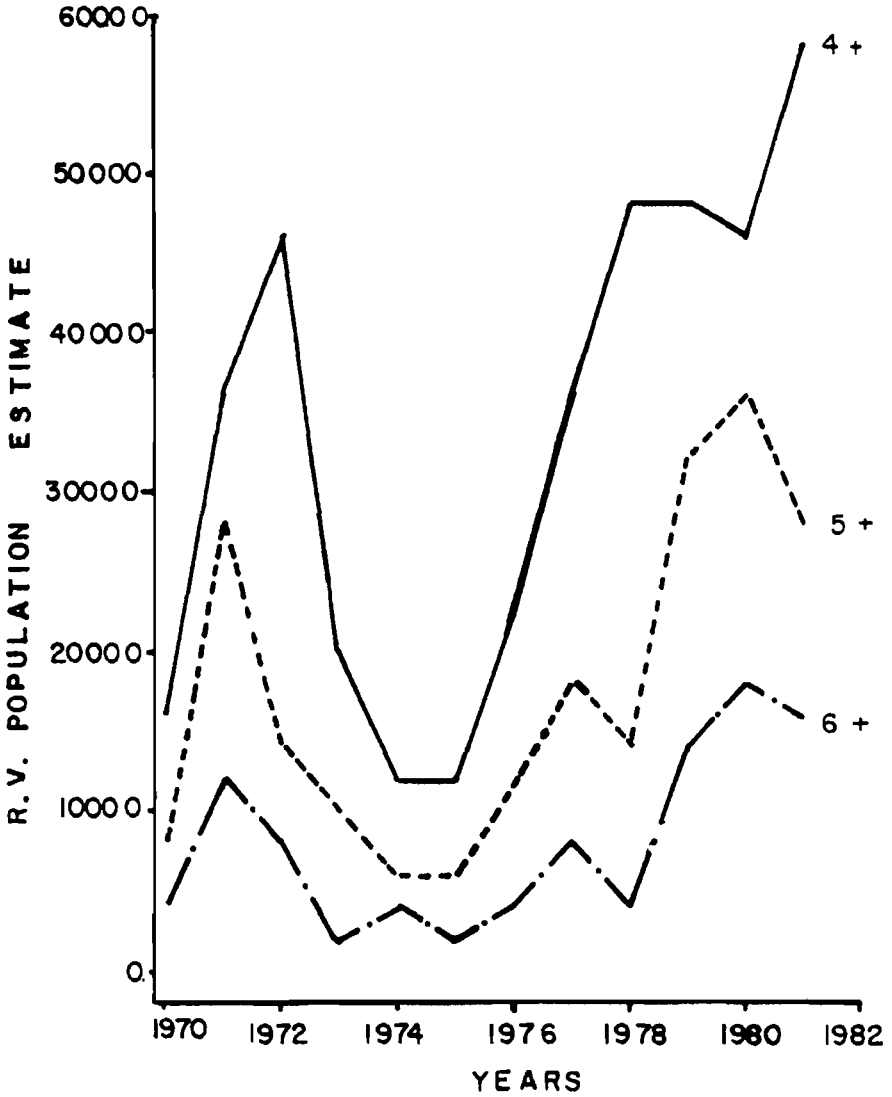

Figure 2. 4VsW cod. Research vessel surveys population estimates ('000 fish) for ages 4+, 5+, and 6+.

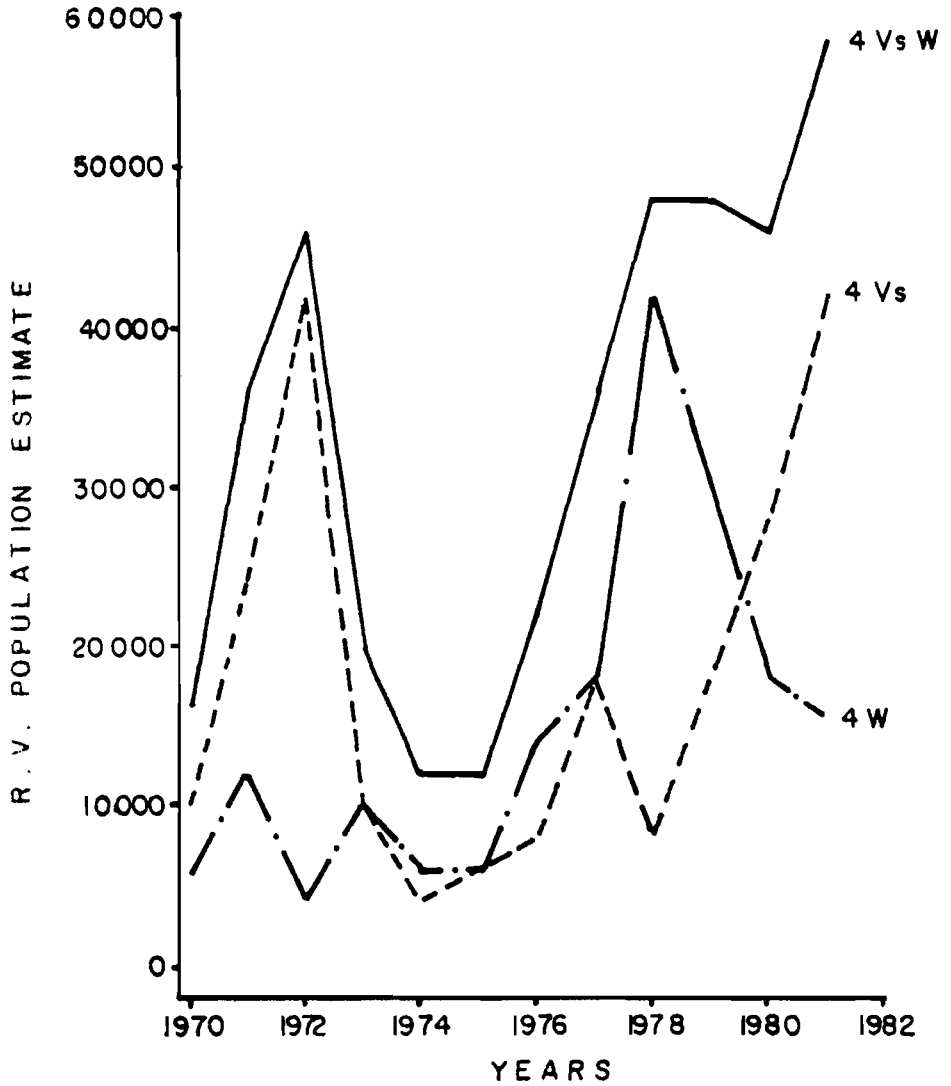

Figure 3. 4VsW cod. Ages 4 and older research vessel population estimates for 4Vs, 4W, and 4VsW.

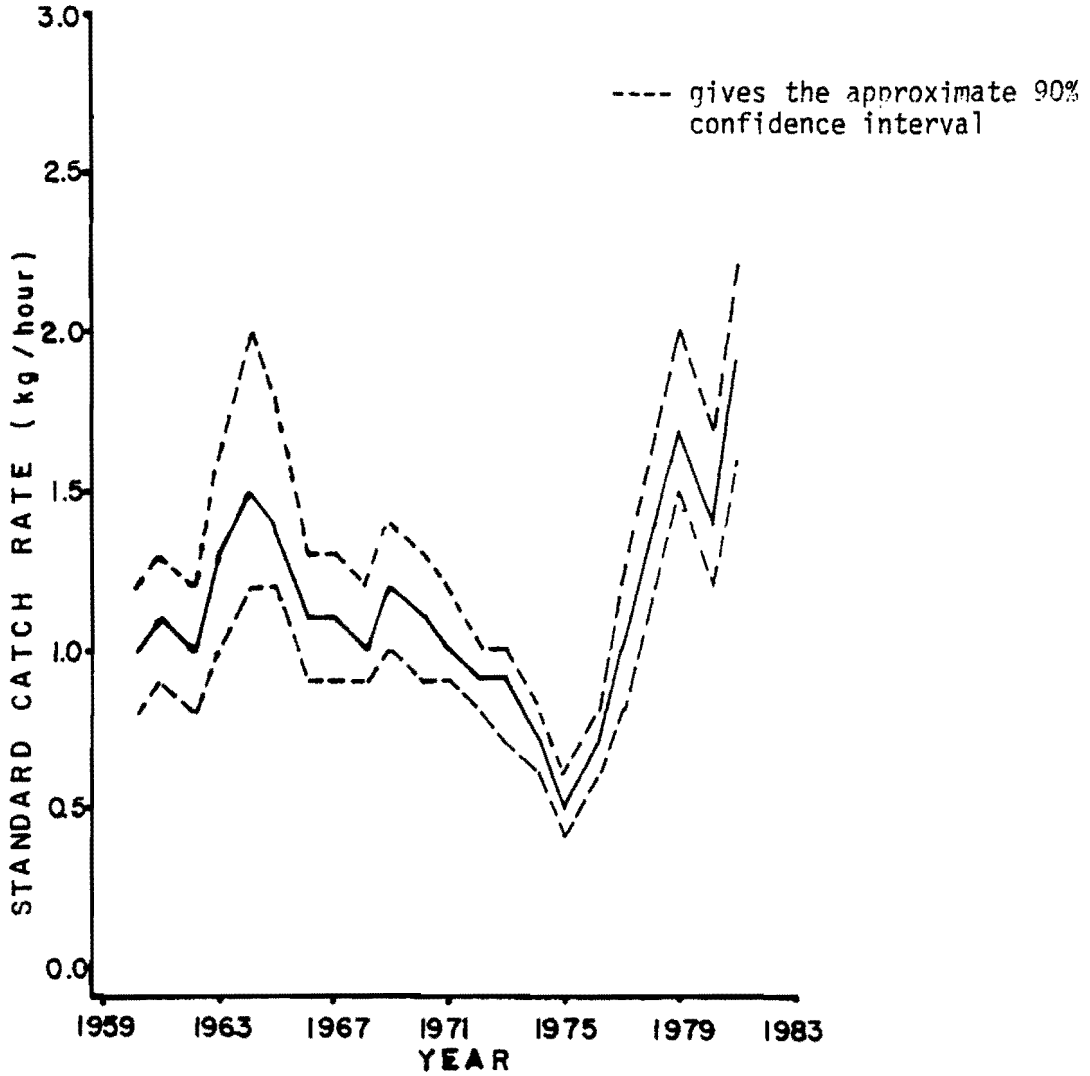

Figure 4. 4VsW cod. Standard commercial catch rate.

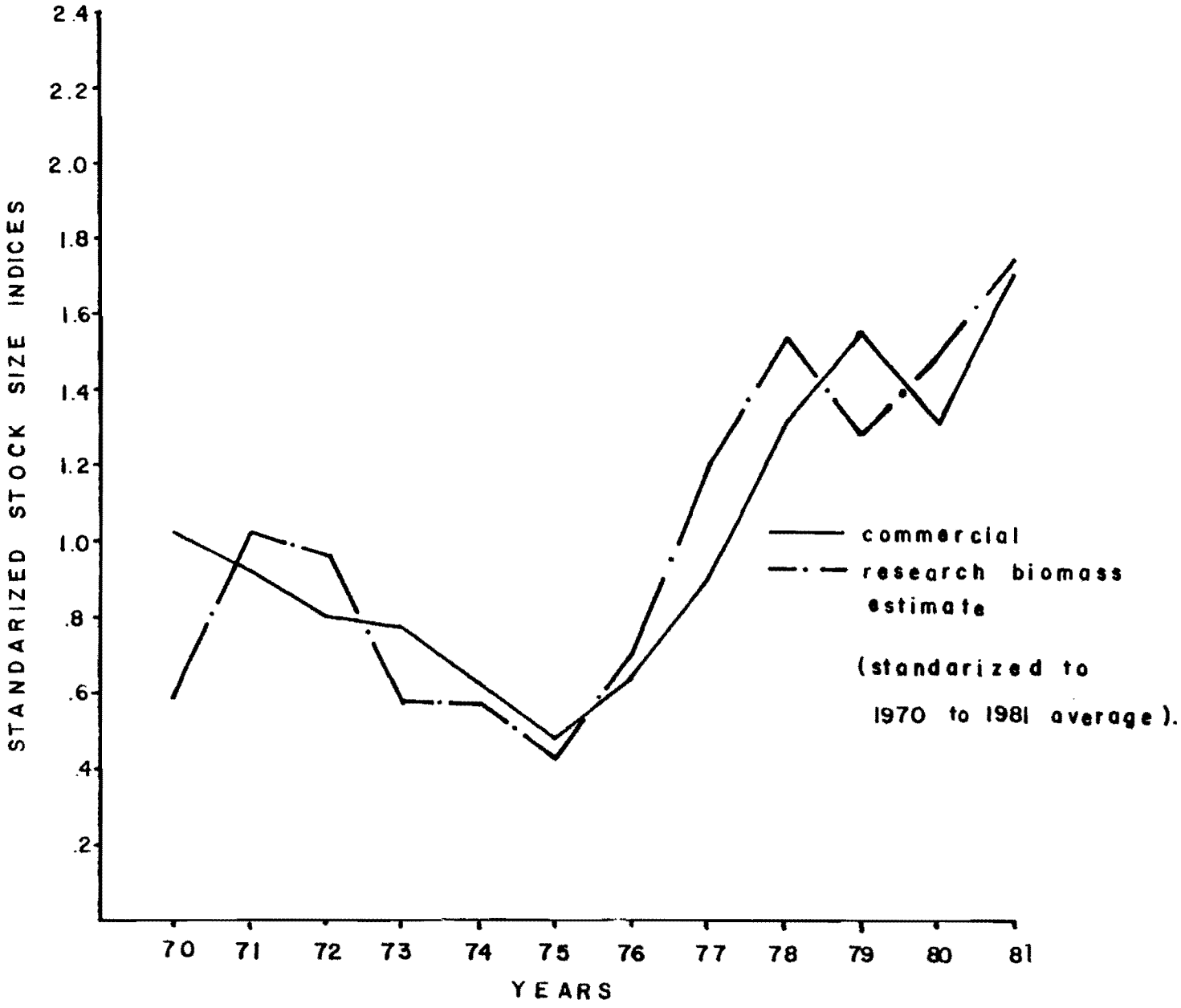

Figure 5a. 4VsW cod. Commercial catch rate and research vessel surveys biomass estimates standardized to their 1970 to 1981 average.

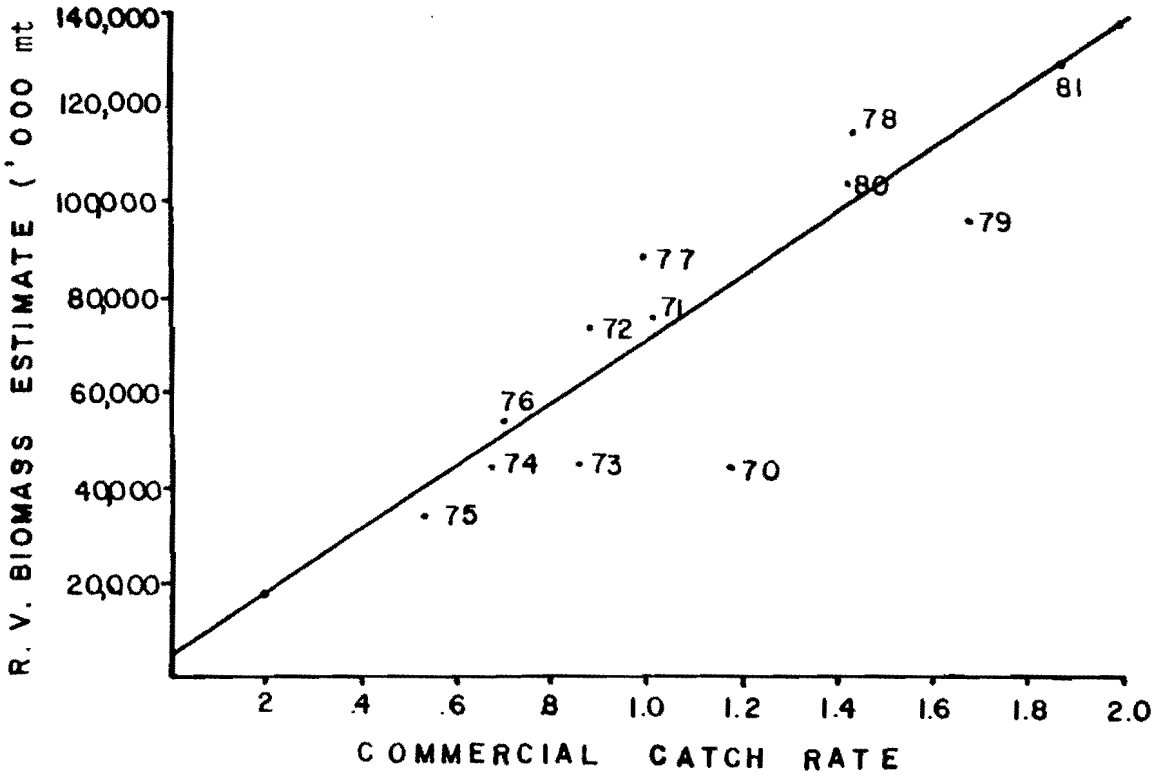

Figure 5b. 4VsW cod. Research vessel survey biomass estimate versus standard commercial catch rate.

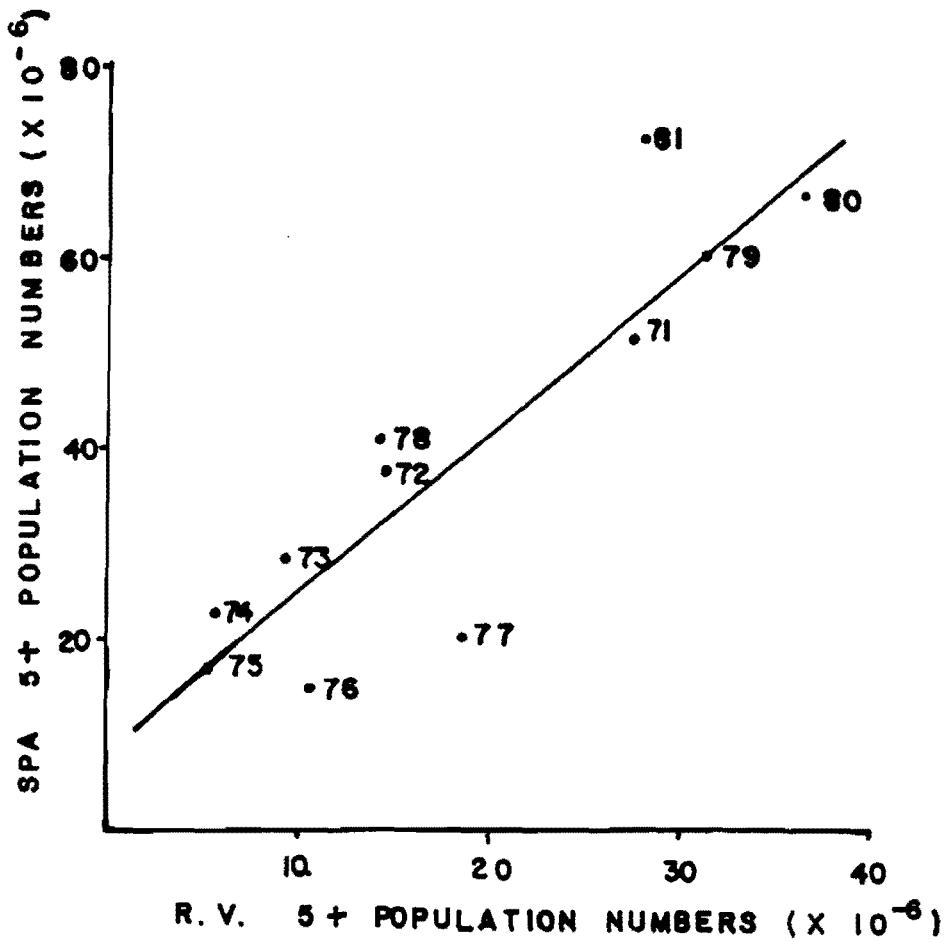

Figure 6. 4VsW cod 5+ research vessel population numbers vs 5+ SPA population numbers calculated with F_T = .225.

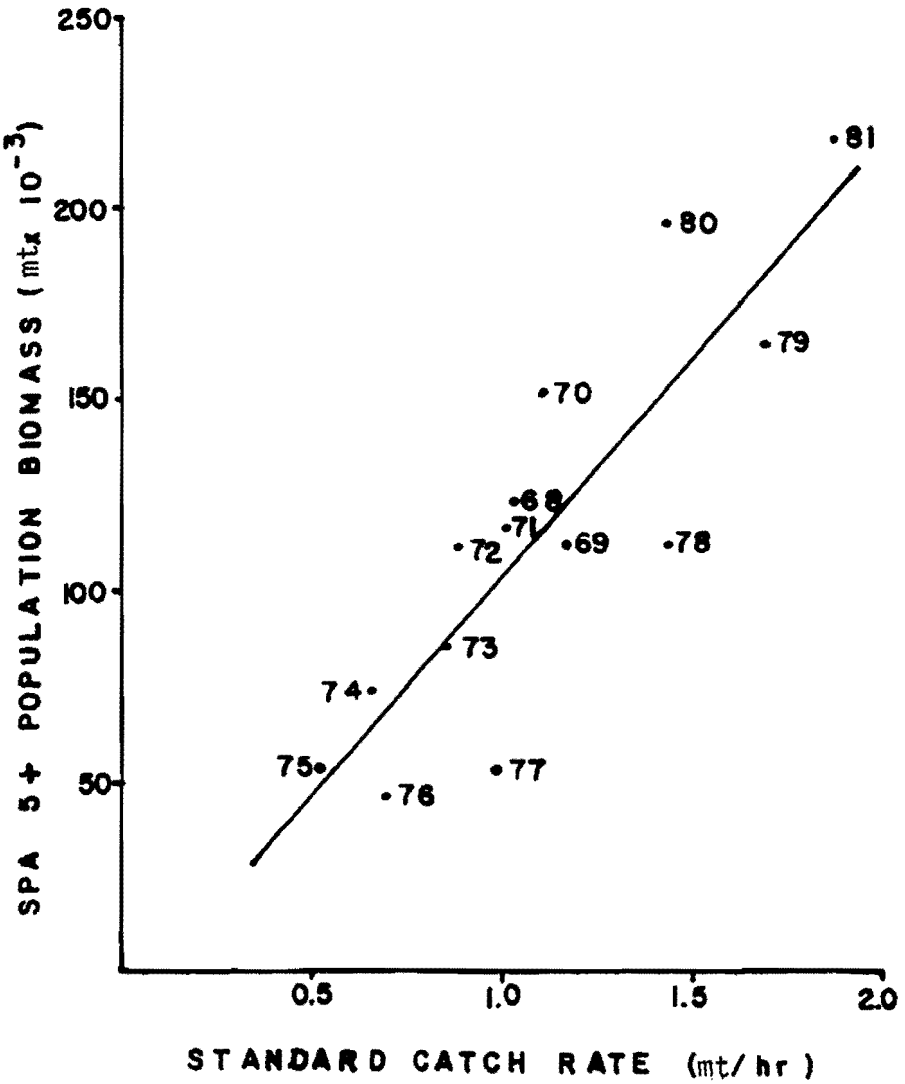

Figure 7. 4VsW cod standardized catch rate vs 5+ SPA population biomass calculated with F_T = .225.

Corrigendum
CAFSAC Research Document 82/40

Subsequent to the presentation of these data the nominal catches by otter trawls and other gear for 1978 (Table 2) were found to be in error. The corrected figures for that year are given below:

Year	Division 4Vs		Division 4W		Totals		
	Trawls	Other Gear	Trawls	Other Gear	Trawls	Other Gear	Totals
1978	9561	313	8037	6731	17598	7044	24642

These changes will not have a significant impact on the results of the assessment.