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An Assessment of the Yellowtail Flounder Stock in Divisions 3LNO

by

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TAC regulation

TACs have been in place since 1973, when a precautionary level of 50,000 t was established. In 1976, the TAC was set at 9000 t, following a series of high catches (Fig.1, Table 1) and a reduction in stock size. From 1977 to 1988, the TAC varied between 12,000 t and 23,000 t and was unchanged at 15,000 t for the last 4 years of that period. *The TAC was set at 5000 t in 1989 and maintained at that level* for 1990, following sharp declines in stock size after the large catches in 1985 and 1986. For 1991-1993, the TAC was set at 7000 t as there appeared to be a slight improvment in recruitment to the fishable stock. In 1994, the TAC was maintained at 7000 t, although it was decided by the NAFO Fisheries Commission that no directed fisheries would be permitted for this stock and 2 other flatfish fisheries on the Grand Bank (A.plaice and witch).

Catch trends

The nominal catch increased from negligible levels in the early 1960s to a peak of over 39,000 t in 1972 (Fig. 1). With the exception of 1985 and 1986, when they were around 30,000 t, catches have been in the range of 10,000 to 18,000 t since 1976. *Canada and the USSR were the major participants* in the fishery up to 1975, with Canada taking virtually all the catch from 1976-81 (Table 1). Canadian catches were consistently around the TAC in the mid to late 1970's, but were under the TAC's in the early 1980's as much of the fishery for flounders was directed toward American plaice in Div. 3L. Catches by other nations began to increase in 1982 as freezer trawlers started to fish in the NAFO Regulatory Area on the Tail of the Bank (Fig.2). In 1985 and 1986, as well as in 1989-1993, catches for all other nations combined exceeded those of Canada. Canadian catches have been stable around 6700 t in each of the last 3 years, which is the lowest level since the late 1960's. USA catches declined steadily from 3,800 t in 1985 to zero in 1991 and 1992 (Table 2), and were negligible in 1993. Catches by Spain and Portugal have also also decreased to very low levels in 1992-93. It should be noted that the catches for S. Korea in many years include a substantial amount of yellowtail determined from breakdowns of catches reported as unspecified flounder.

The following text table shows the catches for 1992 and 1993:

	1992	1993
Canada	6,809	6,697
S. Korea	3,825	0
Others	123	6,868
Total	10,757	13,565

The 6,868 t for others in 1993 is made up of 3,900 t from European-crewed vessels flying flags of non-contracting parties and 2,900 t from Korean-crewed vessels flying similar flags of convenience, with both estimates coming from Canadian surveillance. The remainder was reported by USA vessels.

As in most years, catches of yellowtail flounder in 1993 were mainly from Div. 3N, including virtually all of the catch in the Regulatory Area. However in each of 1992 and 1993 the Canadian fleet caught over 4,100 t of yellowtail in Div. 3O (Tables 3 and 4), which are the highest Canadian catches ever taken in this Division, at least since 1973. This increase can be attributed to the shift in effort of the Canadian flounder fishery (for both A. plaice and yellowtail) to Div. 3O since 1991 (Table 5). As a result, the proportions of directed yellowtail effort in Div. 3O in 1992 and 1993 were 73 and 58% respectively of the total directed effort by Canada on this stock. This compares to a mean value of about 10% from 1982 to 1991, when most (70-90%) of the directed yellowtail fishery by Canada occurred in Div. 3N (Table 5).

Overall, the catches from this stock exceeded the TAC in each year from 1985-93, often by a factor of two (Fig. 1). However, there is still considerable doubt about the precise catch levels from this stock in recent years, with up to one-third of the catch in some years being determined from Canadian surveillance reports and estimates of the proportion of yellowtail flounder in catches of unspecified flounder by S. Korea (Brodie et al. 1993). Given that vessels from several other nations who are not Contracting Parties of NAFO (many flying flags of convenience) continue to fish in the Regulatory Area, it is possible that some yellowtail flounder has been taken in recent years, probably as a by-catch, which is not included in the catch estimates. Based on information from other sources, it was acknowledged that the catch in 1993 may have been slightly higher, perhaps by about 200 t.

Catch-at-age and mean weights-at-age from the commercial fishery

Length frequency and age samples for 1993 were available only from the Canadian catch. Data from the Canadian fishery is shown in Table 6 and the resulting age composition is given in Table 7. As in most years, ages 6 to 8 comprised the vast majority of the Canadian catch in numbers (Table 8) and in weight (Table 11), although prior to 1982 more young fish were present in the catches (Table 9) (Brodie et al. 1993). The mean weights at age have shown little in the way of trends in recent years (Table 10).

In Brodie et al. 1991, it was demonstrated that large changes in the age composition of the catch could be generated by slight changes in how samples were applied to catches, given the much higher proportion of small fish in the age composition of catches by fleets fishing in the Regulatory Area. It was also noted that large portions of catch in some years (e.g., 40-45% in 1986) had no sampling whatsoever, and that there was no sampling data at all from the S. Korean catches, which began in 1982. These concerns apply to the 1990-1993 data, where the S. Korean catch is estimated to be over 25% of the total catch, and for which no sampling data are available. In fact the situation is worse in 1992-93, as there is no sampling whatsoever from any of the otter trawl fisheries in the Regulatory Area, and it would clearly be inappropriate to apply the Canadian age composition to these catches, given the differences referred to above. Thus, at present, there is no reliable catch-at-age calculated for the total removals from this stock again in 1993 and for many of the years since 1984.

Commercial C/E data

A multiplicative analysis was carried out on the catch and effort data for this stock, using the same model as in recent assessments. Canada took almost all the catch from this stock from 1976 to 1983, so only data from this fishery is available as a C/E index. Canadian data from 1965 to 1993 were input to the model. Table 12 gives the results of the analysis, including the C/E index, which is also shown in Figure 3. Catch per unit of effort declined fairly steadily from 1965 to 1976, then rose gradually to a relatively stable level from 1980-85. The index declined sharply in 1986 and remained at this relatively low level through 1990. In 1991 the CPUE declined by almost half and has increased only slightly in the 2 subsequent years. The values in 1991-93 are the lowest value in the time series.

Further examination of the data showed that the decline in 1991 was greatest in Div. 3O and that the CPUE in Div. 3N in 1991 and 1992, while lower than in 1990, was only slightly lower than the level observed in 1988 and 1989 (Fig. 4). In 1993, the CPUE in Div 3O was the same as in 1992, while the CPUE in Div. 3N increased to a value just above that observed in 1990. Thus the decline in the overall index in 1991 and 1992 was due primarily to the switch in effort of the fleet to Div. 3O. A substantial part of the effort labelled 'directed' for one species or the other in this Division was actually effort directed at a mixed fishery of A.plaice and yellowtail during 1991-1993, as can be seen by the by-catch totals in Table 5. Given this major shift in the fishery, some caution must be used in comparing the recent catch rates with those of earlier years. Nonetheless, it is difficult to interpret the 1991-1993 values for CPUE in any way other than to say that they indicate that the stock remains at a relatively low level.

Research vessel surveys

A) Spring groundfish surveys - Canada

Stratified-random trawl surveys have been conducted by Canada in Div. 3LNO since 1971 with the exception of 1983. Stratification is based on depth and the survey strata are presented in Fig. 2. Tables 13 to 15 give the mean weight per tow by stratum as well as the total biomass for Div. 3L, 3N, and 3O respectively. Most of the biomass for this stock occurs in Div. 3N (about 60%-70% in recent years) and has declined from 65,000 t in 1986 to around 30 thousand tons in 1992-94 (Fig. 5). A preliminary analysis of the 1994 data showed that approximately 90% of the biomass estimate for Div. 3N came from stratum 361. In Div. 3L the biomass has declined steadily from about 15,000 t in 1984-85 to practically zero in 1992-93 (the 3L results for 1994 were not available for inclusion in this paper). In Div. 3O, the biomass has fluctuated widely in 1992-94, after a period of relative stability from 1988 to 1991 around 15,000t. Of concern are the estimates for 1992 and 1994 of less than 7400 t, which are the lowest in the time series (Table 15). Figs. 6-8 show the abundance trends by Division up to 1993, with 95% confidence intervals, indicating the high degree of variability around the 1993 estimate in Div. 3O.

Survey abundance at age for all three divisions combined is presented in Table 16, and total abundance at ages 1+ and ages 5-7 are shown in Fig. 9a. These surveys are usually dominated by yellowtail of ages 5-8 years. The 1985 year-class, which appeared in the surveys of 1989-91 to be larger than the several preceeding year-classes, was the lowest in the series at age 7 in 1992 and the second lowest in the series at age 8 in 1993. Thus it was not this year-class which caused the increase in the biomass estimate in 1993, but rather the 1986 and 1987 year-classes which comprised most of the biomass. Fig. 9b shows the size of year-classes as measured at age 5 in the surveys, and indicates that

the 1984-86 year-classes appear to be larger than those of the early 1980's as well as those of 1987 and 1988. However, it must be stressed again that all year-class strengths observed from surveys in the most recent period are considerably lower than those observed during the 1970s and early 1980s. Some caution must also be used in interpreting the population sizes at ages 6 and 7 in 1993, as about 50% of the totals at these ages came from Div. 3O, where the 1993 estimate of abundance was shown to have a very wide confidence interval (Fig. 8).

A further examination of the survey population estimates in Table 16 did not reveal any significant relationship between age 7+ stock size and subsequent recruitment, eg. stock size in year n and recruitment at age 5 in year n+5 (Fig. 10). This was expected given that survey estimates were used and that varying levels of fishing mortality may have been exerted on recruiting year-classes before the age of 5. As well, a positive relationship for many years in the 1980's appears unlikely, given the 1985 and 1986 year-classes were clearly larger than their immediate predecessors, despite a decline in stock size in the mid-1980's.

B) Spring groundfish surveys - USSR

USSR/Russia has conducted stratified random surveys for groundfish in Div. 3LNO since 1983, and before then, fixed station surveys which were post-stratified for purposes of comparison. However, there was no survey in 1992 and the results from the 1993 survey were not available for inclusion in the 1994 assessment. Abundance and biomass estimates for yellowtail from these surveys were presented in previous assessments of this stock, and like the Canadian surveys, show a higher stock size in the 1970's and early 1980's, followed by a decline to lower levels in the late 1980's and early 1990's.

C) Fall groundfish surveys

Stratified-random bottom trawl surveys have been conducted by Canada during the fall in Div. 3L since 1981. From 1990 onward, this survey has been extended to cover Div. 3N and 3O. The biomass estimates from these surveys ranged from 38,000 t to 48,000 t in 1990-92, increasing to 66,000 t in 1993 (Table 17), although it should be noted that the low value in 1992 may be explained by the omission of stratum 375 and part of stratum 362 from the survey coverage due to time constraints. The higher value in 1993 was driven by the estimate for Div. 3N, unlike the increase in spring 1993 which was attributable to Div. 3O.

Age 7 was dominant in the catches in all 4 fall surveys (Table 18). Some caution should be exercised in evaluating these age compositions given the problems with the 1992 survey and the possibility that the increase in 1993 may be due to a 'year effect' rather than an actual increase in abundance.

D) Juvenile yellowtail surveys

During August-September of 1993, a stratified-random survey of the Grand Bank (Fig. 2) was conducted by the research vessel WILFRED TEMPLEMAN, consisting of 258 successful 30-minute fishing tows. This survey constituted year 8 in a time series for juvenile flatfish (see Walsh 1986, Brodie et al. 1993 for details). Tables 19-21 show the average numbers and weights in each stratum, along with biomass and abundance estimates from Divisions 3L, 3N and 3O respectively from the juvenile surveys in 1985-93 (Fig. 11).

Division 3L In 1993, yellowtail were found almost exclusively in strata 363 and 372, at a mean depth of 80.1 m and a mean temperature of 0.92 C. In all surveys, since 1985, these two strata have consistently been the areas of highest abundance in Div. 3L and almost no yellowtail have been found beyond the 93 m depth contour. Both abundance and biomass has been decreasing since 1985 and the 1993 estimates (5.02 million fish; 2500 tons) were 58 and 34% respectively, below the 1992 estimate and were the lowest in the time series.

Division 3N Most of the biomass of this stock has been found in this division. In 1993 yellowtail were mainly concentrated in 4 strata (360, 361, 375 and 376), consistent with other years. Yellowtail were caught at a mean depth of 59.3 m and a mean temperature of 0.57 C. In 1993 the abundance (446 million) and biomass (125.5 tons) estimates showed an increase of 20 and 26%, respectively, over 1992.

Division 3O In 1993, concentrations were mostly located in stratum 352 which is consistent with other years. There was also some evidence of smaller concentrations further to the west. Fish were located in a mean depth of 80.1 m and a mean temperature of 1.13 C. Although the abundance estimate (165.8 million) was 34% higher than in 1992 the biomass remained approximately the same at about 61 thousand tons.

Selected strata Table 22 shows a comparison of average numbers and weights of yellowtail flounder derived from independent day, night and combined estimates (Walsh 1988), from selected strata in the 1986-93 surveys. In 1993, as in other years, the abundance and biomass estimates of yellowtail derived from night catches were substantially larger than those derived from day catches. The combined abundance (550.4 million) and biomass (158.1 tons) estimates showed an increase of 25% and 27%, respectively, over 1992. Most of the biomass was found in strata 352, 361 and 376. Figure 12 shows the distribution of juveniles (ages 1 to 4 yrs.) and adults on the Grand Bank. Juveniles were found in and around the Southeast Shoal, and a large portion of this distribution was found in the NAFO Regulatory Area.

Tables 23 and 24 contain information on the age composition of yellowtail in the selected strata in Div. 3NO from 1986-93. Estimates of juveniles (aged 1 to 4 years) were 14 % higher than in 1992. Estimates of the 1989-92 year classes were either below or about average. The 1988 year class, which was strong at age 3 in 1991 and close to long term average at age 4 in 1992 contributed 23% to the overall abundance in 1993 and ranked second in the 8 year time series of age 5. The 1987 year class, which appeared as the second largest at age 3 in 1990 survey and average at age 4 and 5, made up 18 % of the overall abundance and ranked second in the time series at age 6. The abundance of age 7+ yellowtail was 28 % higher than the 1992 estimate and was the highest in the time series. The 1986 year class, which is the second strongest in the time series at almost every age, contributed 61% to the total estimate of age 7+ fish in 1993. The 1985 year class, which was also relatively strong, produced the highest abundance at age 8 in 1993 (Table 24).

Figs. 13-15 show the relationships between the abundance of yellowtail from the juvenile surveys and the abundance from the spring surveys at ages 4, 5, and 6 respectively for the years 1986-1993. Although the 3 regressions are all significant, caution must be exercised in interpreting the results due to the low number of points (8) in each fit and the nature of some of the relationships ie. '2-point regressions'. The surveys generally agree in estimating abundance at these ages, eg. both series show the 1985 year-class to be about the largest in the short time series and the 1982 year-class to be about the smallest.

One advantage of the juvenile surveys is that it measures population abundance at ages 1-3, which are not captured by the standard fishing gear used in the spring surveys, thereby giving an earlier estimate of the strength of recruiting year-classes. Figs. 16-18 show the relationship between abundance at age in year n+2 in the spring surveys and abundance of the same year-class in year n in the juvenile surveys, for ages 2, 3, and 4 respectively. The regressions were significant for ages 2/4 and 4/6, but not for ages 3/5. The same caveats which applied to the previous set of figures also apply here, given that only 6 points were available for each relationship. Figs. 16 and 18 also indicate the point estimates from the 1992 and 1993 juvenile surveys at ages 2 and 4 respectively.

Assessment

Sequential population analysis (SPA) has been used in the past to assess this stock but has not been used since 1984 as the basis of advice. Since then, it was concluded that the very high values of mortality at the older ages could not be fully explained and that the SPA models attempted were not appropriate. In 1990, the previously noted difficulties with the catch at age were raised, with the conclusion being that catch at age based models, such as SPA, were not suitable for this stock. Confidence in the catch and catch at age data for this stock remains at a low level, especially with the lack of sampling from fisheries in the Regulatory Area in both 1992 and 1993. Thus, evaluation of stock status continues to rely heavily on the interpretation of the independent indices of abundance.

As in the recent assessments, there are 5 indices used to evaluate this stock (Canadian spring and fall groundfish surveys, USSR groundfish surveys, Canadian juvenile flatfish surveys, and C/E from the Canadian commercial fleet) and most indicate that the stock is still at a low level compared to historic values. The decline in stock size in the mid- to late-1980s was caused by poor recruitment from the year-classes of the early 1980s and a rapid increase in catches to about 30,000 t in 1985-86 from 10,000-15,000 t in 1980-83. The year-classes of 1984-86 were stronger than their immediate predecessors and likely were responsible for the increased catches from 1989 to 1991. Available data suggest that there has likely been increased fishing mortality at ages 5 and younger in the late 1980's and early 1990's than in earlier years. Given the continuing inadequacies with the catch and sampling data, and still-unresolved questions about the natural mortality at age for this stock, it remains impossible to estimate the level of fishing mortality in recent years.

Prognosis

In 1993, the prognosis was that the stock has remained at a low level, but that "a catch of 7000 t (current TAC) in 1994 should not be detrimental to the stock". If total catches continue to exceed the TAC, the opportunity for this stock to rebuild to historic levels will likely not be achieved. It is worth reiterating that should the fisheries in the Regulatory Area return to former levels, with high exploitation rates of juveniles as in the past, this stock will likely remain low and perhaps decline further, particularly if predictions of reduced recruitment are accurate. Little has changed in this assessment. Surveys prior to 1993 suggested that the 1987 and 1988 year-classes were average at best, although they are estimated to be somewhat higher in 1993. However, the juvenile surveys also indicate that the 1989 to 1992 year-classes may be average to well below average.

It is important to note that stock size is well below that observed for most of the 1970's and early to mid 1980's, and that recent stability at this level should not be viewed as a sign that recent catch levels and exploitation patterns have been appropriate. There are also concerns that the stock distribution has contracted to a relatively small area west of the Southeast Shoal, and that bottom temperatures over most of the Bank have been below average for a number of years. It is also difficult to ignore the fact that many groundfish fisheries on the Grand Bank have either collapsed or been reduced to very low levels, which leads to the question as to how long yellowtail will be able to maintain stability at its current low level.

The stock has remained at a low level for several years with catches around 10,000-16,000 t (versus TAC's of 5,000-7,000 t) so further reductions in the total catch will be needed to allow some growth in stock size. These reductions in catch should occur in 1994 with the ban on directed fisheries on this stock, provided that catches by non-contracting parties in the Regulatory Area do not occur. Although a total catch of 5,000-7,000 t in 1995 would likely not be detrimental to the stock at its currently

estimated size, the failure in the recent past of status quo TAC's in limiting catches must be carefully considered. Given the forecast of lower recruitment from the 1989-92 year-classes, any resumption of directed fisheries on this stock in 1995 would reduce its potential to rebuild to former levels, when catches of about 15,000 t were maintained from a much higher stock biomass.

References

Brodie, W.B., S.J. Walsh, and W.R. Bowering. 1991. Managing transboundary flatfish stocks: sources and consequences of uncertainty. NAFO Sci. Coun. Studies 16:137-142.

Brodie, W.B., S.J. Walsh, D.Power, and W.R. Bowering. 1993. An assessment of the yellowtail flounder stock in Divisions 3LNO. NAFO SCR Doc. 93/76, Ser. No. N2261, 43 p.

Walsh, S. J. 1986. Juvenile yellowtail surveys on the Grand Banks (NAFO Division 3LNO). NAFO SCR Doc. 86/39, Ser. No. N1153.

1988. Diet variability in trawl catches of juvenile and adult yellowtail flounder on the Grand Banks and the effect on resource assessment. N. Amer. J.Fish. Mgmt. 8:373-381.

Table 1. Nominal catches by country and TACs (tons) of yellowtail in NAFO Divisions 3LNO.

Year	Canada	France	USSR	South Korea[a]	Other[b]	Total	TAC
1963	138	-	380	-	-	518	
1964	126	-	21	-	-	147	
1965	3,075	-	55	-	-	3,130	
1966	4,185	-	2,834	-	7	7,026	
1967	2,122	-	6,736	-	20	8,878	
1968	4,180	14	9,146	-	-	13,340	
1969	10,494	1	5,207	-	6	15,708	
1970	22,814	17	3,426	-	169	26,426	
1971	24,206	49	13,087	-	-	37,342	
1972	26,939	358	11,929	-	33	39,259	
1973	28,492	368	3,545	-	410	32,815	50,000
1974	17,053	60	6,952	-	248	24,313	40,000
1975	18,458	15	4,076	-	345	22,894	35,000
1976	7,910	31	57	-	59	8,057	9,000
1977	11,295	245	97	-	1	11,638	12,000
1978	15,091	375	-	-	-	15,466	15,000
1979	18,116	202	-	-	33	18,351	18,000
1980	12,011	366	-	-	-	12,377	18,000
1981	14,122	558	-	-	-	14,680	21,000
1982	11,479	110	-	1,073	657	13,319	23,000
1983	9,085	165	-	1,223	-	10,473	19,000
1984	12,437	89	-	2,373	1,836[b]	16,735	17,000
1985	13,440	-	-	4,278	11,245[b]	28,963	15,000
1986	14,168	77	-	2,049	13,882[b]	30,176	15,000
1987	13,420	51	-	125	2,718	16,314	15,000
1988	10,607	-	-	1,383	4,166[b]	16,158	15,000
1989	5,009	139	-	3,508	1,551	10,207	5,000
1990	4,966	-	-	5,903	3,117	13,986	5,000
1991[c]	6,642	-	-	4,156	5,458	16,256	7,000
1992[c]	6,809	-	-	3,825	123	10,757	7,000
1993[c,d]	6,697						7,000
1994							7,000[e]

[a]See text for explanation of South Korean catches.
[b]Includes catches estimated from surveillance reports in some years. See Table 2.
[c]Provisional
[d]See text for details of 1993 catches.
[e]No directed fisheries allowed.

Table 2. Breakdown of 1984-92 catches from Table 1 listed as "other."

Year	Spain	Portugal	Panama[a]	USA	Cayman Islands[a]	Other	Total
1984	25	-	1,800	-	-	11	1,836
1985	2,425	-	4,208	3,797	803	12	11,245
1986	366	5,521	4,044	2,221	1,728	2	13,882
1987	1,183	-	-	1,535	-	-	2,718
1988	3,205	-	-	863	-	100[b]	4,163
1989	1,126	5	-	319	-	101[b]	1,551
1990	119	11	-	6	-	2,981[b]	3,117
1991	246	-	-	-	-	5,212[b]	5,212
1992	122	1	-	-	-	-	123

[a]Not reported to NAFO. Catches estimated from surveillance reports.
[b]Includes some estimated catches.

Table 3. Canadian catches of yellowtail by division, month, and gear in Div. 3LNO in 1993.

		3N		3Ø			
Month	3L	OT	Seine	OT	Seine	Other	Total
Jan		5					5
Feb	1						1
Mar				1			1
Apr		36	47	4			87
May		28	86	3	9	1	127
Jun	1	30	154	828	74		1087
Jul	5	829	27	1014	67	1	1943
Aug	1	573	88	1240	16	2	1920
Sep		404	58	655	28		1145
Oct		92	76	101	13		282
Nov		22	6	36	3		67
Dec		11		20	1		32
Total	8	2030	542	3902	211	4	6697
	Div. Totals	3L	3N	3Ø			
		8	2572	4117			
	Gear Totals	OT	Seine	Other			
		5933	573	11			
	Can (N)	6265					
	Can (M)	432					

Table 4. Canadian catches of yellowtail by division, from 1973-93.

Year	OTTER TRAWL 3L	OTTER TRAWL 3N	OTTER TRAWL 3Ø	OTTER TRAWL 3LNO	OTHER GEARS 3LNO
1973	4188	21470	2827	28475	17
1974	1107	14757	1119	16983	70
1975	2315	13289	2852	18456	2
1976	448	4978	2478	7904	6
1977	2546	7166	1583	11295	0
1978	2537	10705	1793	15035	56
1979	2575	14359	1100	18034	82
1980	1892	9501	578	11971	40
1981	2345	11245	515	14105	17
1982	2305	7554	1607	11466	13
1983	2552	5737	770	9059	26
1984	5264	6847	318	12429	8
1985	3404	9098	829	13331	9
1986	2933	10196	1004	14133	35
1987	1584	10248	1529	13361	59
1988	1813	7146	1475	10434	173
1989	844	2407	1506	4757	252
1990	1263	2725	664	4652	317
1991	815	2980	2283	6078	564
1992	95	1266	4636	5997	812
1993	1	2030	3902	5933	764

Table 5. Catches and by-catches (t) of A. plaice and yellowtail, by division, from 1982-93 for Can(N) TC 5 stern trawlers. Figures in square brackets represent the percentage of directed catch taken by division each year, and the figures in parentheses represent the by-catch rates of one species in the directed fishery for the other.

		Directed plaice fishery		Directed yellowtail fishery	
		Plaice	Yellowtail by-catch	Yellowtail	Plaice by-catch
1982	3L	22452 [67]	1106 (5)	650 [12]	416 (39)
	3N	8631 [26]	2100 (20)	4568 [86]	1979 (30)
	3Ø	2423 [7]	560 (19)	71 [2]	50 (41)
1983	3L	11986 [60]	920 (7)	477 [10]	291 (38)
	3N	5733 [29]	1120 (16)	3909 [79]	1416 (27)
	3Ø	2330 [11]	256 (10)	535 [11]	355 (40)
1984	3L	10063 [55]	800 (7)	1787 [28]	781 (30)
	3N	6042 [33]	1162 (16)	4482 [70]	1813 (29)
	3Ø	2042 [12]	85 (4)	107 [2]	53 (33)
1985	3L	14617 [55]	995 (6)	793 [12]	328 (29)
	3N	9978 [38]	1764 (15)	5385 [84]	1439 (21)
	3Ø	1917 [7]	317 (14)	222 [4]	148 (40)
1986	3L	12410 [64]	890 (7)	619 [7]	319 (34)
	3N	4767 [25]	934 (16)	7632 [88]	1666 (18)
	3Ø	2128 [11]	375 (15)	450 [5]	241 (35)
1987	3L	14089 [80]	216 (2)	198 [2]	98 (33)
	3N	1774 [10]	357 (17)	7672 [91]	1492 (16)
	3Ø	1767 [10]	358 (17)	587 [7]	296 (34)
1988	3L	8262 [58]	165 (2)	220 [4]	95 (30)
	3N	3279 [23]	392 (11)	5096 [86]	912 (15)
	3Ø	2709 [19]	430 (14)	571 [10]	310 (35)
1989	3L	11049 [66]	149 (1)	64 [4]	41 (38)
	3N	3129 [19]	428 (12)	1321 [68]	514 (28)
	3Ø	2483 [15]	437 (15)	548 [28]	321 (37)
1990	3L	7388 [57]	176 (2)	194 [9]	92 (32)
	3N	2759 [21]	427 (13)	1753 [80]	626 (26)
	3Ø	2919 [22]	238 (8)	237 [11]	131 (36)
1991	3L	6107 [43]	328 (5)	93 [3]	56 (38)
	3N	2202 [15]	295 (12)	2212 [72]	440 (17)
	3Ø	6089 [42]	1067 (15)	758 [25]	411 (35)
1992	3L	550 [16]	31 (5)	62 [2]	34 (35)
	3N	182 [5]	35 (16)	977 [25]	145 (13)
	3Ø	2782 [79]	918 (25)	2898 [73]	1205 (29)
1993	3L	1 [-]	0 (0)	0 [0]	0 (0)
	3N	1302 [46]	63 (5)	1645 [42]	232 (12)
	3Ø	1538 [54]	436 (22)	2292 [58]	882 (28)

Table 6. Samples used to calculate catch at age and mean weights at age for yellowtail in the Canadian fishery in Div. 3LNO in 1993. The values in parentheses are the number of observations and 'n' is the number of samples.

Age-length key	Length Frequency	n	Catch (t)	Description
Q2, 3N (107)	SS, May, 3N (352)	1	208	3LNO, Jan-Apr, 3LN May
Q2, 3Ø (182)	Jun, (314)	1	185	3LN, Jun
	OT, Jun, 3Ø (1696)	5	915	3Ø, May-Jun
Q3, 3N (182)	OT, Aug, 3N (990)	3	1523	3LN, Jul-Aug
Q3, 3Ø (311)	Sep, (343)	1	462	3LN, Sep
Q3, 3Ø (311)	OT, Jul, 3Ø (1229)	4	1015	3Ø, OT+Other, Jul
	Aug (1917)	6	1242	3Ø, OT+Other, Aug
	Sep (1287)	4	756	3Ø, OT+Other, Sep-Oct
	SS, Jul, (321)	1	124	3Ø, SS, Jul-Oct
Q4, 3N (78)	OT, Dec, 3N (422)	1	267	3LN, Oct-Dec
Q3, 3N (182)				3Ø, Nov-Dec

Table 7. Catch at age and mean weights at age from the Canadian fishery for yellowtail flounder in Div. 3LNO in 1993.

	AVERAGE		CATCH		
AGE	WEIGHT	LENGTH	MEAN	STD. ERR.	C. V.
* 4	0.106	24.500	1	0.01	0.01
* 5	0.185	28.768	134	16.95	0.13
6	0.295	32.893	3017	146.93	0.05
7	0.440	36.960	6434	167.24	0.03
* 8	0.668	41.725	3752	98.09	0.03
* 9	1.015	47.100	418	35.04	0.08

TABLE 8. Catch at age (000) from the Canadian fishery in Div. 3LNO.

AGE	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
4	1414	671	44	1229	3180	113	23	107	0	4	3	85	0	4	0	0	1
5	3723	3553	2003	4937	5193	1513	1748	1374	1162	813	471	546	131	259	203	176	134
6	7918	10758	11116	7792	8173	4623	5587	11958	8701	4210	5055	2877	986	1762	2700	3406	3017
7	7116	10594	17838	7217	9513	7441	6744	11552	12201	13007	10935	7365	3978	4912	6644	6124	6434
8	3503	3795	6315	2201	4098	6538	3456	2662	4172	8088	8437	7322	4150	2968	3081	3540	3752
9	933	259	605	275	330	2121	505	196	664	1650	1609	1226	541	330	334	361	418
10	173	16	24	31	31	325	33	6	26	186	107	66	16	2	0	0	0
4+	24780	29646	37945	23682	30518	22674	18096	27855	26926	27958	26617	19487	9802	10237	12962	13607	13756

TABLE 9. Catch at age (PERCENT) from the Canadian fishery in Div. 3LNO.

AGE	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
4	5.7	2.3	0.1	5.2	10.4	0.5	0.1	0.4	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0
5	15.0	12.0	5.3	20.8	17.0	6.7	9.7	4.9	4.3	2.9	1.8	2.8	1.3	2.5	1.6	1.3	1.0
6	32.0	36.3	29.3	32.9	26.8	20.4	30.9	42.9	32.3	15.1	19.0	14.8	10.1	17.2	20.8	25.0	21.9
7	28.7	35.7	47.0	30.5	31.2	32.8	37.3	41.5	45.3	46.5	41.1	37.8	40.6	48.0	51.3	45.0	46.8
8	14.1	12.8	16.6	9.3	13.4	28.8	19.1	9.6	15.5	28.9	31.7	37.6	42.3	29.0	23.8	26.0	27.3
9	3.8	0.9	1.6	1.2	1.1	9.4	2.8	0.7	2.5	5.9	6.0	6.3	5.5	3.2	2.6	2.7	3.0
10	0.7	0.1	0.1	0.1	0.1	1.4	0.2	0.0	0.1	0.7	0.4	0.3	0.2	0.0	0.0	0.0	0.0

TABLE 10. Weight at age (Kg) from the Canadian fishery in Div. 3LNO.

AGE	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
4	0.251	0.267	0.145	0.256	0.232	0.222	0.198	0.194	0.000	0.090	0.150	0.180	0.000	0.140	0.000	0.000	0.106
5	0.309	0.315	0.242	0.363	0.322	0.306	0.322	0.289	0.289	0.260	0.220	0.250	0.220	0.210	0.203	0.196	0.185
6	0.405	0.409	0.344	0.460	0.423	0.367	0.401	0.371	0.382	0.360	0.330	0.330	0.320	0.320	0.324	0.331	0.295
7	0.477	0.553	0.476	0.549	0.509	0.467	0.507	0.492	0.501	0.470	0.450	0.450	0.440	0.450	0.480	0.472	0.440
8	0.508	0.725	0.652	0.719	0.648	0.594	0.657	0.683	0.686	0.620	0.610	0.620	0.590	0.630	0.709	0.668	0.668
9	0.634	0.800	0.790	0.912	0.929	0.734	0.911	1.025	0.972	0.840	0.840	0.920	0.870	0.890	1.021	1.015	1.015
10	0.793	1.217	0.829	1.132	1.194	0.880	1.267	1.142	1.362	1.030	1.210	1.280	1.370	1.370	0.000	0.000	0.000

TABLE 11. Catch biomass at age (t) from the Canadian fishery in Div. 3LNO.

AGE	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
4	355	179	6	315	738	25	5	21	0	0	0	15	0	1	0	0	0
5	1150	1119	485	1792	1672	463	563	397	336	211	104	137	29	54	41	34	25
6	3207	4400	3824	3584	3457	1697	2240	4436	3324	1516	1668	949	316	564	875	1127	890
7	3394	5858	8491	3962	4842	3475	3419	5684	6113	6113	4921	3314	1750	2210	3189	2891	2831
8	1780	2751	4117	1583	2656	3884	2271	1818	2862	5015	5147	4540	2449	1870	2184	2365	2506
9	592	207	478	251	307	1557	460	201	645	1386	1352	1128	471	294	341	366	424
10	137	19	20	35	37	286	42	7	35	192	129	84	22	3	0	0	0
4+	10615	14535	17421	11522	13708	11386	8999	12564	13315	14433	13321	10168	5036	4995	6631	6783	6676

TABLE 12. ANOVA RESULTS AND REGRESSION COEFFICIENTS FROM A MULTIPLICATIVE MODEL UTILIZED TO DERIVE A STANDARDIZED CATCH RATE SERIES FOR YELLOWTAIL FLOUNDER IN NAFO DIV. 3LNO (1991-1993 BASED ON PRELIMINARY DATA).

REGRESSION OF MULTIPLICATIVE MODEL
MULTIPLE R..... 0.755
MULTIPLE R SQUARED..... 0.571

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DF	SUMS OF SQUARES	MEAN SQUARES	F-VALUE
INTERCEPT	1	3.880E1	3.880E1	
REGRESSION	43	5.505E0	1.280E-1	23.949
Country¦Gear¦TC (1)	2	6.138E-1	3.069E-1	57.412
Division (2)	2	6.553E-1	3.277E-1	61.301
Month (3)	11	6.418E-1	5.834E-2	10.915
Year (4)	28	2.482E0	8.863E-2	16.581
RESIDUALS	775	4.143E0	5.345E-3	
TOTAL	819	4.844E1		

REGRESSION COEFFICIENTS

CATEGORY	CODE	VARIABLE	COEFFICIENT	STD. ERROR	NO. OBS.
Country¦Gear¦TC	3125	INTERCEPT	0.156	0.116	819
Division	34				
Month	10				
Year	65				
(1)	3114	1	-0.289	0.031	162
	3124	2	-0.219	0.032	145
(2)	32	3	-0.224	0.027	194
	35	4	-0.271	0.030	169
(3)	1	5	-0.243	0.082	19
	2	6	-0.324	0.080	21
	3	7	-0.240	0.062	35
	4	8	-0.224	0.051	59
	5	9	-0.282	0.044	111
	6	10	-0.368	0.045	107
	7	11	-0.340	0.045	109
	8	12	-0.241	0.045	103
	9	13	-0.062	0.046	87
	11	14	-0.121	0.052	54
	12	15	-0.164	0.061	40
(4)	66	16	-0.032	0.144	11
	67	17	-0.052	0.145	12
	68	18	-0.218	0.140	14
	69	19	-0.352	0.131	20
	70	20	-0.361	0.119	42
	71	21	-0.404	0.119	41
	72	22	-0.518	0.119	45
	73	23	-0.386	0.118	50
	74	24	-0.791	0.121	37
	75	25	-0.801	0.120	38
	76	26	-0.889	0.128	26
	77	27	-0.701	0.122	38
	78	28	-0.689	0.119	51
(4)	79	29	-0.650	0.119	47
	80	30	-0.541	0.123	30
	81	31	-0.544	0.124	30
	82	32	-0.629	0.127	24
	83	33	-0.510	0.126	24
	84	34	-0.539	0.127	28
	85	35	-0.499	0.124	30
	86	36	-0.805	0.125	30
	87	37	-0.772	0.125	30
	88	38	-0.847	0.127	26
	89	39	-0.835	0.136	17
	90	40	-0.702	0.134	16
	91	41	-1.309	0.133	21
	92	42	-1.221	0.135	15
	93	43	-0.997	0.132	18

LEGEND FOR AVOVA RESULTS:

CGT CODES: 3114 = Can(NFLD) TC 4 Side Trawler
CGT CODES: 3124 = " TC 4 Stern Trawler
3125 = " TC 5 "
DIVISION CODES: 32 = 3L, 34 = 3N, 35 = 30

TABLE 12 . (CONTINUED)

	PREDICTED CATCH RATE					
	LN TRANSFORM		RETRANSFORMED			
YEAR	MEAN	S.E.	MEAN	S.E.	CATCH	EFFORT
1965	0.1562	0.0135	1.164	0.135	3075	2641
1966	0.1241	0.0104	1.129	0.115	4185	3706
1967	0.1043	0.0113	1.107	0.117	2122	1918
1968	-0.0618	0.0086	0.939	0.087	4180	4454
1969	-0.1957	0.0061	0.822	0.064	10494	12767
1970	-0.2045	0.0032	0.816	0.046	22814	27961
1971	-0.2482	0.0030	0.781	0.043	24206	30988
1972	-0.3619	0.0029	0.697	0.037	26939	38637
1973	-0.2298	0.0027	0.796	0.041	28492	35805
1974	-0.6353	0.0034	0.530	0.031	17053	32157
1975	-0.6444	0.0030	0.526	0.029	18458	35120
1976	-0.7332	0.0048	0.481	0.033	7910	16462
1977	-0.5449	0.0038	0.580	0.036	11295	19462
1978	-0.5326	0.0030	0.588	0.032	15091	25675
1979	-0.4937	0.0030	0.611	0.034	18116	29646
1980	-0.3848	0.0044	0.681	0.045	12011	17640
1981	-0.3875	0.0041	0.679	0.044	14122	20794
1982	-0.4727	0.0047	0.624	0.043	11479	18410
1983	-0.3539	0.0043	0.702	0.046	9085	12936
1984	-0.3825	0.0047	0.682	0.047	12437	18227
1985	-0.3425	0.0039	0.711	0.044	13440	18915
1986	-0.6492	0.0041	0.523	0.033	14168	27101
1987	-0.6159	0.0040	0.541	0.034	13420	24828
1988	-0.6911	0.0046	0.501	0.034	10607	21163
1989	-0.6785	0.0070	0.507	0.042	5009	9880
1990	-0.5460	0.0062	0.579	0.046	4966	8577
1991	-1.1532	0.0060	0.316	0.024	6642	21051
1992	-1.0652	0.0064	0.344	0.027	6809	19766
1993	-0.8407	0.0058	0.431	0.033	6697	15527

AVERAGE C.V. FOR THE RETRANSFORMED MEAN: 0.071

Table 13. Mean weight of yellowtail per 30 minute tow, by stratum, from research vessel surveys in Division 3L. Numbers in parentheses are the number of successful tows in each stratum.

Depth (fm)	Stratum	No. of trawlable units	Year-Trip 1971 ATC 187	1972 ATC 199	1973 ATC 207-9	1974 ATC 222	1975 ATC 233	1976 ATC 245-6	1977 ATC 262-3	1978 ATC 276-7	1979 ATC 289-91	1980 ATC 303-5	1981 ATC 317-9	1982 ATC 327-9
51-100	328	114,023	-	-	-	-	-	-	0.0(3)	-	0.0(5)	-	0.0(2)	0.0(3)
51-100	341	118,151	-	-	0.0(3)	-	-	-	0.1(4)	0.1(4)	0.0(6)	0.0(6)	0.0(2)	0.0(5)
51-100	342	43,913	-	-	-	-	-	-	0.0(2)	0.0(2)	0.0(4)	0.0(4)	-	0.0(3)
51-100	343	39,409	-	-	-	-	-	-	0.0(2)	0.0(3)	0.0(4)	0.0(4)	0.0(2)	0.0(4)
101-150	344	112,146	-	-	-	-	-	0.0(4)	0.0(4)	0.0(4)	0.0(2)	0.0(3)	0.0(5)	0.0(4)
151-200	345	107,492	-	-	-	-	-	0.0(4)	0.0(4)	0.0(2)	0.0(4)	0.0(5)	0.0(4)	0.0(4)
151-200	346	64,931	-	-	-	-	0.0(2)	0.0(2)	0.0(3)	-	0.0(4)	0.0(3)	0.0(3)	0.0(3)
101-150	347	73,788	0.0(2)	-	-	0.0(2)	0.0(2)	0.0(3)	0.0(3)	0.0(4)	0.0(4)	0.0(5)	0.0(4)	0.0(2)
51-100	348	159,136	0.0(3)	0.0(3)	-	0.0(6)	0.0(4)	0.0(6)	0.0(6)	0.0(6)	0.0(6)	0.0(7)	0.0(7)	0.0(4)
51-100	349	158,686	4.8(3)	0.0(4)	-	0.0(4)	0.0(2)	0.2(3)	0.0(6)	0.0(6)	0.0(7)	0.0(9)	0.0(4)	0.0(6)
31- 50	350	155,458	32.2(3)	2.3(2)	0.0(4)	0.2(3)	0.0(3)	0.2(4)	3.8(4)	1.5(6)	1.1(9)	1.1(10)	0.3(3)	0.6(7)
31- 50	363	133,614	119.8(3)	21.3(3)	12.5(4)	0.5(4)	1.0(3)	2.5(4)	27.4(5)	6.3(5)	22.3(8)	39.3(5)	3.0(3)	30.4(5)
51-100	364	211,456	13.7(4)	0.0(3)	-	0.0(4)	0.0(2)	0.0(3)	0.2(7)	0.1(6)	0.1(8)	0.4(6)	0.0(3)	0.0(6)
51-100	365	78,142	0.0(3)	0.0(2)	-	0.0(3)	0.0(2)	0.0(3)	0.0(3)	0.0(2)	0.0(4)	0.0(4)	0.0(2)	0.0(3)
101-150	366	104,639	0.0(3)	-	-	0.0(3)	0.0(4)	0.0(4)	0.0(4)	-	0.0(4)	0.0(4)	0.0(3)	0.0(5)
151-200	368	25,071	0.0(2)	-	-	0.0(2)	0.0(2)	0.0(3)	0.0(3)	-	0.0(4)	0.0(2)	0.0(2)	0.0(2)
101-150	369	72,137	0.0(3)	-	-	0.0(3)	0.0(3)	0.0(4)	0.0(3)	0.0(2)	0.0(4)	0.0(3)	0.0(2)	0.0(2)
51-100	370	99,085	1.4(2)	0.3(3)	-	0.0(3)	0.0(3)	0.0(3)	0.5(3)	0.2(3)	0.0(4)	0.0(3)	0.0(2)	0.0(2)
31- 50	371	84,147	88.5(3)	6.4(2)	-	0.0(3)	-	-	1.4(3)	0.3(3)	0.5(3)	80.5(3)	0.0(2)	1.1(4)
31- 50	372	184,658	135.3(4)	28.1(3)	39.6(3)	7.1(3)	7.6(3)	44.2(3)	32.1(6)	20.5(7)	24.3(9)	25.0(6)	13.3(4)	19.8(6)
31- 50	384	84,072	86.0(3)	3.0(2)	2.3(3)	0.6(3)	-	-	7.0(2)	0.0(3)	1.5(4)	0.0(2)	0.4(2)	10.3(2)
51-100	385	176,851	0.0(4)	0.0(4)	0.2(3)	0.0(2)	0.0(4)	0.0(2)	0.0(6)	0.0(6)	0.0(7)	0.0(4)	0.0(3)	0.0(3)
101-150	386	73,788	0.0(2)	-	-	0.0(3)	0.0(3)	0.0(2)	0.0(3)	0.0(3)	0.0(4)	0.0(3)	0.0(2)	0.0(3)
151-200	387	53,896	0.0(3)	-	-	0.0(3)	0.0(2)	0.0(3)	0.0(2)	0.0(3)	0.0(4)	0.0(2)	0.0(2)	0.0(3)
151-200	388	27,098	0.0(2)	-	0.0(2)	0.0(3)	0.0(2)	0.0(2)	0.0(2)	0.0(2)	0.0(3)	0.0(2)	0.0(2)	0.0(2)
101-150	389	61,628	0.0(3)	0.0(2)	0.0(2)	0.0(3)	0.0(2)	0.0(2)	0.0(3)	0.0(3)	0.0(4)	0.0(3)	0.0(2)	0.0(2)
51-100	390	111,170	0.3(3)	0.0(3)	0.0(3)	0.0(3)	0.0(3)	-	0.0(2)	0.0(4)	0.0(5)	0.3(3)	0.0(2)	0.8(4)
101-150	391	21,168	-	0.0(2)	0.0(2)	0.0(3)	0.0(2)	-	0.0(2)	0.0(2)	0.0(4)	0.0(2)	0.0(2)	0.0(2)
151-200	392	10,884	-	-	0.0(3)	0.0(4)	0.0(2)	-	0.0(2)	0.0(3)	0.0(2)	0.0(2)	0.0(2)	0.0(2)
201-300	729	13,962	-	-	-	-	-	-	-	-	-	-	-	-
301-400	730	12,761	-	-	-	-	-	-	-	-	-	-	-	-
201-300	731	16,214	-	-	-	-	-	-	-	-	-	-	-	-
301-400	732	17,340	-	-	-	-	-	-	-	-	-	-	-	-
201-300	733	35,130	-	-	-	-	-	-	-	-	-	-	-	-
301-400	734	17,115	-	-	-	-	-	-	-	-	-	-	-	-
201-300	735	20,417	-	-	-	-	-	-	-	-	-	-	0.0(2)	-
301-400	736	13,136	-	-	-	-	-	-	-	-	-	-	-	-
Biomass ('000 t)			64.5	9.2	9.2	1.4	1.5	8.5	11.0	4.9	7.8	10.2	2.9	8.8

Table 13. (Cont'd.)

Depth (fm)	Stratum	Year-Trip 1984 AN 27-28	1985 AN 43 WT 28-30	1986 WT 48	1987 WT 59, 60	1988 WT 70, 71	1989 WT 82, 83	1990 WT 95-96	1991 WT 106, 107	1992 WT 120-122	1993 WT 136-138
51-100	328	0.0(2)	0.0(4)	0.0(9)	0.0(7)	0.0(2)	0.0(8)	0.1(7)	0.2(6)	0.0(4)	0.0(6)
51-100	341	0.0(4)	0.01(9)	0.0(9)	0.1(6)	0.0(6)	0.0(8)	0.0(4)	0.0(6)	0.0(8)	0.0(6)
51-100	342	0.0(4)	0.0(3)	0.0(3)	0.2(2)	0.0(2)	0.1(3)	0.0(2)	0.0(2)	0.0(3)	0.0(3)
51-100	343	-	0.0(3)	0.0(4)	0.0(3)	0.0(3)	0.0(3)	0.2(3)	0.0(2)	0.0(3)	0.0(2)
101-150	344	-	0.0(5)	0.0(8)	0.0(4)	0.0(6)	0.0(7)	0.0(6)	0.0(5)	0.0(6)	0.0(6)
151-200	345	-	0.0(5)	0.0(7)	0.0(4)	0.0(8)	0.0(9)	0.0(4)	0.0(3)	0.0(6)	0.0(6)
151-200	346	-	0.0(2)	0.0(5)	0.0(5)	0.0(4)	0.0(4)	0.0(4)	-	0.0(4)	0.0(4)
101-150	347	-	0.0(5)	0.0(5)	0.0(3)	0.0(5)	0.0(6)	0.0(4)	0.0(4)	0.0(4)	0.0(4)
51-100	348	-	0.0(18)	0.0(12)	0.1(8)	0.0(11)	0.0(9)	0.0(11)	0.0(8)	0.0(9)	0.0(8)
51-100	349	0.1(6)	0.1(14)	1.3(14)	0.1(11)	0.1(8)	0.0(11)	0.0(9)	0.0(9)	0.0(9)	0.0(9)
31-50	350	1.5(6)	3.7(12)	2.3(11)	0.6(11)	1.6(8)	0.6(11)	0.2(7)	1.0(8)	0.1(11)	0.0(9)
31-50	363	28.2(5)	15.2(8)	8.3(10)	7.6(9)	4.9(7)	1.5(9)	3.4(7)	0.6(7)	0.1(9)	0.0(8)
51-100	364	0.6(5)	0.0(17)	0.0(17)	0.0(15)	0.0(10)	0.0(16)	0.0(12)	0.0(11)	0.0(12)	0.0(12)
51-100	365	-	0.0(7)	0.0(5)	0.0(5)	0.0(4)	0.0(6)	0.0(4)	0.0(4)	0.0(4)	0.0(5)
101-150	366	-	0.0(6)	0.0(8)	0.0(7)	0.0(6)	0.0(8)	0.0(6)	-	0.0(6)	0.0(7)
151-200	368	-	0.0(2)	0.0(2)	0.0(3)	0.0(2)	0.0(3)	0.0(2)	-	0.0(2)	0.0(2)
101-150	369	-	0.0(5)	0.0(6)	0.0(5)	0.0(4)	0.0(6)	0.0(5)	0.0(2)	0.0(4)	0.0(5)
51-100	370	-	0.0(8)	0.0(8)	0.0(7)	0.0(5)	0.0(8)	0.0(7)	0.0(6)	0.0(6)	0.0(6)
31-50	371	-	0.4(7)	0.3(6)	0.0(7)	0.1(5)	0.1(6)	0.0(6)	0.1(5)	0.0(5)	0.0(5)
31-50	372	59.4(5)	56.5(12)	36.3(14)	13.9(13)	7.0(11)	12.7(13)	4.7(7)	2.2(10)	0.3(10)	0.4(11)
31-50	384	-	4.6(6)	1.6(6)	1.1(7)	0.2(5)	0.1(6)	0.0(4)	0.0(4)	0.0(5)	0.0(5)
51-100	385	-	0.0(15)	0.0(13)	0.0(11)	0.0(10)	0.0(12)	0.0(11)	0.0(8)	0.0(10)	0.0(11)
101-150	386	-	0.0(5)	0.0(6)	0.0(5)	0.0(4)	0.0(6)	0.0(5)	0.0(3)	0.0(4)	0.0(5)
151-200	387	-	0.0(6)	0.0(4)	0.0(4)	0.0(4)	0.0(5)	0.0(4)	0.0(3)	0.0(3)	0.0(3)
151-200	388	-	0.0(2)	0.0(2)	0.0(2)	0.0(2)	0.0(3)	0.0(2)	0.0(3)	0.0(2)	0.0(2)
101-150	389	-	0.0(5)	0.0(5)	0.0(6)	0.0(3)	0.0(5)	0.0(4)	0.0(3)	0.0(3)	0.0(4)
51-100	390	-	0.3(9)	0.0(8)	0.0(7)	0.0(5)	0.0(8)	0.0(5)	0.0(5)	0.0(6)	0.0(6)
101-150	391	-	0.0(2)	0.0(2)	0.0(2)	0.0(2)	0.0(3)	0.0(2)	0.0(2)	0.0(2)	0.0(2)
151-200	392	-	0.0(2)	0.0(2)	0.2(2)	0.0(2)	0.0(3)	0.0(2)	0.0(2)	0.0(2)	0.0(2)
201-300	729	-	0.0(2)	-	-	-	-	-	0.0(2)	0.0(2)	0.0(2)
301-400	730	-	0.0(2)	-	-	-	-	-	0.0(2)	0.0(2)	0.0(2)
201-300	731	-	0.0(2)	-	-	-	-	-	0.0(2)	0.0(2)	0.0(2)
301-400	732	-	0.0(2)	-	-	-	-	-	0.0(2)	0.0(2)	0.0(2)
201-300	733	-	0.0(3)	-	-	-	-	-	0.0(2)	0.0(2)	0.0(3)
301-400	734	-	0.0(2)	-	-	-	-	-	0.0(2)	0.0(2)	0.0(2)
201-300	735	-	0.0(2)	-	-	-	-	-	-	0.0(2)	0.0(2)
301-400	736	-	0.0(2)	-	-	-	-	-	-	0.0(2)	0.0(2)
Biomass ('000 t)		15.1	13.5	8.5	3.8	2.2	2.7	1.4	0.7	0.1	0.1

Table 14. Mean weight of yellowtail per 30 minute tow, by stratum, from research vessel surveys in Division 3N. Numbers in parentheses are the number of successful sets in each stratum. The stratified mean weight per tow and the biomass estimates are given at the bottom of the table.

Depth (fm)	Stratum	No. of trawlable units	Year-Trip 1971 ATC 187	1972 ATC 199	1973 ATC 207-9	1974 ATC 222	1975 ATC 233	1976 ATC 245-6	1977 ATC 262-3	1978 ATC 276-7	1979 ATC 289-91	1980 ATC 303-5	1981 ATC 317-9	1982 ATC 327-9
151-200	357	12,311	-	-	0.0(2)	-	-	-	0.0(2)	-	0.0(3)	0.0(3)	0.0(2)	0.0(2)
101-150	358	16,889	-	0.0(4)	0.0(3)	-	-	-	0.0(2)	-	0.0(2)	0.0(3)	0.3(3)	0.0(3)
51-100	359	31,602	-	0.0(3)	0.0(3)	-	-	0.0(3)	0.0(2)	-	0.0(4)	0.0(4)	0.0(3)	0.0(3)
31-50	360	224,592	-	58.3(4)	-	-	12.1(4)	128.6(4)	55.9(4)	43.5(4)	27.6(9)	83.8(11)	78.4(6)	36.7(7)
31-50	361	139,094	45.8(2)	115.8(3)	93.4(4)	151.5(4)	105.3(4)	113.0(5)	141.5(3)	122.8(4)	92.3(8)	128.4(7)	-	118.9(6)
31-50	362	189,162	140.2(2)	132.8(4)	22.1(5)	38.9(4)	33.3(3)	44.1(5)	62.4(5)	28.8(4)	40.3(12)	53.6(11)	104.2(5)	47.2(8)
31-50	373	189,162	73.6(4)	135.1(4)	26.7(4)	24.2(4)	-	23.3(5)	74.5(4)	50.5(5)	22.1(11)	48.1(8)	58.4(5)	23.7(5)
31-50	374	69,885	67.8(2)	42.4(2)	115.4(4)	16.1(2)	62.1(2)	-	22.4(3)	22.0(3)	24.8(4)	39.0(3)	71.7(3)	19.1(4)
≤ 30	375	119,577	60.0(3)	69.0(3)	121.9(3)	94.5(3)	80.3(3)	-	62.7(4)	30.6(5)	66.1(5)	57.8(4)	69.3(4)	61.1(5)
≤ 30	376	112,521	-	45.4(2)	10.3(3)	-	82.1(2)	126.4(3)	78.3(3)	4.6(2)	86.4(4)	125.3(3)	74.3(4)	63.0(7)
51-100	377	7,506	-	0.0(2)	0.0(2)	0.0(3)	0.0(2)	-	0.0(2)	0.0(2)	0.0(3)	0.0(4)	0.0(3)	0.0(2)
101-150	378	10,434	0.0(2)	0.0(2)	0.0(2)	0.2(3)	-	-	0.0(2)	1.4(2)	0.0(3)	0.0(2)	0.0(2)	0.0(2)
151-200	379	7,957	-	-	0.0(2)	0.0(3)	-	-	0.0(2)	0.3(2)	0.0(3)	0.0(3)	0.0(3)	0.0(2)
151-200	380	8,707	-	0.0(2)	0.0(3)	0.0(2)	-	-	0.0(2)	-	0.0(2)	0.0(3)	0.0(3)	-
101-150	381	13,662	0.0(4)	0.5(4)	0.0(3)	0.0(4)	0.0(2)	-	0.0(2)	0.0(3)	0.0(3)	0.5(4)	0.0(3)	0.0(2)
51-100	382	48,567	0.0(3)	0.0(4)	0.0(3)	0.0(3)	-	0.0(2)	0.0(3)	0.0(3)	0.0(3)	0.0(4)	0.0(2)	0.0(2)
31-50	383	50,593	18.6(2)	7.3(2)	0.1(2)	0.0(2)	-	0.0(3)	2.7(3)	0.0(2)	0.0(3)	0.5(4)	1.3(3)	10.0(2)
201-300	723	11,635	-	-	-	-	-	-	-	-	-	-	-	-
301-400	724	9,308	-	-	-	-	-	-	-	-	-	-	-	-
201-300	725	7,882	-	-	-	-	-	-	-	-	-	-	-	-
301-400	726	5,405	-	-	-	-	-	-	-	-	-	-	-	-
201-300	727	12,010	-	-	-	-	-	-	-	-	-	-	-	-
301-400	728	11,710	-	-	-	-	-	-	-	-	-	-	-	-
Mean (no. sets)			71.9(24)	78.4(45)	44.8(48)	53.2(37)	53.5(22)	72.7(30)	60.8(48)	40.2(41)	40.1(82)	63.6(81)	63.0(54)	43.8(60)
Biomass ('000 t)			59.7	96.6	46.0	45.4	46.8	71.6	76.2	47.6	50.2	79.7	70.1	54.4

Table 14. - (Cont'd.)

Depth (fm)	Stratum	Year-Trip 1984 AN 27-28	1985 AN 43 WT 29	1986 WT 47	1987 WT 58-60	1988 WT 70	1989 WT 82	1990 WT 95-96	1991 WT 106	1992 WT 119-120	1993 WT 136-137	1994[a] WT 152-153
151-200	357	0.0(2)	0.0(2)	0.0(2)	-	0.0(2)	0.0(2)	0.0(2)	0.0(2)	0.0(2)	0.0(2)	
101-150	358	0.0(2)	0.0(2)	0.0(2)	0.0(2)	0.0(2)	0.0(2)	0.0(2)	0.0(2)	0.0(2)	0.0(2)	
51-100	359	0.0(2)	0.0(2)	0.0(2)	0.0(2)	0.0(2)	0.0(2)	0.0(2)	0.0(2)	0.0(2)	0.4(2)	
31-50	360	142.1(7)	54.0(16)	14.1(13)	9.2(15)	2.4(12)	30.9(15)	6.6(15)	10.4(12)	19.6(14)	7.5(11)	
31-50	361	139.9(5)	67.1(7)	44.1(10)	73.8(8)	88.7(7)	48.6(10)	125.2(9)	92.3(8)	38.9(8)	95.1(8)	
31-50	362	95.1(7)	36.6(11)	73.2(14)	47.8(13)	43.8(10)	30.5(13)	35.3(10)	30.5(10)	3.0(12)	52.5(9)	
31-50	373	63.5(7)	32.0(9)	17.9(4)	23.1(13)	23.8(10)	14.8(13)	0.9(10)	8.9(11)	0.1(10)	0.1(9)	
31-50	374	35.5(3)	25.3(4)	11.6(6)	5.7(5)	2.3(5)	0.1(5)	0.9(5)	0.2(5)	0.8(5)	0.0(3)	
≤ 30	375	176.1(5)	97.8(8)	231.7(8)	142.8(8)	68.1(6)	23.2(8)	102.7(8)	14.9(6)	141.1(6)	60.0(6)	
≤ 30	376	32.5(4)	78.5(7)	88.2(90	59.4(8)	4.3(6)	72.6(8)	40.3(7)	113.8(7)	11.2(7)	3.3(6)	
51-100	377	0.0(2)	0.0(2)	0.0(2)	0.0(2)	0.5(2)	0.0(2)	0.0(2)	0.0(2)	0.0(2)	0.0(2)	
101-150	378	0.0(2)	0.0(2)	0.0(2)	0.0(2)	0.0(2)	0.0(2)	0.0(2)	0.0(3)	0.0(2)	0.0(2)	
151-200	379	0.0(2)	0.0(2)	0.0(3)	0.0(2)	0.0(2)	0.0(2)	0.0(2)	0.0(2)	0.0(2)	0.0(2)	
151-200	380	0.0(2)	0.0(2)	0.0(3)	0.0(2)	0.0(2)	0.0(2)	0.0(2)	0.0(2)	0.0(2)	0.0(2)	
101-150	381	0.0(2)	0.0(2)	0.0(3)	0.0(2)	0.0(2)	0.0(2)	0.0(2)	0.0(2)	0.0(2)	0.0(2)	
51-100	382	0.0(3)	0.0(4)	0.0(4)	0.0(3)	0.0(2)	0.0(3)	0.0(3)	0.0(2)	0.0(3)	0.0(2)	
31-50	383	1.8(3)	0.0(3)	0.0(4)	0.1(3)	0.0(2)	0.0(3)	0.0(2)	0.0(3)	0.0(2)	0.0(3)	
201-300	723	-	-	-	-	-	-	-	0.0(2)	0.0(2)	0.0(2)	
301-400	724	-	-	-	-	-	-	-	0.0(2)	0.0(2)	0.0(2)	
201-300	725	-	-	-	-	-	-	-	0.0(2)	0.0(1)	0.0(2)	
301-400	726	-	-	-	-	-	-	-	0.0(2)	0.0(2)	0.0(2)	
201-300	727	-	-	-	-	-	-	-	0.0(2)	0.0(2)	0.0(2)	
301-400	728	-	-	-	-	-	-	-	0.0(2)	0.0(2)	0.0(2)	
Mean (No. sets)		83.5(60)	45.3(85)	51.9(101)	40.2(91)	27.5(77)	26.5(94)	34.1(85)	28.4(93)	22.0(94)	24.7(85)	
Biomass ('000 t)		104.6	56.7	65.0	49.9	34.4	33.3	42.6	37.2	28.6	32.4	30.3

Table 15. Mean weight of yellowtail per 30-minute tow, by stratum, from research vessel surveys in Division 3Ø. Numbers in parentheses are the number of successful tows in each stratum. The stratified mean weight per tow and the biomass estimates are given at the bottom of the table.

Depth (fm)	Stratum	No. of trawlable units	Year-Trip 1973 ATC 207, 208, 209	1975 ATC 233	1976 ATC 245, 246	1977 ATC 262, 263	1978 ATC 276, 277	1979 ATC 289, 290, 191	1980 ATC 303, 304, 305	1981 ATC 317, 318, 319	1982 ATC 327, 328, 329
51-100	329	129,185	0.0(2)	-	0.0(2)	0.0(3)	0.2(5)	0.0(6)	0.0(2)	0.0(2)	0.0(6)
31- 50	330	156,809	0.1(6)	1.1(3)	0.2(3)	2.0(3)	5.6(6)	10.0(7)	0.0(2)	0.1(4)	1.9(7)
31- 50	331	34,229	33.6(2)	0.4(2)	9.2(2)	-	7.3(2)	6.0(3)	3.5(2)	-	4.0(4)
51-100	332	78,592	-	3.2(2)	2.0(3)	11.5(3)	2.6(3)	2.0(4)	0.0(2)	-	0.3(4)
101-150	333	11,335	-	0.0(2)	0.0(2)	0.0(2)	0.0(3)	0.0(2)	0.0(2)	-	0.0(4)
151-200	334	6,906	-	-	0.0(2)	0.0(2)	0.0(3)	0.0(3)	0.0(2)	-	0.0(4)
151-200	335	4,354	0.0(2)	-	0.0(3)	-	0.0(2)	0.0(2)	0.0(3)	-	0.0(2)
101-150	336	9,083	0.0(3)	0.0(2)	0.0(2)	0.0(2)	0.0(2)	0.0(4)	0.0(2)	-	0.0(2)
51-100	337	71,161	0.2(3)	1.3(3)	4.5(2)	6.6(2)	0.0(2)	0.6(4)	0.0(3)	-	0.3(3)
31- 50	338	142,472	33.7(5)	7.5(2)	9.1(3)	23.8(4)	2.3(5)	54.1(7)	23.0(5)	-	1.0(5)
51-100	339	43,913	1.4(2)	0.0(2)	-	-	0.7(2)	0.4(3)	-	0.0(2)	0.1(4)
31- 50	340	128,810	-	0.6(3)	2.4(6)	22.2(3)	10.2(3)	32.8(7)	1.3(2)	15.0(3)	3.9(6)
31- 50	351	189,162	31.2(5)	29.3(4)	15.7(4)	80.6(5)	26.4(6)	78.5(11)	68.2(10)	51.0(4)	34.2(9)
31- 50	352	193,666	47.5(5)	55.5(4)	62.0(4)	76.6(5)	92.2(4)	79.7(12)	67.3(11)	-	40.3(7)
31- 50	353	96,232	0.5(3)	43.9(3)	9.1(2)	41.7(3)	8.5(3)	68.6(5)	0.4(4)	-	4.5(3)
51-100	354	35,580	0.0(3)	-	4.8(3)	3.6(2)	-	0.0(4)	0.0(3)	0.0(2)	0.0(2)
101-150	355	7,732	0.0(2)	0.0(2)	0.0(2)	-	-	0.0(4)	0.0(2)	0.0(2)	0.0(2)
151-200	356	4,579	0.0(2)	-	-	-	-	0.0(2)	0.0(2)	0.0(2)	0.0(2)
201-300	717	6,981	-	-	-	-	-	-	-	-	-
301-400	718	8,332	-	-	-	-	-	-	-	-	-
201-300	719	5,705	-	-	-	-	-	-	-	-	-
301-400	720	7,882	-	-	-	-	-	-	-	-	-
201-300	721	5,705	-	-	-	-	-	-	-	-	-
301-400	722	6,981	-	-	-	-	-	-	-	-	-
Mean (No. sets)			19.0(45)	19.1(34)	14.2(45)	33.8(39)	20.6(51)	37.8(90)	22.7(59)	16.7(21)	11.8(74)
Biomass ('000 t)			21.2	22.2	18.4	42.1	26.7	50.8	29.5	11.6	15.8

Table 15. - (Cont'd.)

Depth (fm)	Stratum	Year - Trip 1984 AN 27, 28	1985 AN 43	1986 WT 47	1987 WT 58-60	1988 WT 70	1989 WT 82	1990 WT 94-95	1991 WT 105, 106	1992 WT 119, 120	1993 WT 136-138	1994[a] WT 152-153
51-100	329	0.0(5)	0.0(8)	0.0(8)	0.0(9)	0.0(7)	0.0(9)	0.0(7)	0.2(9)	0.0(8)	0.1(6)	
31- 50	330	0.5(4)	7.8(10)	3.3(9)	0.7(11)	0.7(9)	1.2(11)	0.6(10)	4.8(11)	0.0(10)	0.1(7)	
31- 50	331	23.8(3)	36.7(3)	3.6(4)	16.0(2)	6.0(2)	18.7(2)	-	0.7(2)	0.0(2)	1.3(2)	
51-100	332	0.0(2)	0.3(5)	9.8(6)	5.9(5)	0.1(4)	12.7(5)	0.8(5)	0.8(6)	0.5(5)	6.6(4)	
101-150	333	0.0(2)	0.0(2)	0.0(3)	0.0(2)	0.0(2)	0.0(2)	0.0(2)	0.0(2)	0.0(2)	0.0(2)	
151-200	334	0.0(2)	0.0(2)	0.0(2)	0.0(2)	0.0(2)	0.0(2)	0.0(2)	0.0(2)	0.2(2)	0.0(2)	
151-200	335	0.0(2)	0.0(2)	0.0(2)	0.0(2)	0.0(2)	0.0(2)	0.0(2)	0.0(3)	0.0(3)	0.0(2)	
101-150	336	0.0(2)	0.0(2)	0.0(2)	0.0(2)	0.0(2)	0.0(2)	0.0(2)	0.0(2)	0.0(2)	0.0(2)	
51-100	337	0.0(2)	0.0(5)	0.6(5)	0.7(6)	1.3(4)	1.7(5)	0.0(2)	0.0(5)	0.4(4)	4.8(2)	
31- 50	338	15.8(5)	11.1(9)	6.8(9)	2.4(9)	23.0(8)	7.2(10)	6.1(8)	5.4(10)	9.6(6)	5.7(6)	
51-100	339	0.4(2)	0.1(3)	0.1(3)	0.1(3)	0.0(3)	0.0(3)	0.4(3)	0.0(3)	0.0(2)	0.0(2)	
31- 50	340	3.0(4)	7.2(9)	8.3(7)	21.4(9)	5.8(7)	3.4(9)	9.7(9)	2.7(9)	1.8(5)	1.5(6)	
31- 50	351	40.5(6)	42.3(9)	39.1(14)	19.3(13)	36.5(10)	21.9(13)	27.3(12)	13.2(12)	3.3(10)	2.2(9)	
31- 50	352	30.5(7)	29.7(11)	34.9(14)	51.4(13)	24.8(11)	27.0(13)	36.0(13)	49.4(14)	22.8(8)	109.4(7)	
31- 50	353	1.0(2)	56.3(6)	21.8(7)	106.3(6)	2.2(5)	6.0(7)	12.0(6)	17.6(7)	5.6(4)	36.4(4)	
51-100	354	0.0(2)	0.5(3)	0.0(3)	0.0(2)	0.0(2)	0.1(2)	0.0(2)	1.8(3)	0.0(2)	0.0(2)	
101-150	355	0.0(2)	0.0(2)	0.0(2)	0.0(2)	0.0(2)	0.0(2)	0.0(2)	0.0(2)	0.0(2)	0.0(2)	
151-200	356	0.0(2)	0.0(2)	0.0(2)	0.0(2)	0.0(2)	0.0(2)	0.0(2)	0.0(2)	0.0(2)	0.0(2)	
201-300	717	-	-	-	-	-	-	-	0.0(2)	0.0(2)	0.0(2)	
301-400	718	-	-	-	-	-	-	-	0.0(2)	0.0(2)	0.0(2)	
201-300	719	-	-	-	-	-	-	-	0.0(2)	0.0(2)	0.0(2)	
301-400	720	-	-	-	-	-	-	-	0.0(2)	0.0(2)	0.0(2)	
201-300	721	-	-	-	-	-	-	-	0.0(2)	0.0(2)	0.0(2)	
301-400	722	-	-	-	-	-	-	-	0.0(2)	0.0(2)	0.0(2)	
Mean (No. sets)		12.8(56)	18.0(93)	14.7(102)	20.9(100)	12.2(84)	9.9(101)	11.9(93)	11.4(116)	5.2(91)	19.5(81)	
Biomass ('000 t)		17.2	24.2	19.7	28.1	16.3	13.4	15.6	15.8	7.3	27.0	5.9

[a]Preliminary analysis.

TABLE 16. Abundance (millions) of yellowtail from Canadian spring surveys in Div. 3LNO.

AGE	1975	1976	1977	1978	1979	1980	1981	1982	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	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	0.0	0.2	0.1	0.1	0.0	1.4	0.0	0.0	0.0	0.0	0.1	0.2	0.0	0.1	0.1	0.0
3	0.8	3.9	0.2	2.9	0.9	5.0	1.1	5.5	0.3	0.7	0.1	0.1	0.1	2.4	0.8	0.4	1.0	0.5
4	12.7	16.5	3.1	9.9	6.0	11.1	2.0	18.8	3.5	2.5	1.8	0.5	1.2	23.8	7.9	5.6	5.2	7.6
5	63.8	73.8	18.6	38.2	12.6	37.9	8.8	38.6	26.4	12.9	11.8	6.4	1.6	25.9	22.1	27.0	11.0	18.4
6	92.1	100.7	45.5	70.4	50.3	97.7	37.9	56.1	94.0	52.8	30.3	20.2	9.5	27.3	29.3	39.3	26.3	39.2
7	106.8	92.5	121.7	73.1	129.2	140.0	97.3	87.4	131.0	90.9	93.7	56.5	31.8	33.5	45.6	39.3	26.1	41.7
8	26.0	18.7	99.5	38.2	61.8	45.4	101.8	56.7	56.5	42.1	45.7	76.3	45.8	17.2	38.6	19.6	12.0	15.0
9	2.9	0.4	27.7	4.0	7.2	3.1	19.6	13.9	4.4	3.3	6.6	7.6	9.1	1.7	4.9	2.8	2.7	1.5
10	0.2	0.0	4.2	0.1	0.9	0.1	5.3	2.0	0.1	0.3	0.5	0.6	0.4	0.1	0.4	0.0	0.0	0.0
11	0.0	0.1	0.3	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1+	305.3	306.6	320.8	237.0	269.1	340.3	273.9	280.8	316.2	205.5	190.5	168.2	99.7	132.2	149.5	134.2	84.4	123.9
2+	305.3	306.6	320.8	237.0	269.1	340.3	273.9	280.7	316.2	205.5	190.5	168.2	99.7	132.2	149.5	134.2	84.4	123.9
3+	305.3	306.6	320.8	236.8	269.0	340.2	273.9	279.3	316.2	205.5	190.5	168.2	99.6	132.0	149.5	134.1	84.3	123.9
4+	304.5	302.7	320.6	233.9	268.1	335.2	272.8	273.8	315.9	204.8	190.4	168.1	99.5	129.6	148.7	133.7	83.3	123.4
5+	291.8	286.2	317.5	224.0	262.1	324.1	270.8	255.0	312.4	202.3	188.6	167.6	98.3	105.8	140.9	128.1	78.1	115.8
6+	228.0	212.4	298.9	185.8	249.5	286.2	262.0	216.4	286.0	189.4	176.8	161.2	96.7	79.9	118.8	101.0	67.1	97.4
7+	135.9	111.7	253.4	115.4	199.2	188.5	224.1	160.3	192.0	136.6	146.5	141.0	87.1	52.5	89.5	61.7	40.8	58.2
8+	29.1	19.2	131.7	42.3	69.9	48.6	126.7	72.9	61.0	45.7	52.8	84.5	55.3	19.0	43.9	22.4	14.7	16.5
9+	3.1	0.5	32.2	4.1	8.1	3.2	24.9	16.2	4.5	3.6	7.1	8.2	9.5	1.8	5.3	2.8	2.7	1.5

Table 17. Biomass estimates ('000 t) of yellowtail, by stratum, from fall R.V. surveys in Div. 3LNO from 1990 to 1993.

	1990	1991	1992	1993
Div. 3L (Total)	1.3	0.6	0.6	0.7
Div. 3N				
360	2.9	4.3	5.3	14.0
361	6.4	11.1	15.6	19.3
362	4.4	4.1	0.6	0.2
375	1.7	3.3	-	5.4
376	12.5	4.5	4.1	15.7
Other	0.1	0.4	0.0	0.0
Total	28.1	27.7	25.7	54.6
Div. 3Ø				
329-332	0.4	0.6	0.3	1.2
337-340	1.0	4.0	0.2	0.9
351	3.5	1.4	0.1	3.2
352	4.6	13.3	10.9	5.5
353	1.6	0.0	0.0	0.4
Total	11.2	19.3	11.6	11.2
Div. 3LNØ Total	40.6	47.6	37.9	66.5

TABLE 18. Abundance (millions) of yellowtail from Canadian fall surveys in Div. 3LNO.

AGE	1990	1991	1992	1993
1	0.0	0.0	0.0	0.0
2	0.1	0.1	0.1	0.0
3	2.2	2.4	1.2	0.7
4	5.9	6.6	5.9	22.3
5	16.9	15.1	10.0	35.6
6	22.9	33.8	18.5	46.2
7	30.3	36.0	31.1	40.6
8	13.4	20.9	17.6	13.8
9	1.4	2.2	2.8	0.8
10	0.0	0.0	0.0	0.0
1+	93.1	117.1	87.2	160.0
2+	93.1	117.1	87.2	160.0
3+	93.0	117.0	87.1	160.0
4+	90.8	114.6	85.9	159.3
5+	84.9	108.0	80.0	137.0
6+	68.0	92.9	70.0	101.4
7+	45.1	59.1	51.5	55.2
8+	14.8	23.1	20.4	14.6
9+	1.4	2.2	2.8	0.8

Table 19. Mean numbers and weight (kg) of yellowtail per tow, by stratum from r.v. juvenile surveys in Division 3L. Numbers in parentheses are the number of successful 30-minute tows in each stratum. The stratified mean number and weight per tow (kg/30 min.), abundance (millions), and biomass (t x 10^{-3}) are shown at the bottom of the table.

Depth (fm)	Stratum	Category	Year								
			1985	1986	1987	1988	1989	1990	1991	1992	1993
51-100	328	Av.No./set	-	-	-	-	0.00(3)	-	0.00(5)	0.00(3)	0.00(3)
		Av.wt./set									
51-100	341	Av.No./set	-	-	-	-	0.00(4)	0.00(5)	0.00(4)	0.00(5)	0.00(5)
		Av.wt./set									
51-100	342	Av.No./set	-	-	-	-	0.00(2)	-	-	0.00(2)	0.00(2)
		Av.wt./set									
51-100	343	Av.No./set	-	-	-	-	0.00(2)	-	0.00(2)	0.00(2)	0.00(2)
		Av.wt./set									
101-150	344	Av.No./set	-	-	-	-	-	-	-	0.00(2)	0.00(3)
		Av.wt./set									
101-150	347	Av.No./set	-	-	-	-	-	-	-	0.00(2)	0.00(3)
		Av.wet./set									
51-100	348	Av.No./set	-	-	-	-	0.00(7)	0.00(4)	0.00(7)	0.00(12)	0.00(11)
		Av.wt./set									
51-100	349	Av.No./set	-	-	-	-	0.00(5)	0.00(7)	0.00(7)	0.00(8)	0.00(7)
		Av.wt./set									
31-50	350	Av.No./set	59.00(5)	7.83(6)	-	37.97(5)	0.88(8)	0.00(4)	1.37(8)	0.50(6)	0.43(7)
		Av.wt./set	25.50	3.58		3.70	0.49		0.58	0.24	0.20
31-50	363	Av.No./set	53.80(5)	48.89(5)	-	42.47(6)	13.71(7)	7.25(4)	15.99(4)	13.60(5)	17.40(5)
		Av.wt./set	21.00	22.77		19.65	7.54	3.39	8.06	6.67	8.84

Table 19. (Cont'd).

Depth (fm)	Stratum	Category	Year 1985	1986	1987	1988	1989	1990	1991	1992	1993
51-100	364	Av.No./set	-	-	-	-	0.00(11)	0.00(5)	0.00(6)	0.00(17)	0.13(16)
		Av.wt./set									0.03
51-100	365	Av.No./set	-	-	-	-	0.00(4)	0.00(3)	0.00(4)	0.00(6)	0.00(6)
		Av.wt./set									
101-150	366	Av.No./set	-	-	-	-	-	-	-	0.00(3)	0.00(2)
		Av.wt./set									
101-150	369	Av.No./set	-	-	-	-	-	-	-	0.00(3)	0.00(3)
		Av.wt./set									
51-100	370	Av.No./set	-	-	-	-	0.00(6)	0.00(3)	24.98(3)	0.00(8)	0.00(7)
		Av.wt./set							0.48		
31-50	371	Av.No./set	2.25(4)	-	-	1.20(5)	6.50(4)	4.00(3)	-	1.08(3)	0.33(3)
		Av.wt./set	1.88			0.70	3.70	1.95		0.65	0.08
31-50	372	Av.No./set	93.06(9)	101.00(8)	-	64.83(8)	41.00(8)	78.75(4)	58.21(4)	34.67(6)	5.60(10)
		Av.wt./set	39.49	48.13		34.31	20.21	40.21	27.57	9.25	2.72
31-50	384	Av.No./set	35.25(4)	-	-	1.00(5)	0.25(4)	0.50(2)	0.00(3)	0.00(4)	0.75(4)
		Av.wt./set	22.88			0.18	0.13	0.47			0.45
51-100	385	Av.No./set	-	-	-	-	0.00(5)	0.00(4)	0.00(6)	0.00(13)	0.00(12)
		Av.wt./set									
101-150	386	Av.No./set	-	-	-	-	-	-	-	0.00(3)	0.00(3)
		Av.wt./set									

Table 19. (Cont'd).

Depth (fm)	Stratum	Category	Year 1985	1986	1987	1988	1989	1990	1991	1992	1993
101-150	389	Av.No./set	-	-	-	-	-	-	-	0.00(3)	0.00(3)
		Av.wt./set									
51-100	390	Av.No./set	-	-	-	-	0.00(4)	0.00(3)	0.00(4)	0.00(4)	0.00(4)
		Av.wt./set									
101-150	391	Av.No./set	-	-	-	-	-	-	-	0.00(2)	0.00(2)
		Av.wt./set									
Mean No./set (# sets)			57.16(27)	55.73(19)	(0)	29.53(29)	5.18(84)	9.06(51)	7.64(67)	3.39(122)	1.43(123)
Abundance (Nos x 10^{-6})			52.0	37.4		26.9	14.3	22.5	19.7	11.9	5.02
Mean wt./set			25.15	26.36		14.98	2.63	4.61	3.44	1.09	0.71
Biomass ('000t)			22.9	17.7		13.6	7.3	11.4	8.9	3.8	2.5

Table 20. Mean numbers and weight (kg) of yellowtail per tow, by stratum from r.v. juvenile surveys in Division 3N. Numbers in parentheses are the number of successful 30-minute tows in each stratum. The stratified mean number and weight per tow (kg/30 min.), abundance (millions), and biomass (t x 10^{-3}) are shown at the bottom of the table.

Depth (fm)	Stratum	Category	Year 1985	1986	1987	1988	1989	1990	1991	1992	1993
101-15	358	Av.No./set Av.Wt./set	-	-	-	-	-	-	-	0.00(2)	-
51-100	359	Av.No./set Av.wt./set	-	-	-	-	0.00(2)	0.00(3)	0.00(4)	0.00(3)	0.00(3)
31-50	360	Av.No./set Av.wt./set	57.67(3) 26.83	259.14(14) 19.96	192.22(19) 12.75	112.51(20) 22.73	373.03(19) 46.28	392.00(21) 58.37	456.87(18) 75.37	332.50(16) 59.95	457.92(14) 89.25
31-50	361	Av.No./set Av.wt./set	99.83(6) 33.58	188.50(8) 61.78	399.94(8) 174.37	162.38(6) 62.29	286.33(9) 107.86	379.63(10) 133.26	521.72(8) 172.86	431.63(8) 156.88	714.92(8) 266.33
31-50	362	Av.No./set Av.wt./set	166.89(9) 59.50	109.14(7) 43.14	38.00(2) 16.75	129.29(6) 57.64	103.13(8) 45.31	79.40(9) 40.37	292.89(7) 126.99	40.17(6) 18.09	71.18(8) 33.93
31-50	373	Av.No./set Av.wt./set	160.80(10) 75.60	112.93(7) 49.60	-	29.85(8) 15.74	32.25(8) 15.38	14.78(9) 8.67	1.13(7) 0.78	1.00(5) 0.43	7.63(8) 3.68
31-50	374	Av.No./set Av.wt./set	16.00(4) 7.50	12.00(4) 6.38	-	5.25(4) 3.63	0.33(3) 0.17	0.75(4) 0.15	0.00(2) 0.00	7.00(3) 3.67	0.25(4) 0.19
≤ 30	375	Av.No./set Av.wt./set	228.29(7) 104.14	236.65(5) 115.19	407.26(7) 43.22	146.44(9) 25.67	284.88(8) 88.88	266.65(11) 73.25	450.51(7) 144.79	458.33(11) 169.22	157.01(10) 84.80
≤ 30	376	Av.No./set Av.wt./set	148.50(2) 47.75	325.75(4) 150.46	1015.22(10) 58.55	363.72(12) 38.79	916.22(9) 160.04	1505.36(11) 206.24	1658.82(10) 160.03	475.13(8) 58.53	701.78(9) 127.06
51-100	377*	Av.No./set Av.wt./set	-	-	-	-	-	-	-	-	0.00(2)
101-150	381*	Av.No./set Av.wt./set	-	-	-	-	-	-	-	-	0.00(2)
51-100	382	Av.No./set Av.wt./set	-	-	-	-	0.00(2)	0.00(3)	0.00(3)	0.00(2)	0.00(2)
31-50	383	Av.No./set Av.wt./set	0.00(4)	-	-	2.00(4) 0.32	0.00(3)	0.00(3)	0.00(4)	0.00(2)	0.00(2)
Mean No./set (# sets)			122.37(45)	184.12(49)	342.85(46)	125.06(69)	243.79(71)	306.43(84)	401.52(70)	210.85(66)	263.35(72)
Abundance (Nos x 10^{-6})			189.9	272.2	381.1	193.9	405.6	509.8	667.7	355.8	446.0
Mean wt./set			50.52	59.17	53.60	32.32	55.78	62.05	85.58	55.27	74.13
Biomass ('000t)			78.2	85.4	59.6	56.1	92.7	103.2	142.4	93.3	125.5

*New strata in 1993.

Table 21. Mean numbers and weight (kg) of yellowtail per tow, by stratum from r.v. surveys in Division 3Ø. Numbers in parentheses are the number of successful 30-minute tows in each stratum. The stratified mean number and weight per tow (kg/30 min.), abundance (millions), and biomass (t x 10^{-3}) are shown at the bottom of the table.

Depth (fm)	Stratum	Category	Year 1985	1986	1987	1988	1989	1990	1991	1992	1993
51–100	329	Av.No./set Av.Wt./set	–	–	–	–	0.00(4)	–	0.00(6)	2.50(6) 1.02	0.00(5)
31–50	330	Av.No./set Av.wt./set	–	–	–	10.99(2) 5.50	6.87(7) 3.54	37.14(7) 18.20	4.00(6) 1.65	53.40(5) 29.16	3.40(5) 1.32
31–50	331	Av.No./set Av.wt./set	–	–	–	0.50(2) 0.25	12.50(2) 7.75	19.00(2) 10.56	8.99(3) 4.91	4.00(2) 1.48	1.51(2) 1.80
51–100	332	Av.No./set Av.wt./set	–	–	–	–	6.50(4) 3.75	7.00(2) 1.88	27.98(4) 12.48	0.00(4)	3.50(4) 1.43
101–150	333[a]	Av.No./set Av.wt./set	–	–	–	–	–	–	–	–	0.00(2)
101–150	336[a]	Av.No./set Av.wt./set	–	–	–	–	–	–	–	–	0.00(2)
51–100	337	Av.No./set Av.wt./set	–	–	–	–	0.00(2)	10.67(3) 2.82	1.25(4) 0.39	1.25(4) 0.17	15.00(4) 5.91
31–50	338	Av.No./set Av.wt./set	–	86.67(3) 41.17	–	18.99(6) 9.58	48.50(6) 20.12	9.25(4) 3.89	9.83(6) 4.21	33.75(4) 17.96	81.00(4) 35.55
51–100	339	Av.No./set Av.wt./set	–	–	–	–	0.00(2)	0.00(3)	4.50(4) 8.17	4.50(4) 0.34	0.75(4) 0.25
31–30	340	Av.No./set Av.wt./set	–	–	–	7.59(3) 2.85	33.50(6) 15.33	6.71(7) 3.16	29.18(5) 11.82	9.75(4) 3.88	4.33(3) 1.79
31–50	351	Av.No./set Av.wt./set	166.00(3) 63.67	175.78(9) 66.00	–	85.93(7) 28.68	69.38(8) 29.31	99.42(9) 43.95	41.40(7) 18.90	63.66(7) 27.60	72.38(8) 32.89
31–50	352	Av.No./set Av.wt./set	–	210.77(13) 73.68	134.00(1) 65.35	167.78(11) 58.81	206.93(14) 77.43	158.95(16) 66.01	231.96(16) 80.02	352.08(13) 97.62	457.85(13) 155.71
31–50	353	Av.No./set Av.wt./set	–	118.00(5) 68.75	–	19.24(4) 9.19	21.67(3) 10.33	0.00(4)	86.73(5) 37.86	6.25(4) 2.84	7.25(4) 3.80
51–100	354	Av.No./set Av.wt./set	–	–	–	–	0.00(2)	0.00(3)	0.00(3)	0.00(4)	0.00(3)
Mean No./set (# sets)			166.00(3)	157.31(30)	. (1)	58.68(35)	57.72(60)	50.88(60)	53.09(69)	59.13(61)	88.71(63)
Abundance (Nos x 10^{-6})			44.5	138.5		78.2	97.0	84.3	97.7	108.8	165.8
Mean wt./set			63.67	63.13		21.58	21.15	21.88	20.05	24.80	32.43
Biomass ('000t)			17.1	52.4		28.8	38.9	36.3	36.9	60.4	60.6

[a]New strata in 1993.

Table 22. A comparison of average numbers and weights of yellowtail flounder per 30-minute tows from day, night, and combined juvenile surveys from 1986 to 1993. Selected strata in Div. 3NØ used. Abundance and biomass are given at the bottom of the table.

Selected strata	Category	1986			1987			1988			1989			1990		
		Day	Night	Combined	Day	Night	Combined	Day	Night	Combined	Day	Night	Combined	Day	Night	Combined
352	No. of sets	7	6	13	-	-	-	6	5	11	4	10	14	11	5	16
	Av. no./set	78.29	365.33	210.77				60.67	290.00	164.91	115.25	243.6	206.93	184.47	102.80	158.95
	Av. wt./set	37.86	115.47	72.68				26.75	97.37	58.85	48.88	88.85	77.43	81.04	32.95	66.01
360	No. of sets	7	7	14	7	12	19	11	8	20	12	7	19	11	10	21
	Av. no./set	20.57	497.71	259.14	24.57	290.25	192.22	39.18	227.63	112.60	540.72	85.55	373.03	152.00	656.00	392.00
	Av. wt./set	5.50	34.43	19.96	2.72	18.61	12.75	10.89	41.89	22.75	61.42	20.31	46.28	25.80	94.20	58.37
361	No. of sets	4	4	8	4	4	8	2	4	6	6	3	9	3	7	10
	Av. no./set	160.00	217.00	188.50	146.75	653.75	399.94	137.00	175.25	162.50	197.33	464.33	286.33	404.75	368.86	379.63
	Av. wt./set	72.81	50.75	61.78	69.25	279.75	174.37	77.00	55.00	62.33	93.25	137.07	107.86	177.94	114.12	133.26
375	No. of sets	2	3	5	3	4	7	6	3	9	5	3	8	4	7	11
	Av. no./set	4.10	391.69	236.65	29.33	691.25	407.26	19.33	401.00	146.56	161.20	491.00	284.88	47.50	391.89	266.65
	Av. wt./set	1.40	191.05	115.19	14.75	64.63	43.22	9.69	57.70	25.69	70.10	120.17	88.88	14.69	106.70	73.25
376	No. of sets	3	1	4	3	7	10	7	5	12	5	4	9	5	6	11
	Av. no./set	69.67	-	325.76	109.67	1404.23	1015.22	148.57	665.60	364.00	456.20	1491.25	916.22	1076.2	1863.0	1505.36
	Av. wt./set	19.70	-	150.46	22.00	74.27	58.22	16.13	50.59	38.82	69.50	273.22	160.04	154.47	249.38	206.24
Total	No. of sets	23	20	44	17	27	44	32	25	58	32	27	59	34	35	69
	Av. no./set	67.36	385.95	240.92	70.12	692.37	439.31	74.24	322.28	175.20	306.31	452.83	381.08	320.4	601.73	472.35
	Av. wt./set	28.55	85.50	73.53	24.31	78.55	65.24	26.99	64.30	41.32	66.42	108.87	87.44	82.8	106.70	96.77
Abundance (millions)		71.1	367.3	269.3	59.1	561.9	370.9	83.0	360.4	195.8	342.4	506.2	426.0	358.2	672.7	528.1
Biomass (000s t)		57.8	84.7	82.2	20.5	83.8	55.0	30.2	71.9	46.1	74.2	121.7	97.7	92.6	119.3	108.2

Table 22. (Cont'd.)

Selected strata	Category	1991 Day	1991 Night	1991 Combined	1992 Day	1992 Night	1992 Combined	1993 Day	1993 Night	1993 Combined
352	No. of sets	7	9	16	7	6	13	8	5	13
	Av. no./set	133.19	309.09	232.14	257.43	250.17	254.08	250.50	786.60	457.85
	Av. wt./set	59.69	95.93	80.08	90.39	106.05	97.62	118.09	215.90	155.71
360	No. of sets	10	8	18	10	6	16	9	5	14
	Av. no./set	371.10	564.88	457.22	220.20	503.00	332.50	89.88	1120.40	457.97
	Av. wt./set	66.33	86.79	75.43	49.72	76.98	59.95	28.15	199.23	89.25
361	No. of sets	5	3	8	6	2	8	4	4	8
	Av. no./set	306.0	882.33	522.13	249.00	979.50	431.63	549.00	880.84	714.92
	Av. wt./set	113.10	272.49	172.99	103.75	316.73	156.88	236.55	296.12	266.33
375	No. of sets	4	3	7	6	5	11	6	4	10
	Av. no./set	320.5	624.67	450.86	113.93	871.60	458.33	176.68	127.50	157.01
	Av. wt./set	134.10	159.31	144.90	57.97	302.73	169.22	96.84	66.75	84.80
376	No. of sets	7	3	10	4	4	8	6	3	9
	Av. no./set	1241.86	2636.0	1660.10	117.00	833.45	475.13	198.00	1709.33	701.78
	Av. wt./set	143.7	198.54	160.16	21.83	95.24	58.53	40.76	299.71	127.06
Total	No. of sets	33	26	59	33	23	56	33	21	54
	Av. no./set	417.71	862.32	583.92	206.45	627.83	370.11	238.73	930.59	492.36
	Av. wt./set	94.27	148.66	116.36	66.49	163.07	102.62	99.13	214.65	141.47
Abundance (millions)		467.0	964.0	652.8	230.8	701.9	413.8	266.9	1040.3	550.4
Biomass (000s t)		105.4	166.2	130.1	74.3	182.3	114.7	110.8	240.00	158.1

Table 23. Average numbers per tow at age of yellowtail from selected strata in juvenile surveys of NAFO Division 3NO (strata 352, 360, 361, 375, and 376) 1986-93.

Age	1986	1987*	1988	1989	1990	1991	1992	1993
1	21.48	30.48	5.67	3.68	4.33	0.30	2.66	3.5
2	16.95	113.11	15.01	17.88	42.22	30.80	4.77	33.3
3	27.29	88.50	40.07	40.20	76.71	184.53	61.94	43.6
4	10.05	80.17	27.81	125.86	90.74	75.49	67.50	77.9
5	18.99	20.09	17.27	62.01	139.22	107.27	63.95	111.8
6	41.41	19.05	18.19	43.82	54.33	90.41	70.65	89.2
7	53.87	37.65	31.45	58.22	38.43	53.05	59.63	80.5
8	41.66	46.10	17.47	24.57	22.25	35.73	30.24	42.8
9	8.07	4.40	2.37	2.87	2.71	9.12	5.73	9.2
10	0.62	0.12	0.02	0.09	0.15	0.00	0.00	0.0
11	0.08	0.00	0.00	0.01	0.04	0.00	0.00	0.0
Av. no./tow	240.47	439.67	175.33	379.21	471.12	586.70	367.27	492.3

*Incomplete survey, stratum 352 not surveyed.

Table 24. Abundance (Nos x 10^{-6}) at age of yellowtail from selected strata in Div. 3NO estimated from juvenile surveys (strata 352, 360, 361, 375, and 376) from 1986-93.

Age	1986	1987[a]	1988	1989	1990	1991	1992	1993
1	24.0	25.7	6.3	4.1	4.8	0.3	2.9	3.9
2	18.9	95.4	16.8	20.0	47.2	34.4	5.3	37.3
3	30.5	74.7	44.8	44.9	85.8	206.3	69.2	48.7
4	11.2	67.6	31.1	140.7	101.4	84.4	75.5	87.1
5	21.2	17.0	19.3	69.3	155.6	119.9	71.5	125.0
6	46.3	16.1	20.3	49.0	60.7	101.1	78.9	99.7
7	60.3	31.8	35.2	65.1	43.0	59.3	66.7	90.0
8	46.6	38.9	19.5	27.5	24.9	39.9	33.8	47.8
9	9.0	3.7	2.7	3.2	3.0	10.2	6.4	10.4
10	0.7	0	0	0	0.2	0	0	0
Total 1+	268.7	370.9	196.0	423.8	526.6	655.8	410.6	550.4
5+	184.1	107.5	97.1	214.1	287.4	330.4	257.3	372.9
7+	116.5	74.4	57.4	95.9	71.1	109.4	106.9	148.2
1 to 4	84.6	263.4	99.0	209.7	239.2	325.4	152.9	177.0

[a]Incomplete survey; stratum 352 not surveyed.

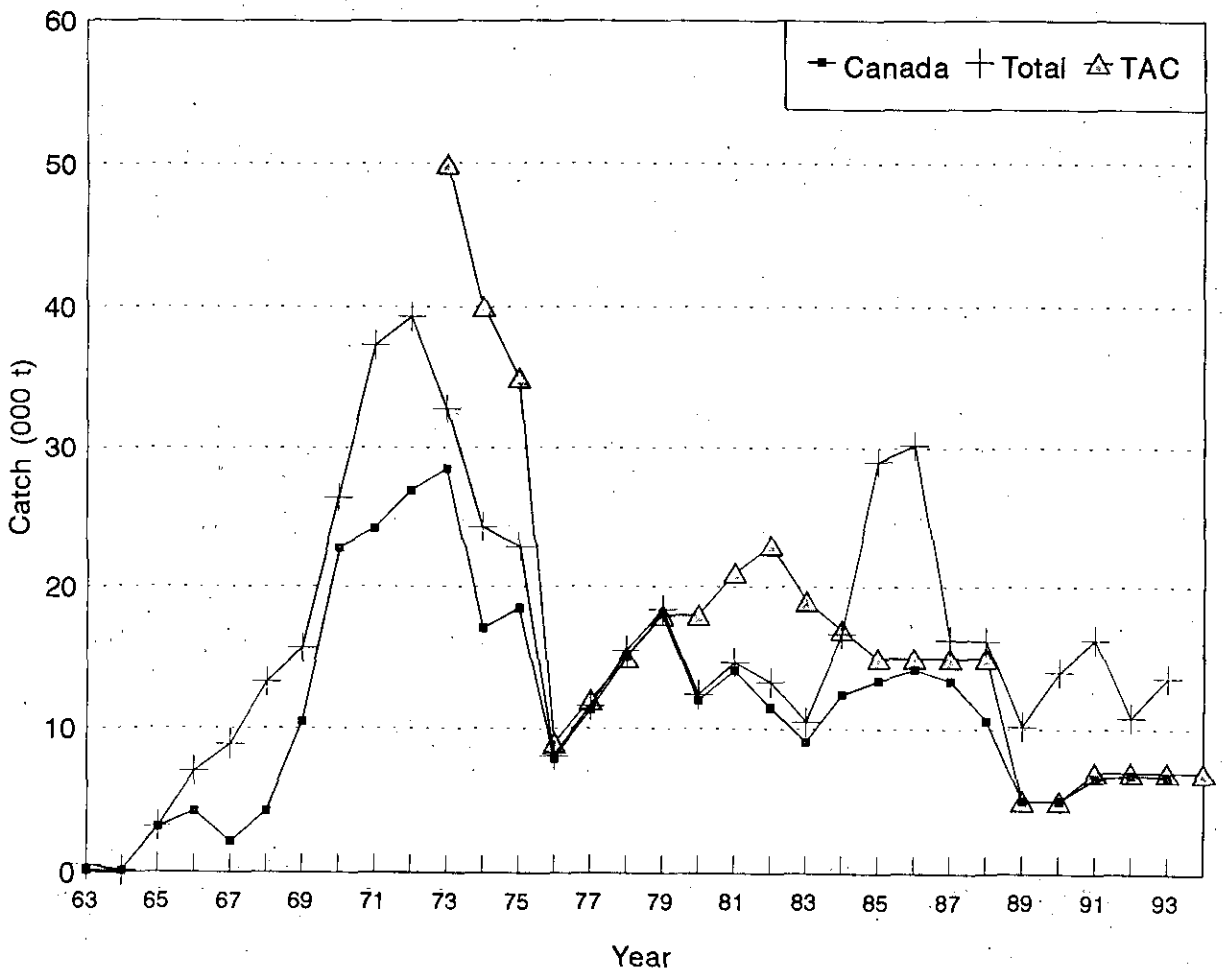

Fig. 1. Catches and TAC's of yellowtail in Div. 3LNO.

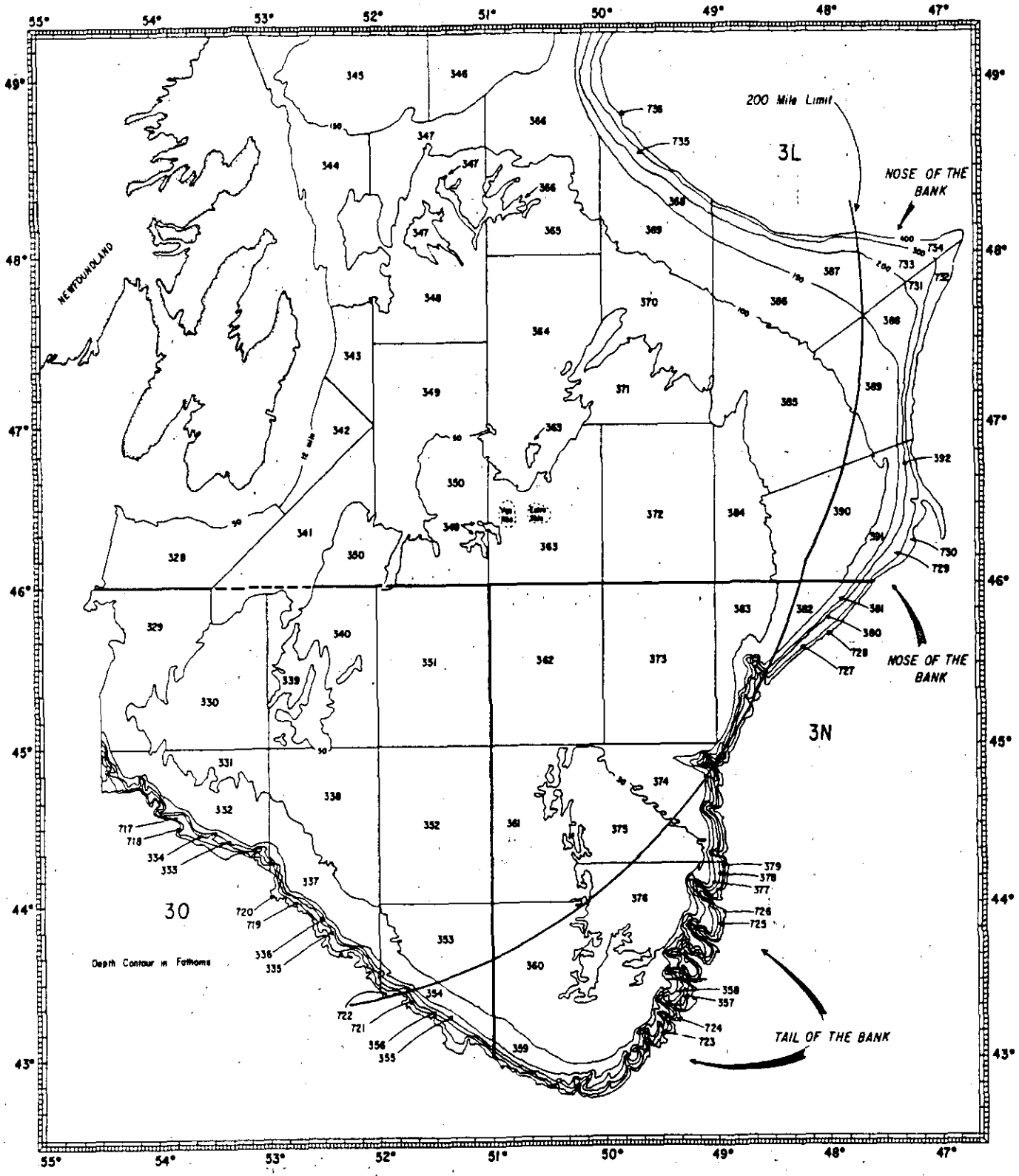

Fig. 2. Grand Banks, NAFO Div. 3LNO, showing the Canadian 200 mile limit in relation to the Nose and Tail of the Bank as well as the stratification scheme used in Canadian groundfish surveys.

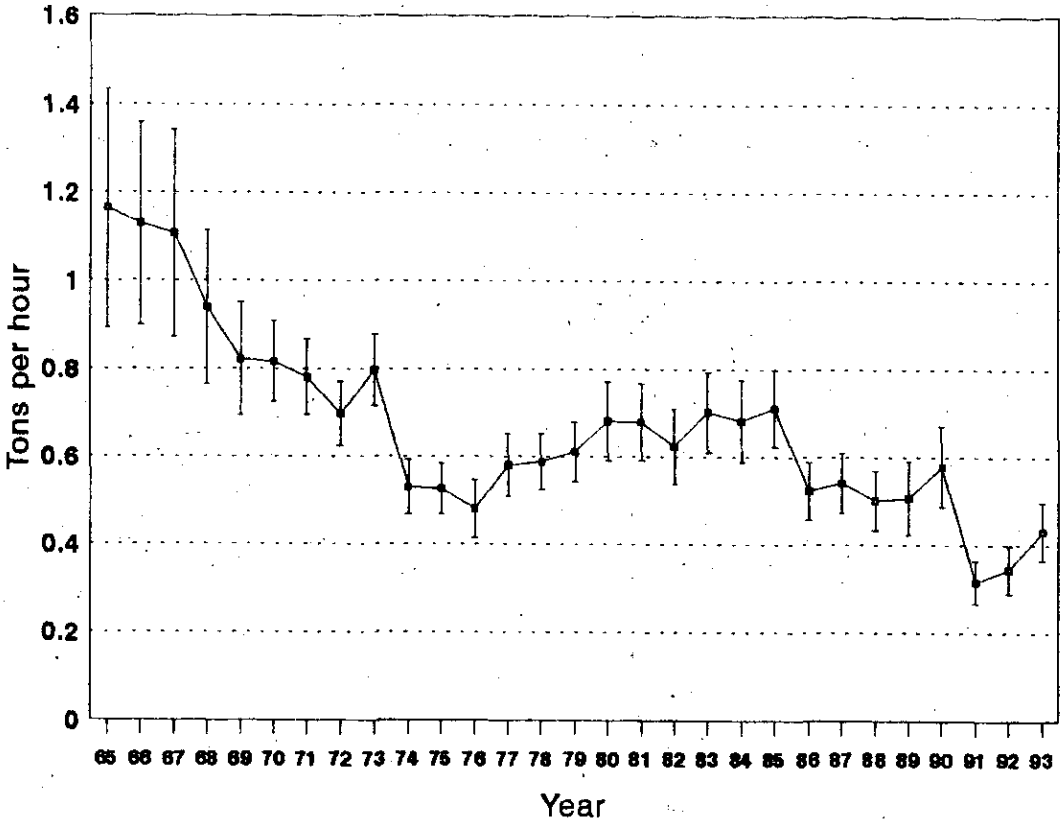

Fig. 3 Standardized CPUE with approximate 95% confidence intervals for Yellowtail flounder in Div. 3LNO from 1965-1993.

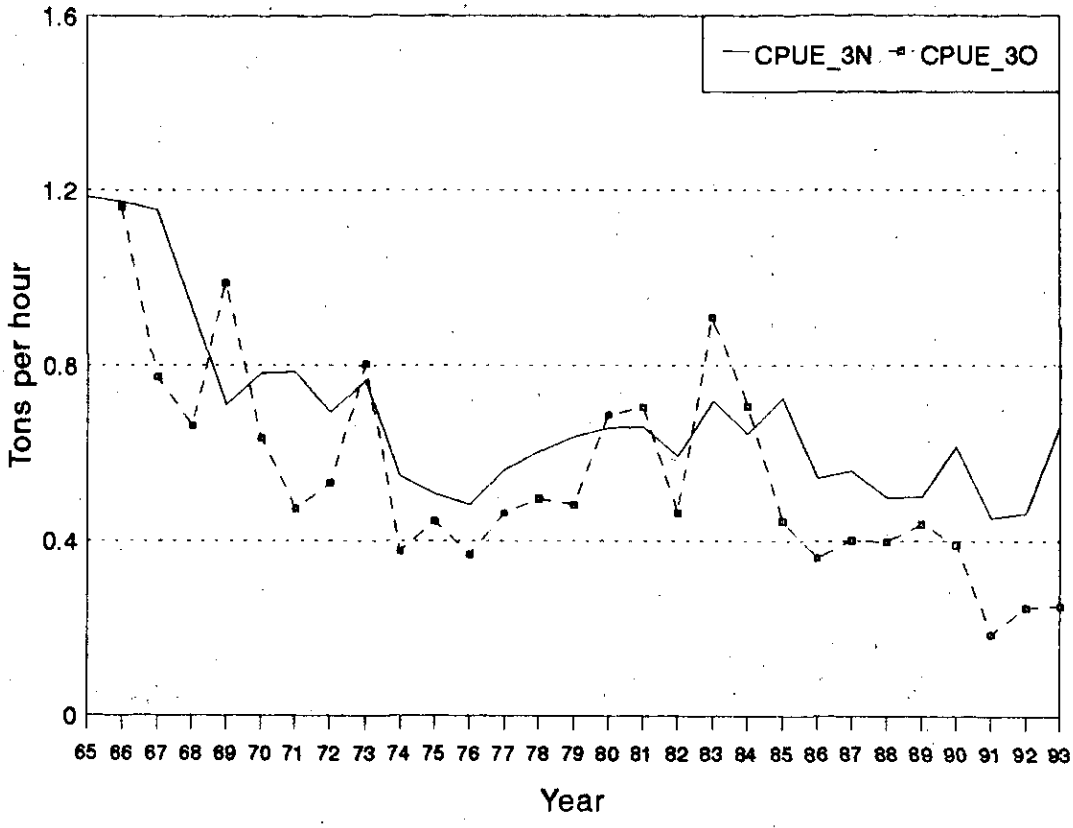

Fig. 4 Standardized CPUE for Yellowtail flounder in Div. 3N and Div. 30 based on separate analyses for each division.

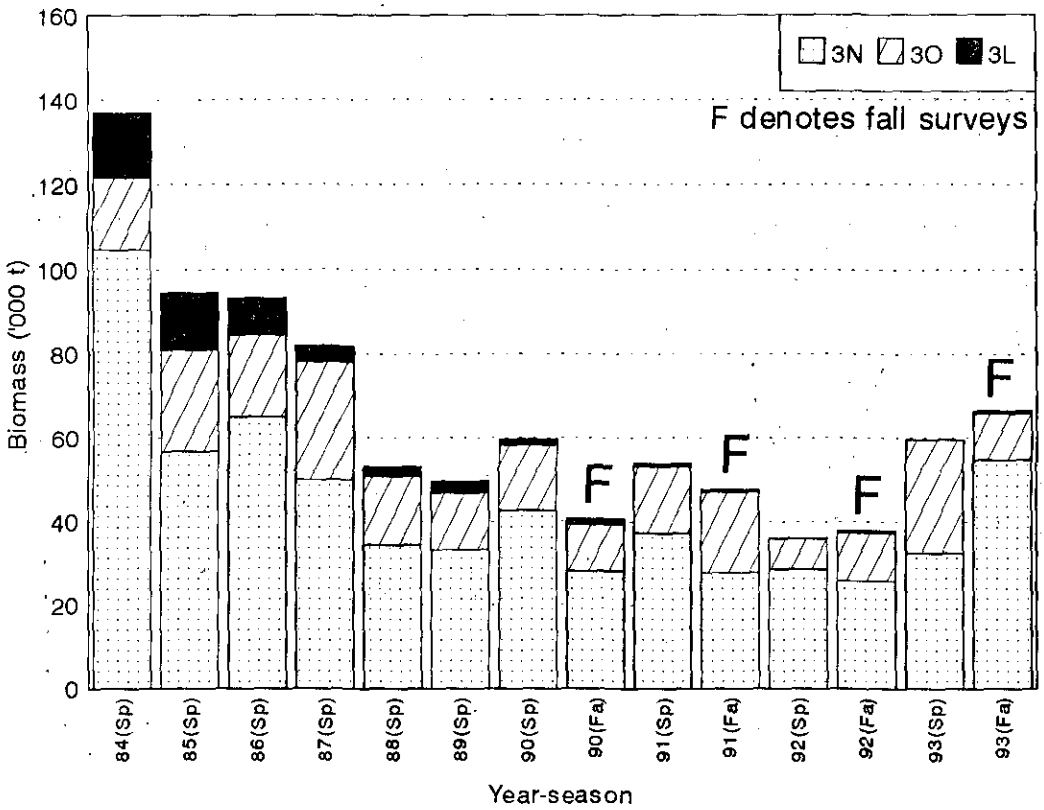

Fig. 5 . Biomass of yellowtail flounder from Canadian RV surveys conducted in spring and fall in Div. 3LNO.

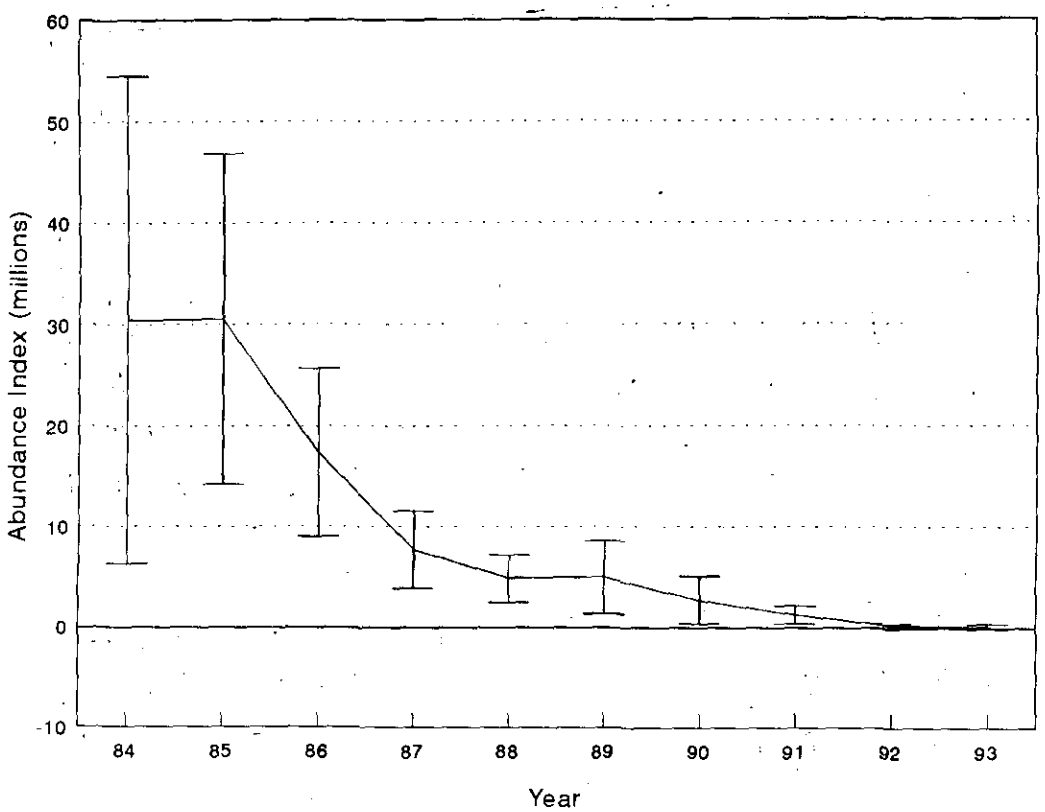

Fig. 6 . Abundance estimates of yellowtail (with 95% C.I.) from Canadian spring surveys in Div.3L.

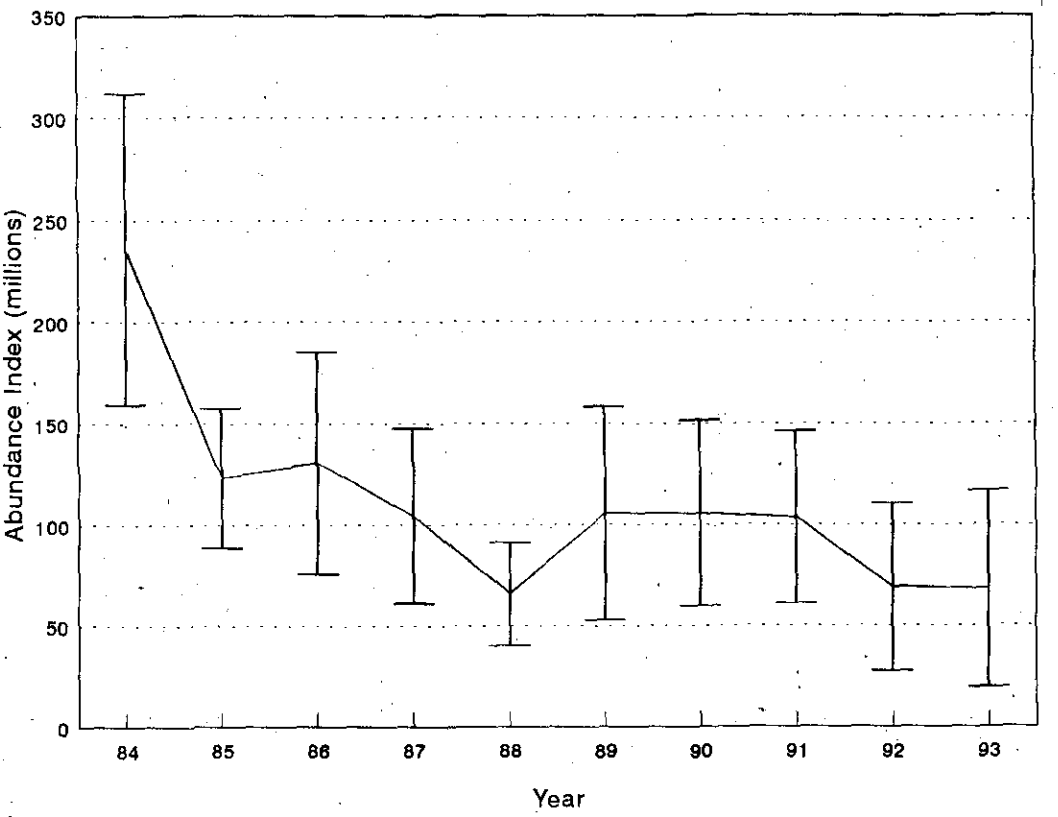

Fig. 7 . Abundance estimates of yellowtail (with 95% C.I.) from Canadian spring surveys in Div.3N.

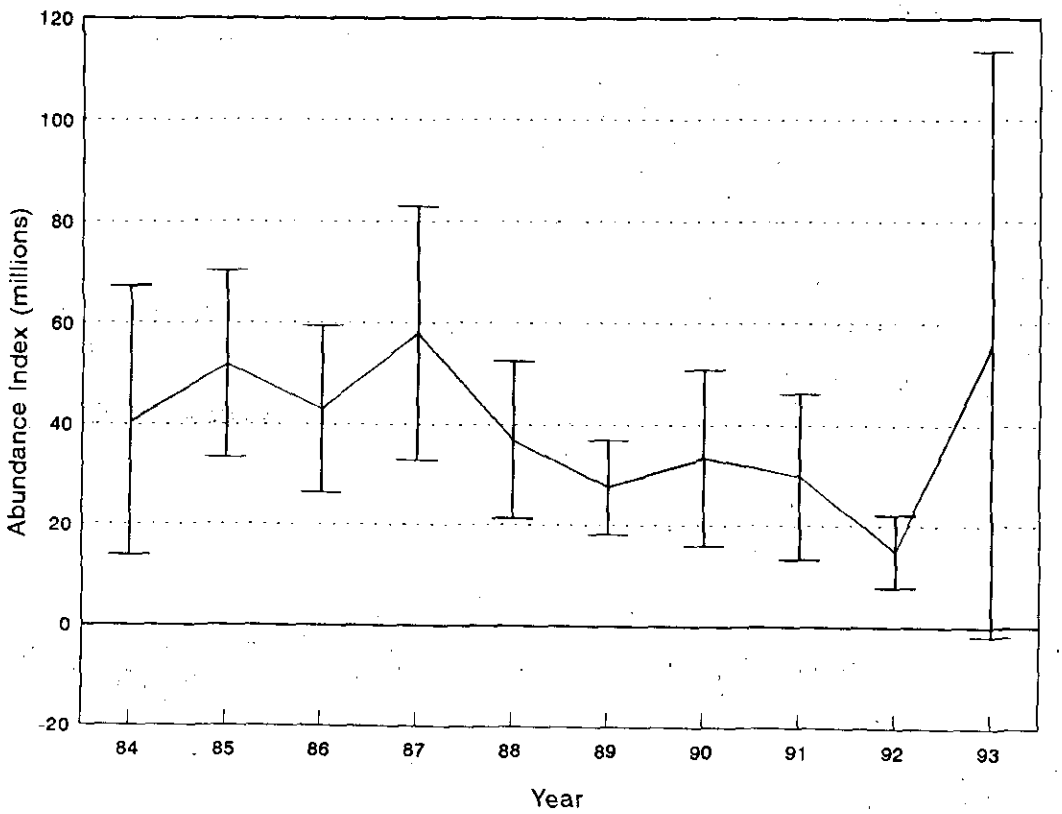

Fig. 8 . Abundance estimates of yellowtail (with 95% C.I.) from Canadian spring surveys in Div.3O.

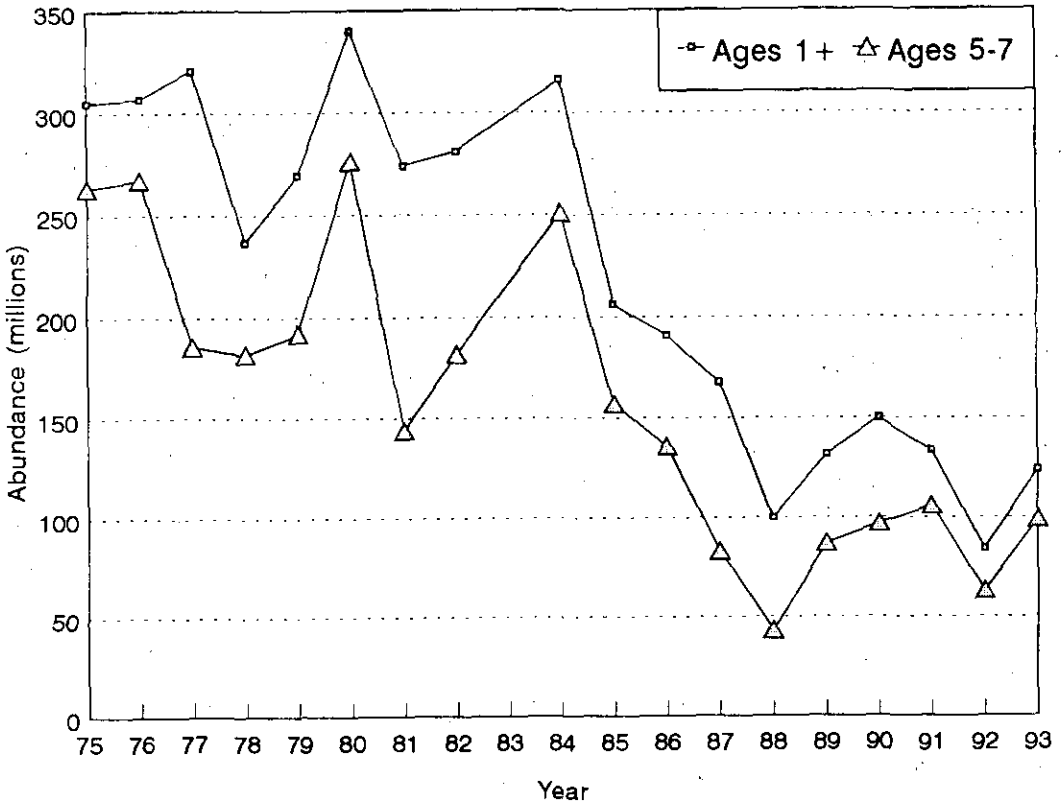

Fig. 9a. Abundance of yellowtail in Div. 3LNO as measured by Canadian spring RV surveys.

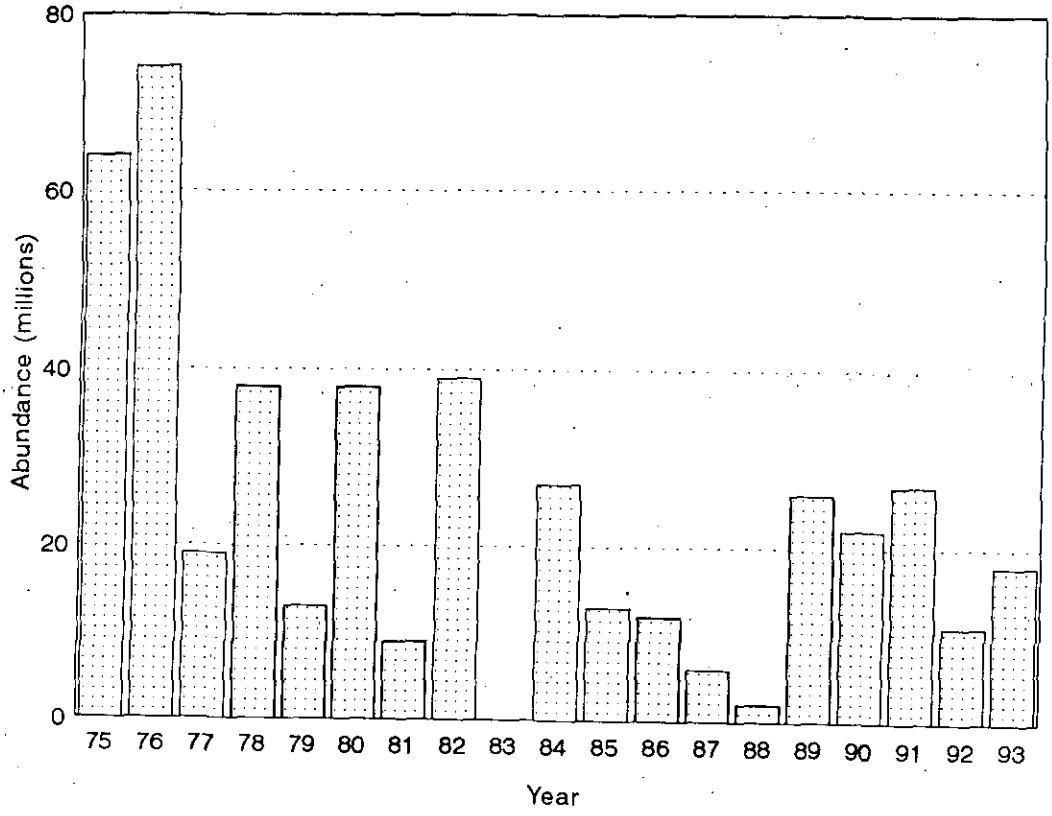

Fig. 9b. Abundance at age 5 from Canadian spring RV surveys in Div 3LNO.

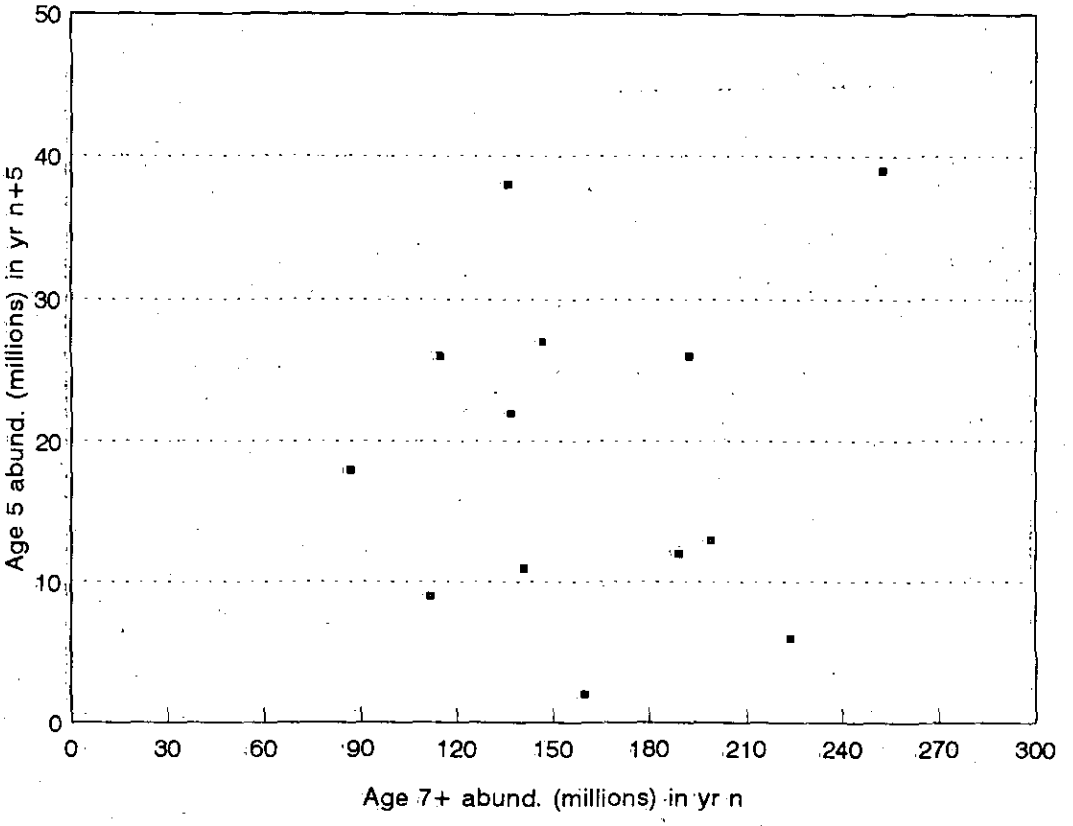

Fig. 10. Regression of age 5 abundance (yr n+5) from spring surveys against age 7+ abundance (yr n, 1975-88) from spring surveys, Div. 3LNO.

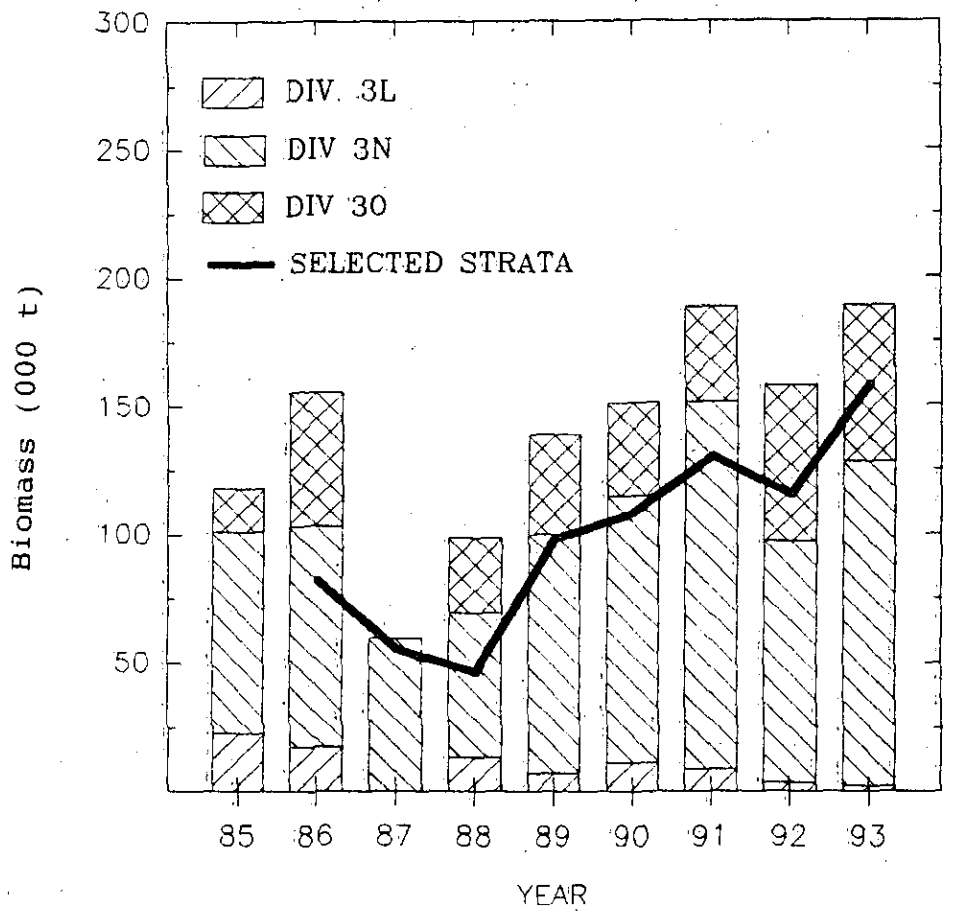

Fig.11Trends in biomass of yellowtail from the Canadian juvenile surveys of the Grand Bank (Selected Strata: 352 in Div. 30, 360, 361, 375 & 376 in Div. 3N).

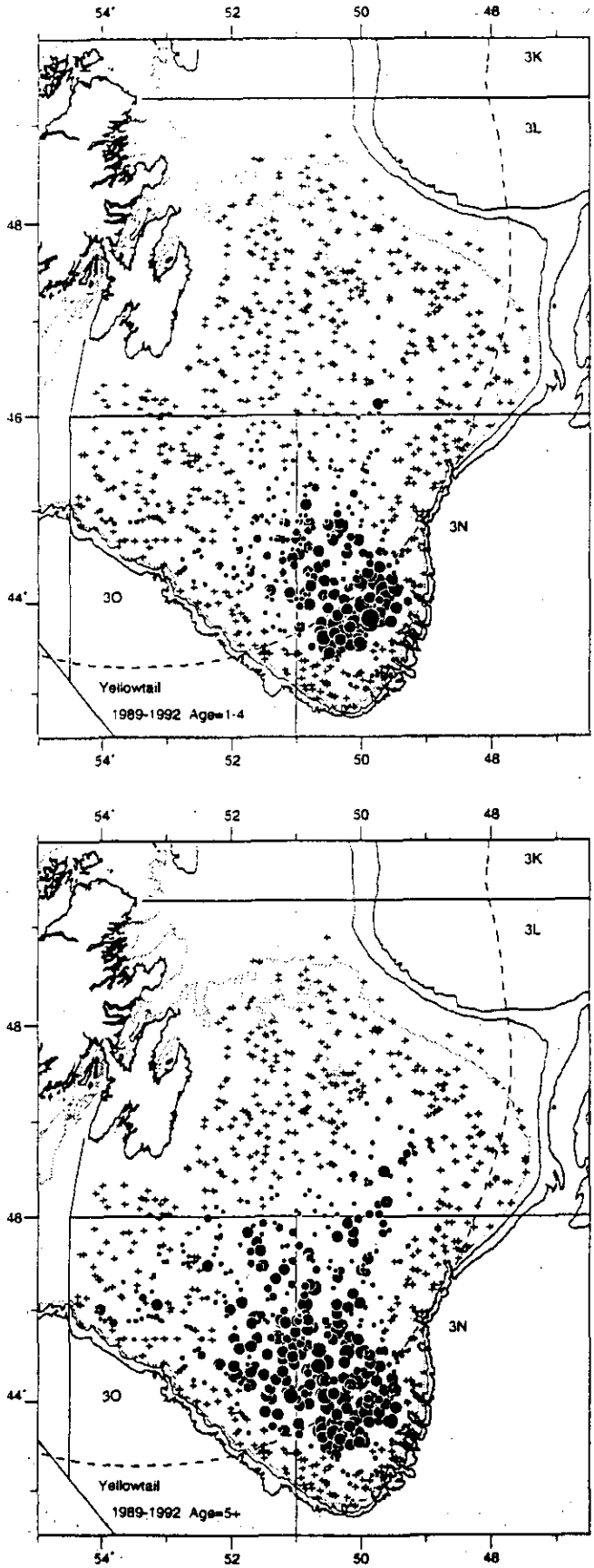

Fig. 12. Distribution of yellowtail catches from 1989-1992 (combined) Canadian juvenile flatfish surveys in Div. 3LNO. Plots are for ages 1-4 and ages 5+.

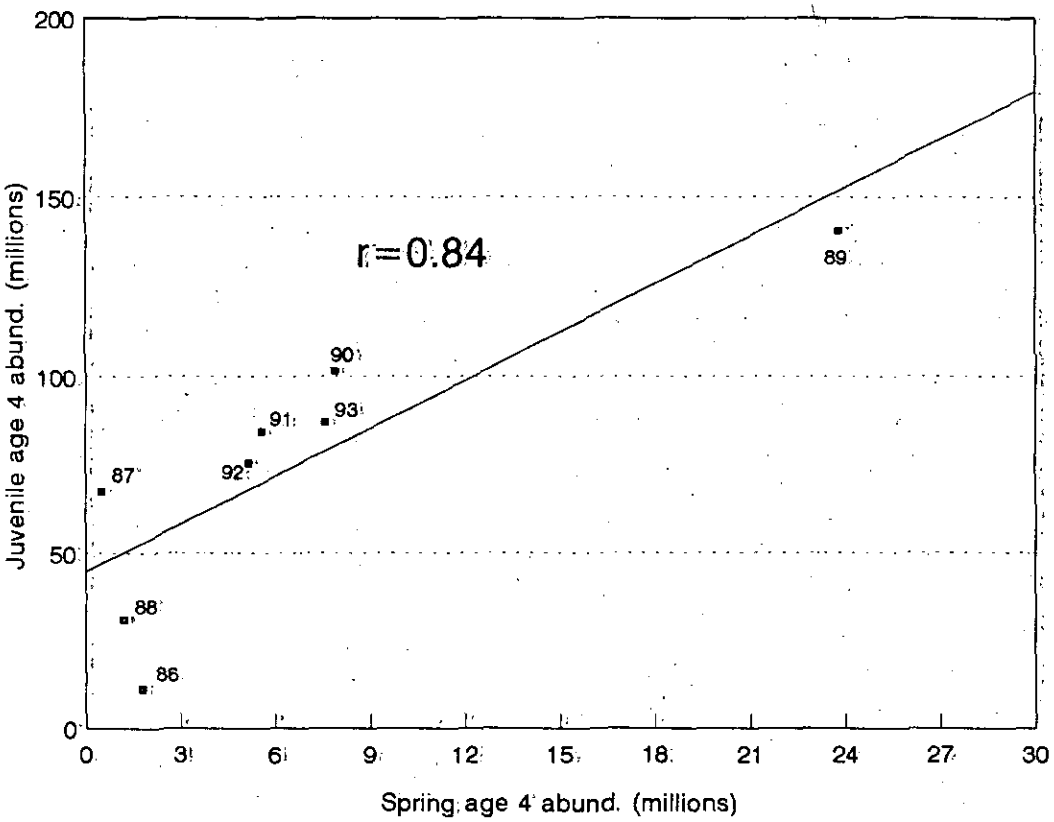

Fig. 13. Regression of age 4 abundance from juvenile surveys against age 4 abundance from spring surveys, Div. 3LNO.

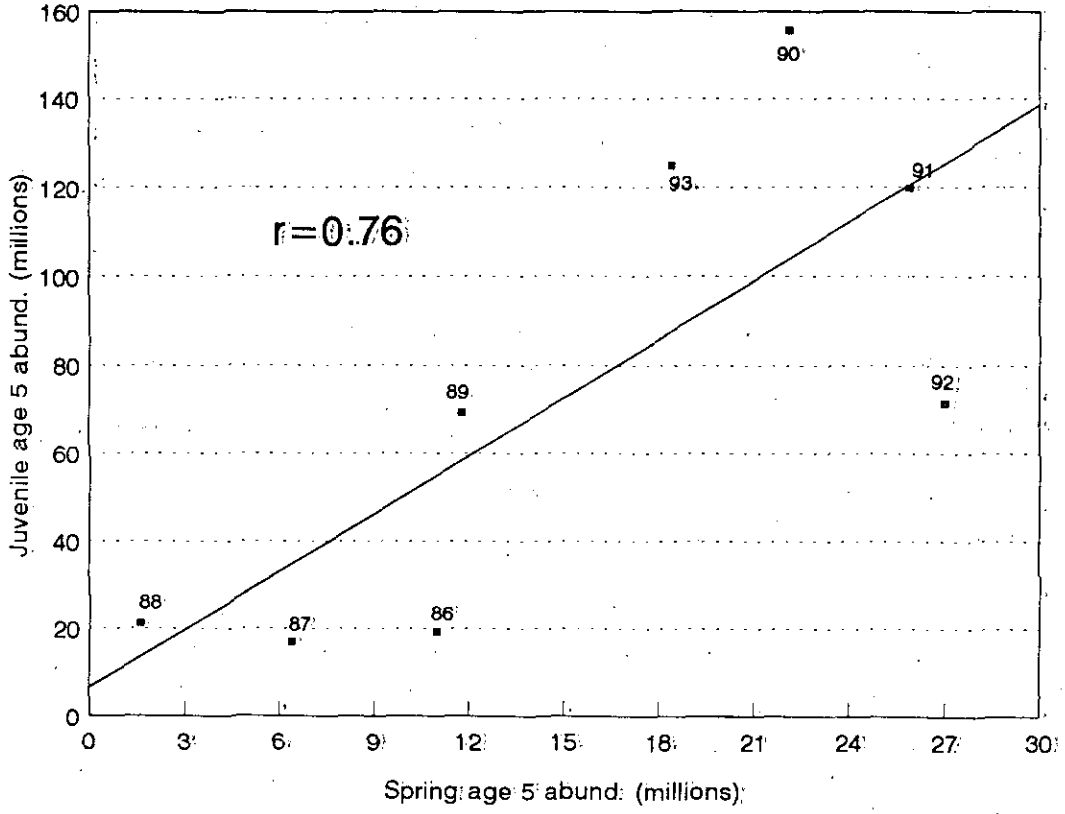

Fig. 14. Regression of age 5 abundance from juvenile surveys against age 5 abundance from spring surveys, Div. 3LNO.

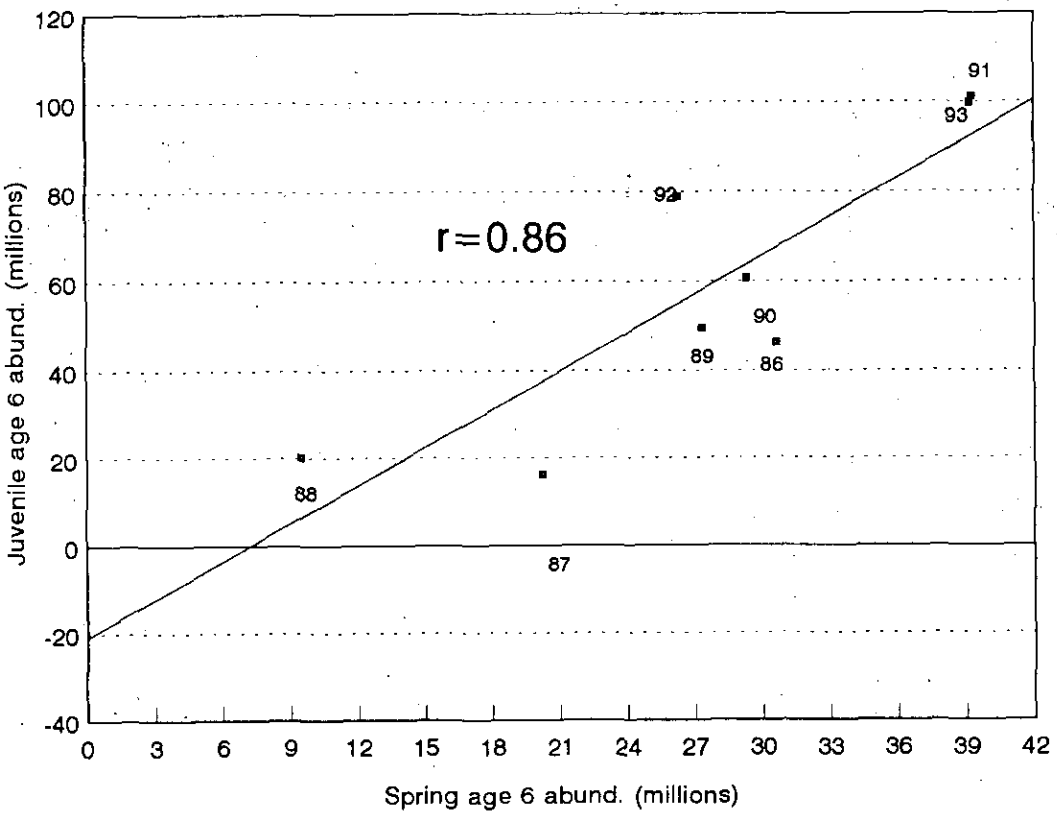

Fig. 15. Regression of age 6 abundance from juvenile surveys against age 6 abundance from spring surveys, Div. 3LNO.

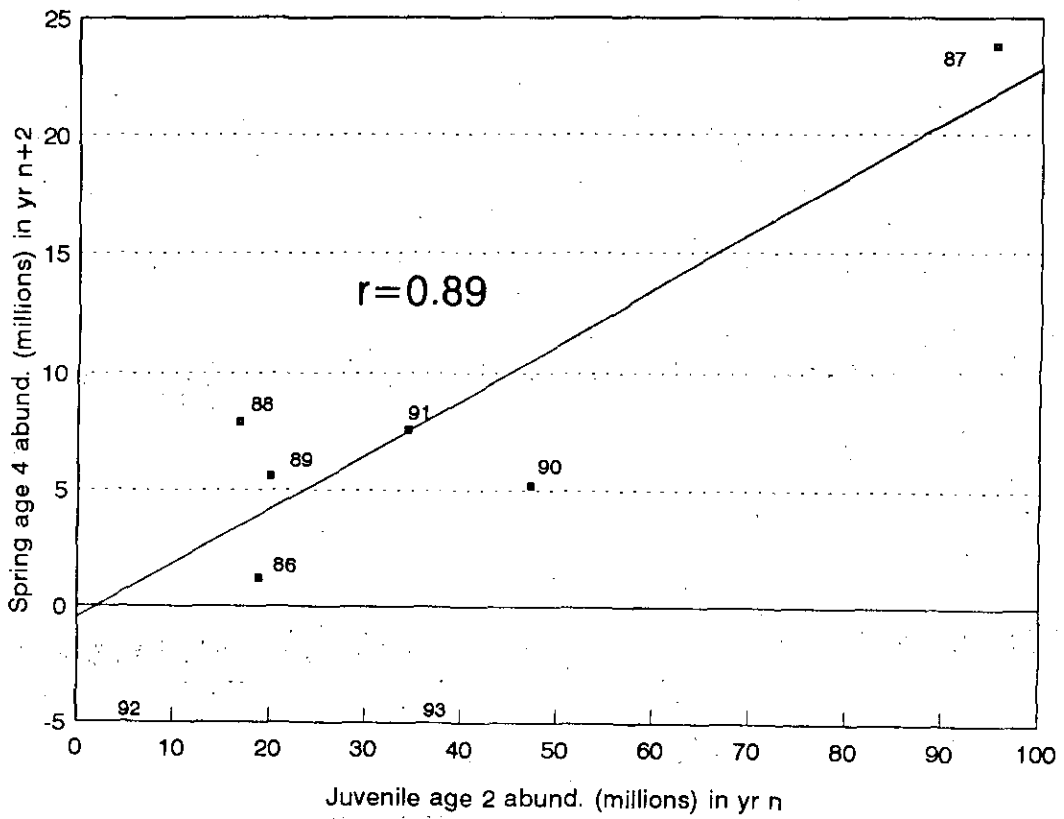

Fig. 16. Regression of age 4 abundance (yr n+2) from spring surveys against age 2 abundance (yr n) from juvenile surveys, Div. 3LNO.

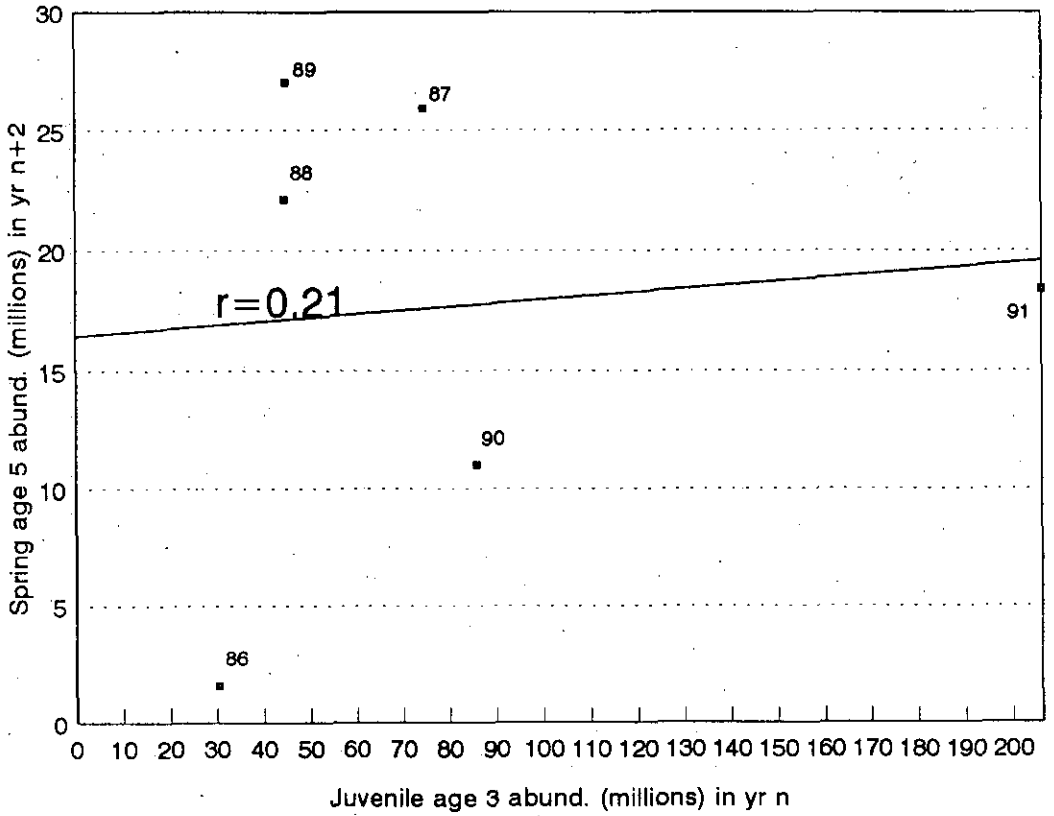

Fig. 17. Regression of age 5 abundance (yr n+2) from spring surveys against age 3 abundance (yr n) from juvenile surveys, Div. 3LNO.

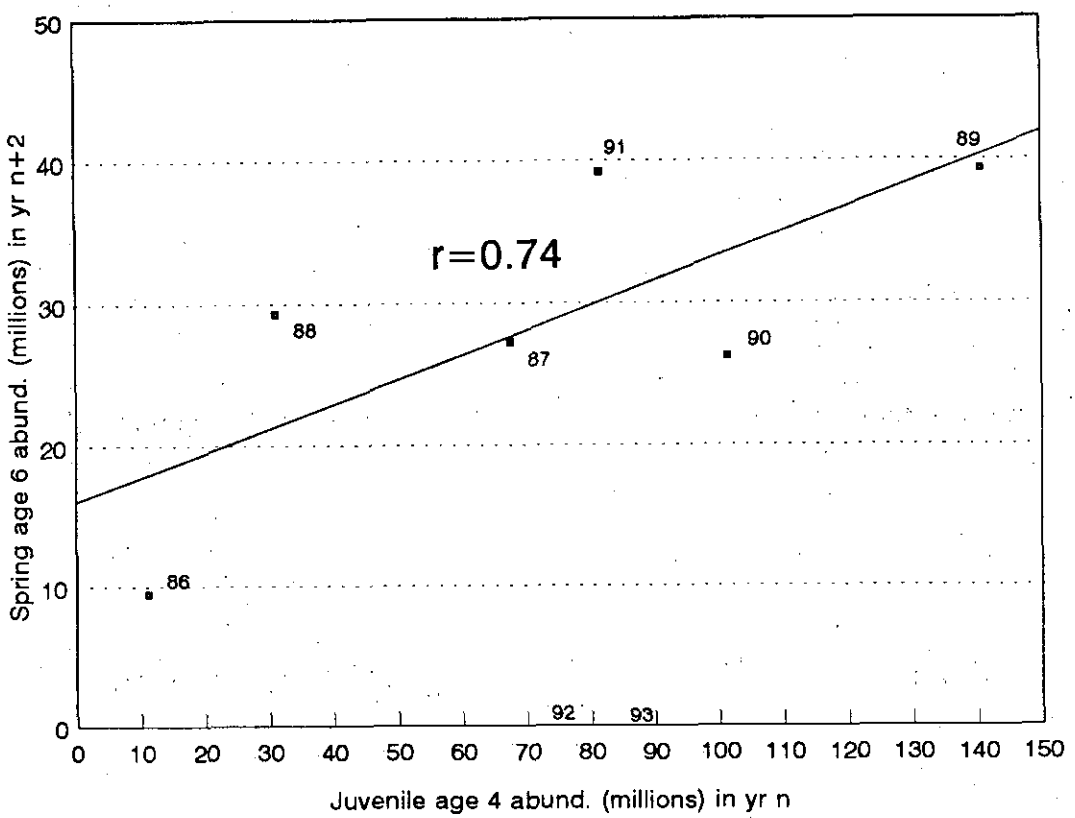

Fig. 18. Regression of age 6 abundance (yr n+2) from spring surveys against age 4 abundance (yr n) from juvenile surveys, Div. 3LNO.