Northwest Atlantic Fisheries Organization

Serial No. N2261

NAFO SCR Doc. 93/76

SCIENTIFIC COUNCIL MEETING - JUNE 1993

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.

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). 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). 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, and 1989-1992, catches for all other nations combined exceeded those of Canada and total removals from the stock were about 30,000 t in both 1985 and 1986. Catches by most fleets declined from 1986 to 1989 as some of the fishing effort was diverted to redfish in the deeper waters of the Regulatory Area, although catches increased again in 1990 and 1991. In 1992, catches declined to about the 1989 level, due mainly to a switch in effort of the Spanish and Portuguese freezer fleets to deep water fisheries.

The following text table shows the catches for 1991 and 1992:

	1991	1992
Canada	6,642	6,809
S. Korea	4,156	3,825
Others	5,458	123
Total	16,256	10,757

The 1991 catch is 1156 t higher than that used in the previous assessment due to a revision in the S. Korean catch. The catches for S. Korea in many years prior to 1991 include a substantial amount of yellowtail determined from breakdowns of catches reported as unspecified flounder. The S. Korean catch in 1990 is the highest value for this country (Table 1). USA catches declined steadily from 1985 to 1990 (Table 2), and no USA catches were taken from this stock in 1991 or 1992.

As in most years, catches of yellowtail flounder in 1992 were mainly from Div. 3N, including virtually all of the catch in the Regulatory Area. Table 3 shows the trends by division from 1965 to 1988. However in 1991 the Canadian fleet caught 2,500 t of yellowtail in Div. 3O, increasing to almost 5,000 t in 1992 (Table 4), which is the highest Canadian catch in this Division, at least since 1973 (Table 5). This increase can be attributed to the shift in effort of the Canadian flounder fishery (for both A. plaice and yellowtail) to Div. 3O in 1991 and 1992 (Table 6). As a result, the proportion of directed yellowtail effort in Div. 3O in 1992 was 73% of the total directed effort by Canada on this stock. This is about triple the values in 1989 and 1991, and compares with values of 11% or less from 1982-1988 (Table 7). Prior to 1992, most (70-90%) of the directed yellowtail fishery by Canada took place in Div. 3N (Table 7).

Overall, the catches from this stock exceeded the TAC in each year from 1985-92, often by a factor of two. However, there is still considerable doubt about the precise catch levels from this stock in recent years. About 25% of the catch from this stock in 1984-86 was determined from Canadian surveillance reports and estimates of the proportion of yellowtail flounder in catches of unspecified flounder by S. Korea. Based on the above text table, the estimated portion of the catch in 1991 is about 33%. Given that vessels from several other nations who are not Contracting Parties of NAFO 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. Data from surveillance for these nations is not always adequate to allow a breakdown of flounder catches by species.

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

Length frequency samples for 1992 were available from the small Portuguese gillnet catch, and the Canadian catch. Data from the Canadian fishery is shown in Table 8 and the resulting age composition is given in Table 9. In most years ages 6 to 8 comprise over 85% of the Canadian catch numbers (Table 10), although prior to 1982 more young fish were present in the catches. The reason for this is a change in mesh size from 120 mm to 130 mm by the Canadian fleet in late 1981. The mean weights at age have shown little in the way of trends in recent years (Table 11).

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 large differences in the age composition of catches by different fleets. It was also stated that large portions of catch in some years (e.g., 40%-45% in 1986) had no sampling whatsoever. These same caveats apply to the 1990-1992 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, as there is no sampling at all from any of the otter trawl fisheries in the Regulatory Area, and it would 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 in 1992 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 1992 were input to the model. Table 13 gives the results of the analysis, including the C/E index, which is also shown in Figure 3a. Catch per unit of effort declined fairly steadily from 1965 to 1976, then rose gradually to a relatively stable level in 1983-85. The index declined sharply in 1986 and remained at this relatively low level through 1989, followed by an increase in 1990 of about 15%. In 1991 the CPUE declined 45% from 1990 to the lowest value in the time series, and remained at approximately this level in 1992.

Analysis of just the data from 1981-1992 (to discount possible effects of the change in mesh size noted previously) showed the same patterns, ie. the sharp declines in 1986 and 1991 (Fig. 3b).

Further examination of the data showed that the decline in 1991 was greatest in Div. 3O and that the CPUE in Div. 3N, while lower than in 1990, was still at the level observed in 1988 and 1989 (Fig. 3c). In 1992, the CPUE in Div 3O was up slightly from 1991, while the CPUE in Div. 3N was slightly lower. The values in Div. 3O for 1991 and 1992 are substantially below any other in the series but these 2 values in Div. 3N are about the same as the previously observed lows in 1975-76. 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.

Some of the effort labelled 'directed yellowtail' in this Division was effort directed at a mixed fishery of A.plaice and yellowtail in 1991 and particularly 1992. As observed in Table 7, the directed effort in Div. 3O in 1992 was far greater than any other year, with the increase starting in 1991. Given this major shift in the fishery, some caution must be used in comparing the recent catch rates with those of earlier years. The 1991 and 1992 values for CPUE do not translate into a similar decline in stock size, although they do 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 14 to 16 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 between 33 and 40 thousand tons in 1989-92 (Fig.4). In 1993 the biomass estimate was also in this range, at approximately 34,000 t. The biomass has declined steadily in Div. 3L from about 15,000 t in 1984-85 to practically zero in 1992. In Div. 3O, the biomass was relatively stable from 1988 to 1991 around 15,000t, declined to a low of 7,000 t in 1992 and increased to 27,000 t in 1993, which is similar to the values in 1985 and 1987 (Table 16, Fig. 4).

The total stock biomass has been variable and was in the range of 80,000-140,000 t during the early 1980s, declining to a fairly stable but much lower level in the 1988-91 period, averaging about 55,000 t. Results from the 1992 survey indicated a reduction of about 30%, although preliminary analysis of the 1993 survey indicates an increase back to the 1988-91 level. Trends in biomass for strata located wholly or partly outside the 200-mile limit are shown in Table 17 for the 1984-93 period. Biomass estimated from these strata declined steadily from 1984 to 1988 but was at a higher level in 1989-92 due mainly to the strength of the 1984-86 year-classes. The lower estimate in 1993 may reflect the spread of these year-classes into other areas as they became older, or it may be an indication of a decrease in recruitment from subsequent year-classes.

Survey abundance at age for all three divisions combined is presented in Table 18. To account for incomplete survey coverage during some years, estimates for non-sampled strata, derived using a multiplicative model, were included in the calculation of total abundance up to and including 1991. It was assumed that the age composition in these non-sampled strata was the same as those strata where sampling occurred. The estimates for 1971-82 were also increased by a factor of 1.4 to account for a different vessel-gear combination used during this period. The estimates for 1971-1974 are not presented as it was felt that these were not as reliable due to the large numbers of missing strata in these years. The 1992 estimates of abundance at age were simply added to the results of the previous analysis, ie. the multiplicative model was not re-run with the 1992 data included.

Total survey abundance for the 1975-84 period was fairly stable, averaging just under 300 million fish; however, during 1985-88, a steady decline occurred and the 1988 abundance was estimated to be only about 100 million fish (Fig. 5). The 1989-91 values are about 30 to 50% higher than the 1988 estimate, but the 1992 estimate of 84 million was the lowest in the 17-year research vessel time series for this stock. Age by age estimates of abundance from the 1993 survey are not available at this time, but the preliminary estimates of biomass from Div. 3NO suggest an increase in total abundance to around the 1989-91 level. Figs. 6-8 show the trends in total abundance (with 95% confidence limits) for Divisions 3L, 3N, and 3O respectively for 1984-92.

The Canadian surveys are usually dominated by yellowtail of ages 5-8 years (Table 18). The 1985 and 1986 year-classes appeared in the 1991 survey to be larger than any year-classes at these ages in the most recent 5 or 6 years. However, in 1992 the abundance of these year-classes was lower, with the 1986 year-class being about the average of the 1980-1984 year-classes at age 6 and the 1985 year-class being the lowest in the series at age 7. Given the higher biomass estimated in the 1993 survey, it is not possible to say if the 1992 results represent a low year-effect in the surveys or if the abundance of these year-classes was substantially reduced due to the increased catches in the Regulatory Area in 1991. Fig.9 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 their immediate predecessors. However, it should be noted 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. The 1992 estimate of the 1987 year-class placed it at a level similar to the weak year-classes of 1980 and 1981.

A further examination of the survey population estimates in Table 18 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. This could be 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.

For the first time in the assessment of this stock, the spring survey data from Div. 3LNO were plotted using expanding symbols to represent catch sizes (ACON). Figs. 10-13 show these plots for each year from 1978 to 1992 (except 1983). These figures clearly show the distribution of this stock to be centred around the western side of the Southeast Shoal. After the decline in biomass from the early 1980's to the late 1980's, the distribution of the stock shrunk towards this area. This is particularly noticeable in 1991 and 1992 when there were very few large catches north of 45 degrees N.

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. Abundance and biomass estimates for yellowtail from these surveys were presented in the previous assessment of this stock. These data, 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. In 1990-1992, this survey was extended to cover Div. 3N and 3O. The biomass estimates from these surveys ranged from 38,000 t to 48,000 t (Table 19), 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. Age 7 was dominant in the catches in all 3 fall surveys.

D) Juvenile yellowtail surveys

During August-September of 1992, a stratified-random survey of the Grand Bank (Fig. 2) was conducted by the research vessel WILFRED TEMPLEMAN, consisting of 250 successful 30-minute fishing hauls. This survey constituted year 8 in a time series for juvenile flatfish. From 1985-88, the survey covered strata inside the 91-m isobath; and from 1989-91 the coverage was extended out to the 200-m isobath. In 1992, the survey coverage was further extended out to the 273 m (150 fm) isobath as part of the survey design for juvenile American plaice.

The standard juvenile flatfish trawl, a Yankee (80/104) 41 shrimp trawl, was used in all surveys. This bottom trawl has a mesh size of 38 mm throughout, with a 12-mm stretched mesh liner in the codend, and was rigged with 30-cm rubber bobbin footgear. The standard towing speed used, as determined from Doppler speed log was 2.5 knots, with each fishing haul being 30 minutes duration. An average towing distance of 1.25 miles and a wingspread of 14.5m were used to calculate the swept area estimates of biomass and abundance.

The WEBBER sampling design, formulated in 1985 to give independent day and night biomass estimates of yellowtail flounder using randomly assigned day and night hauls (on a 50:50: basis) within each stratum, was used to account for significant diel variability in trawl catches (see Walsh, 1986, for a detailed description of this method, and Walsh, 1988). From 1985-87, an attempt was made to sample all strata inside the 91-m contour using this day/night split survey; but because of time constraints, in 1988 this design was only used in selected strata (352, 360, 361, 375, and 376), which, based on historical data, were selected to monitor juvenile yellowtail abundance. All of the other strata were then surveyed in the regular way. This sampling scheme has been followed since 1988. Fishing hauls were proportionally allocated based on a further stratification of the survey area by fish density based on historical information.

After many discussions in NAFO Scientific Council on the validity of using the 1985 survey estimate, due to poor coverage in the selected strata, it has been excluded from the time series of age-by-age analyses.

Tables 20-22 show the average numbers and weights in each stratum, along with biomass and abundunce estimates from Divisions 3L, 3N and 3O respectively from the juvenile surveys in 1985-92. In Division 3L in 1992, yellowtail were found almost exclusively in strata 363 and 372, at a mean depth of 72.7 m and a mean temperature of 0.05 C. Since 1985, both of these strata have consistently been the areas of highest abundance in Div. 3L and no yellowtail have been found beyond the 93 m depth contour. However, the biomass has been decreasing since 1988 and the 1992 estimate, the lowest in the time series, was 56% below the 1991 estimate. Abundance estimates also show a downward trend. In Division 3N, where most of the biomass of this stock has consistently been found, yellowtail in 1992 were mainly concentrated as usual in the 4 selected strata found in Div. 3N (360, 361, 375 and 376) at a mean depth of 59.1 m and a mean temperature of 1.6 C. In 1992 the biomass estimate, which had been slowly increasing since 1988, was 35% lower than the 1991 estimate of 142 thousand tons, which was the highest in the time series. As well there was also a dramatic reduction by 48% in the abundance estimate from the 1991 high. In Division 3O in 1992, concentrations were mostly located in the other selected 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 77.9 m and a mean temperature of 0.5 C. Biomass, which was stable during the last three years, showed a 19 % increase in 1992, while abundance estimates have been relatively stable since 1988 (Table 22)

Table 23 shows a comparison of average numbers and weights of yellowtail flounder derived from independent day and night estimates, and the combined estimate of the two, from the selected strata in 1986-92 surveys. In 1992, 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 biomass estimates showed a 12% decrease from 1991 following a general increasing trend in the 1989-91 estimates. The reduction was greatest in strata in the Regulatory Area (360 and 376), and there was a noticeable increase in biomass of yellowtail in stratum 352, in Div. 3O.

Tables 24 and 25 contain information on the age composition of yellowtail in the selected strata in Div. 3NO from 1986-92. In 1992 the overall average number per tow (and similarly total abundance) at age showed a 37% decrease from the 1991 estimate. This was due mainly to a 53% decrease in juveniles aged 1 to 4 years and a moderate decrease in the abundance of the 1985 and 1986 cohorts. The abundance of age 1-4 yellowtail in 1992 was the third lowest in the 7 year time series, while the abundance of age 7+ yellowtail was close to the 1991 estimate and was the third highest in the time series. The 1985 yearclass, which is the strongest in the time series at almost every age, contributed 63% to the
total estimate of age 7+ fish in 1992.

The 1991 yearclass, at age 1, is the second lowest in the time series, next to the 1991 survey estimate of the 1990 yearclass. The 1990 yearclass, at age 2, is the lowest in the time series, well below the long term average. The 1989 yearclass, at age 3, was slightly below the long term average and appears to be a moderate yearclass. The 1988 yearclass which appeared to be strong at age 2 in the 1990 survey and extremely strong at age 3 in the 1991 survey, was found to be of moderate size in the 1992 survey, being slightly above the long term average. The 1987 yearclass at age 5 was about average. The 1986 yearclass, at age 6, which has been consistently the second highest yearclass (behind 1985) during the time series, maintained this ranking again in 1992, and was well above the long term average.

Table 26 describes the distribution of the 1983-91 year-classes present in the 1992 survey of selected strata in Div. 3NO, along with average size at age. The majority of the 1987 to 1991 year-classes at ages 1 to 5 were found in stratum 376, which is the southern portion of the Southeast Shoal (Fig.2) and in stratum 360, both of which are in the Regulatory Area. The 1986 year-class at age 6 was spread evenly throughout most strata while the 1983-85 yearclasses, at ages 7 to 9, were found mainly inside the Regulatory Area. This was consistent with the distribution of these yearclasses in the previous assessment of this stock. Juvenile and sub-adult yellowtail flounder are consistently found concentrated in the Southern Grand Bank, mainly in the Regulatory Area, and as they mature their distribution radiates in a north and northwest direction (Walsh, 1991 & 1992).

Figs. 14-16 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 1986-1992. Although the 3 regressions are all significant, caution must be exercised in interpreting the results due to the low number of points (7) in each fit and the nature of some of the relationships ie '2-point regressions'. Nonetheless, the surveys generally agree in estimating abundance, 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 fishing gear used in the spring surveys, thereby giving an earlier estimate of the strength of recruiting year-classes. Figs. 17-19 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 Figs. 14-16 also apply here, given that only 5 points were available for each relationship. Figs. 17 and 19 also indicate the point estimates from the 1991 and 1992 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 value of fishing 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. If anything, the confidence in the catch and catch at age data for this stock is now lower, especially with the lack of sampling from fisheries in the Regulatory Area in 1992. 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. Although the 1984-86 year-classes do not appear to be as strong as most of the 1970's year-classes at ages 4 and 5, comparisons are somewhat difficult, given that large numbers of the recent year-classes were caught at younger ages relative to the earlier cohorts; i.e., there is likely to be more of an influence from fishing mortality on the recent estimates of year-classes at ages 4 and 5 compared to the years prior to the mid-1980s. This would be caused by the exploitation of younger fish in the Regulatory Area; e.g., the Spanish catches in 1989 to 1991 were dominated by the 1985 year-class. Given the inadequacies with the catch and sampling data, and 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 1992, the prognosis was that the stock remained at a low level, although improved recruitment appeared likely. In this assessment, the first part of that statement remains true, although there is some doubt about the second part. While there is little doubt that the 1985 and 1986 year-classes were more abundant than those of the early 1980's, these will have essentially passed through the fishery after 1994. The spring and juvenile surveys suggest that the

1987 and 1988 year-classes may be average at best, although there is some conflicting data on the 1988 year-class in the juvenile surveys. The juvenile surveys also indicate that the 1989 and 1990 year-classes may be below average and well below average respectively. The biomass increase in the 1993 spring survey is a positive sign although little can be concluded from this until analysis of the age composition is completed.

The stock has remained at a low level in recent years with catches around 10,000-16,000 t (versus TAC's of 5000-7000 t) so it is apparent that further reductions in the total catch will be needed to allow some growth in stock size. As in 1992, it appears that further reductions in fishing effort on this stock may be forthcoming. EEC fleets moved out of this fishery almost entirely in 1992 and S.Korean vessels agreed to withdraw in April, 1993. If these actions hold in 1993, catches in the Regulatory Area should be reduced substantially, assuming other non-contracting party effort remains near current levels. Given the current estimated stock biomass, 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 chance for this stock to rebuild to historic levels will be reduced. 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 borne out.

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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	16,735	17,000
1985	13,440	-	-	4,278	11,245	28,963	15,000
1986	14,168	77	-	2,049	13,882	30,176	15,000
1987	13,420	51	-	125	2,718	16,314	15,000
1988	10,607	-	-	1,383	4,166	16,158	15,000
1989	5,009	139	-	3,508	1,551	10,207	5,000
1990[c]	4,969	-	-	5,903	3,117	13,989	5,000
1991[c]	6,642			4,156	5,458	16,256	7,000
1992[c,d]	6,809						7,000
1993							7,000

[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 1992 catches.

Table 2. Breakdown of 1984-91 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]	5,458

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

Table 3. Breakdown of nominal catches (tons) of yellowtail by NAFO Div. 3L, 3N, and 3O for 1965-89.

Year	3L	3N	30	Total
1965	117	2,958	55	3,130
1966	62	6,442	522	7,026
1967	453	6,117	2,308	8,878
1968	2,815	8,459	2,066	13,340
1969	5,287	7,215	3,206	15,708
1970	7,419	18,668	339	26,426
1971	6,632	25,174	5,536	37,342
1972	9,292	25,788	4,179	39,259
1973	4,856	23,693	4,266	32,815
1974	1,544	19,329	3,440	24,313
1975	2,638	16,156	4,100	22,894
1976	516	5,023	2,518	8,057
1977	2,651	7,381	1,606	11,638
1978	2,547	11,079	1,840	15,466
1979	2,595	14,556	1,200	18,351
1980	1,898	9,805	674	12,377
1981	2,345	11,733	602	14,680
1982[a]	2,305	9,327	1,687	13,319
1983[a]	2,552	6,966	925	10,473
1984[a,b]	5,264	10,799	672	16,735
1985[a,b]	3,478	23,912	1,573	28,963
1986[a,b]	3,053	25,475	1,648	30,176
1987[a]	1,600	12,791	1,923	16,314
1988[a,b]	2,127	12,331	1,700	16,158
1989[a,b]	875	7,568	1,764	10,207

[a]Includes estimated breakdown of unspecified flounder catches by S. Korea.

[b]Includes estimates of non-reported catch outside Canadian 200-mile limit. These catches are attributed 90%: 10% to Div. 3N:3Ø.

Table 4. Canadian catches of yellowtail, by division, month, and gear, in Div. 3LNO in 1992.

	3L		3N		3Ø		
Month	**O.T.**	**Other**	**O.T.**	**Other**	**O.T.**	**Other**	**Total**
Jan.							
Feb.							
Mar.				1			1
Apr.			16	33			49
May			9	9	18	1	37
June		1	37	23	1292	123	1476
July	51	2	47	43	1625	112	1880
Aug.	37	3	375	128	840	24	1407
Sept.	7	1	679	185	784	46	1702
Oct.			80	66	77	8	231
Nov.			23			3	26
Dec.							
Total	95	7	1266	488	4636	317	6809
Div. Total	102		1754		4953		

Canada (Nfld)	6367
Canada (M)	442
Otter trawl	5997
Danish & Scottish Seine	788
Other	24

Table 5. Canadian catches of yellowtail by division, from 1973-92.

Year	OTTER TRAWL 3L	3N	3Ø	3LNØ	OTHER GEARS 3LNØ
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

Table 6. Catches of yellowtail by Canada(N) otter trawlers in the directed (main species yellowtail) fishery and their percentage of the otter trawl catch (by Division) of yellowtail by Canada.

	3L		3N		3Ø		3LNØ	
Year	Directed	%	Directed	%	Directed	%	Directed	%
1973	1617	39	18338	85	1272	45	21227	75
1974	399	36	13002	88	624	56	14025	83
1975	1312	57	10303	78	1730	61	13345	72
1976	107	24	3673	74	1106	45	4886	62
1977	847	33	3563	50	646	41	5056	45
1978	599	24	7830	73	865	48	9294	62
1979	873	34	11872	83	526	48	13271	74
1980	568	30	6878	72	414	72	7860	66
1981	682	29	9566	85	174	34	10422	74
1982	699	30	4794	63	92	6	5585	49
1983	477	19	4071	71	54	7	4602	51
1984	1890	36	4861	71	107	34	6858	55
1985	830	24	5804	64	235	28	6869	52
1986	624	21	7819	77	450	45	8893	63
1987	198	13	8144	79	607	40	8949	67
1988	243	13	5254	74	598	41	6095	58
1989	64	8	1386	58	594	39	2044	43
1990	95	8	1860	68	245	37	2200	47
1991	95	12	2254	76	895	39	3244	53
1992	62	65	992	78	2925	63	3979	66

Table 7. Catches and by-catches (t) of A. plaice and yellowtail, by division, from 1982-92 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	Yellowtail	Plaice
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)

Table 8. Samples used to calculate catch at age and mean weights at age for Yellowtail in the Canadian fishery in *Div. 3LNØ in 1992. Numbers 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 (57)	OT,April, 3N (312)	1	50	3LNØ, Jan.-Apr.
3Ø (467)	May, 3Ø (341)	1	37	May
	June, 3Ø (3588)	11	1476	June
Q3, 3N (230)	OT, Aug. 3N (329)	1	422	3N, OT, July-Aug.
	Dan. Seine,Aug.(289)	1	171	3N, Seine, July-Aug.
	Scot.Seine July(337)	1	185	3N, Seine, Sept.
Q3, 3Ø (491)	OT, July, 3Ø (4476)	13	1790	3LØ, July
	Aug. (2647)	8	904	August
	Sept. (1348)	4	1517	3LNØ (excl.3N seine),Sep.
Q4, 3N (86) Q3, 3N (230)	Scot. Seine,Oct.(337)	1	257	3LNØ, Oct.-Dec.

Table 9 . Catch at age and mean weights at age from the Canadian fishery for yellowtail in Div. 3LNO in 1992.

	AVERAGE		CATCH		
AGE	WEIGHT	LENGTH	MEAN	STD. ERR.	C. V.
* 5	0.196	29.143	176	23.71	0.13
6	0.331	33.956	3406	205.37	0.06
7	0.472	37.680	6124	251.38	0.04
* 8	0.668	41.668	3540	165.72	0.05
* 9	1.015	47.114	361	31.08	0.09

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

TABLE 11. 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
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
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
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
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
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
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
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

TABLE 12. 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
4	355	179	6	315	738	25	5	21	0	0	0	15	0	1	0	0
5	1150	1119	485	1792	1672	463	563	397	336	211	104	137	29	54	41	34
6	3207	4400	3824	3584	3457	1697	2240	4436	3324	1516	1668	949	316	564	875	1127
7	3394	5858	8491	3962	4842	3475	3419	5684	6113	6113	4921	3314	1750	2210	3189	2891
8	1780	2751	4117	1583	2656	3884	2271	1818	2862	5015	5147	4540	2449	1870	2184	2365
9	592	207	478	251	307	1557	460	201	645	1386	1352	1128	471	294	341	366
10	137	19	20	35	37	286	42	7	35	192	129	84	22	3	0	0
4+	10615	14535	17421	11522	13708	11386	8999	12564	13315	14433	13321	10168	5036	4995	6631	6784

TABLE 13. ANOVA RESULTS AND REGRESSION COEFFICIENTS FROM A MULTIPLICATIVE MODEL UTILIZED TO DERIVE A STANDARDIZED CATCH RATE SERIES FOR YELLOWTAIL FLOUNDER IN NAFO DIV. 3LNO. (1990-1992 BASED ON PROVISIONAL DATA)

REGRESSION OF MULTIPLICATIVE MODEL

MULTIPLE R............. 0.746
MULTIPLE R SQUARED..... 0.557

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DF	SUMS OF SQUARES	MEAN SQUARES	F-VALUE
INTERCEPT	1	3.665E1	3.665E1	
REGRESSION	42	4.928E0	1.173E-1	22.672
Country/Gear/TC (1)	2	5.954E-1	2.977E-1	57.520
Division (2)	2	5.467E-1	2.734E-1	52.819
Month (3)	11	5.705E-1	5.187E-2	10.022
Year (4)	27	2.411E0	8.930E-2	17.254
RESIDUALS	758	3.923E0	5.175E-3	
TOTAL	801	4.550E1		

REGRESSION COEFFICIENTS

CATEGORY	CODE	VARIABLE	COEFFICIENT	STD. ERROR	NO. OBS.
CGT	3125	INTERCEPT	0.156	0.116	801
Division	34				
Month	10				
Year	65				
(1)	3114	1	-0.290	0.031	162
	3124	2	-0.218	0.033	141
(2)	32	3	-0.224	0.027	194
	35	4	-0.238	0.030	159
(3)	1	5	-0.236	0.082	19
	2	6	-0.316	0.079	21
	3	7	-0.234	0.062	35
	4	8	-0.227	0.051	58
	5	9	-0.279	0.044	110
	6	10	-0.345	0.045	106
	7	11	-0.330	0.045	106
	8	12	-0.249	0.046	99
	9	13	-0.060	0.046	84
	11	14	-0.111	0.052	53
	12	15	-0.172	0.062	38
(4)	66	16	-0.037	0.144	11
	67	17	-0.059	0.145	12
	68	18	-0.221	0.140	14
	69	19	-0.357	0.131	20
	70	20	-0.365	0.119	42
	71	21	-0.408	0.118	41
	72	22	-0.524	0.119	45
	73	23	-0.395	0.118	50
	74	24	-0.802	0.121	37
	75	25	-0.813	0.120	38
	76	26	-0.905	0.128	26
	77	27	-0.714	0.121	38
	78	28	-0.700	0.118	51
	79	29	-0.660	0.119	47
(4)	80	30	-0.554	0.123	30
	81	31	-0.550	0.124	30
	82	32	-0.639	0.127	24
	83	33	-0.515	0.126	24
	84	34	-0.545	0.127	28
	85	35	-0.505	0.124	30
	86	36	-0.817	0.125	30
	87	37	-0.784	0.125	30
	88	38	-0.859	0.127	26
	89	39	-0.857	0.136	17
	90	40	-0.706	0.133	16
	91	41	-1.305	0.131	21
	92	42	-1.237	0.134	15

PREDICTED CATCH RATE

YEAR	LN TRANSFORM MEAN	LN TRANSFORM S.E.	RETRANSFORMED MEAN	RETRANSFORMED S.E.	CATCH	EFFORT
1965	0.1563	0.0134	1.164	0.135	3075	2641
1966	0.1191	0.0105	1.123	0.115	4185	3725
1967	0.0971	0.0113	1.099	0.116	2122	1931
1968	-0.0651	0.0085	0.935	0.086	4180	4468
1969	-0.2006	0.0061	0.818	0.064	10494	12830
1970	-0.2088	0.0032	0.812	0.046	22814	28085
1971	-0.2517	0.0030	0.778	0.042	24206	31101
1972	-0.3679	0.0029	0.693	0.037	26939	38875
1973	-0.2387	0.0027	0.789	0.041	28492	36127
1974	-0.6454	0.0034	0.525	0.030	17053	32485
1975	-0.6567	0.0030	0.519	0.028	18458	35556
1976	-0.7488	0.0048	0.473	0.033	7910	16722
1977	-0.5578	0.0038	0.573	0.035	11295	19717
1978	-0.5433	0.0030	0.581	0.032	15091	25954
1979	-0.5040	0.0030	0.605	0.033	18116	29956
1980	-0.3974	0.0044	0.672	0.044	12011	17864
1981	-0.3939	0.0041	0.675	0.043	14122	20929
1982	-0.4826	0.0047	0.617	0.042	11479	18594
1983	-0.3589	0.0042	0.699	0.046	9085	13002
1984	-0.3889	0.0047	0.678	0.046	12437	18345
1985	-0.3491	0.0038	0.706	0.044	13440	19042
1986	-0.6610	0.0040	0.517	0.033	14168	27423
1987	-0.6274	0.0040	0.534	0.034	13420	25116
1988	-0.7031	0.0045	0.495	0.033	10607	21420
1989	-0.7012	0.0069	0.496	0.041	5009	10108
1990	-0.5495	0.0062	0.577	0.045	4969	8613
1991	-1.1487	0.0056	0.317	0.024	6642	20955
1992	-1.0811	0.0063	0.339	0.027	6809	20083

AVERAGE C.V. FOR THE RETRANSFORMED MEAN: 0.070

LEGEND FOR ANOVA RESULTS

CODE CGT: 3114 = CAN(NFLD) Tonnage Class 4, Side Trawler
3124 = CAN(NFLD) Tonnage Class 4, Stern Trawler
3125 = CAN(NFLD) Tonnage Class 5, Stern Trawler
CODE DIVISION: 32 = DIV 3L, 34 = DIV 3N, 35 = DIV 3O

Table 14. 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	1984 AN 27-28
51-100	328	114,023	-	-	-	-	-	-	0.0(3)	-	0.0(5)	-	0.0(2)	0.0(3)	0.0(2)
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)	0.0(4)
51-100	342	43,913	-	-	-	-	-	-	0.0(2)	0.0(2)	0.0(4)	0.0(4)	-	0.0(3)	0.0(4)
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)	0.1(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)	1.5(6)
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)	28.2(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)	0.6(5)
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)	59.4(5)
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	15.1

Table 14 (Cont'd.)

Depth (fm)	Stratum	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
51-100	328	0.0(4)	0.0(9)	0.0(7)	0.0(2)	0.0(8)	0.1(7)	0.2(6)	0.0(4)
51-100	341	0.01(9)	0.0(9)	0.1(6)	0.0(6)	0.0(8)	0.0(4)	0.0(6)	0.0(8)
51-100	342	0.0(3)	0.0(3)	0.2(2)	0.0(2)	0.1(3)	0.0(2)	0.0(2)	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)
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)
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)
151-200	346	0.0(2)	0.0(5)	0.0(5)	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)
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)
51-100	349	0.1(14)	1.3(14)	0.1(11)	0.1(8)	0.0(11)	0.0(9)	0.0(9)	0.0(9)
31-50	350	3.7(12)	2.3(11)	0.6(11)	1.6(8)	0.6(11)	0.2(7)	1.0(8)	0.1(11)
31-50	363	15.2(8)	8.3(10)	7.6(9)	4.9(7)	1.5(9)	3.4(7)	0.6(7)	0.1(9)
51-100	364	0.0(17)	0.0(17)	0.0(15)	0.0(10)	0.0(16)	0.0(12)	0.0(11)	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)
101-150	366	0.0(6)	0.0(8)	0.0(7)	0.0(6)	0.0(8)	0.0(6)	-	0.0(6)
151-200	368	0.0(2)	0.0(2)	0.0(3)	0.0(2)	0.0(3)	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)
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)
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)
31-50	372	56.5(12)	36.3(14)	13.9(13)	7.0(11)	12.7(13)	4.7(7)	2.2(10)	0.3(10)
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)
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)
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)
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)
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)
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)
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)
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)
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)
201-300	729	0.0(2)	-	-	-	-	-	0.0(2)	0.0(2)
301-400	730	0.0(2)	-	-	-	-	-	0.0(2)	0.0(2)
201-300	731	0.0(2)	-	-	-	-	-	0.0(2)	0.0(2)
301-400	732	0.0(2)	-	-	-	-	-	0.0(2)	0.0(2)
201-300	733	0.0(3)	-	-	-	-	-	0.0(2)	0.0(2)
301-400	734	0.0(2)	-	-	-	-	-	0.0(2)	0.0(2)
201-300	735	0.0(2)	-	-	-	-	-	-	0.0(2)
301-400	736	0.0(2)	-	-	-	-	-	-	0.0(2)
Biomass ('000 t)		13.5	8.5	3.8	2.2	2.7	1.4	0.7	0.1

Table 15. 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	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
151-200	357	12,311	-	-	0.0(2)	-	-	-	0.0(2)	-	0.0(3)	0.0(3)
101-150	358	16,889	-	0.0(4)	0.0(3)	-	-	-	0.0(2)	-	0.0(2)	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)
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)
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)
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)
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)
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)
≤ 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)
≤ 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)
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)
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)
151-200	379	7,957	-	-	0.0(2)	0.0(3)	-	-	0.0(2)	0.3(2)	0.0(3)	0.0(3)
151-200	380	8,707	-	0.0(2)	0.0(3)	0.0(2)	-	-	0.0(2)	-	0.0(2)	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)
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)
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)
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)
Biomass ('000 t)			59.7	96.6	46.0	45.4	46.8	71.6	76.2	47.6	50.2	79.7

Table 15 - (Cont'd.)

Depth (fm)	Stratum	Year-Trip 1981 ATC 317-9	1982 ATC 327-9	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[a] WT 136-137
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)	0.0(2)	0.0(2)
101-150	358	0.3(3)	0.0(3)	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(3)	0.0(3)	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	78.4(6)	36.7(7)	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	-	118.9(6)	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)	108.4(7)
31-50	362	104.2(5)	47.2(8)	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	58.4(5)	23.7(5)	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	71.7(3)	19.1(14)	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	69.3(4)	61.1(5)	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	74.3(4)	63.0(7)	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(3)	0.0(2)	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(2)	0.0(2)	0.0(3)	0.0(2)	0.0(2)
151-200	379	0.0(3)	0.0(2)	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(3)	-	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(3)	0.0(2)	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(2)	0.0(2)	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	1.3(3)	10.0(2)	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)		63.0(54)	43.8(60)	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)	-(84)
Biomass ('000 t)		70.1	54.4	104.6	56.7	65.0	49.9	34.4	33.3	42.6	37.2	28.6	34.3

[a]Preliminary analysis

Table 16. 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	1984 AN 27, 28	1985 AN 43
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)	0.0(5)	0.0(8)
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)	0.5(4)	7.8(10)
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)	23.8(3)	36.7(3)
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)	0.0(2)	0.3(5)
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)	0.0(2)	0.0(2)
151-200	334	6,906	-	-	0.0(2)	0.0(2)	0.0(3)	0.0(3)	0.0(2)	-	0.0(4)	0.0(2)	0.0(2)
151-200	335	4,354	0.0(2)	-	0.0(3)	-	0.0(2)	0.0(2)	0.0(3)	-	0.0(2)	0.0(2)	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)	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)	0.0(2)	0.0(5)
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)	15.8(5)	11.1(9)
51-100	339	43,913	1.4(2)	0.0(2)	-	-	0.7(2)	0.4(3)	-	0.0(2)	0.1(4)	0.4(2)	0.1(3)
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)	3.0(4)	7.2(9)
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)	40.5(6)	42.3(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)	30.5(7)	29.7(11)
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)	1.0(2)	56.3(6)
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)	0.0(2)	0.5(3)
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)	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)	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)	12.8(56)	18.0(93)
Biomass ('000 t)			21.2	22.2	18.4	42.1	26.7	50.8	29.5	11.6	15.8	17.2	24.2

Table 16 - (Cont'd.)

Depth (fm)	Stratum	Year - Trip 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[a] WT 136
51-100	329	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	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	3.6(4)	16.0(2)	6.0(2)	18.7(2)	-	0.7(2)	0.0(2)	1.3(2)
51-100	332	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(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)	0.2(2)	0.0(2)
151-200	335	0.0(2)	0.0(2)	0.0(2)	0.0(2)	0.0(2)	0.0(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)
51-100	337	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	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	0.1(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	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	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	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	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(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)
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)
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)		14.7(102)	20.9(100)	12.2(84)	9.9(101)	11.9(93)	11.4(116)	5.2(91)	-(81)
Biomass ('000 t)		19.7	28.1	16.3	13.4	15.6	15.8	7.3	27.0

[a]Preliminary analysis.

Table 17. Biomass ('000t) of yellowtail outside 200 miles in NAFO Div. 3NO as estimated from Canadian r.v. surveys from 1984-93.

Strata	% Outside 200 miles	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993[a]
						3N					
357	100	0	0	0	-	0	0	0	0	0	0
358	100	0	0	0	0	0	0	0	0	0	0
359	100	0	0	0	0	0	0	0	0	0	+
360	93	25.9	11.3	3.0	2.0	0.5	6.4	1.4	2.1	4.1	1.6
374	23	0.6	0.4	0.2	0.1	+	+	+	+	+	0
375	17	3.6	2.0	4.7	2.9	1.4	0.5	2.1	0.3	2.9	1.2
376	89	3.3	7.8	8.8	6.0	0.4	7.3	4.0	11.4	1.1	0.3
377	100	0	0	0	0	0	0	0	0	0	0
378	100	0	0	0	0	0	0	0	0	0	0
379	100	0	0	0	0	0	0	0	0	0	0
380	83	0	0	0	0	0	0	0	0	0	0
381	79	0	0	0	0	0	0	0	0	0	0
382	53	0	0	0	0	0	0	0	0	0	0
Biomass outside		33.4	21.5	16.7	11.0	2.3	14.2	7.5	13.8	8.1	3.1
Total biomass		104.6	56.7	65.0	49.9	34.4	33.3	42.6	37.2	28.6	34.3
% Biomass outside		31.9	37.9	25.7	22.0	6.7	42.6	17.6	37.1	28.3	9.0
							3O				
353	21	+	1.1	0.4	2.1	+	0.1	0.3	0.4	0.1	0.7
354	52	0	+	0	0	0	+	0	+	0	0
355	72	0	0	0	0	0	0	0	0	0	0
356	77	0	0	0	0	0	0	0	0	0	0
Biomass outside		+	1.1	0.4	2.1	+	0.1	0.3	0.4	0.1	0.7
Total biomass		17.2	24.2	19.7	28.1	16.3	13.4	15.6	15.8	7.3	27.0
% Biomass outside		+	4.6	2.0	7.5	+	0.8	1.9	2.5	1.4	2.6
3LNO biomass outside		33.4	22.6	17.1	13.1	2.3	14.3	7.8	14.2	8.2	3.8
Total 3LNO biomass		136.9	94.4	93.2	81.8	52.9	49.4	59.6	53.7	36.0	61.3[b]
% Biomass outside		24.4	23.9	18.3	6.2	4.3	28.9	13.1	26.4	22.8	6.2

[a] Preliminary Analysis

[b] Excludes small portion expected in Div. 3L

Table 18 . ABUNDANCE (MILLIONS) OF YELLOWTAIL, FROM CANADIAN SPRING RV SURVEYS IN DIV. 3LNO.

AGE	1975	1976	1977	1978	1979	1980	1981	1982	1984	1985	1986	1987	1988	1989	1990	1991	1992
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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

Table 19. Biomass estimates ('000t) of yellowtail from Fall R.V. surveys in Div. 3LNO from 1990 to 1992.

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

Table 20. Mean numbers and weight (kg) of yellowtail per tow, by stratum from r.v. 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
51-100	328	Av.No./set Av.wt./set	-	-	-	-	0.00(3)	-	0.00(5)	0.00(3)
51-100	341	Av.No./set Av.wt./set	-	-	-	-	0.00(4)	0.00(5)	0.00(4)	0.00(5)
51-100	342	Av.No./set Av.wt./set	-	-	-	-	0.00(2)	-	-	0.00(2)
51-100	343	Av.No./set Av.wt./set	-	-	-	-	0.00(2)	-	0.00(2)	0.00(2)
101-150	344	Av.No./set Av.wt./set	-	-	-	-	-	-	-	0.00(2)
101-150	347	Av.No./set Av.wet./set	-	-	-	-	-	-	-	0.00(2)
51-100	348	Av.No./set Av.wt./set	-	-	-	-	0.00(7)	0.00(4)	0.00(7)	0.00(12)
51-100	349	Av.No./set Av.wt./set	-	-	-	-	0.00(5)	0.00(7)	0.00(7)	0.00(8)
31-50	350	Av.No./set Av.wt./set	59.00(5) 25.50	7.83(6) 3.58	-	37.97(5) 3.70	0.88(8) 0.49	0.00(4)	1.37(8) 0.58	0.50(6) 0.24
31-50	363	Av.No./set Av.wt./set	53.80(5) 21.00	48.89(5) 22.77	-	42.47(6) 19.65	13.71(7) 7.54	7.25(4) 3.39	15.99(4) 8.06	13.60(5) 6.67

Table 20 (Cont'd).

Depth (fm)	Stratum	Category	Year 1985	1986	1987	1988	1989	1990	1991	1992
51-100	364	Av.No./set	-	-	-	-	0.00(11)	0.00(5)	0.00(6)	0.00(17)
		Av.wt./set								
51-100	365	Av.No./set	-	-	-	-	0.00(4)	0.00(3)	0.00(4)	0.00(6)
		Av.wt./set								
101-150	366	Av.No./set	-	-	-	-	-	-	-	0.00(3)
		Av.wt./set								
101-150	369	Av.No./set	-	-	-	-	-	-	-	0.00(3)
		Av.wt./set								
51-100	370	Av.No./set	-	-	-	-	0.00(6)	0.00(3)	24.98(3)	0.00(8)
		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)
		Av.wt./set	1.88			0.70	3.70	1.95		0.65
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)
		Av.wt./set	39.49	48.13		34.31	20.21	40.21	27.57	9.25
31-50	384	Av.No./set	35.25(4)	-	-	1.00(5)	0.25(4)	0.50(2)	0.00(3)	0.00(4)
		Av.wt./set	22.88			0.18	0.13	0.47		
51-100	385	Av.No./set	-	-	-	-	0.00(5)	0.00(4)	0.00(6)	0.00(13)
		Av.wt./set								
101-150	386	Av.No./set	-	-	-	-	-	-	-	0.00(3)
		Av.wt./set								

Table 20 (Cont'd).

Depth (fm)	Stratum	Category	Year 1985	1986	1987	1988	1989	1990	1991	1992
101-150	389	Av.No./set	-	-	-	-	-	-	-	0.00(3)
		Av.wt./set								
51-100	390	Av.No./set	-	-	-	-	0.00(4)	0.00(3)	0.00(4)	0.00(4)
		Av.wt./set								
101-150	391	Av.No./set	-	-	-	-	-	-	-	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)
Abundance (Nos x 10^{-6})			52.0	37.4		26.9	14.3	22.5	19.7	11.9
Mean wt./set			25.15	26.36		14.98	2.63	4.61	3.44	1.09
Biomass ('000t)			22.9	17.7		13.6	7.3	11.4	8.9	3.8

Table 21. Mean numbers and weight (kg) of yellowtail per tow, by stratum from r.v. 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
101-15	358	Av.No./set	-	-	-	-	-	-	-	0.00(2)
		Av.Wt./set								
51-100	359	Av.No./set			-		0.00(2)	0.00(3)	0.00(4)	0.00(3)
		Av.wt./set								
31-50	360	Av.No./set	57.67(3)	259.14(14)	192.22(19)	112.51(20)	373.03(19)	392.00(21)	456.87(18)	332.50(16)
		Av.wt./set	26.83	19.96	12.75	22.73	46.28	58.37	75.37	59.95
31-50	361	Av.No./set	99.83(6)	188.50(8)	399.94(8)	162.38(6)	286.33(9)	379.63(10)	521.72(8)	431.63(8)
		Av.wt./set	33.58	61.78	174.37	62.29	107.86	133.26	172.86	156.88
31-50	362	Av.No./set	166.89(9)	109.14(7)	38.00(2)	129.29(6)	103.13(8)	79.40(9)	292.89(7)	40.17(6)
		Av.wt./set	59.50	43.14	16.75	57.64	45.31	140.37	126.99	18.09
31-50	373	Av.No./set	160.80(10)	112.93(7)	-	29.85(8)	32.25(8)	14.78(9)	1.13(7)	1.00(5)
		Av.wt./set	75.60	49.60		15.74	15.38	8.67	0.78	0.43
31-50	374	Av.No./set	16.00(4)	12.00(4)	-	5.25(4)	0.33(3)	0.75(4)	0.00(2)	7.00(3)
		Av.wt./set	7.50	6.38		3.63	0.17	0.15	0.00	3.67
≤ 30	375	Av.No./set	228.29(7)	236.65(5)	407.26(7)	146.44(9)	284.88(8)	266.65(11)	450.51(7)	458.33(11)
		Av.wt./set	104.14	115.19	43.22	25.67	88.88	73.25	144.79	169.22
≤ 30	376	Av.No./set	148.50(2)	325.75(4)	1015.22(10)	363.72(12)	916.22(9)	1505.36(11)	1658.82(10)	475.13(8)
		Av.wt./set	47.75	150.46	58.55	38.79	160.04	206.24	160.03	58.53
51-100	382	Av.No./set	-	-	-	-	0.00(2)	0.00(3)	0.00(3)	0.00(2)
		Av.wt./set								
31-50	383	Av.No./set	0.00(4)	-	-	2.00(4)	0.00(3)	0.00(3)	0.00(4)	0.00(2)
		Av.wt./set				0.32				
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)
Abundance (Nos x 10^{-6})			189.9	272.2	381.1	193.9	405.6	509.8	667.7	355.8
Mean wt./set			50.52	59.17	53.60	32.32	55.78	62.05	85.58	55.27
Biomass ('000t)			78.2	85.4	59.6	56.1	92.7	103.2	142.4	93.3

Table 22. 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 $\times 10^{-3}$) are shown at the bottom of the table.

Depth (fm)	Stratum	Category	Year 1985	1986	1987	1988	1989	1990	1991	1992
51-100	329	Av.No./set	-	-	-	-	0.00(4)	-	0.00(6)	2.50(6)
		Av.Wt./set								1.02
31-50	330	Av.No./set	-	-	-	10.99(2)	6.87(7)	37.14(7)	4.00(6)	53.40(5)
		Av.wt./set				5.50	3.54	18.20	1.65	29.16
31-50	331	Av.No./set	-	-	-	0.50(2)	12.50(2)	19.00(2)	8.99(3)	4.00(2)
		Av.wt./set				0.25	7.75	10.56	4.91	1.48
51-100	332	Av.No./set	-	-	-	-	6.50(4)	7.00(2)	27.98(4)	0.00(4)
		Av.wt./set					3.75	1.88	12.48	
51-100	337	Av.No./set	-	-	-	-	0.00(2)	10.67(3)	1.25(4)	1.25(4)
		Av.wt./set						2.82	0.39	0.17
31-50	338	Av.No./set	-	86.67(3)	-	18.99(6)	48.50(6)	9.25(4)	9.83(6)	33.75(4)
		Av.wt./set		41.17		9.58	20.12	3.89	4.21	17.96
51-100	339	Av.No./set	-	-	-	-	0.00(2)	0.00(3)	4.50(4)	4.50(4)
		Av.wt./set							8.17	0.34
31-30	340	Av.No./set	-	-	-	7.59(3)	33.50(6)	6.71(7)	29.18(5)	9.75(4)
		Av.wt./set				2.85	15.33	3.16	11.82	3.88
31-50	351	Av.No./set	166.00(3)	175.78(9)	-	85.93(7)	69.38(8)	99.42(9)	41.40(7)	63.66(7)
		Av.wt./set	63.67	66.00		28.68	29.31	43.95	18.90	27.60
31-50	352	Av.No./set	-	210.77(13)	134.00(1)	167.78(11)	206.93(14)	158.95(16)	231.96(16)	352.08(13)
		Av.wt./set		73.68	65.35	58.81	77.43	66.01	80.02	97.62
31-50	353	Av.No./set	-	118.00(5)	-	19.24(4)	21.67(3)	0.00(4)	86.73(5)	6.25(4)
		Av.wt./set		68.75		9.19	10.33		37.86	2.84
51-100	354	Av.No./set	-	-	-	-	0.00(2)	0.00(3)	0.00(3)	0.00(4)
		Av.wt./set								
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)
Abundance (Nos x 10^{-6})			44.5	138.5		78.2	97.0	84.3	97.7	108.8
Mean wt./set			63.67	63.13		21.58	21.15	21.88	20.05	24.80
Biomass ('000t)			17.1	52.4		28.8	38.9	36.3	36.9	45.7

Table 23. A comparison of average numbers and weights of yellowtail flounder per 30-minute tows from day, night, and combined juvenile surveys from 1985 to 1992. Selected strata in Div. 3NØ used. Abundance and biomass are given at the bottom of the table.

Selected		1986			1987			1988			1989			1990		
strata	Category	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 23. (Cont'd.)

Selected strata	Category	1991 Day	1991 Night	1991 Combined	1992 Day	1992 Night	1992 Combined
352	No. of sets	7	9	16	7	6	13
	Av. no./set	133.19	309.09	232.14	257.43	250.17	254.08
	Av. wt./set	59.69	95.93	80.08	90.39	106.05	97.62
360	No. of sets	10	8	18	10	6	16
	Av. no./set	371.10	564.88	457.22	220.20	503.00	332.50
	Av. wt./set	66.33	86.79	75.43	49.72	76.98	59.95
361	No. of sets	5	3	8	6	2	8
	Av. no./set	306.0	882.33	522.13	249.00	979.50	431.63
	Av. wt./set	113.10	272.49	172.99	103.75	316.73	156.88
375	No. of sets	4	3	7	6	5	11
	Av. no./set	320.5	624.67	450.86	113.93	871.60	458.33
	Av. wt./set	134.10	159.31	144.90	57.97	302.73	169.22
376	No. of sets	7	3	10	4	4	8
	Av. no./set	1241.86	2636.0	1660.10	117.00	833.45	475.13
	Av. wt./set	143.7	198.54	160.16	21.83	95.24	58.53
Total	No. of sets	33	26	59	33	23	56
	Av. no./set	417.71	862.32	583.92	206.45	627.83	370.11
	Av. wt./set	94.27	148.66	116.36	66.49	163.07	102.62
Abundance (millions)		467.0	964.0	652.8	230.8	701.9	413.8
Biomass (000s t)		105.4	166.2	130.1	74.3	182.3	114.7

Table 24. Average numbers per tow at age from selected strata in juvenile flatfish surveys of NAFO Division 3NO (strata 352, 360, 361, 375, and 376) 1986-92.

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

[a]Incomplete survey, stratum 352 not surveyed.

Table 25. 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 1986-92.

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

[a]Incomplete survey; stratum 352 not surveyed.

Table 26. Percent abundance of the 1983 to 1991 year-classes in the various selected strata from the 1992 juvenile survey.

Year-class	Age	Mean len.(cm)	Abundance millions	Selected strata - Percentage 352	360[a]	361	375	376[b]
1991	1	7.6	2.9	4	24	4	4	64
1990	2	12.3	5.3	3	18	20	11	48
1989	3	17.1	69.2	9	39	7	7	39
1988	4	22.3	75.5	7	39	11	13	30
1987	5	27.7	71.5	14	30	17	17	21
1986	6	32.6	78.9	19	19	30	25	7
1985	7	37.7	66.7	23	13	30	32	2
1984	8	42.6	33.8	37	7	32	23	0
1983	9	46.9	6.4	31	5	41	22	2

[a]93% outside 200-mile limit.

[b]89% outside 200-mile limit.

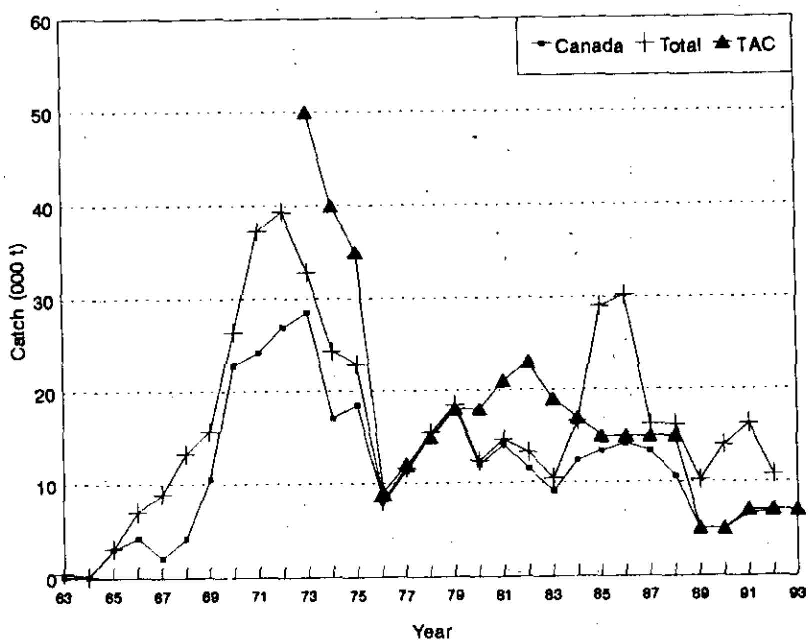

Fig. 1. Catches and TAC's of yellowtail in Div. 3LNO.

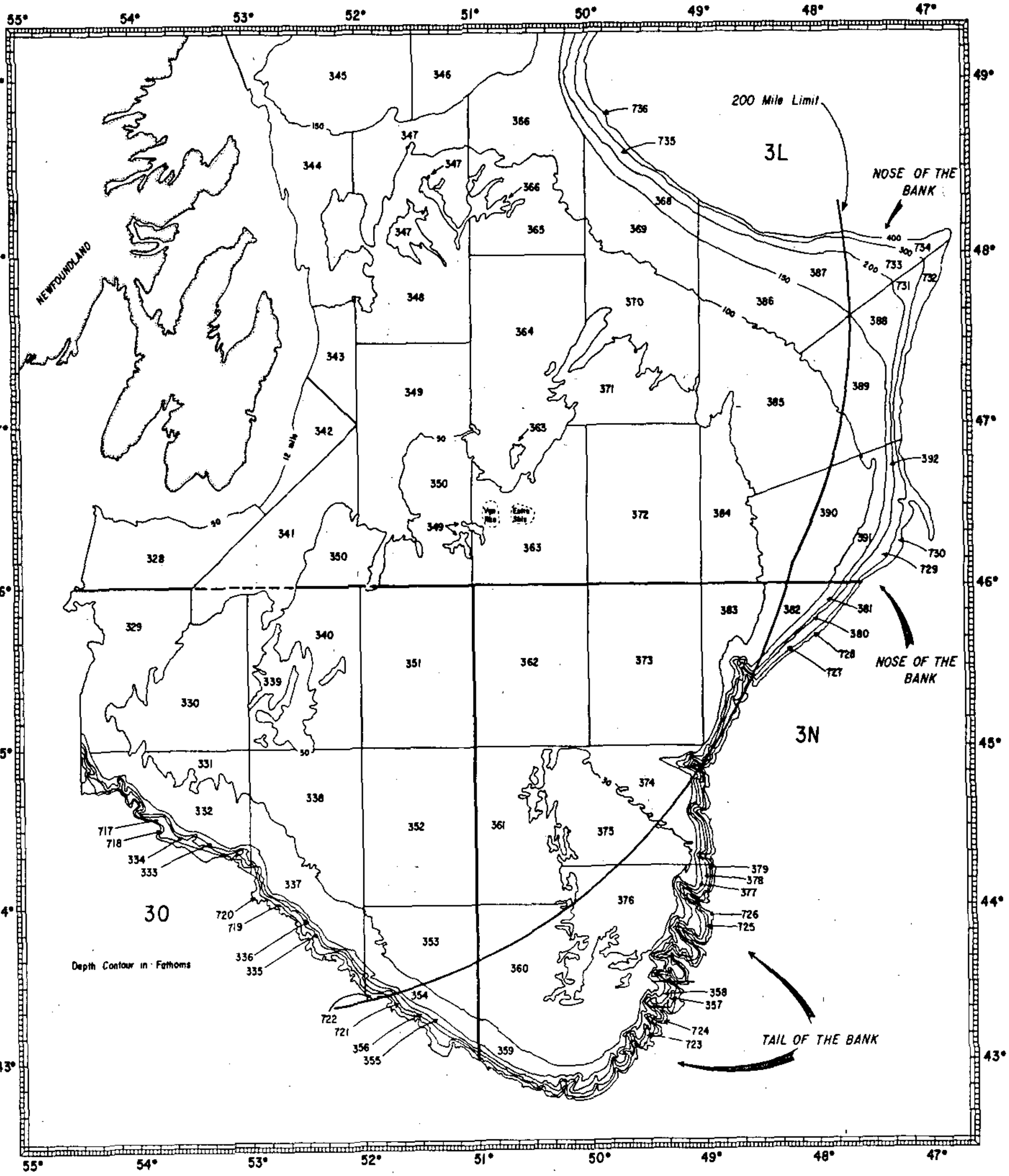

Fig. 2. Grand Banks, NAFO Div. 3LNO, showing the Canadian 200 mile limit in relation to the Nose and Tail of the Bank as well as the stratification scheme used in Canadian groundfish surveys.

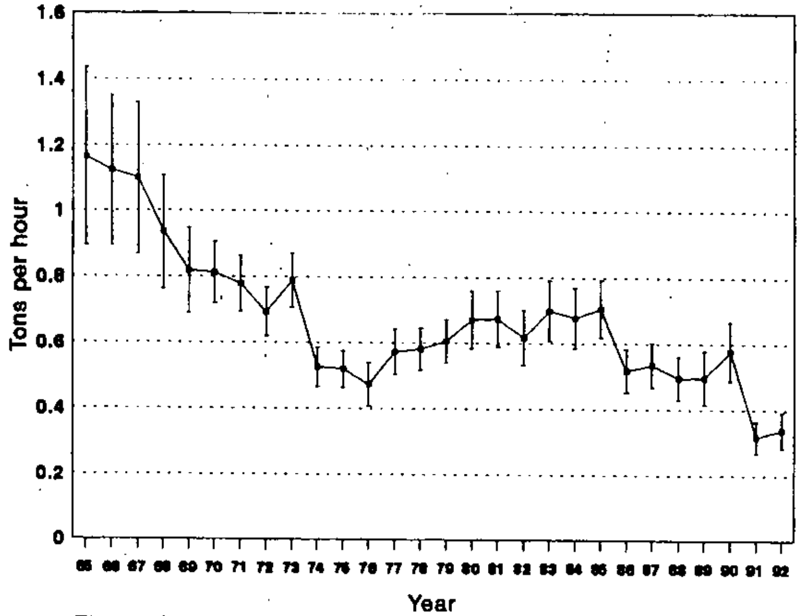

Fig 3a Standardized CPUE with approximate 95% confidence intervals for Yellowtail flounder in Div. 3LNO from 1965-1992.

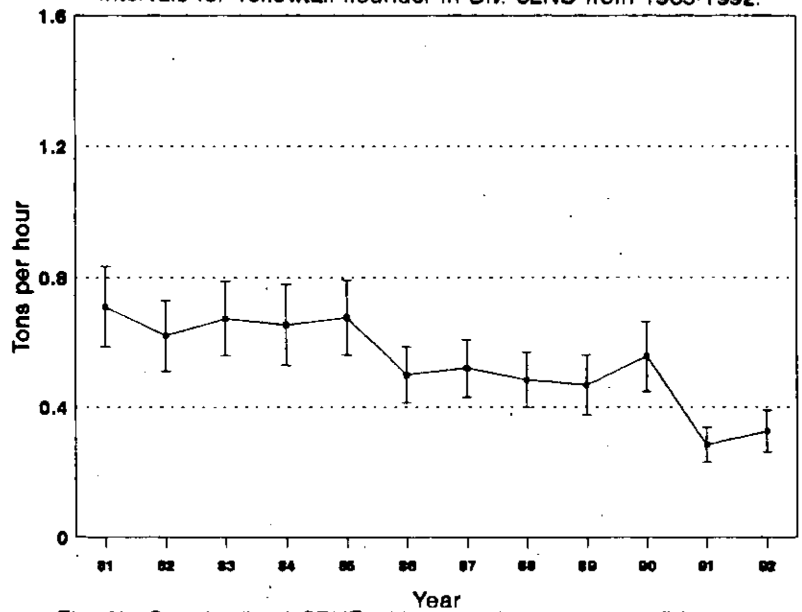

Fig. 3b. Standardized CPUE with approximate 95% confidence intervals for Yellowtail flounder in Div. 3LNO from 1981-1992.

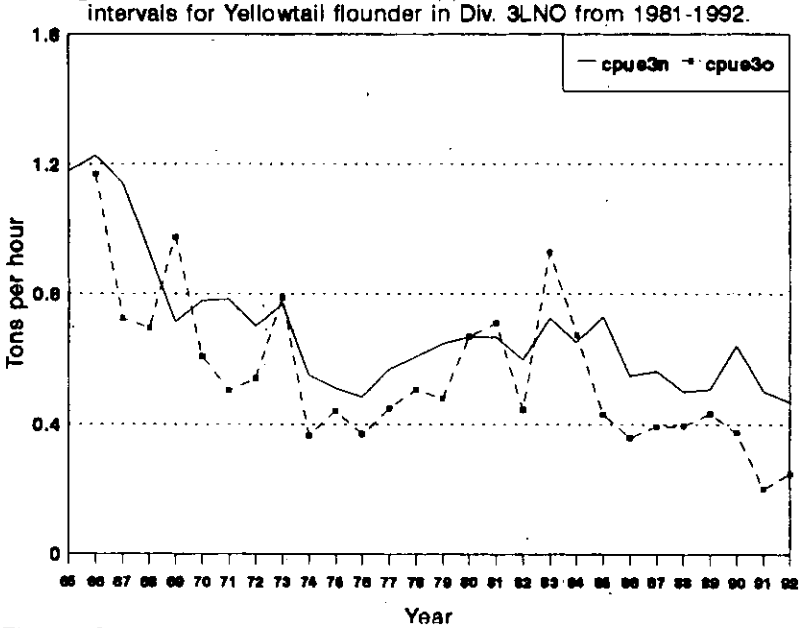

Fig. 3c. Standardized CPUE for Yellowtail flounder in Div. 3N and Div. 30 based on separate analyses for each division.

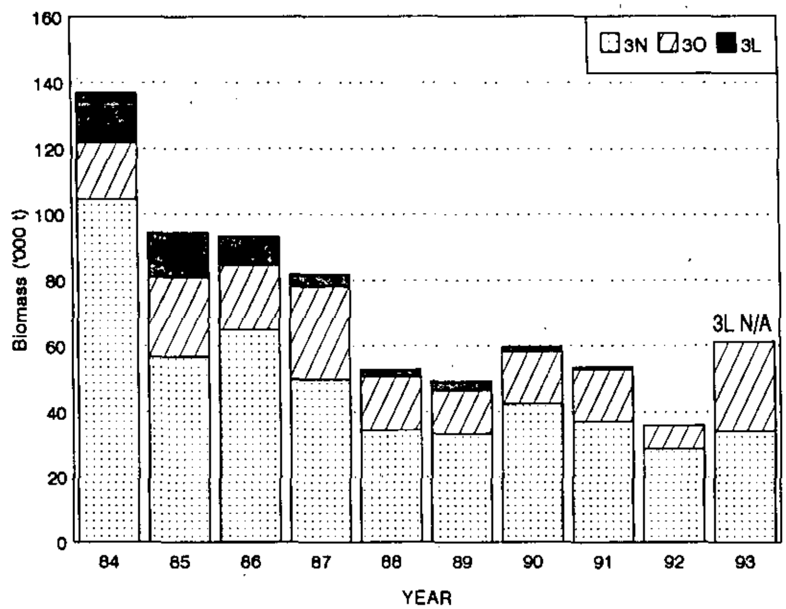

Fig. 4. Biomass of yellowtail flounder from Canadian RV surveys conducted in Div. 3LNO.

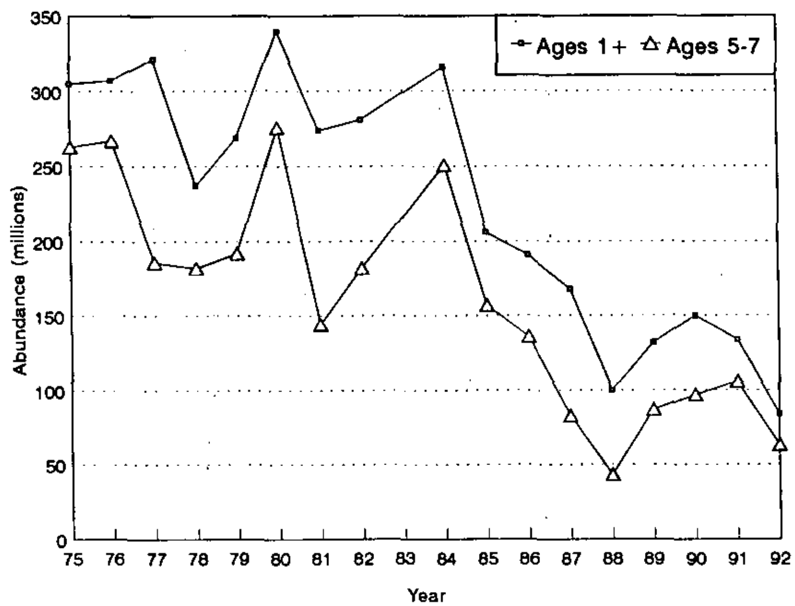

Fig. 5. Abundance of yellowtail in Div. 3LNO as measured by Canadian spring RV surveys.

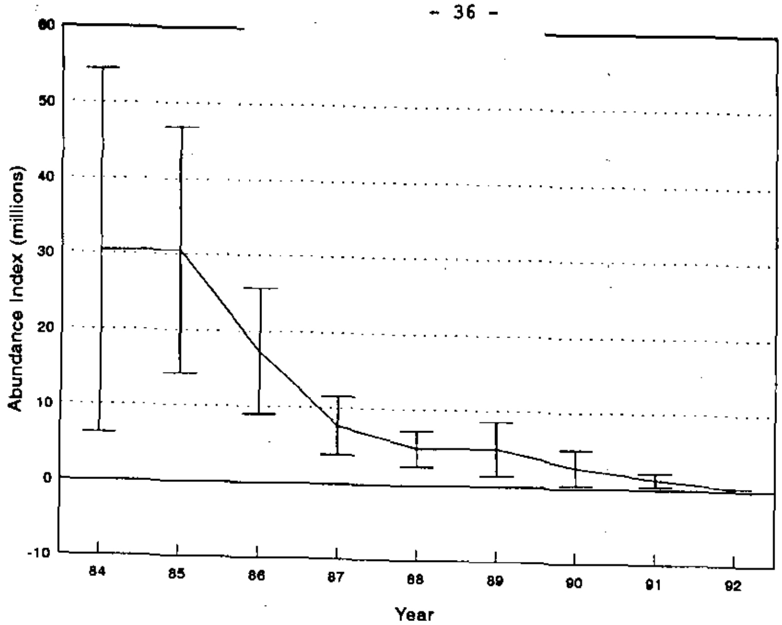

Fig. 6. Abundance estimates of yellowtail (with 95% C.I.) from Canadian spring surveys in Div.3L.

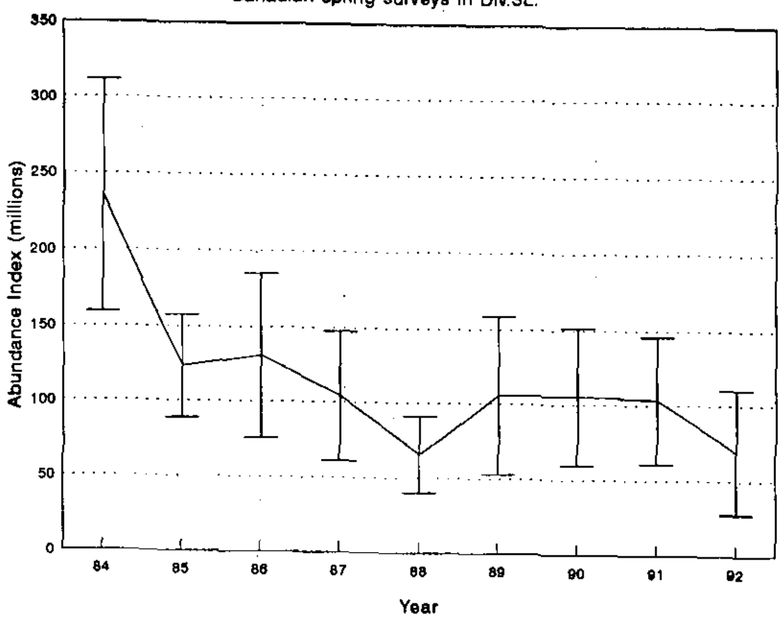

Fig. 7. Abundance estimates of yellowtail (with 95% C.I.) from Canadian spring surveys in Div.3N.

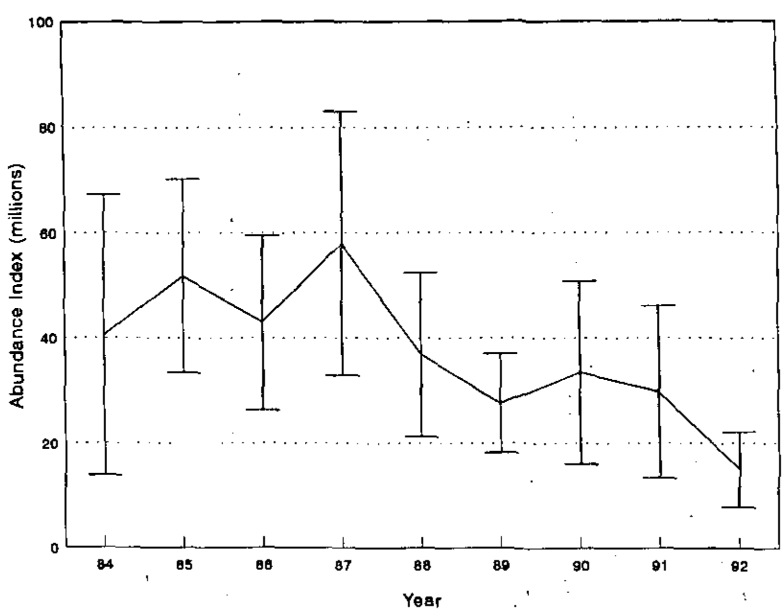

Fig. 8. Abundance estimates of yellowtail (with 95% C.I.) from Canadian spring surveys in Div.3O.

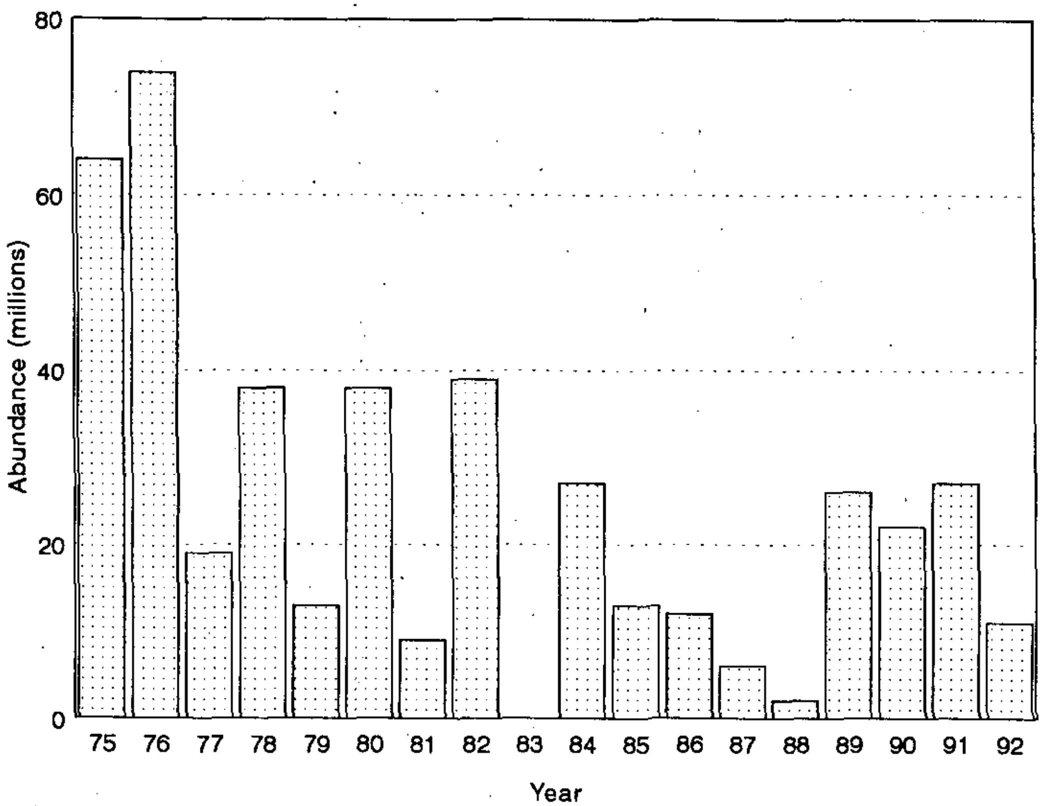

Fig. 9. Abundance at age 5 from Canadian spring RV surveys in Div 3LNO.

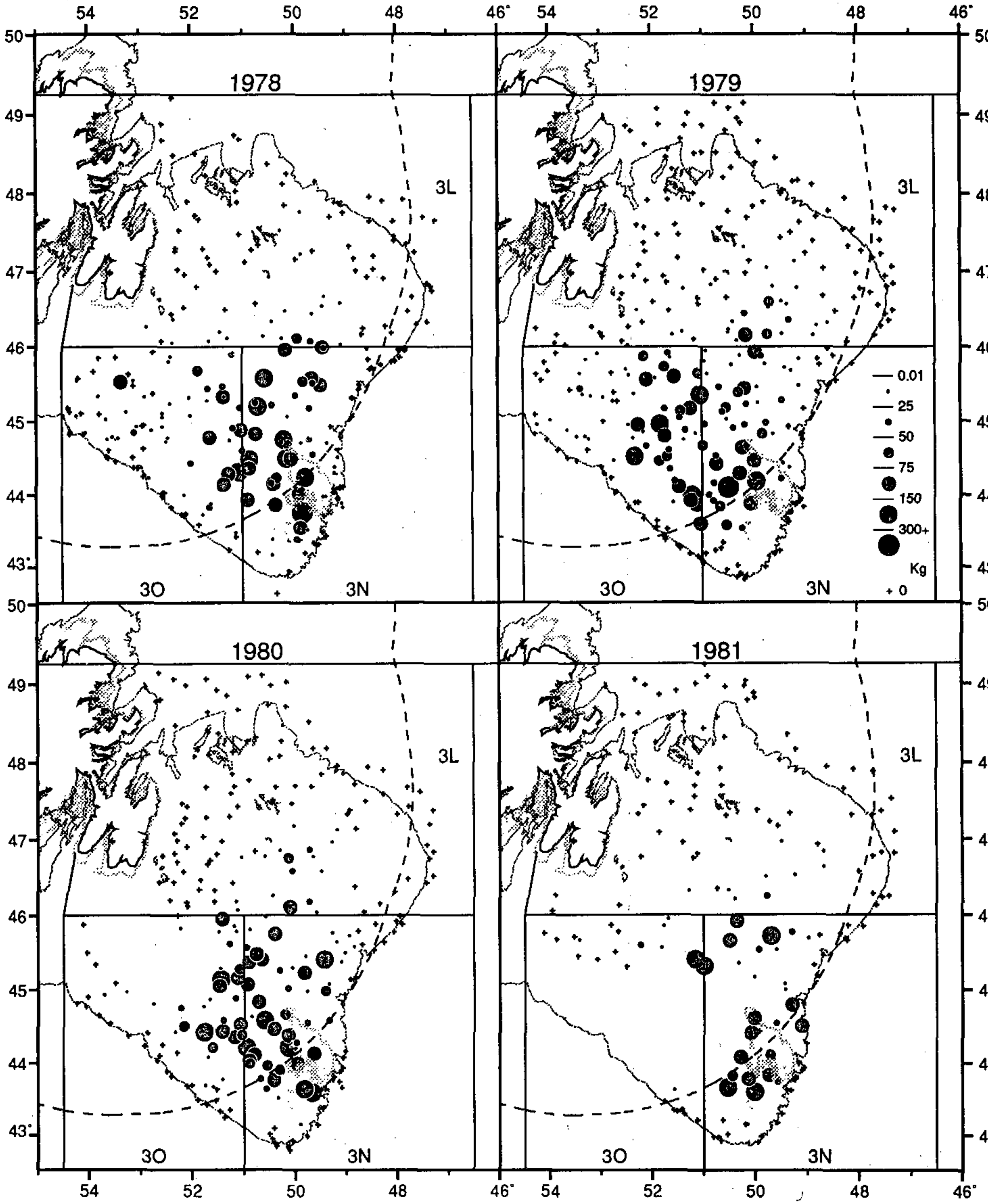

Fig. 10 Distribution of Yellowtail flounder catches (Kg. per standard tow) from 1978-1981 Canadian spring surveys to Div. 3LNO showing 50m (light dotted) and 200m (dark dotted) depth contours. Dashed line represents division between the Canadian economic zone and the NAFO Regulatory area.

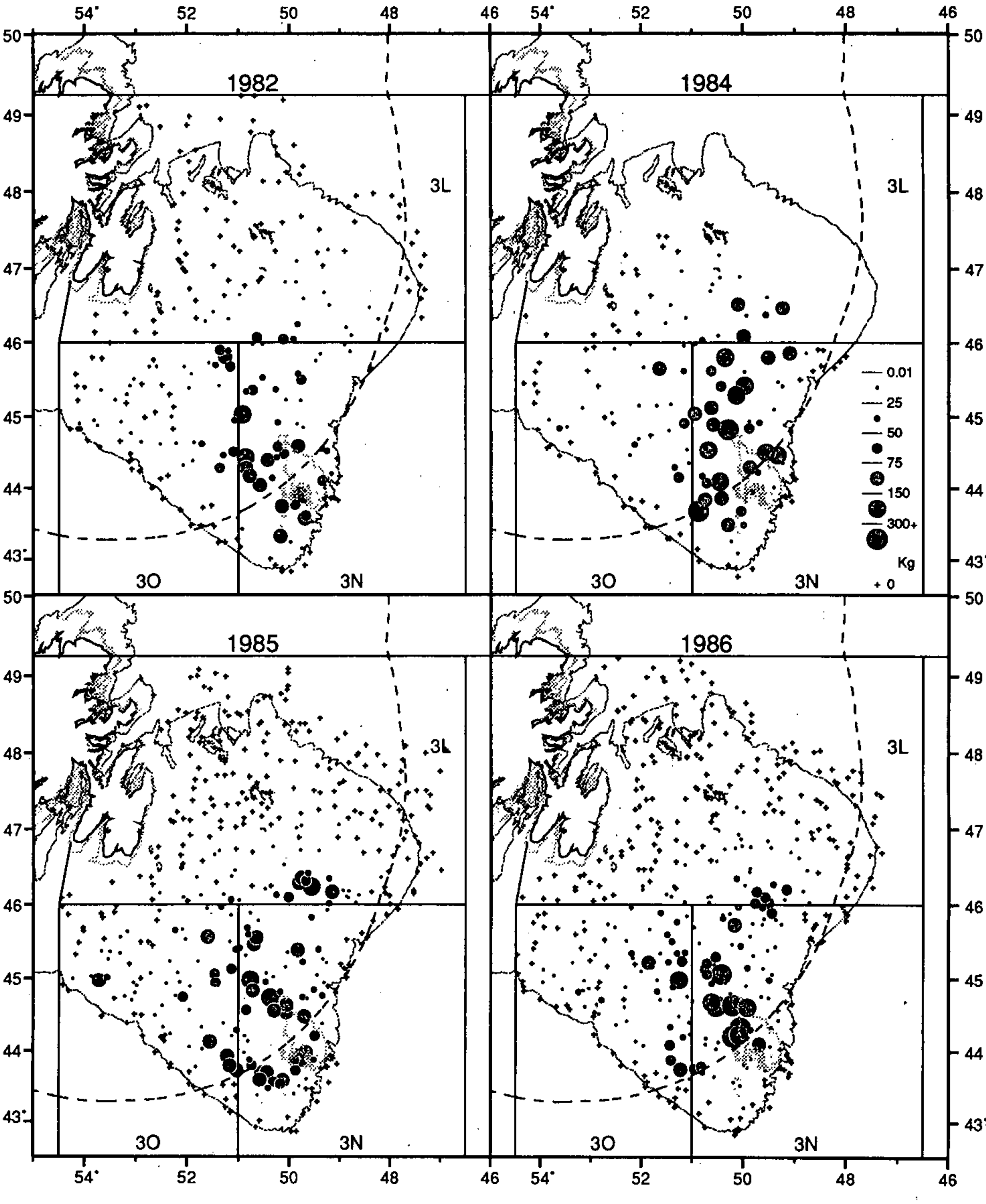

Fig. 11 Distribution of Yellowtail flounder catches (Kg. per standard tow) from 1982-1986 Canadian spring surveys to Div. 3LNO showing 50m (light dotted) and 200m (dark dotted) depth contours. Dashed line represents division between the Canadian economic zone and the NAFO Regulatory area.

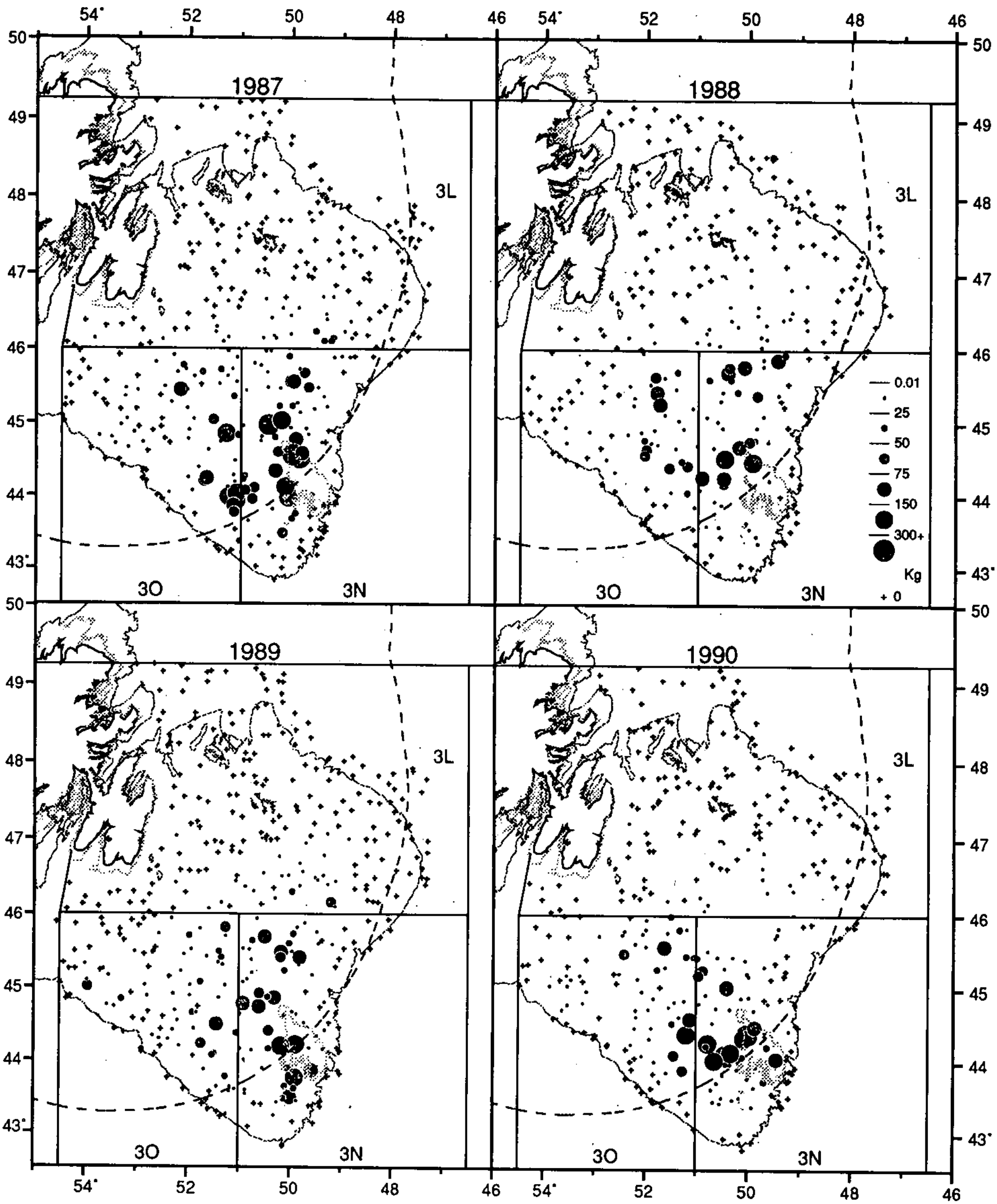

Fig. 12 Distribution of Yellowtail flounder catches (Kg. per standard tow) from 1987-1990 Canadian spring surveys to Div. 3LNO showing 50m (light dotted) and 200m (dark dotted) depth contours. Dashed line represents division between the Canadian economic zone and the NAFO Regulatory area.

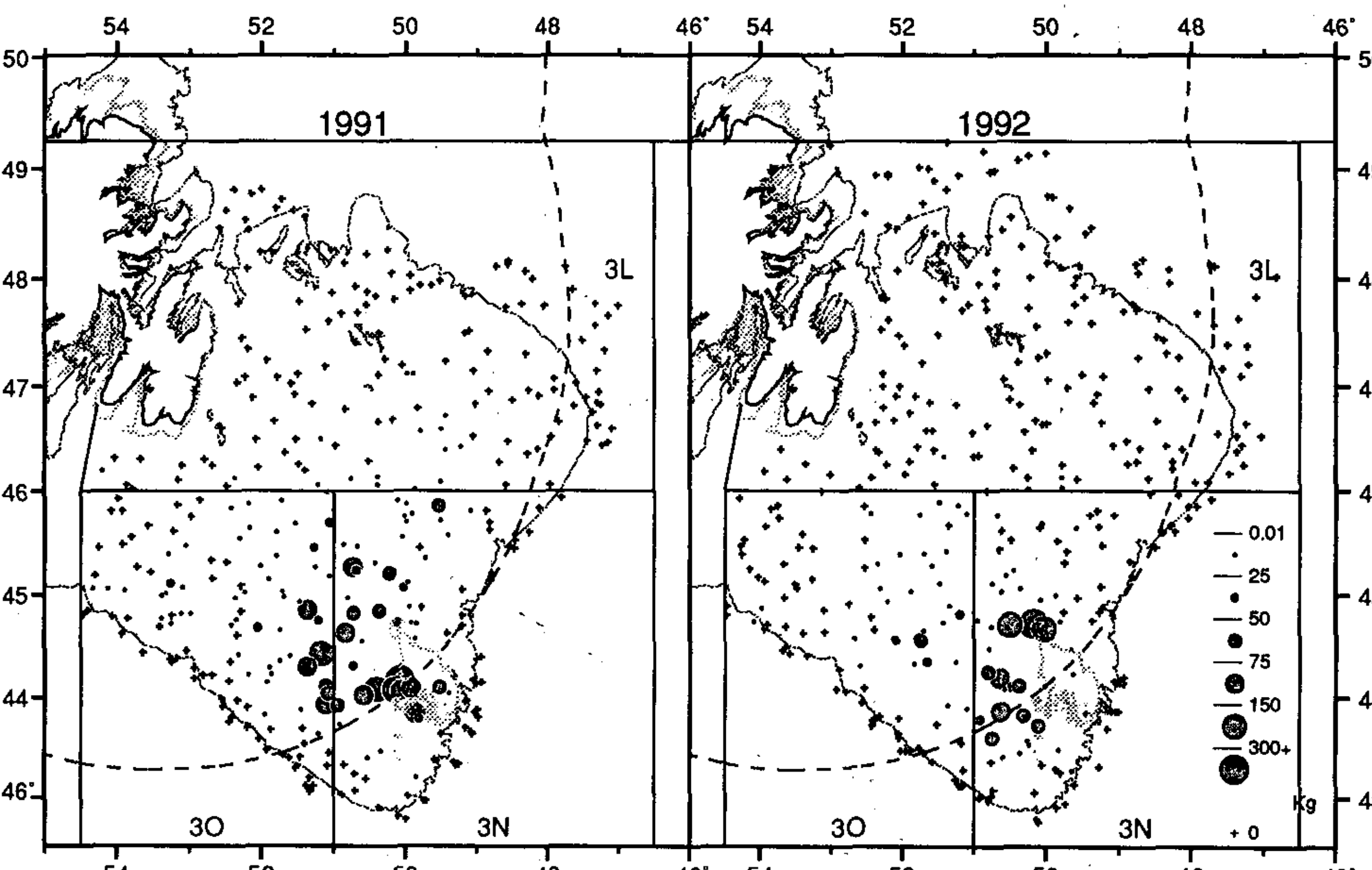

Fig. 13 Distribution of Yellowtail flounder catches (Kg. per standard tow) from 1991-1992 Canadian spring surveys to Div. 3LNO showing 50m (light dotted) and 200m (dark dotted) depth contours. Dashed line represents division between the Canadian economic zone and the NAFO Regulatory area.

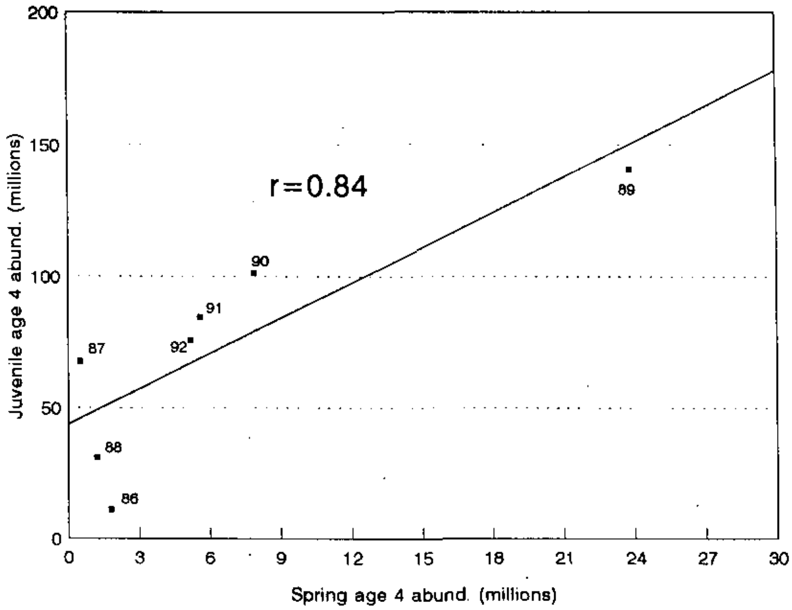

Fig. 14 Regression of age 4 abundance from juvenile surveys against age 4 abundance from spring surveys, Div. 3LNO.

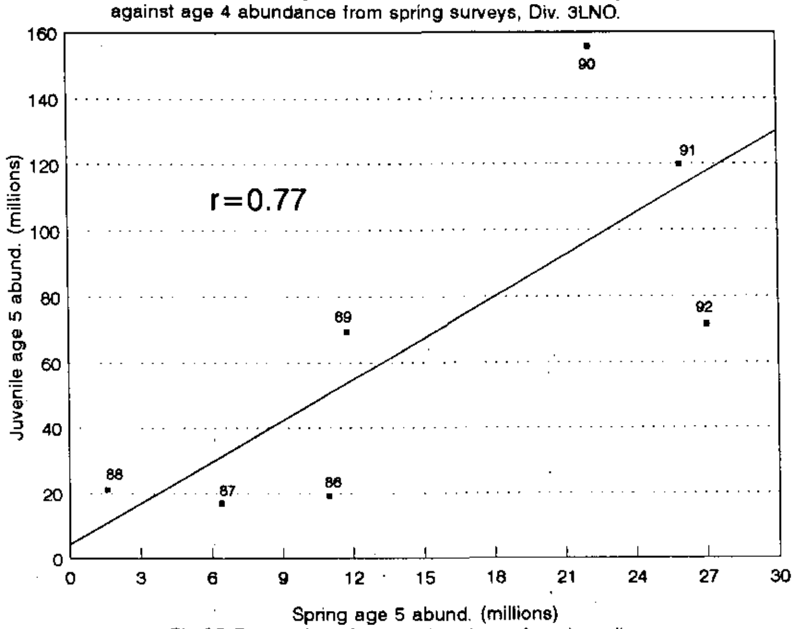

Fig. 15 Regression of age 5 abundance from juvenile surveys against age 5 abundance from spring surveys, Div. 3LNO.

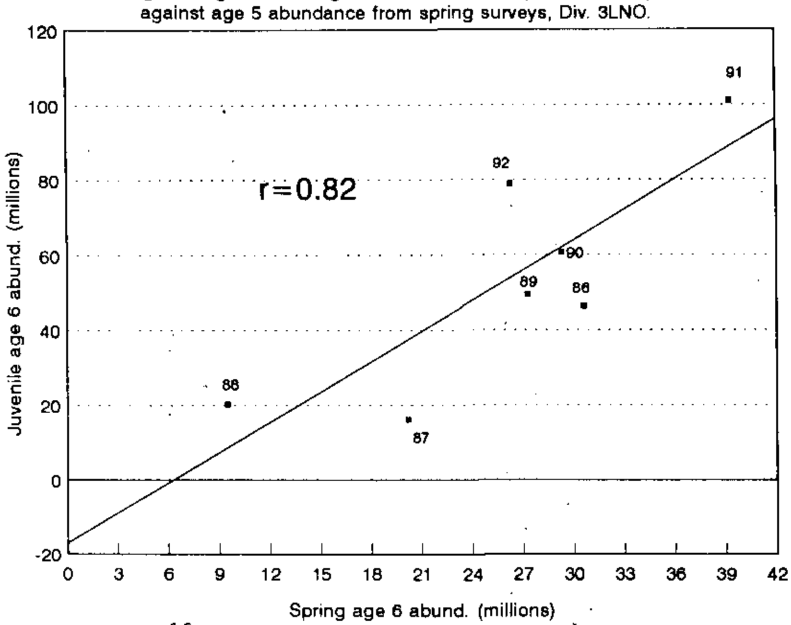

Fig. 16 Regression of age 6 abundance from juvenile surveys against age 6 abundance from spring surveys, Div. 3LNO.

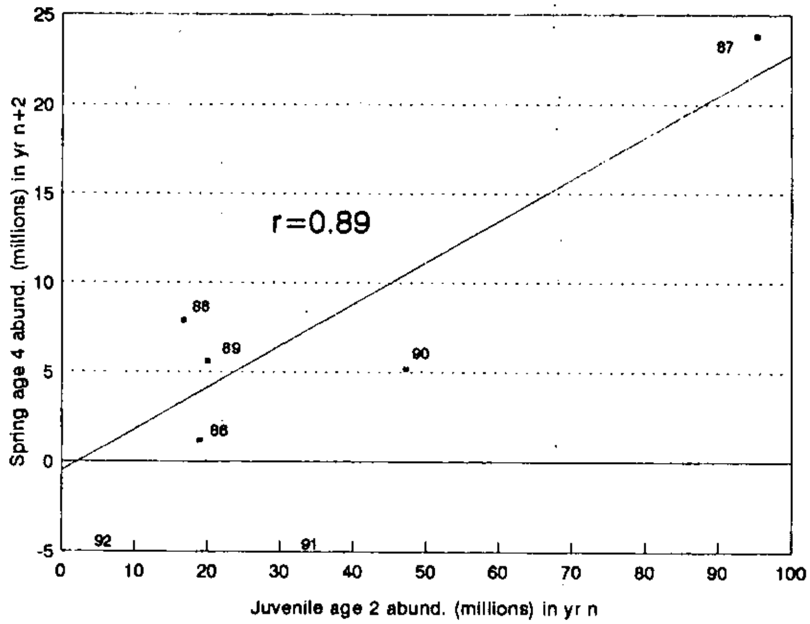

Fig.17. Regression of age 4 abundance (yr n+2) from spring surveys against age 2 abundance (yr n) from juvenile surveys, Div. 3LNO.

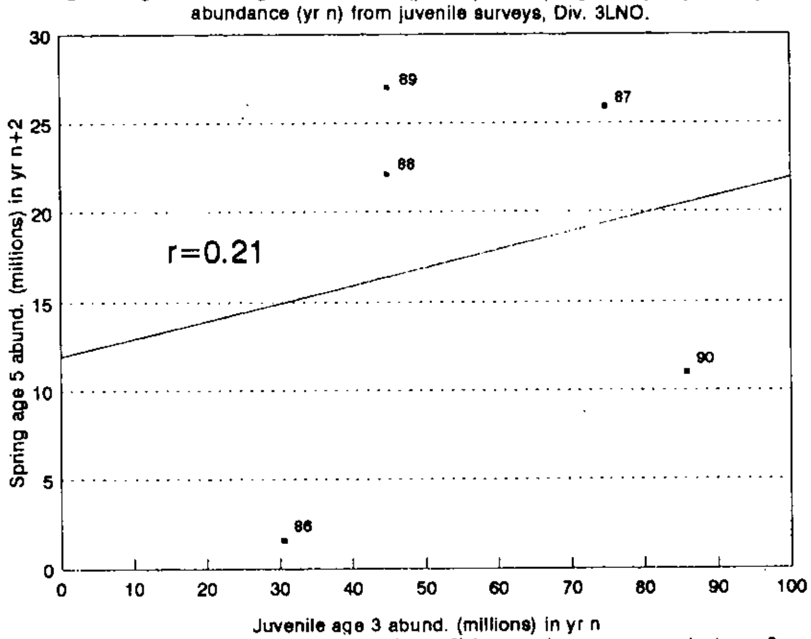

Fig.18 Regression of age 5 abundance (yr n+2) from spring surveys against age 3 abundance (yr n) from juvenile surveys, Div. 3LNO.

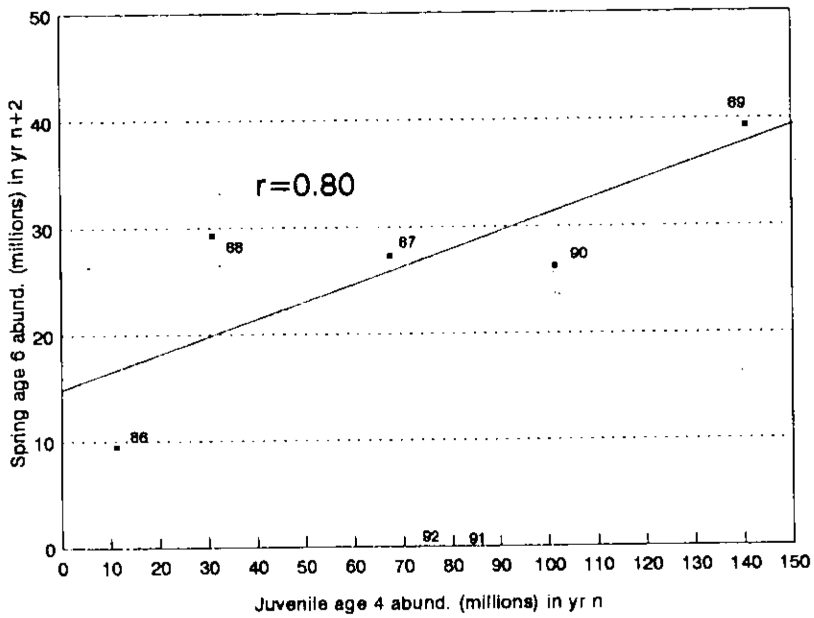

Fig. 19 Regression of age 6 abundance (yr n+2) from spring surveys against age 4 abundance (yr n) from juvenile surveys, Div. 3LNO.