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# An Assessment of the Yellowtail Flounder Stock in Division 3LNO

by

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## Introduction

### TAC regulation

This stock has been under TAC regulation since 1973, when a precautionary level of 50,000 t was established. In 1976 the TAC was lowered to 9,000 t from 35,000 t, following a number of large catches and a decrease in stock biomass. After 1977, the TAC increased steadily to 23,000 t in 1982 and was set at 15,000 t from 1985-88, based on average catches over several years preceding 1984. For 1989, the TAC was reduced to 5,000 t, based on a sharp reduction in stock biomass following very large catches in 1985 and 1986.

### Catch history

The nominal catch from this stock increased rapidly from a few hundred tons in 1963-64 to a high of about 37-39,000 t in 1971-72 (Table 1(a), Fig. 1). Vessels from Canada and the USSR took almost all of the catch up to and including 1975, with only Canada taking significant catches in 1976-81. With the entrance of South Korean vessels into the fishery in 1982, catches by non-Canadian vessels began to increase rapidly, approaching the Canadian catch in 1985 and 1986. For 1987 and 1988, however, preliminary estimates indicate that catches by non-Canadian vessels were substantially lower than in 1986 (Table 1(b)). In 1988, catches by non-member countries continued the decline noticed in 1987. The Canadian catch also declined in 1988 to about 10,500 t, down about 3,000 t from the relatively stable catch level in 1985-87 (Table 1(a)).

The fishery for this stock is conducted almost exclusively by large offshore otter trawlers, with the majority of the catch coming from Div. 3N (Table 2, Fig. 2). In 1985 and 1986, the catches from this division approached the highest on record and this can be attributed to the increased fishing effort on the tail of the bank, outside the Canadian 200 mile limit, much of which is excellent yellowtail habitat (Fig. 3). It should be noted that not all countries observed fishing in this area have reported catches to NAFO. For these countries, catches are estimated from Canadian surveillance reports (Table 1(b)).

In 1987 and 1988 the decline in the yellowtail catch of many nations (Table 1(a)) was attributed (by Canadian surveillance personnel) to a shifting of effort to deeper water for redfish, after catch rates for flounder on the tail of the bank decreased substantially from 1986 to 1987. Preliminary reports in 1989 indicate some effort is now being redirected towards flatfish on the Tail of the Bank.

For South Korea, catches of unspecified flounder were reported to NAFO in 1982-84 and a ratio of 60%/40% yellowtail to A. plaice was used to estimate landings by species. In 1985, S. Korea reported a mixture of A. plaice, yellowtail, and unspecified flounder, and the ratio of yellowtail to A. plaice (63/37) was used to break down the unspecified flounder catch. For 1986 and 1987, surveillance estimates were used for the South Korean catch.

Given the offshore nature of the fishery and its concentration in Div. 3N, which is usually ice-free, catches occur in all months, often peaking in the fall. It should be noted that monthly breakdowns are not available for substantial portions of the catch in 1984-86.

## Assessment

### Catch sampling (1988)

#### Canada

Length frequencies and otoliths were available from the Canadian fishery in 1988. The level of sampling from the Canadian fishery remains high for this stock, as shown in Table 3, which indicates how the catch at age from this fishery was calculated. The standard weight-length relationship which has been used in recent assessments was used to convert the average lengths at age to average weights at age (Table 4).

#### USA

Numbers at length were available for the USA catch in Div. 3LNO for all months combined. To determine the age composition, Canadian age-length keys from Q3+Q4 in Div. 3N (sexes combined) were used, as most of the USA catch occurred after June in this division.

#### Spain

Length frequencies from the catch by Spanish freezer trawlers in Div. 3NO in 1988 were available (SCS Doc. 89/16). To determine the numbers removed at each length group, the sample weights (derived using the standard weight-length relationship) were adjusted to the monthly catches applied to each frequency. To derive the numbers at age, age-length keys from the Canadian spring survey and the Canadian fall juvenile flatfish survey were used. The average weights at age were also calculated from the mean lengths at age using the weight-length relationship. The sum of products check was 5% lower than the nominal catch.

#### Portugal

Length frequencies from the Portuguese catch in 1988 were reported in SCS Doc. 89/15. However, there was no exact figure for catch available for Portugal as the small amount of yellowtail caught was not separated from other flounder landings.

### Catch numbers and average weights at age

Table 5 indicates that the catch at age of yellowtail in the Canadian and American fisheries was similar in 1988, with age 7 being dominant in both catches. The USA catches did contain a slightly higher percentage of small fish, which is not surprising given the distribution of young yellowtail in the area outside the 200 mile limit. Table 7 shows that the Canadian catch at age in 1988 was typical of recent years, being dominated by ages 7 and 8. The average weights at age (Table 8) in the Canadian fishery have been constant over the 1986-88 period.

Table 6 shows the major differences between the catch at age for Canada and Spain in 1988. As indicated in Fig. 4, some 84% of the Spanish catch numbers are at ages 3-5, compared to about 3% in the Canadian catch. This is consistent with data from surveys which indicates that young yellowtail are located mainly outside the Canadian 200-mile limit in Div. 3N.

In the 1988 assessment of this stock, a detailed account was given of the incorporation of Spanish and American length frequency data into the catch at age for 1985-87. These calculations were reviewed this year and found to be reasonable. However, it must be noted that there are still substantial portions of the catch in some years for which no catch at age is available. For example, in 1986, some 13,600 t or 44% of the catch, all of which came from the Tail of the Bank, was not sampled.

The catch at age and average weight at age matrices for Div. 3LNO yellowtail are shown in Tables 9-12.

### Commercial CPUE data

A multiplicative model was used to analyze the catch and effort data for this stock for the first time. Because data were available from the NAFO Statistical Bulletins only from 1974 onward in a format identifying main species yellowtail data, it was decided to use Canadian (Newfoundland) trawler data from 1965 to 1988, from files maintained at the Northwest Atlantic Fisheries Center in St. John's. It should be noted that for some years, particularly the late 1970's, the Canadian fleet provided the only source of CPUE data for this stock. The data used in the model were the same as those used to calculate the CPUE series used previously. However, in 1989, an error was discovered in the data which led to underestimates of effort in 1984-87 of up to 12-15%. These errors were most severe in 1984 and were corrected before the data were used in the multiplicative model.

As is the norm when using the multiplicative model noted previously, values of catch (t) and effort (hrs) less than 10 were eliminated. Again, as is often the case, plots of residuals indicated data with higher levels of catch and effort tended to be less variable. Therefore, a weighted regression was conducted. Table 13 and Fig. 5 show the results of the analysis, and Fig. 6 gives the points in the series from 1965 to 1988. A comparison of the multiplicative model series with the CPUE values calculated previously for this stock revealed that the two indices were similar. However, with the correction of the erroneous data for 1984-87 and the application of the model, a change in the catch rate trend is apparent in the early 1980's, with 1981 and 1982 no longer showing up as high points (Fig. 7). The decline in catch rate from 1985 to 1986, however, is still obvious. It is also important to note that the model shows the 1986-88 CPUE values to be about as low as the previously observed lows for this stock in 1975-76.

As was noted previously for this stock, it is likely that the Canadian catch rate index does not reflect the true magnitude of recent declines in stock abundance, as this fleet rarely entered the area outside the 200 mile limit in recent years, an area where catches and estimated catch rates have been declining after the large catches in 1985 and 1986.

From Table 13 it can be seen that the catch rates are highest in Div. 3N, highest for large (TC 5) stern trawlers, and generally highest in the last 4 months of the year.

Research vessel survey results

A) Spring biomass surveys

Stratified-random trawl surveys have been carried out by Canadian research vessels on the Grand Bank each year from 1971 to 1982 and 1984 to 1989. Figure 3 shows the stratification scheme used in these surveys. Tables 14-16 show the mean weight per tow on a stratified basis, along with the total estimated biomass for Div. 3L, 3N, and 3O respectively, and as can be seen here, most of the biomass of this stock is found in Div. 3N. In this division the biomass has declined from about 60,000 t in 1985-86 to about 35,000 t in 1988-89. Overall, the stock biomass (Div. 3LNO) has decreased from about 94,000 t in 1985-86 to 82,000 t in 1987, and 53,000 t in 1988. The value for the recently completed 1989 survey is slightly lower at 47,000 t. Table 17 shows the trends in strata 360 and 376, which are located mainly outside the 200 mile limit, compared to the rest of Div. 3N. After declining to negligible levels from 1984 to 1988, the biomass in these strata in 1989 was estimated to comprise over 40% of the total in Div. 3N. This increase measured by the recent survey is consistent with reports of increased commercial effort on flounders in the area around the 200 mile limit in 1989.

As was done in the 1988 assessment, a multiplicative model was employed to obtain estimates of abundance which accounted for strata not surveyed in some years. Using the same dataset, with the addition of the 1989 values, produced the abundance estimates shown in Table 18. As was done in 1988, the age by age estimates were calculated from the population structure in strata in Div. 3LN, with the exception of 1989, where Div. 3NO was used. The age by age abundance values are shown in Table 18. The estimates from 1971-82 have been adjusted upward by a factor of 1.4 to account for the different vessel-gear used in these surveys. After a decline from very high levels in the early 1970's, the abundance remained relatively stable between 240 and 340 million from 1975 to 1984, after which time it declined steadily to about 100 million in 1988. The 1989 estimate is about 30% higher, but is still the second lowest value in the 18 year series. The decline from the mid to late 1980's is also present in the groundfish surveys conducted by the USSR.

On an age by age basis, the 1981 and 82 year-classes continue to show up as very poor and the 1983 year-class, which showed as the worst in the series at age 5 in 1988, improved only slightly at age 6 in 1989, and is still very poor. The following table, which shows the ranks of the estimates of the 1981-83 year-classes at age 5-8 (1986-89 surveys), indicates that the recent estimates for all three year-classes are the worst in the 18 year series:

| Year-class | Age 5 | Age 6 | Age 7 | Age 8 |
|---|---|---|---|---|
| 1981 | 15 | 17 | 18 | 17 |
| 1982 | 17 | 18 | 17 | - |
| 1983 | 18 | 16 | - | - |

These three consecutive poor year-classes produced a population estimate at ages 6-8 in 1989 of about 78 million, which is the lowest value at these ages in the series and is about 38% of the average at these ages from 1972 to 1989. This is important because it is these 3 ages which contribute almost exclusively to the commercial catch at age in many years.

On the optimistic side, the population sizes at ages 4 and 5 were higher in 1989 than in all surveys since 1982. The 1985 year-class, which has also shown strongly in the juvenile surveys, was the highest value at age 4 (in 1989) since the 1968 year-class. The 1984 year-class, which did not show well in the 1988 survey, appears to be larger than the 1980-83 year-classes, but is still about 20% lower than the average size at age 5 for the 1968-83 year-classes. It is interesting to note that biomass of strata 360 and 376, known areas of young yellowtail abundance, was much higher in 1989 than 1988, as the 1984 and 1985 year-classes recruited to the survey. In fact, of the total population abundance at ages 4 and 5 in the stock in 1989 (Table 18), over 90% was estimated to be in these 2 strata, which are largely outside the 200-mile limit. This is of concern given that some fisheries in this area appear to be taking large catches of young yellowtail.

B) Juvenile yellowtail surveys

During August-September of 1988, a stratified-random survey of the Grand Bank was conducted by the research vessel WILFRED TEMPLEMAN. One hundred thirty four (134) successful 30-minute fishing hauls and 11 additional experimental sets were made, mostly in depth strata 91-183 m on the southeast slope of the Bank (Fig. 3). This survey constituted year 4 in a time series for juvenile flatfish surveys. The majority of fishing hauls were made inside the 91 m depth zone.

The standard juvenile flatfish trawl, a Yankee 41 shrimp trawl, was used in the survey. This trawl has a mesh size of 38 mm throughout, uses a 12 mm stretched mesh codend liner, and is rigged with rubber bobbin footgear. The standard towing speed used is 2.5 knots and each haul was 30 minutes duration covering a distance of 1.25 miles.

The WEBBER[1] sampling design formulated in 1985 to give independent day and night biomass estimates of yellowtail flounder using randomly assigned day and night hauls within sampling strata to track diel variability in trawl catches was modified in 1988 (see Walsh, 1986, for a detailed description of this method). While in 1985-1987 an attempt was made to sample all strata inside the 91 m contour using this day/night split survey, in 1988 it was decided to only use this design in the selected strata 352, 360, 361, 375, and 376 which are used to monitor juvenile yellowtail. All of the other strata would be surveyed in the regular way.

Table 19 shows the average numbers and weights, along with biomass and abandunce estimates from the juvenile surveys in 1985, 1986, 1987, and 1988. All depth strata inside the 91 m depth contour were sampled in 1988. Largest catches (in numbers) of yellowtail were made in stratum 352 in Div. 3O, and strata 360, 361, 362, 375, and 376 in Div. 3N. Catches in Div. 3L were smaller in comparison.

Table 20 shows a comparison of average numbers and weights of yellowtail flounder derived from independent day and night estimates and the sum of the two for juvenile selected strata in 1985-88 surveys. In 1988, again the abundance estimates of yellowtail derived from night catches were more than 4 times larger than day catches, with biomass estimates being twice as high. Biomass estimates show a steady decline since 1986 as was documented in the 1988 assessment (Brodie and Walsh, 1988).

Tables 21 and 22 contain information on the age composition of the 1985-88 juvenile surveys from selected strata. In 1988, average numbers per tow, after showing an increase from 1985 to 1987, were less than half of the 1987 estimate. Estimates of commercial size yellowtail, age 4+ and fully-recruited yellowtail, age 7+, both showed a steady decline in abundance since 1986. In 1988, abundance estimates of 1 to 4 year juvenile yellowtail were less than half of the 1987 estimate. The 1981 year-class made up the bulk of commercial size yellowtail (age 7) in the 1988 survey (Table 22, Fig. 8). Although in the 1988 assessment, it was reported in the 1987 juvenile surveys that the 1981 year-class looked poor, it was much stronger in the 1988 juvenile survey. An explanation for this is that in 1987 stratum 352 was not sampled while in 1988 it contained most of the abundance of 6- and 7-year-old fish. It would appear that by not sampling stratum 352 in 1987 when yellowtail were age 6, the 1981 year-class was underestimated. However, the 1982 and 1983 year-classes (ages 5 and 6) were only moderate in size while the 1985 and 1984 year-classes appear to be much stronger (Table 22, Fig. 8).

Table 23 contains an average catch per tow (numbers) of all strata sampled during the 1985-88 juvenile surveys. Highest catches of ages 1, 2, 3, and 4 years are found

1.An acronym based on the names of researchers at DFO's Newfoundland Region who design a double (day and night) biomass stratified-random survey.

consistently in strata 360, 375, and 376 of Div. 3N. Average catches of 1- to 4-year-old yellowtail were lower in 1988 than in 1987 but were higher for stratum 361 in Div. 3N. Larger yellowtail were found distributed mainly in stratum 352 of Div. 3Ø and stratum 361 of Div. 3N. Figures 9-12 show the distribution of 1-year-olds found in the surveys since 1985-88 concentrated mainly in and around the Southeast Shoal. Length frequency plot of catches in the 1988 survey showed that the majority of yellowtail under 30 cm were distributed in stratum 376, of which 93% of the area is outside of the 200-mile limit, and stratum 360, of which 89% of the area is outside the 200-mile limit (Fig. 13).

## Sequential Population Analysis (SPA)

The very high levels of mortality observed at the older ages in SPA have still not been resolved for this stock. In addition, the unusual pattern of catch at age observed in 1988 made the calculation of fishing mortalities at age (in particular the partial recruitment values) very difficult. Consequently, it was concluded that SPA could not be used as the basis for catch projections for this stock.

## Summary and Prognosis

The population size of ages 6-8 in the 1989 Canadian spring survey is about one-third of the long-term average, prompting concern over the spawning stock biomass. The 1984 and 1985 year-classes appear to be stronger than the preceeding ones, but are being taken in large numbers by some fisheries in the Regulatory Area, meaning a considerable loss in yield per recruit is possible.

Given the concerns that it may be possible to continue reducing this stock, perhaps even to the very low level of the early 1960's, and that an overshoot of the 1989 TAC is very likely, a continuation of the TAC of 5,000 t for 1990 was advised. It was noted that in some recent years the catches have been about double the TAC. This situation has arisen from the development of unregulated fisheries in the Regulatory Area and the decision by some nations to fish quotas which are greater than those imposed by NAFO. Given that the 1984 and 1985 year-classes were located primarily outside the 200 mile limit in the 1989 survey, it may be possible that high fishing mortality levels on these year-classes in 1988-90 could reduce their numbers substantially, with the result that the spawning stock biomass will be seriously depleted.

## References

Brodie, W. B., and S. J. Walsh. 1988. An update on the status of the yellowtail flounder in Division 3LNO. NAFO SCR Doc. 88/38. Ser. No. N1478: 42p.

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

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

| Year | Canada | France | USSR | South Korea[a] | Other | 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[b] | 12,437 | 89 | - | 2,373 | 1,811 | 16,710 | 17,000 |
| 1985[b] | 13,440 | - | - | 4,278 | 11,056 | 28,774 | 15,000 |
| 1986[b,c] | 14,155 | - | - | 2,620 | 13,961 | 30,736 | 15,000 |
| 1987[b,c] | 13,414 | - | - | 250 | 2,717 | 16,381 | 15,000 |
| 1988[b,c] | 10,544 | - | - | - | 4,137 | 14,681 | 15,000 |
| 1989 | | | | | | | 5,000 |

[a]See text for explanation of South Korean catches.

[b]Catches for S. Korea and/or some others are estimated.

[c]Provisional.

Table 1b. Breakdown of 1984-88 catches from Table 1(a) listed as "other".

| Year | Spain | Portugal | Panama[a] | USA | Cayman Islands[a] | Other | Total |
|---|---|---|---|---|---|---|---|
| 1984 | 25 | - | 1,775 | - | - | 11 | 1,811 |
| 1985 | 2,425 | - | 4,067 | 3,797 | 755 | 12 | 11,056 |
| 1986[b] | 366 | 5,521 | 3,785 | 2,562 | 1,725 | 2 | 13,961 |
| 1987[b] | 1,183 | - | - | 1,534 | - | - | 2,717 |
| 1988[b] | 3,205 | - | - | 862 | - | 70[a] | 4,137 |

[a]Not reported to NAFO. Catches estimated from surveillance reports.

[b]Provisional.

Table 2. Breakdown of nominal catches (tons) of yellowtail by NAFO Div. 3L, 3N, and 3O.

| Year | 3L | 3N | 3O | UNK | 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 | 10,777 | 669 | - | 16,710 |
| 1985[a,b] | 3,478 | 23,742 | 1,554 | - | 28,774 |
| 1986[a,b,c] | 3,049 | 25,801 | 1,886 | - | 30,736 |
| 1987[a,b,c] | 1,599 | 13,080 | 1,702 | - | 16,381 |
| 1988[b,c] | 1,783 | 10,938 | 1,960 | - | 14,681 |

[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:3O.

[c]Provisional.

Table 3. Commercial samples and catch used to calculate catch at age and average weights at age for yellowtail in the Canadian fishery in Div. 3LNO in 1988. Numbers in small parentheses are the number of observations.

| Age-length key | Length frequency | # Samples | Catch (t) | Description |
|---|---|---|---|---|
| ALKS03CN3L (173) | LFOTMAYCN3L (252) | 1 | 286 | Canada, 3L, all gears, Jan-May |
| + | JUL (798) | 2 | 759 | " " " " Jun-Jul |
| ALKS04CN3L (207) | AUG (466) | 1 | 263 | " " " " Aug |
| | SEP (407) | 1 | 222 | " " " " Sep |
| | OCT (842) | 2 | 230 | " " " " Oct-Nov |
| | DEC (310) | 1 | 23 | " " " " Dec |
| | | | 1783 | |
| ALKS01CN3N (92) | LFOTMARCN3N (508) | 1 | 43 | Canada, 3N, all gears, Jan-Mar |
| + | MAY (1525) | 3 | 1014 | " " " " Apr-Jun |
| ALKS02CN3N (100) | | | 1057 | |
| ALKS03CN3N (546) | LFOTJULCN3N (700) | 2 | 747 | Canada, 3N, all gears, Jul |
| | AUG (3174) | 8 | 1883 | " " " " Aug |
| | SEP (1353) | 3 | 1089 | " " " " Sep |
| | | | 3719 | |
| ALKS04CN3N (479) | LFOTOCTCN3N (1817) | 4 | 1033 | Canada, 3N, all gears, Oct |
| | NOV (2184) | 5 | 1387 | " " " " Nov-Dec |
| | | | 2420 | |
| ALKS02CN3O (332) | LFOTJUNCN3O (2647) | 6 | 1205 | Canada, 3O, otter trawl, Jan-Jul |
| ALKS03CN3O (76) | LFOTSEPCN3O (417) | 1 | 299 | Canada, 3O, otter trawl, Aug-Dec |
| + | LFSCNOVCN3O (1279) | 3 | 61 | " " Scottish seine, Jan-Dec |
| ALKS04CN3O (137) | | | 360 | |

Table 4. Catch at age and avg. wts. at age in the Canadian fishery in 1988.

| AGE | AVERAGE WEIGHT | AVERAGE LENGTH | CATCH MEAN | CATCH STD. ERR. | CATCH C. V. |
|---|---|---|---|---|---|
| * 3 | 0.106 | 24.500 | 1 | 0.00 | 0.01 |
| * 4 | 0.183 | 28.638 | 85 | 14.47 | 0.17 |
| * 5 | 0.250 | 31.247 | 546 | 60.00 | 0.11 |
| * 6 | 0.328 | 33.837 | 2877 | 138.83 | 0.05 |
| 7 | 0.448 | 37.098 | 7365 | 213.54 | 0.03 |
| * 8 | 0.622 | 40.792 | 7322 | 183.64 | 0.03 |
| * 9 | 0.918 | 45.705 | 1226 | 63.10 | 0.05 |
| *10 | 1.282 | 50.384 | 66 | 10.71 | 0.16 |
| *11 | 1.501 | 52.847 | 1 | 0.88 | 0.98 |

**Table 5 . Comparison of yellowtail catch at age ('000) in 1988 from the Canadian and USA fisheries in Div. 3LNO.**

| Age | Canada Catch at age | % | USA Catch at age | % |
|---|---|---|---|---|
| 3 | 1 | 0.01 | 1 | 0.06 |
| 4 | 85 | 0.4 | 21 | 1.2 |
| 5 | 546 | 2.8 | 128 | 7.1 |
| 6 | 2,877 | 14.8 | 473 | 26.2 |
| 7 | 7,365 | 37.8 | 650 | 36.0 |
| 8 | 7,322 | 37.6 | 466 | 25.8 |
| 9 | 1,226 | 6.3 | 62 | 3.4 |
| 10 | 66 | 0.3 | 6 | 0.3 |
| 11 | 1 | 0.01 | - | - |
| Total | 19,489 | | 1,807 | |
| Catch (t) | 10,544 | | 862 | |

Table 6. Comparison of yellowtail catch at age ('000) in 1988 from the Canadian and Spanish fisheries in Div. 3LNO.

| Age | Canada Catch at age | % | Spain Catch at age | % |
|---|---|---|---|---|
| 2 | | | 12 | 0.01 |
| 3 | 1 | 0.01 | 2651 | 11.1 |
| 4 | 85 | 0.4 | 10793 | 45.0 |
| 5 | 546 | 2.8 | 6646 | 27.7 |
| 6 | 2877 | 14.8 | 2122 | 8.9 |
| 7 | 7365 | 37.8 | 1202 | 5.0 |
| 8 | 7322 | 37.6 | 491 | 2.0 |
| 9 | 1226 | 6.3 | 37 | 0.2 |
| 10 | 66 | 0.3 | 4 | - |
| 11 | 1 | 0.01 | | |
| Total | 19489 | | 23958 | |
| Catch(t) | 10544 | | 3205 | |

**Table 7 . Comparison of yellowtail catch at age ('000) from the Canadian fishery in Div. 3LNO from 1986 to 1988.**

| Age | 1986 Catch | 1986 % | 1987 Catch | 1987 % | 1988 Catch | 1988 % |
|---|---|---|---|---|---|---|
| 3 | 1 | | | | 1 | 0.01 |
| 4 | 4 | 0.01 | 3 | 0.01 | 85 | 0.4 |
| 5 | 813 | 2.9 | 471 | 1.8 | 546 | 2.8 |
| 6 | 4,210 | 15.1 | 5,055 | 19.0 | 2,877 | 14.8 |
| 7 | 13,007 | 46.5 | 10,935 | 41.0 | 7,365 | 37.8 |
| 8 | 8,088 | 28.9 | 8,437 | 31.7 | 7,322 | 37.6 |
| 9 | 1,650 | 5.9 | 1,609 | 6.0 | 1,226 | 6.3 |
| 10 | 186 | 0.7 | 107 | 0.4 | 66 | 0.3 |
| 11 | | | 1 | | 1 | 0.01 |
| Total | 27,959 | | 26,618 | | 19,489 | |
| Catch (t) | 14,155 | | 13,144 | | 10,544 | |

**Table 8 . Comparison of yellowtail average weights at age (kg) from the Canadian fishery in Div. 3LNO from 1986 to 1988.**

| Age | 1986 | 1987 | 1988 |
|---|---|---|---|
| 3 | - | - | .11 |
| 4 | .09 | .15 | .18 |
| 5 | .26 | .22 | .25 |
| 6 | .36 | .33 | .33 |
| 7 | .47 | .45 | .45 |
| 8 | .62 | .61 | .62 |
| 9 | .84 | .84 | .92 |
| 10 | 1.03 | 1.21 | 1.28 |
| 11 | 1.26 | 1.67 | 1.50 |

TABLE 9. CATCH NUMBERS AT AGE IN THOUSANDS.

| AGE | 1968 | 1969 | 1970 | 1971 | 1972 | 1973 | 1974 |
|---|---|---|---|---|---|---|---|
| 4 | 573 | 80 | 141 | 169 | 1943 | 3734 | 1375 |
| 5 | 6202 | 2993 | 2776 | 7534 | 10128 | 21280 | 19800 |
| 6 | 12483 | 15035 | 19839 | 30365 | 22502 | 23709 | 18100 |
| 7 | 9154 | 12076 | 20615 | 22117 | 19416 | 17053 | 11200 |
| 8 | 1421 | 3150 | 4557 | 5869 | 10553 | 4713 | 2400 |
| 9 | 47 | 326 | 610 | 2152 | 4206 | 862 | 850 |
| 10 | 1 | 40 | 68 | 245 | 1110 | 300 | 130 |
| 4+ | 29881 | 33700 | 48606 | 68451 | 69858 | 71651 | 53855 |

| AGE | 1975 | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 |
|---|---|---|---|---|---|---|---|
| 4 | 955 | 409 | 1391 | 691 | 1061 | 1142 | 3245 |
| 5 | 11240 | 2529 | 3211 | 3654 | 4783 | 5130 | 5077 |
| 6 | 20931 | 7650 | 6851 | 10979 | 13067 | 3383 | 8191 |
| 7 | 12737 | 5361 | 7331 | 11028 | 14284 | 7199 | 9991 |
| 8 | 2536 | 953 | 4078 | 3870 | 4940 | 1519 | 4361 |
| 9 | 372 | 74 | 1433 | 310 | 773 | 224 | 356 |
| 10 | 23 | 15 | 289 | 34 | 109 | 28 | 29 |
| 4+ | 48794 | 16991 | 24584 | 30566 | 39017 | 23625 | 31250 |

| AGE | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 |
|---|---|---|---|---|---|---|---|
| 4 | 111 | 25 | 116 | 108 | 609 | 5 | 10899 |
| 5 | 1501 | 2081 | 1440 | 2127 | 6365 | 912 | 7320 |
| 6 | 5244 | 6792 | 13160 | 15558 | 13677 | 6838 | 5472 |
| 7 | 8901 | 7862 | 14341 | 26544 | 27433 | 12741 | 9217 |
| 8 | 7591 | 3932 | 3932 | 11133 | 13940 | 9213 | 8279 |
| 9 | 2184 | 546 | 281 | 1538 | 2988 | 1791 | 1325 |
| 10 | 307 | 25 | 11 | 193 | 272 | 135 | 76 |
| 4+ | 25839 | 21264 | 33280 | 57201 | 65284 | 31635 | 42588 |

TABLE 10. AVERAGE WEIGHTS AT AGE IN KILOGRAMS

| AGE | 1968 | 1969 | 1970 | 1971 | 1972 | 1973 | 1974 |
|---|---|---|---|---|---|---|---|
| 4 | 0.247 | 0.247 | 0.247 | 0.247 | 0.247 | 0.247 | 0.200 |
| 5 | 0.305 | 0.305 | 0.305 | 0.305 | 0.305 | 0.305 | 0.300 |
| 6 | 0.456 | 0.456 | 0.456 | 0.456 | 0.456 | 0.456 | 0.452 |
| 7 | 0.610 | 0.610 | 0.610 | 0.610 | 0.610 | 0.610 | 0.600 |
| 8 | 0.725 | 0.725 | 0.725 | 0.725 | 0.725 | 0.725 | 0.725 |
| 9 | 0.842 | 0.842 | 0.842 | 0.842 | 0.842 | 0.842 | 0.842 |
| 10 | 1.030 | 1.030 | 1.030 | 1.030 | 1.030 | 1.030 | 1.030 |

| AGE | 1975 | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 |
|---|---|---|---|---|---|---|---|---|
| 4 | 0.184 | 0.200 | 0.214 | 0.249 | 0.178 | 0.271 | 0.228 | 0.225 |
| 5 | 0.298 | 0.322 | 0.324 | 0.315 | 0.278 | 0.274 | 0.308 | 0.277 |
| 6 | 0.450 | 0.486 | 0.409 | 0.430 | 0.378 | 0.493 | 0.349 | 0.329 |
| 7 | 0.569 | 0.615 | 0.532 | 0.557 | 0.504 | 0.635 | 0.496 | 0.464 |
| 8 | 0.743 | 0.814 | 0.648 | 0.740 | 0.668 | 0.750 | 0.661 | 0.648 |
| 9 | 0.953 | 1.030 | 0.809 | 0.981 | 0.787 | 0.927 | 0.909 | 0.899 |
| 10 | 1.110 | 1.200 | 0.905 | 1.240 | 0.756 | 1.220 | 1.190 | 1.260 |

| AGE | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 |
|---|---|---|---|---|---|---|
| 4 | 0.198 | 0.194 | 0.118 | 0.093 | 0.135 | 0.087 |
| 5 | 0.321 | 0.288 | 0.247 | 0.188 | 0.194 | 0.124 |
| 6 | 0.401 | 0.368 | 0.356 | 0.301 | 0.307 | 0.279 |
| 7 | 0.507 | 0.489 | 0.493 | 0.456 | 0.444 | 0.439 |
| 8 | 0.652 | 0.674 | 0.699 | 0.616 | 0.607 | 0.619 |
| 9 | 0.909 | 1.000 | 1.000 | 0.863 | 0.844 | 0.918 |
| 10 | 1.260 | 1.170 | 1.310 | 1.070 | 1.210 | 1.273 |

TABLE 11. CATCH AT AGE AS PERCENTAGES OF TOTAL.

| AGE | 1968 | 1969 | 1970 | 1971 | 1972 | 1973 | 1974 | 1975 | 1976 | 1977 | 1978 | 1979 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4 | 1.9 | 0.2 | 0.3 | 0.2 | 2.8 | 5.2 | 2.6 | 2.0 | 2.4 | 5.7 | 2.3 | 2.7 |
| 5 | 20.8 | 8.9 | 5.7 | 11.0 | 14.5 | 29.7 | 36.8 | 23.0 | 14.9 | 13.1 | 12.0 | 12.3 |
| 6 | 41.8 | 44.6 | 40.8 | 44.4 | 32.2 | 33.1 | 33.6 | 42.9 | 45.0 | 27.9 | 35.9 | 33.5 |
| 7 | 30.6 | 35.8 | 42.4 | 32.3 | 27.8 | 23.8 | 20.8 | 26.1 | 31.6 | 29.8 | 36.1 | 36.6 |
| 8 | 4.8 | 9.3 | 9.4 | 8.6 | 15.1 | 6.6 | 4.5 | 5.2 | 5.6 | 16.6 | 12.7 | 12.7 |
| 9 | 0.2 | 1.0 | 1.3 | 3.1 | 6.0 | 1.2 | 1.6 | 0.8 | 0.4 | 5.8 | 1.0 | 2.0 |
| 10 | 0.0 | 0.1 | 0.1 | 0.4 | 1.6 | 0.4 | 0.2 | 0.0 | 0.1 | 1.2 | 0.1 | 0.3 |

| AGE | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 |
|---|---|---|---|---|---|---|---|---|---|
| 4 | 4.8 | 10.4 | 0.4 | 0.1 | 0.3 | 0.2 | 0.9 | 0.0 | 25.6 |
| 5 | 21.7 | 16.2 | 5.8 | 9.8 | 4.3 | 3.7 | 9.7 | 2.9 | 17.2 |
| 6 | 35.5 | 26.2 | 20.3 | 31.9 | 39.5 | 27.2 | 21.0 | 21.6 | 12.8 |
| 7 | 30.5 | 32.0 | 34.4 | 37.0 | 43.1 | 46.4 | 42.0 | 40.3 | 21.6 |
| 8 | 6.4 | 14.0 | 29.4 | 18.5 | 11.8 | 19.5 | 21.4 | 29.1 | 19.4 |
| 9 | 0.9 | 1.1 | 8.5 | 2.6 | 0.8 | 2.7 | 4.6 | 5.7 | 3.1 |
| 10 | 0.1 | 0.1 | 1.2 | 0.1 | 0.0 | 0.3 | 0.4 | 0.4 | 0.2 |

TABLE 12. CALCULATED CATCH BIOMASS IN TONS.

| AGE | 1968 | 1969 | 1970 | 1971 | 1972 | 1973 | 1974 |
|---|---|---|---|---|---|---|---|
| 4 | 142 | 20 | 35 | 42 | 480 | 922 | 275 |
| 5 | 1892 | 913 | 847 | 2298 | 3089 | 6490 | 5940 |
| 6 | 5692 | 6856 | 9047 | 13846 | 10261 | 10811 | 8181 |
| 7 | 5584 | 7366 | 12575 | 13491 | 11844 | 10402 | 6720 |
| 8 | 1030 | 2284 | 3304 | 4255 | 7651 | 3417 | 1740 |
| 9 | 40 | 274 | 514 | 1812 | 3541 | 726 | 716 |
| 10 | 1 | 41 | 70 | 252 | 1143 | 309 | 134 |
| 4+ | 14380 | 17754 | 26391 | 35997 | 38009 | 33078 | 23706 |

| AGE | 1975 | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 |
|---|---|---|---|---|---|---|---|---|
| 4 | 176 | 82 | 298 | 172 | 189 | 309 | 740 | 25 |
| 5 | 3350 | 814 | 1040 | 1151 | 1330 | 1406 | 1564 | 416 |
| 6 | 9419 | 3718 | 2802 | 4721 | 4939 | 4133 | 2859 | 1725 |
| 7 | 7247 | 3297 | 3900 | 6143 | 7199 | 4571 | 4956 | 4130 |
| 8 | 1884 | 776 | 2643 | 2864 | 3300 | 1139 | 2883 | 4919 |
| 9 | 355 | 76 | 1159 | 304 | 608 | 208 | 324 | 1963 |
| 10 | 26 | 18 | 262 | 42 | 82 | 34 | 35 | 387 |
| 4+ | 22456 | 8781 | 12104 | 15397 | 17648 | 11800 | 13359 | 13565 |

| AGE | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 |
|---|---|---|---|---|---|---|
| 4 | 5 | 22 | 13 | 56 | 1 | 946 |
| 5 | 668 | 415 | 525 | 1197 | 177 | 910 |
| 6 | 2724 | 4843 | 5539 | 4117 | 2099 | 1528 |
| 7 | 3986 | 7013 | 13086 | 12509 | 5657 | 4043 |
| 8 | 2564 | 2650 | 7782 | 8587 | 5592 | 5122 |
| 9 | 497 | 281 | 1538 | 2579 | 1512 | 1216 |
| 10 | 31 | 13 | 253 | 291 | 163 | 97 |
| 4+ | 10475 | 15236 | 28736 | 29336 | 15201 | 13861 |

**TABLE 13. RESULTS OF CATCH RATE STANDARDIZATION FOR YTAIL IN DIV. 3LNO.**

REGRESSION OF MULTIPLICATIVE MODEL

MULTIPLE R............. 0.720
MULTIPLE R SQUARED..... 0.518

ANALYSIS OF VARIANCE

| SOURCE OF VARIATION | DF | SUMS OF SQUARES | MEAN SQUARES | F-VALUE |
|---|---|---|---|---|
| INTERCEPT | 1 | 5.000E2 | 5.000E2 | |
| REGRESSION | 38 | 5.371E1 | 1.413E0 | 19.565 |
| TYPE 1 | 2 | 1.010E1 | 5.051E0 | 69.920 |
| TYPE 2 | 2 | 5.167E0 | 2.583E0 | 35.761 |
| TYPE 3 | 11 | 8.964E0 | 8.149E⁻1 | 11.280 |
| TYPE 4 | 23 | 2.620E1 | 1.139E0 | 15.766 |
| RESIDUALS | 691 | 4.992E1 | 7.224E⁻2 | |
| TOTAL | 730 | 6.036E2 | | |

STANDARDS USED VARIABLE NUMBERS: 3125 34 10

PREDICTED CATCH RATE

| YEAR | LN TRANSFORM MEAN | LN TRANSFORM S.E. | RETRANSFORMED MEAN | RETRANSFORMED S.E. | CATCH | EFFORT |
|---|---|---|---|---|---|---|
| 1965 | 0.1752 | 0.0114 | 1.228 | 0.131 | 3130 | 2548 |
| 1966 | 0.1183 | 0.0088 | 1.162 | 0.109 | 7026 | 6047 |
| 1967 | 0.0855 | 0.0095 | 1.124 | 0.109 | 8878 | 7898 |
| 1968 | ⁻0.0994 | 0.0074 | 0.935 | 0.081 | 13340 | 14263 |
| 1969 | ⁻0.2165 | 0.0053 | 0.833 | 0.061 | 15708 | 18862 |
| 1970 | ⁻0.2210 | 0.0029 | 0.830 | 0.045 | 26426 | 31838 |
| 1971 | ⁻0.2597 | 0.0027 | 0.799 | 0.042 | 37342 | 46758 |
| 1972 | ⁻0.3861 | 0.0026 | 0.704 | 0.036 | 39259 | 55782 |
| 1973 | ⁻0.2523 | 0.0025 | 0.805 | 0.040 | 32815 | 40781 |
| 1974 | ⁻0.6534 | 0.0030 | 0.539 | 0.030 | 24313 | 45138 |
| 1975 | ⁻0.6851 | 0.0028 | 0.522 | 0.027 | 22894 | 43869 |
| 1976 | ⁻0.7559 | 0.0042 | 0.486 | 0.031 | 8057 | 16583 |
| 1977 | ⁻0.5737 | 0.0034 | 0.583 | 0.034 | 11638 | 19955 |
| 1978 | ⁻0.5504 | 0.0027 | 0.597 | 0.031 | 15466 | 25899 |
| 1979 | ⁻0.5153 | 0.0027 | 0.618 | 0.032 | 18351 | 29672 |
| 1980 | ⁻0.4054 | 0.0039 | 0.690 | 0.043 | 12377 | 17940 |
| 1981 | ⁻0.4107 | 0.0037 | 0.686 | 0.042 | 14680 | 21389 |
| 1982 | ⁻0.4996 | 0.0042 | 0.628 | 0.041 | 13319 | 21216 |
| 1983 | ⁻0.3293 | 0.0039 | 0.745 | 0.047 | 10473 | 14066 |
| 1984 | ⁻0.3954 | 0.0042 | 0.697 | 0.045 | 16710 | 23983 |
| 1985 | ⁻0.3711 | 0.0035 | 0.714 | 0.042 | 28774 | 40290 |
| 1986 | ⁻0.6910 | 0.0036 | 0.519 | 0.031 | 30736 | 59269 |
| 1987 | ⁻0.6499 | 0.0036 | 0.540 | 0.032 | 16381 | 30316 |
| 1988 | ⁻0.7241 | 0.0040 | 0.502 | 0.032 | 14681 | 29269 |

AVERAGE C.V. FOR THE RETRANSFORMED MEAN: 0.065

TABLE 13. CONT.

REGRESSION COEFFICIENTS

| CATEGORY | CODE | VARIABLE | COEFFICIENT | STD. ERROR | NO. OBS. |
|---|---|---|---|---|---|
| 1 | 3125 | INTERCEPT | 0.175 | 0.107 | 730 |
| 2 | 34 | | | | |
| 3 | 10 | | | | |
| 4 | 65 | | | | |
| 1 | 3114 | 1 | ¯0.300 | 0.029 | 161 |
| | 3124 | 2 | ¯0.232 | 0.031 | 128 |
| 2 | 32 | 3 | ¯0.174 | 0.026 | 178 |
| | 35 | 4 | ¯0.202 | 0.030 | 138 |
| 3 | 1 | 5 | ¯0.228 | 0.076 | 19 |
| | 2 | 6 | ¯0.322 | 0.073 | 21 |
| | 3 | 7 | ¯0.240 | 0.058 | 35 |
| | 4 | 8 | ¯0.257 | 0.049 | 56 |
| | 5 | 9 | ¯0.289 | 0.043 | 100 |
| | 6 | 10 | ¯0.358 | 0.044 | 92 |
| | 7 | 11 | ¯0.332 | 0.044 | 90 |
| | 8 | 12 | ¯0.241 | 0.045 | 87 |
| | 9 | 13 | ¯0.057 | 0.045 | 76 |
| | 11 | 14 | ¯0.105 | 0.050 | 51 |
| | 12 | 15 | ¯0.205 | 0.059 | 36 |
| 4 | 66 | 16 | ¯0.057 | 0.132 | 11 |
| | 67 | 17 | ¯0.090 | 0.132 | 12 |
| | 68 | 18 | ¯0.275 | 0.129 | 14 |
| | 69 | 19 | ¯0.392 | 0.120 | 20 |
| | 70 | 20 | ¯0.396 | 0.110 | 42 |
| | 71 | 21 | ¯0.435 | 0.109 | 41 |
| | 72 | 22 | ¯0.561 | 0.109 | 45 |
| | 73 | 23 | ¯0.427 | 0.108 | 50 |
| | 74 | 24 | ¯0.829 | 0.111 | 37 |
| | 75 | 25 | ¯0.860 | 0.111 | 37 |
| | 76 | 26 | ¯0.931 | 0.117 | 26 |
| | 77 | 27 | ¯0.749 | 0.112 | 38 |
| | 78 | 28 | ¯0.726 | 0.109 | 51 |
| | 79 | 29 | ¯0.690 | 0.109 | 47 |
| | 80 | 30 | ¯0.581 | 0.113 | 30 |
| | 81 | 31 | ¯0.586 | 0.114 | 30 |
| | 82 | 32 | ¯0.675 | 0.117 | 24 |
| | 83 | 33 | ¯0.504 | 0.117 | 23 |
| | 84 | 34 | ¯0.571 | 0.117 | 28 |
| | 85 | 35 | ¯0.546 | 0.114 | 30 |
| | 86 | 36 | ¯0.866 | 0.115 | 30 |
| | 87 | 37 | ¯0.825 | 0.115 | 30 |
| | 88 | 38 | ¯0.899 | 0.117 | 26 |

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.

| | | | Year-Trip | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth (fm) | Stratum | No. of trawable 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 |
| 51-100 | 328 | 114,023 | - | - | - | - | - | - | 0.0(3) | - | 0.0(5) |
| 51-100 | 341 | 118,151 | - | - | 0.0(3) | - | - | - | 0.1(4) | 0.1(4) | 0.0(6) |
| 51-100 | 342 | 43,913 | - | - | - | - | - | - | 0.0(2) | 0.0(2) | 0.0(4) |
| 51-100 | 343 | 39,409 | - | - | - | - | - | - | 0.0(2) | 0.0(3) | 0.0(4) |
| 101-150 | 344 | 112,146 | - | - | - | - | - | 0.0(4) | 0.0(4) | 0.0(4) | 0.0(2) |
| 151-200 | 345 | 107,492 | - | - | - | - | - | 0.0(4) | 0.0(4) | 0.0(2) | 0.0(4) |
| 151-200 | 346 | 64,931 | - | - | - | - | 0.0(2) | 0.0(2) | 0.0(3) | - | 0.0(4) |
| 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) |
| 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) |
| 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) |
| 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) |
| 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) |
| 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) |
| 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) |
| 101-150 | 366 | 104,639 | 0.0(3) | - | - | 0.0(3) | 0.0(4) | 0.0(4) | 0.0(4) | - | 0.0(4) |
| 151-200 | 368 | 25,071 | 0.0(2) | - | - | 0.0(2) | 0.0(2) | 0.0(3) | 0.0(3) | - | 0.0(4) |
| 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) |
| 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) |
| 31-50 | 371 | 84,147 | 88.5(3) | 6.4(2) | - | 0.0(3) | - | - | 1.4(3) | 0.3(3) | 0.5(3) |
| 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) |
| 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) |
| 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) |
| 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) |
| 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) |
| 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) |
| 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) |
| 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) |
| 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) |
| 151-200 | 392 | 10,884 | - | - | 0.0(3) | 0.0(4) | 0.0(2) | - | 0.0(2) | 0.0(3) | 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 | - | - | - | - | - | - | - | - | - |
| 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 |

Table 14 (Cont'd.).

| Depth (fm) | Stratum | 1980 ATC 303-5 | 1981 ATC 317-9 | 1982 ATC 327-9 | 1984 ATC 27-28 | 1985 AN 28-30 | 1986 WT 48 | 1987 WT 59,60 | 1988 WT 70,71 | 1989[a] WT 82,83 |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Year-Trip | | | | | | | | |
| 51-100 | 328 | - | 0.0(2) | 0.0(3) | 0.0(2) | 0.0(4) | 0.0(9) | 0.0(7) | 0.0(2) | 0.0(8) |
| 51-100 | 341 | 0.0(6) | 0.0(2) | 0.0(5) | 0.0(4) | 0.01(9) | 0.0(9) | 0.1(6) | 0.0(6) | 0.0(8) |
| 51-100 | 342 | 0.0(4) | - | 0.0(3) | 0.0(4) | 0.0(3) | 0.0(3) | 0.2(2) | 0.0(2) | 0.1(3) |
| 51-100 | 343 | 0.0(4) | 0.0(2) | 0.0(4) | - | 0.0(3) | 0.0(4) | 0.0(3) | 0.0(3) | 0.0(3) |
| 101-150 | 344 | 0.0(3) | 0.0(5) | 0.0(4) | - | 0.0(5) | 0.0(8) | 0.0(4) | 0.0(6) | 0.0(7) |
| 151-200 | 345 | 0.0(5) | 0.0(4) | 0.0(4) | - | 0.0(5) | 0.0(7) | 0.0(4) | 0.0(8) | 0.0(9) |
| 151-200 | 346 | 0.0(3) | 0.0(3) | 0.0(3) | - | 0.0(2) | 0.0(5) | 0.0(5) | 0.0(4) | 0.0(4) |
| 101-150 | 347 | 0.0(5) | 0.0(4) | 0.0(2) | - | 0.0(5) | 0.0(5) | 0.0(3) | 0.0(5) | 0.0(6) |
| 51-100 | 348 | 0.0(7) | 0.0(7) | 0.0(4) | - | 0.0(18) | 0.0(12) | 0.1(8) | 0.0(11) | 0.0(9) |
| 51-100 | 349 | 0.0(9) | 0.0(4) | 0.0(6) | 0.1(6) | 0.1(14) | 1.3(14) | 0.1(11) | 0.1(8) | 0.0(11) |
| 31-50 | 350 | 1.1(10) | 0.3(3) | 0.6(7) | 1.5(6) | 3.7(12) | 2.3(11) | 0.6(11) | 1.6(8) | 0.5(11) |
| 31-50 | 363 | 39.3(5) | 3.0(3) | 30.4(5) | 28.2(5) | 15.2(8) | 8.3(10) | 7.6(9) | 4.9(7) | 1.5(9) |
| 51-100 | 364 | 0.4(6) | 0.0(3) | 0.0(6) | 0.6(5) | 0.0(17) | 0.0(17) | 0.0(15) | 0.0(10) | 0.0(16) |
| 51-100 | 365 | 0.0(4) | 0.0(2) | 0.0(3) | - | 0.0(7) | 0.0(5) | 0.0(5) | 0.0(4) | 0.0(6) |
| 101-150 | 366 | 0.0(4) | 0.0(3) | 0.0(5) | - | 0.0(6) | 0.0(8) | 0.0(7) | 0.0(6) | 0.0(8) |
| 151-200 | 368 | 0.0(2) | 0.0(2) | 0.0(2) | - | 0.0(2) | 0.0(2) | 0.0(3) | 0.0(2) | 0.0(3) |
| 101-150 | 369 | 0.0(3) | 0.0(2) | 0.0(2) | - | 0.0(5) | 0.0(6) | 0.0(5) | 0.0(4) | 0.0(6) |
| 51-100 | 370 | 0.0(3) | 0.0(2) | 0.0(2) | - | 0.0(8) | 0.0(8) | 0.0(7) | 0.0(5) | 0.0(8) |
| 31-50 | 371 | 80.5(3) | 0.0(2) | 1.1(4) | - | 0.4(7) | 0.3(6) | 0.0(7) | 0.1(5) | 0.1(6) |
| 31-50 | 372 | 25.0(6) | 13.3(4) | 19.8(6) | 59.4(5) | 56.5(12) | 36.3(14) | 13.9(13) | 7.0(11) | 12.7(13) |
| 31-50 | 384 | 0.0(2) | 0.4(2) | 10.3(2) | - | 4.6(6) | 1.6(6) | 1.1(7) | 0.2(5) | 0.1(6) |
| 51-100 | 385 | 0.0(4) | 0.0(3) | 0.0(3) | - | 0.0(15) | 0.0(13) | 0.0(11) | 0.0(10) | 0.0(12) |
| 101-150 | 386 | 0.0(3) | 0.0(2) | 0.0(3) | - | 0.0(5) | 0.0(6) | 0.0(5) | 0.0(4) | 0.0(6) |
| 151-200 | 387 | 0.0(2) | 0.0(2) | 0.0(3) | - | 0.0(6) | 0.0(4) | 0.0(4) | 0.0(4) | 0.0(5) |
| 151-200 | 388 | 0.0(2) | 0.0(2) | 0.0(2) | - | 0.0(2) | 0.0(2) | 0.0(2) | 0.0(2) | 0.0(3) |
| 101-150 | 389 | 0.0(3) | 0.0(2) | 0.0(2) | - | 0.0(5) | 0.0(5) | 0.0(6) | 0.0(3) | 0.0(5) |
| 51-100 | 390 | 0.3(3) | 0.0(2) | 0.8(4) | - | 0.3(9) | 0.0(8) | 0.0(7) | 0.0(5) | 0.0(8) |
| 101-150 | 391 | 0.0(2) | 0.0(2) | 0.0(2) | - | 0.0(2) | 0.0(2) | 0.0(2) | 0.0(2) | 0.0(3) |
| 151-200 | 392 | 0.0(2) | 0.0(2) | 0.0(2) | - | 0.0(2) | 0.0(2) | 0.2(2) | 0.0(2) | 0.0(3) |
| 201-300 | 729 | - | - | - | - | 0.0(2) | - | - | - | |
| 301-400 | 730 | - | - | - | - | 0.0(2) | - | - | - | |
| 201-300 | 731 | - | - | - | - | 0.0(2) | - | - | - | |
| 301-400 | 732 | - | - | - | - | 0.0(2) | - | - | - | |
| 201-300 | 733 | - | - | - | - | 0.0(3) | - | - | - | |
| 301-400 | 734 | - | - | - | - | 0.0(2) | - | - | - | |
| 201-300 | 735 | - | 0.0(2) | - | - | 0.0(2) | - | - | - | |
| 301-400 | 736 | - | - | - | - | 0.0(2) | - | | - | |
| Biomass ('000 t) | | 10.2 | 2.9 | 8.8 | 15.1 | 13.5 | 8.5 | 3.8 | 2.2 | 2.6 |

[a]Preliminary analysis.

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 trawable 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 151-200 | 357 | 12,317 | - | - | 0.0(2) | - | - | - | 0.0(2) | - | 0.0(3) |
| 101-150 | 358 | 16,899 | - | 0.0(4) | 0.0(3) | - | - | - | 0.0(2) | - | 0.0(2) |
| 51-100 | 359 | 31,620 | - | 0.0(3) | 0.0(3) | - | - | 0.0(3) | 0.0(2) | - | 0.0(4) |
| 31-50 | 360 | 224,717 | - | 58.3(4) | - | - | 12.1(4) | 128.6(4) | 55.9(4) | 43.5(4) | 27.6(9) |
| 31-50 | 361 | 139,171 | 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) |
| 31-50 | 362 | 189,267 | 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) |
| 31-50 | 373 | 189,267 | 73.6(4) | 135.1(4) | 26.7(4) | 24.2(4) | - | 23.3(5) | 74.5(4) | 50.5(5) | 22.1(11) |
| 31-50 | 374 | 69,924 | 67.8(2) | 42.4(2) | 115.4(4) | 16.1(2) | 62.1(2) | - | 22.4(3) | 22.0(3) | 24.8(4) |
| ≤30 | 375 | 119,644 | 60.0(3) | 69.0(3) | 121.9(3) | 94.5(3) | 80.3(3) | - | 62.7(4) | 30.6(5) | 66.1(5) |
| ≤30 | 376 | 112,584 | - | 45.4(2) | 10.3(3) | - | 82.1(2) | 126.4(3) | 78.3(3) | 4.6(2) | 86.4(4) |
| 51-100 | 377 | 7,511 | - | 0.0(2) | 0.0(2) | 0.0(3) | 0.0(2) | - | 0.0(2) | 0.0(2) | 0.0(3) |
| 101-150 | 378 | 10,440 | 0.0(2) | 0.0(2) | 0.0(2) | 0.2(3) | - | - | 0.0(2) | 1.4(2) | 0.0(3) |
| 151-200 | 379 | 7,961 | - | - | 0.0(2) | 0.0(3) | - | - | 0.0(2) | 0.3(2) | 0.0(3) |
| 151-200 | 380 | 8,712 | - | 0.0(2) | 0.0(3) | 0.0(2) | - | - | 0.0(2) | - | 0.0(2) |
| 101-150 | 381 | 13,669 | 0.0(4) | 0.5(4) | 0.0(3) | 0.0(4) | 0.0(2) | - | 0.0(2) | 0.0(3) | 0.0(3) |
| 51-100 | 382 | 48,594 | 0.0(3) | 0.0(4) | 0.0(3) | 0.0(3) | - | 0.0(2) | 0.0(3) | 0.0(3) | 0.0(3) |
| 31-50 | 383 | 50,621 | 18.6(2) | 7.3(2) | 0.1(2) | 0.0(2) | - | 0.0(3) | 2.7(3) | 0.0(2) | 0.0(3) |
| 201-300 | 723 | - | - | - | - | - | - | - | - | - | - |
| 301-400 | 724 | - | - | - | - | - | - | - | - | - | - |
| 201-300 | 725 | - | - | - | - | - | - | - | - | - | - |
| 301-400 | 726 | - | - | - | - | - | - | - | - | - | - |
| 201-300 | 727 | - | - | - | - | - | - | - | - | - | - |
| 301-400 | 728 | - | - | - | - | - | - | - | - | - | - |
| 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) |
| Biomass ('000 t) | | | 59.7 | 96.6 | 46.0 | 45.4 | 46.8 | 71.6 | 76.2 | 47.6 | 50.2 |

Table 15 (Cont'd.).

| Depth (fm) | Stratum | Year-Trip 1980 ATC 303-5 | 1981 ATC 317-9 | 1982 ATC 327-9 | 1984 ATC 27-28 | 1985 WT 29 | 1986 ATC 245-6 | 1987 WT 58-60 | 1988 WT 70 | 1989 WT 82 |
|---|---|---|---|---|---|---|---|---|---|---|
| 151-200 | 357 | 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 | 358 | 0.0(3) | 0.3(3) | 0.0(3) | 0.0(2) | 0.0(2) | 0.0(2) | 0.0(2) | 0.0(2) | 0.0(2) |
| 51-100 | 359 | 0.0(4) | 0.0(3) | 0.0(3) | 0.0(2) | 0.0(2) | 0.0(2) | 0.0(2) | 0.0(2) | 0.0(2) |
| 31-50 | 360 | 83.8(11) | 78.4(6) | 36.7(7) | 142.1(7) | 54.0(16) | 14.1(13) | 9.2(15) | 2.4(12) | 30.9(15) |
| 31-50 | 361 | 128.4(7) | - | 118.9(6) | 139.9(5) | 67.1(7) | 44.1(10) | 73.8(8) | 88.7(7) | 48.6(10) |
| 31-50 | 362 | 53.6(11) | 104.2(5) | 47.2(8) | 95.1(7) | 36.6(11) | 73.2(14) | 47.8(13) | 43.8(10) | 30.5(13) |
| 31-50 | 373 | 48.1(8) | 58.4(5) | 23.7(5) | 63.5(7) | 32.0(9) | 17.9(4) | 23.1(13) | 23.8(10) | 14.8(13) |
| 31-50 | 374 | 39.0(3) | 71.7(3) | 19.1(14) | 35.5(3) | 25.3(4) | 11.6(6) | 5.7(5) | 2.3(5) | 0.1(5) |
| 30 | 375 | 57.8(4) | 69.3(4) | 61.1(5) | 176.1(5) | 97.8(8) | 231.7(8) | 142.8(8) | 68.1(6) | 23.2(8) |
| 30 | 376 | 125.3(3) | 74.3(4) | 63.0(7) | 32.5(4) | 78.5(7) | 88.2(90 | 59.4(8) | 4.3(6) | 72.6(8) |
| 51-100 | 377 | 0.0(4) | 0.0(3) | 0.0(2) | 0.0(2) | 0.0(2) | 0.0(2) | 0.0(2) | 0.5(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) |
| 151-200 | 379 | 0.0(3) | 0.0(3) | 0.0(2) | 0.0(2) | 0.0(2) | 0.0(3) | 0.0(2) | 0.0(2) | 0.0(2) |
| 151-200 | 380 | 0.0(3) | 0.0(3) | - | 0.0(2) | 0.0(2) | 0.0(3) | 0.0(2) | 0.0(2) | 0.0(2) |
| 101-150 | 381 | 0.5(4) | 0.0(3) | 0.0(2) | 0.0(2) | 0.0(2) | 0.0(3) | 0.0(2) | 0.0(2) | 0.0(2) |
| 51-100 | 382 | 0.0(4) | 0.0(2) | 0.0(2) | 0.0(3) | 0.0(4) | 0.0(4) | 0.0(3) | 0.0(2) | 0.0(3) |
| 31-50 | 383 | 0.5(4) | 1.3(3) | 10.0(2) | 1.8(3) | 0.0(3) | 0.0(4) | 0.1(3) | 0.0(2) | 0.0(3) |
| 201-300 | 723 | - | - | - | - | - | - | - | - | |
| 301-400 | 724 | - | - | - | - | - | - | - | - | |
| 201-300 | 725 | - | - | - | - | - | - | - | - | |
| 301-400 | 726 | - | - | - | - | - | - | - | - | |
| 201-300 | 727 | - | - | - | - | - | - | - | - | |
| 301-400 | 728 | - | - | - | - | - | - | - | - | |
| Mean (No. sets) | | 63.6(81) | 63.0(54) | 43.8(60) | 83.5(60) | 45.3(85) | 51.9(101) | 40.2(91) | 27.5(77) | 26.5(94) |
| Biomass ('000 t) | | 79.7 | 70.1 | 54.4 | 104.6 | 56.7 | 65.0 | 49.9 | 34.4 | 33.3 |

Table 16. Mean weight of yellowtail per 30 minute tow, by stratum, from research vessel surveys in Division 3O. 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.

| | | | Year-Trip | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 1973 | 1975 | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 |
| Depth (fm) | Stratum | No. of trawable units | ATC 207, 208,209 | ATC 233 | ATC 245,246 | ATC 262,263 | ATC 276,277 | 289, 290,191 | 303, 304,305 | 317, 318,319 | 327, 328,329 | AN 27,28 | AN 43 | WT 47 | WT 58-60 | WT 70 | WT 82 |
| 51-100 | 329 | 129,257 | 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) | 0.0(8) | 0.0(9) | 0.0(7) | 0.0(9) |
| 31-50 | 330 | 156,896 | 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) | 3.3(9) | 0.7(11) | 0.7(9) | 1.2(11) |
| 31-50 | 331 | 34,248 | 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) | 3.6(4) | 16.0(2) | 6.0(2) | 18.7(2) |
| 51-100 | 332 | 78,636 | - | 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) | 9.8(6) | 5.9(5) | 0.1(4) | 12.7(5) |
| 101-150 | 333 | 11,341 | - | 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) | 0.0(3) | 0.0(2) | 0.0(2) | 0.0(2) |
| 151-200 | 334 | 6,910 | - | - | 0.0(2) | 0.0(2) | 0.0(3) | 0.0(3) | 0.0(2) | - | 0.0(4) | 0.0(2) | 0.0(2) | 0.0(2) | 0.0(2) | 0.0(2) | 0.0(2) |
| 151-200 | 335 | 4,356 | 0.0(2) | - | 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 | 336 | 9,088 | 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) | 0.0(2) | 0.0(2) | 0.0(2) | 0.0(2) |
| 51-100 | 337 | 71,200 | 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) | 0.6(5) | 0.7(6) | 1.3(4) | 1.7(5) |
| 31-50 | 338 | 142,551 | 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) | 6.8(9) | 2.4(9) | 23.0(8) | 7.2(10) |
| 51-100 | 339 | 43,937 | 1.4(2) | 0.0(2) | - | - | 0.7(2) | 0.4(3) | - | 0.0(2) | 0.1(4) | 0.4(2) | 0.1(3) | 0.1(3) | 0.1(3) | 0.0(3) | 0.0(3) |
| 31-50 | 340 | 128,882 | - | 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) | 8.3(7) | 21.4(9) | 5.8(7) | 3.4(9) |
| 31-50 | 351 | 189,267 | 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) | 39.1(14) | 19.3(13) | 36.5(10) | 21.9(13) |
| 31-50 | 352 | 193,773 | 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) | 34.9(14) | 51.4(13) | 24.8(11) | 27.0(13) |
| 31-50 | 353 | 96,286 | 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) | 21.8(7) | 106.3(6) | 2.2(5) | 6.0(7) |
| 51-100 | 354 | 35,600 | 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) | 0.0(3) | 0.0(2) | 0.0(2) | 0.1(2) |
| 101-150 | 355 | 7,736 | 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) | 0.0(2) | 0.0(2) | 0.0(2) | 0.0(2) |
| 151-200 | 356 | 4,581 | 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 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 301-400 | 718 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 201-300 | 719 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 301-400 | 720 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 201-300 | 721 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 301-400 | 722 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 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) | 14.7(102) | 20.9(100) | 12.2(84) | 9.9(101) |
| 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 | 19.7 | 28.1 | 16.3 | 13.4 |

Table 17. Comparison of yellowtail biomass (000 t) from different strata in Division 3N from surveys in 1984-89.

| | Stratum 360[a] | Stratum 376[b] | Total 360+376 | Total all other strata in Div. 3N | Total 3N |
|---|---|---|---|---|---|
| 1984 | 27.9 | 3.7 | 31.6 | 73.0 | 104.6 |
| 1985 | 12.1 | 8.8 | 20.9 | 35.8 | 56.7 |
| 1986 | 3.2 | 9.9 | 13.1 | 51.9 | 65.0 |
| 1987 | 2.1 | 6.7 | 8.8 | 41.1 | 49.9 |
| 1988 | 0.5 | 0.5 | 1.0 | 33.4 | 34.4 |
| 1989 | 6.9 | 8.2 | 15.1 | 18.2 | 33.3 |

[a]93% of area outside 200-mile limit.

[b]89% of area outside 200-mile limit.

TABLE 18 . ESTIMATES OF YTAIL ABUNDANCE(MILLIONS) FROM CANADIAN SURVEYS IN DIV 3LNO. RESULTS ARE FROM A MODEL WHICH ACCOUNTS FOR MISSING STRATA.

| AGE | 1971 | 1972 | 1973 | 1974 | 1975 | 1976 | 1977 | 1978 | 1979 | 1980 |
|---|---|---|---|---|---|---|---|---|---|---|
| 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 | 0.0 | 0.0 | 0.0 | 0.2 | 0.1 | 0.1 |
| 3 | 8.5 | 9.6 | 0.7 | 1.8 | 0.8 | 4.1 | 0.2 | 2.9 | 0.9 | 5.0 |
| 4 | 99.7 | 72.0 | 10.2 | 15.9 | 13.1 | 17.4 | 3.1 | 9.9 | 6.0 | 11.1 |
| 5 | 224.0 | 142.0 | 67.4 | 51.1 | 65.7 | 77.7 | 18.7 | 38.2 | 12.6 | 37.9 |
| 6 | 422.0 | 163.0 | 87.0 | 67.7 | 94.8 | 106.0 | 45.6 | 70.4 | 50.2 | 97.7 |
| 7 | 382.0 | 87.9 | 88.9 | 44.3 | 110.0 | 97.4 | 122.0 | 73.1 | 129.0 | 140.0 |
| 8 | 51.4 | 28.0 | 34.0 | 5.3 | 26.8 | 19.7 | 99.8 | 38.2 | 61.7 | 45.4 |
| 9 | 16.4 | 3.0 | 11.6 | 0.8 | 3.0 | 0.4 | 27.8 | 4.0 | 7.2 | 3.1 |
| 10 | 0.2 | 0.2 | 1.0 | 0.0 | 0.2 | 0.0 | 4.2 | 0.1 | 0.9 | 0.1 |
| 11 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.3 | 0.0 | 0.0 | 0.0 |
| 1+ | 1204.2 | 505.7 | 300.8 | 207.1 | 314.4 | 322.8 | 321.7 | 237.0 | 268.6 | 340.4 |

| AGE | 1981 | 1982 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 |
|---|---|---|---|---|---|---|---|---|
| 1 | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2 | 0.0 | 1.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.2 |
| 3 | 1.2 | 5.5 | 0.3 | 0.7 | 0.1 | 0.1 | 0.1 | 2.4 |
| 4 | 2.2 | 18.8 | 3.5 | 2.5 | 1.8 | 0.5 | 1.2 | 23.8 |
| 5 | 9.8 | 38.6 | 26.4 | 12.9 | 11.8 | 6.4 | 1.6 | 25.9 |
| 6 | 42.1 | 56.1 | 94.0 | 52.9 | 30.3 | 20.2 | 9.5 | 27.3 |
| 7 | 108.0 | 87.4 | 121.0 | 90.9 | 93.7 | 56.5 | 31.7 | 33.5 |
| 8 | 113.0 | 56.7 | 56.5 | 42.1 | 45.7 | 76.3 | 45.6 | 17.2 |
| 9 | 21.7 | 13.9 | 4.4 | 3.3 | 6.6 | 7.6 | 9.1 | 1.7 |
| 10 | 5.9 | 2.0 | 0.1 | 0.3 | 0.5 | 0.6 | 0.4 | 0.1 |
| 11 | 0.0 | 0.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1+ | 303.9 | 280.8 | 316.2 | 205.5 | 190.5 | 168.2 | 99.3 | 132.1 |

Table 19. A comparison of average numbers and weights of yellowtail per 30-minute set for Div. 3LNO from juvenile surveys in 1985, 1986, 1987, and 1988.

| Div. | Stratum | Category | 1985 | 1986 | 1987 | 1988 |
|---|---|---|---|---|---|---|
| 3Ø | 330 | No. of sets | – | – | – | 2 |
| | | Av. no./set | | | | 10.99 |
| | | Av. wt./set | | | | 5.50 |
| 3Ø | 331 | No. of sets | – | – | – | 2 |
| | | Av. no./set | | | | 0.50 |
| | | Av. wt./set | | | | 0.25 |
| 3Ø | 340 | No. of sets | – | – | – | 3 |
| | | Av. no./set | | | | 7.59 |
| | | Av. wt./set | | | | 2.85 |
| 3Ø | 338 | No. of sets | – | 3 | – | 6 |
| | | Av. no./set | | 86.67 | | 18.99 |
| | | Av. wt./set | | 41.17 | | 9.58 |
| 3L | 350 | No. of sets | 5 | 6 | – | 5 |
| | | Av. no./set | 59.00 | 7.83 | | 37.97 |
| | | Av. wt./set | 25.50 | 3.58 | | 3.70 |
| 3Ø | 351 | No. of sets | 3 | 9 | – | 7 |
| | | Av. no./set | 166.00 | 175.78 | | 85.93 |
| | | Av. wt./set | 63.67 | 66.00 | | 28.68 |
| 3Ø | 352 | No. of sets | – | 13 | 1[a] | 11 |
| | | Av. no./set | | 210.77 | 134 | 164.78 |
| | | Av. wt./set | | 73.68 | 65.35 | 58.81 |
| 3Ø | 353 | No. of sets | – | 5 | – | 4 |
| | | Av. no./set | | 118.00 | | 19.24 |
| | | Av. wt./set | | 68.75 | | 9.19 |
| 3N | 360 | No. of sets | 3 | 14 | 19 | 20 |
| | | Av. no./set | 57.67 | 259.14 | 192.22 | 112.51 |
| | | Av. wt./set | 26.83 | 19.96 | 12.75 | 22.73 |
| 3N | 361 | No. of sets | 6 | 8 | 8 | 6 |
| | | Av. no./set | 99.83 | 188.50 | 399.94 | 162.38 |
| | | Av. wt./set | 33.58 | 61.78 | 174.37 | 62.29 |
| 3N | 362 | No. of sets | 9 | 7 | 2 | 6 |
| | | Av. no./set | 166.89 | 109.14 | 38.00 | 129.29 |
| | | Av. wt./set | 59.50 | 43.14 | 16.75 | 57.64 |

Table 19 (Cont'd.).

| Div. | Stratum | Category | 1985 | 1986 | 1987 | 1988 |
|---|---|---|---|---|---|---|
| 3L | 363 | No. of sets | 5 | 5 | - | 6 |
| | | Av. no./set | 53.80 | 48.89 | | 42.47 |
| | | Av. wt./set | 21.00 | 22.77 | | 19.65 |
| 3L | 371 | No. of sets | 4 | - | - | 5 |
| | | Av. no./set | 2.25 | | | 1.20 |
| | | Av. wt./set | 1.88 | | | 0.70 |
| 3L | 372 | No. of sets | 9 | 8 | - | 8 |
| | | Av. no./set | 93.06 | 101.00 | | 64.83 |
| | | Av. wt./set | 39.49 | 48.13 | | 34.31 |
| 3N | 373 | No. of sets | 10 | 7 | - | 8 |
| | | Av. no./set | 160.80 | 112.93 | | 29.85 |
| | | Av. wt./set | 75.60 | 49.60 | | 15.74 |
| 3N | 374 | No. of sets | 4 | 4 | - | 4 |
| | | Av. no./set | 16.00 | 12.00 | | 5.25 |
| | | Av. wt./set | 7.50 | 6.38 | | 3.63 |
| 3N | 375 | No. of sets | 7 | 5 | 7 | 9 |
| | | Av. no./set | 228.29 | 236.65 | 407.26 | 146.44 |
| | | Av. wt./set | 104.14 | 115.19 | 43.22 | 25.67 |
| 3N | 376 | No. of sets | 2 | 4 | 10 | 12 |
| | | Av. no./set | 148.50 | 325.75 | 1015.22 | 363.72 |
| | | Av. wt./set | 47.75 | 150.46 | 58.55 | 38.79 |
| 3N | 383 | No. of sets | 4 | - | - | 4 |
| | | Av. no./set | 0.00 | | | 2.00 |
| | | Av. wt./set | 0.00 | | | 0.32 |
| 3L | 384 | No. of sets | 4 | - | - | 5 |
| | | Av. no./set | 35.25 | | | 1.00 |
| | | Av. wt./set | 22.88 | | | 0.18 |
| | Total | No. of sets | 75 | 98 | 46 | 134 |
| | | Av. no./set | 104.92 | 147.90 | 342.59 | 78.77 |
| | | Av. wt./set | 43.35 | 53.05 | 53.55 | 24.37 |
| Abundance (million nos.) | | | 286.1 | 448.0 | 318.0 | 298.9 |
| | 3L Biomass | | 22.9 | 22.7 | - | 13.6 |
| | 3N Biomass | | 78.2 | 85.4 | 59.6 | 56.10 |
| | 3Ø Biomass | | 17.1 | 52.5 | - | 28.8 |
| | Total biomass (000 t) | | 118.2 | 160.7 | 59.6 | 92.5 |

Table 20. A comparison of average numbers and weights of yellowtail flounder per 30-minute tows from day and night and combined surveys. Selected strata in Div. 3NØ used. Abundance and biomass are given at the bottom of the table.

| Stratum | Category | 1985 Day | 1985 Night | 1985 Combined | 1986 Day | 1986 Night | 1986 Combined | 1987 Day | 1987 Night | 1987 Combined | 1988 Day | 1988 Night | 1988 Combined |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 352 | No. of sets | - | - | - | 7 | 6 | 13 | - | - | - | 6 | 5 | 11 |
| | Av. no./set | | | | 78.29 | 365.33 | 210.77 | | | | 60.67 | 290.00 | 164.91 |
| | Av. wt./set | | | | 37.86 | 115.47 | 72.68 | | | | 26.75 | 97.37 | 58.85 |
| 360 | No. of sets | 3 | - | 3 | 7 | 7 | 14 | 7 | 12 | 19 | 11 | 8 | 20 |
| | Av. no./set | 57.67 | | 57.67 | 20.57 | 497.71 | 259.14 | 24.57 | 290.25 | 192.22 | 39.18 | 227.63 | 112.60 |
| | Av. wt./set | 26.83 | | 26.83 | 5.50 | 34.43 | 19.96 | 2.72 | 18.61 | 12.75 | 10.89 | 41.89 | 22.75 |
| 361 | No. of sets | 4 | 2 | 6 | 4 | 4 | 8 | 4 | 4 | 8 | 2 | 4 | 6 |
| | Av. no./set | 58.50 | 182.50 | 99.83 | 160.00 | 217.00 | 188.50 | 146.75 | 653.75 | 399.94 | 137.00 | 175.25 | 162.50 |
| | Av. wt./set | 26.13 | 63.50 | 36.58 | 72.81 | 50.75 | 61.78 | 69.25 | 279.75 | 174.37 | 77.00 | 55.00 | 62.33 |
| 375 | No. of sets | 4 | 3 | 7 | 2 | 3 | 5 | 3 | 4 | 7 | 6 | 3 | 9 |
| | Av. no./set | 60.50 | 452.00 | 228.29 | 4.10 | 391.69 | 236.65 | 29.33 | 691.25 | 407.26 | 19.33 | 401.00 | 146.56 |
| | Av. wt./set | 36.50 | 194.33 | 104.14 | 1.40 | 191.05 | 115.19 | 14.75 | 64.63 | 43.22 | 9.69 | 57.70 | 25.69 |
| 376 | No. of sets | - | - | 2 | 3 | 1 | 4 | 3 | 7 | 10 | 7 | 5 | 12 |
| | Av. no./set | - | | 148.50 | 69.67 | - | 325.76 | 109.67 | 1404.23 | 1015.22 | 148.57 | 665.60 | 364.00 |
| | Av. wt./set | - | | 47.75 | 19.70 | - | 150.46 | 22.00 | 74.27 | 58.22 | 16.13 | 50.59 | 38.82 |
| Total | No. of sets | 11 | 5 | 18 | 23 | 20 | 44 | 17 | 27 | 44 | 32 | 25 | 58 |
| | Av. no./set | 59.00 | 344.20 | 118.91 | 67.36 | 385.95 | 240.92 | 70.12 | 692.37 | 439.31 | 74.24 | 322.28 | 175.20 |
| | Av. wt./set | 30.09 | 142.00 | 49.04 | 28.55 | 85.50 | 73.53 | 24.31 | 78.55 | 65.24 | 26.99 | 64.30 | 41.32 |
| Abundance (000s) | | 40.0 | 112.4 | 100.3 | 71.1 | 367.3 | 269.3 | 59.1 | 561.9 | 370.9 | 83.0 | 360.4 | 195.8 |
| Biomass (000s t) | | 19.7 | 45.50 | 41.3 | 57.8 | 84.7 | 82.2 | 20.5 | 83.8 | 55.0 | 30.2 | 71.9 | 46.1 |

Table 21. Average numbers per tow at age from selected strata in juvenile flatfish surveys of NAFO Division 3NØ (strata 352, 360, 361, 375, and 376) 1985-88.

| Age | 1985[a] | 1986 | 1987[a] | 1988 |
|---|---|---|---|---|
| 1 | 4.72 | 21.48 | 30.48 | 5.67 |
| 2 | 2.76 | 16.95 | 113.11 | 15.01 |
| 3 | 1.43 | 27.29 | 88.50 | 40.07 |
| 4 | 7.29 | 10.05 | 80.17 | 27.81 |
| 5 | 9.98 | 18.99 | 20.09 | 17.27 |
| 6 | 14.67 | 41.41 | 19.05 | 18.19 |
| 7 | 35.32 | 53.87 | 37.65 | 31.45 |
| 8 | 35.45 | 41.66 | 46.10 | 17.47 |
| 9 | 7.10 | 8.07 | 4.40 | 2.37 |
| 10 | 0.36 | 0.62 | 0.12 | 0.02 |
| 11 | 0.00 | 0.08 | 0.00 | 0.00 |
| Av. no./tow | 118.91 | 240.92 | 439.31 | 175.20 |

[a]Incomplete survey, stratum 352 not surveyed.

Table 22. Abundance (Nos. x $10^{-3}$) at age of yellowtail from selected strata in Division 3NO juvenile flatfish surveys (strata 352, 360, 361, 375, and 376).

| Age | 1985[a] | 1986 | 1987[a] | 1988 |
|---|---|---|---|---|
| 1 | 3,978 | 24,015 | 25,718 | 6,343 |
| 2 | 2,330 | 18,944 | 95,432 | 16,781 |
| 3 | 1,209 | 30,511 | 74,667 | 44,793 |
| 4 | 6,151 | 11,238 | 67,634 | 31,092 |
| 5 | 8,420 | 21,225 | 16,951 | 19,309 |
| 6 | 12,377 | 46,289 | 16,073 | 20,337 |
| 7 | 29,801 | 60,226 | 31,764 | 35,159 |
| 8 | 29,906 | 46,568 | 38,897 | 19,528 |
| 9 | 5,989 | 9,016 | 3,714 | 2,654 |
| 10 | 301 | 688 | 99 | 18 |
| Unknown | 0 | 88 | 698 | 70 |
| Totals 1+ | 100,462 | 268,720 | 370,949 | 196,091 |
| 4+ | 92,945 | 195,250 | 175,132 | 128,174 |
| 7+ | 65,997 | 116,498 | 74,474 | 57,429 |
| 1 - 4 | 13,668 | 84,708 | 263,451 | 99,009 |

[a]Incomplete survey; Stratum 352 not surveyed.

Table 23. Average catch per tow of juvenile and adult yellowtail on the Grand Banks, NAFO Div. 3LNO in juvenile surveys 1985-88.

| Stratum | Category | 1985 | 1986 | 1987 | 1988 |
|---|---|---|---|---|---|
| Div. 3Ø 330 | No. of sets | - | - | - | 2 |
| | Age 1 | | | | 0 |
| | Age 2 | | | | 0 |
| | Age 3 | | | | 0 |
| | Age 4 | | | | 0.29 |
| Div. 3Ø 331 | No. of sets | - | - | - | 2 |
| | Age 1 | | | | 0 |
| | Age 2 | | | | 0 |
| | Age 3 | | | | 0 |
| | Age 4 | | | | 0 |
| Div. 3Ø 338 | No. of sets | - | 3 | - | 6 |
| | Age 1 | | 0 | | 0.01 |
| | Age 2 | | 0 | | 0.20 |
| | Age 3 | | 0.75 | | 0.64 |
| | Age 4 | | 1.50 | | 0.43 |
| Div. 3Ø 340 | No. of sets | - | 1 | - | 3 |
| | Age 1 | | | | 0 |
| | Age 2 | | | | 0 |
| | Age 3 | | | | 0 |
| | Age 4 | | | | 0 |
| Div. 3L 350 | No. of sets | 5 | 6 | - | 5 |
| | Age 1 | 0.0 | 0 | | 0.0 |
| | Age 2 | 0.0 | 0 | | 0.0 |
| | Age 3 | 0.0 | 0 | | 0.0 |
| | Age 4 | 0.0 | 0 | | 0.0 |
| Div. 3Ø 351 | No. of sets | 3 | 9 | - | 7 |
| | Age 1 | 0.0 | 0.22 | | 0.05 |
| | Age 2 | 0.33 | 0.13 | | 0.66 |
| | Age 3 | 1.69 | 0.34 | | 4.41 |
| | Age 4 | 2.51 | 0.28 | | 2.78 |
| Div. 3Ø 352 | No. of sets | 1 | 13 | 1 | 11 |
| | Age 1 | | 1.28 | | 1.20 |
| | Age 2 | | 1.55 | | 6.61 |
| | Age 3 | | 2.15 | | 12.86 |
| | Age 4 | | 6.49 | | 6.87 |
| Div. 3Ø 353 | No. of sets | - | 5 | 1 | 4 |
| | Age 1 | | 0.95 | | 0.03 |
| | Age 2 | | 0.81 | | 0.55 |
| | Age 3 | | 1.21 | | 0.91 |
| | Age 4 | | 0.79 | | 1.15 |

Table 23 (Cont'd.).

| Stratum | Category | 1985 | 1986 | 1987 | 1988 |
|---|---|---|---|---|---|
| Div. 3N 360 | No. of sets | 3 | 14 | 19 | 20 |
| | Age 1 | 0.48 | 71.80 | 15.54 | 1.84 |
| | Age 2 | 2.37 | 47.79 | 72.18 | 7.96 |
| | Age 3 | 1.30 | 71.62 | 49.35 | 38.45 |
| | Age 4 | 1.65 | 13.94 | 30.55 | 17.81 |
| Div. 3N 361 | No. of sets | 6 | 8 | 8 | 6 |
| | Age 1 | 1.12 | 1.99 | 1.64 | 4.09 |
| | Age 2 | 0.62 | 5.97 | 5.93 | 12.33 |
| | Age 3 | 0.83 | 8.41 | 5.51 | 24.58 |
| | Age 4 | 9.30 | 10.07 | 9.04 | 14.64 |
| Div. 3N 362 | No. of sets | 9 | 7 | 2 | 6 |
| | Age 1 | 0.0 | 0.14 | 0 | 0.0 |
| | Age 2 | 0.78 | 0.0 | 0.19 | 0.78 |
| | Age 3 | 1.34 | 0.04 | 0.31 | 1.34 |
| | Age 4 | 5.43 | 1.49 | 0.13 | 5.43 |
| Div. 3L 363 | No. of sets | 5 | 5 | - | 6 |
| | Age 1 | 0.0 | 0.0 | | 0.0 |
| | Age 2 | 0.0 | 0.0 | | 0.0 |
| | Age 3 | 0.0 | 0.0 | | 0.0 |
| | Age 4 | 0.0 | 0.0 | | 0.0 |
| Div. 3L 371 | No. of sets | 4 | - | - | 5 |
| | Age 1 | 0.0 | | | 0.0 |
| | Age 2 | 0.0 | | | 0.0 |
| | Age 3 | 0.0 | | | 0.0 |
| | Age 4 | 0.0 | | | 0.0 |
| Div. 3L 372 | No. of sets | 9 | 8 | - | 8 |
| | Age 1 | 0.0 | 0 | | 0 |
| | Age 2 | 0.12 | 0 | | 0 |
| | Age 3 | 4.70 | 0 | | 0 |
| | Age 4 | 18.26 | 0.09 | | 0.01 |
| Div. 3N 373 | No. of sets | 10 | 7 | - | 8 |
| | Age 1 | 0.0 | 0.14 | | 0.0 |
| | Age 2 | 0.0 | 0 | | 0.0 |
| | Age 3 | 0.21 | 0 | | 0.21 |
| | Age 4 | 1.19 | 0.08 | | 1.19 |
| Div. 3N 374 | No. of sets | 4 | 4 | 1 | 4 |
| | Age 1 | 0.25 | 0.25 | | 0 |
| | Age 2 | 0.25 | 0.31 | | 0 |
| | Age 3 | 0.49 | 0.19 | | 0.24 |
| | Age 4 | 0.76 | 0.04 | | 0.26 |

Table 23 (Cont'd.).

| Stratum | Category | 1985 | 1986 | 1987 | 1988 |
|---|---|---|---|---|---|
| Div. 3N 375 | No. of sets | 7 | 5 | 7 | 9 |
| | Age 1 | 3.29 | 0.40 | 32.04 | 20.60 |
| | Age 2 | 1.00 | 3.97 | 166.52 | 31.38 |
| | Age 3 | 0.96 | 5.72 | 81.64 | 20.81 |
| | Age 4 | 7.83 | 6.75 | 59.82 | 11.99 |
| Div. 3N 376 | No. of sets | 2 | 4 | 10 | 12 |
| | Age 1 | 19.14 | 2.30 | 94.31 | 7.12 |
| | Age 2 | 8.07 | 9.23 | 270.56 | 29.45 |
| | Age 3 | 2.94 | 28.38 | 276.54 | 129.75 |
| | Age 4 | 15.49 | 11.92 | 288.76 | 116.92 |
| Div. 3N 383 | No. of sets | 4 | - | - | 4 |
| | Age 1 | 0 | | | 0 |
| | Age 2 | 0 | | | 0 |
| | Age 3 | 0 | | | 0 |
| | Age 4 | 0 | | | 0 |
| Div. 3L 384 | No. of sets | 4 | - | - | 5 |
| | Age 1 | 0 | | | 0 |
| | Age 2 | 0 | | | 0 |
| | Age 3 | 0 | | | 0 |
| | Age 4 | 0 | | | 0 |

Commercial Catch of Yellowtail in Div. 3LNO

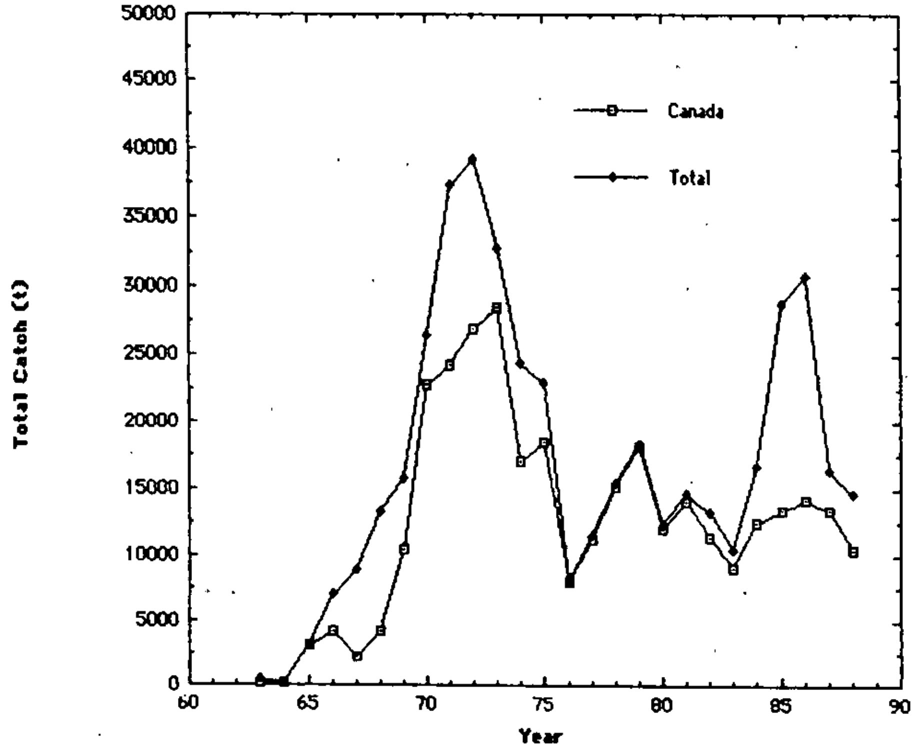



Fig. 1 Commercial catch of yellowtail flounder in Div. 3LNO from 1963-88.

Catches of Yellowtail in Div. 3LNO by Division

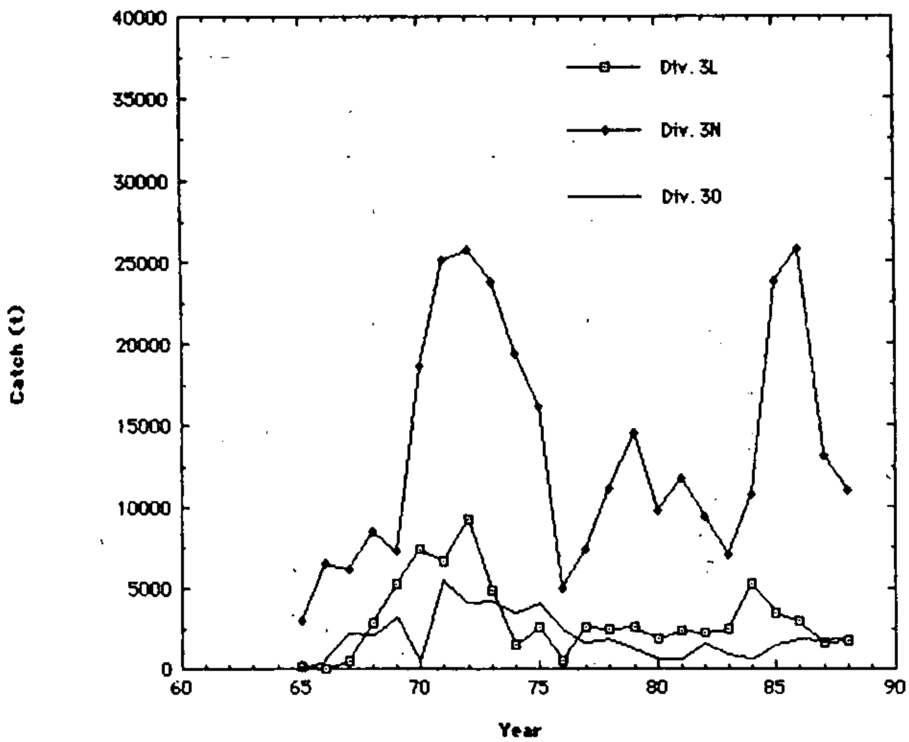



Fig. 2 Catches of yellowtail in Div. 3LNO by Division from 1963-88.

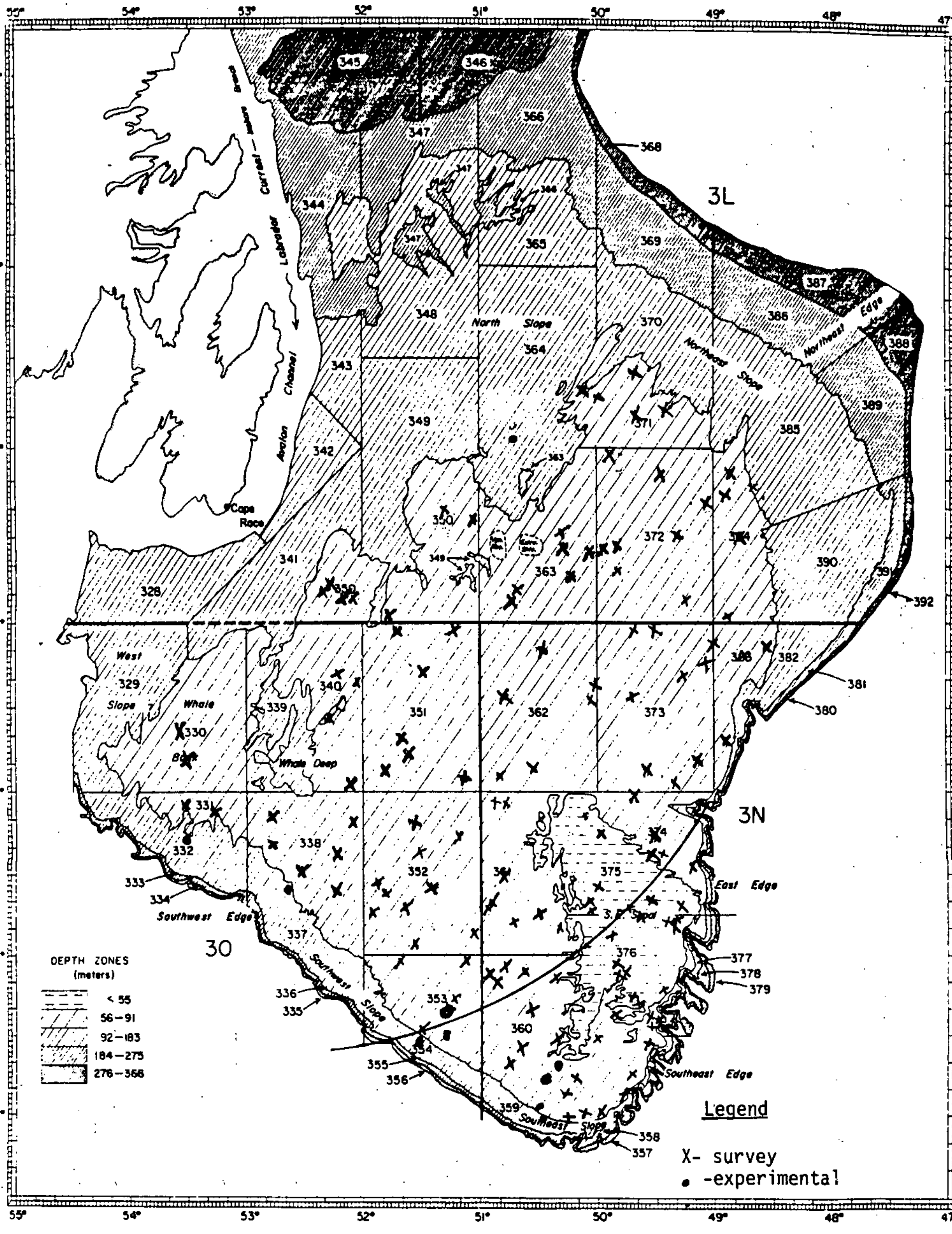
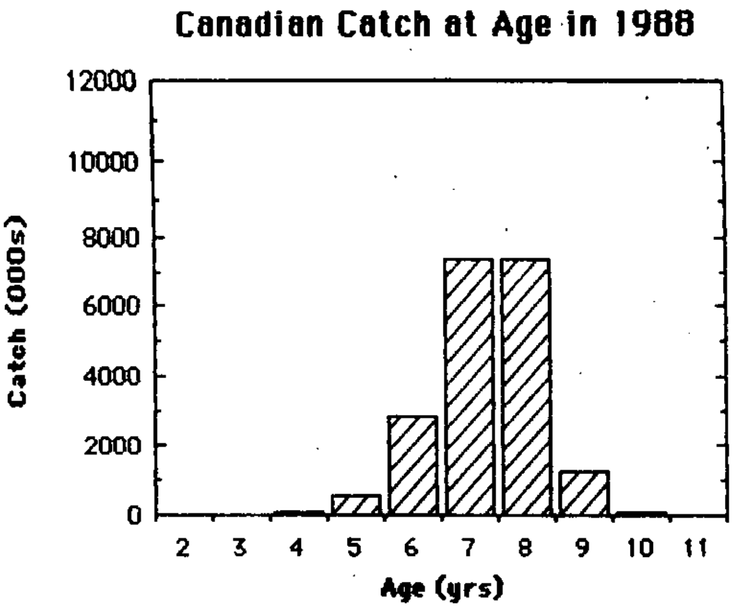



Fig. 3 Fishing hauls made during the 1988 juvenile flatfish survey



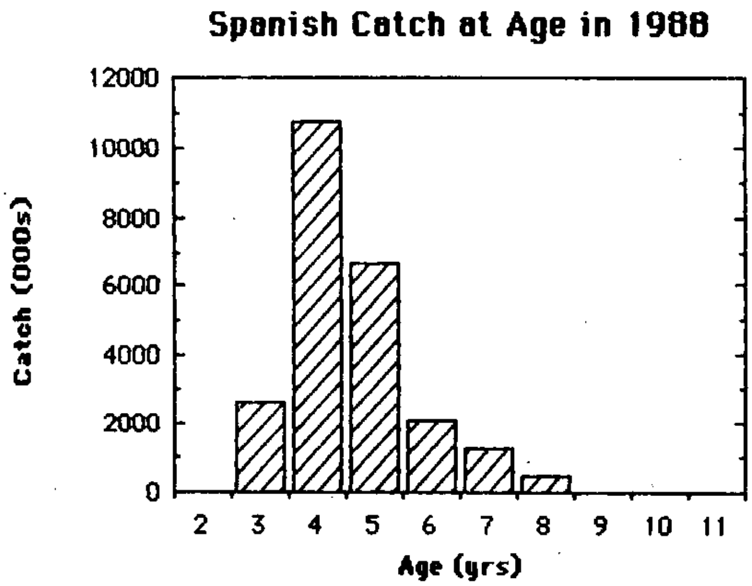




Fig.4 Catch at age of yellowtail in Div. 3LNO in 1988 by Canada and Spain.

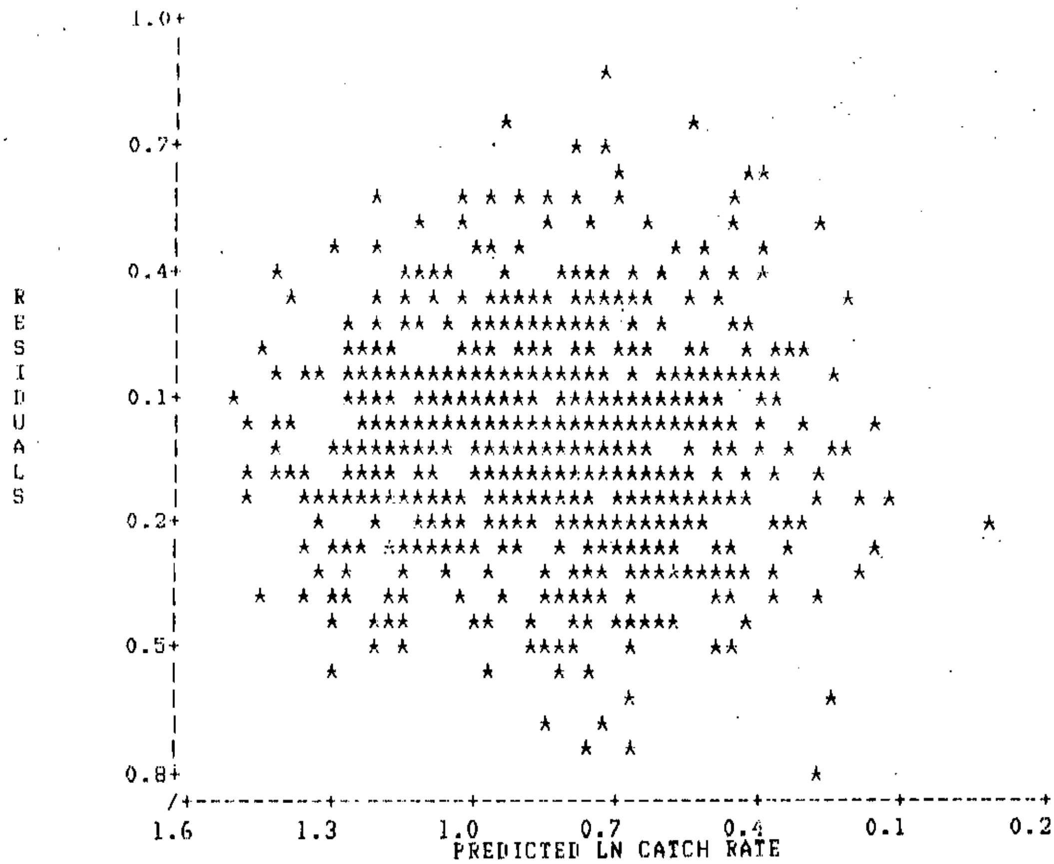



FIG. 5. RESIDUAL PLOTS FROM MULTIPLICATIVE ANALYSIS OF CPUE.

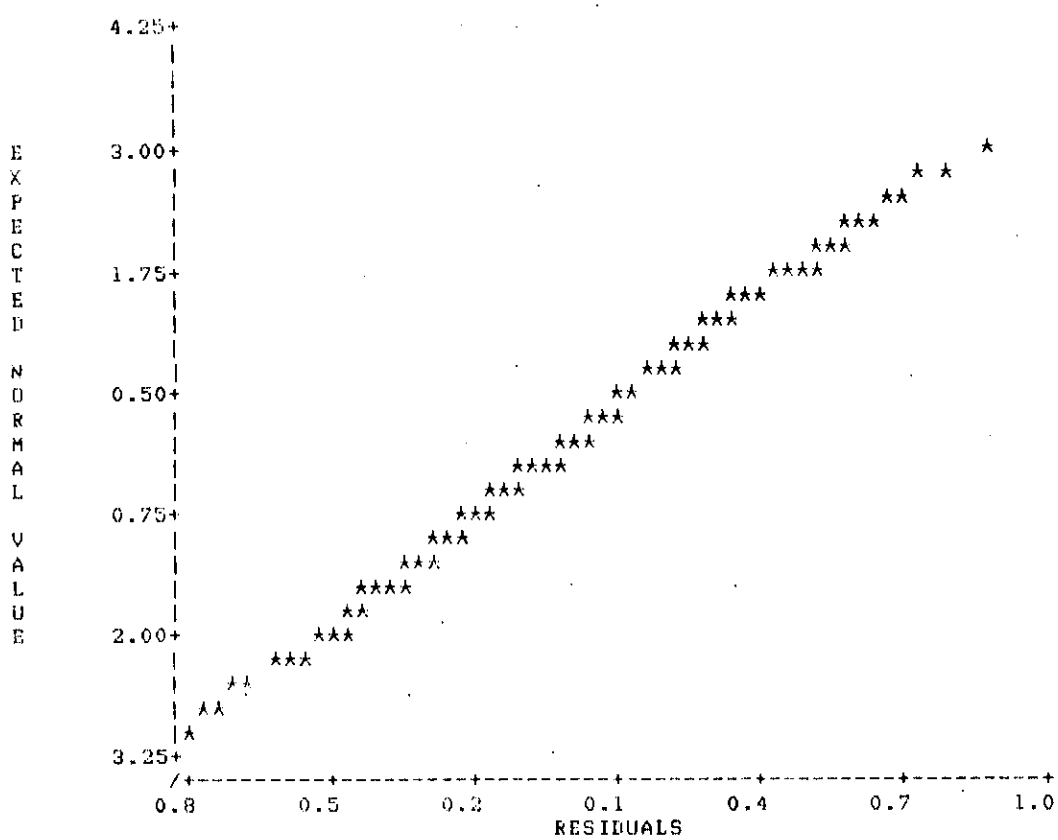



FIG. 5. CONTINUED.

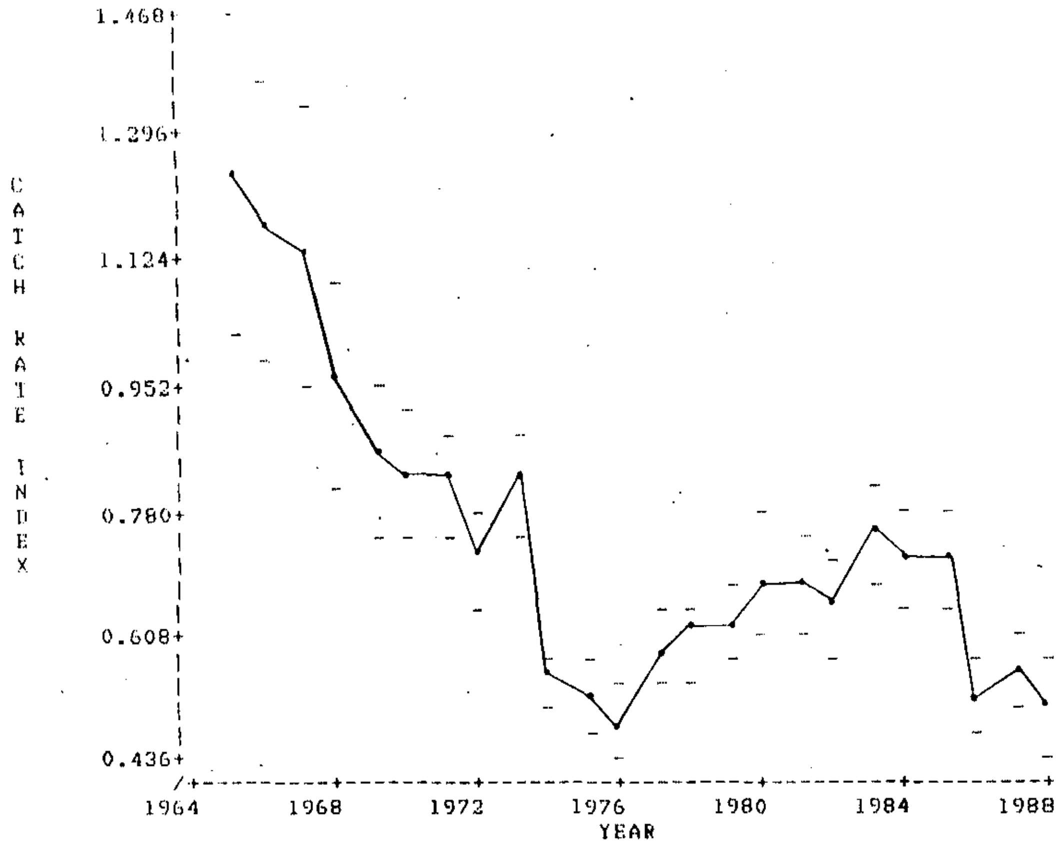



FIG. 6. CPUE FOR YELLOWTAIL FROM 1965-88

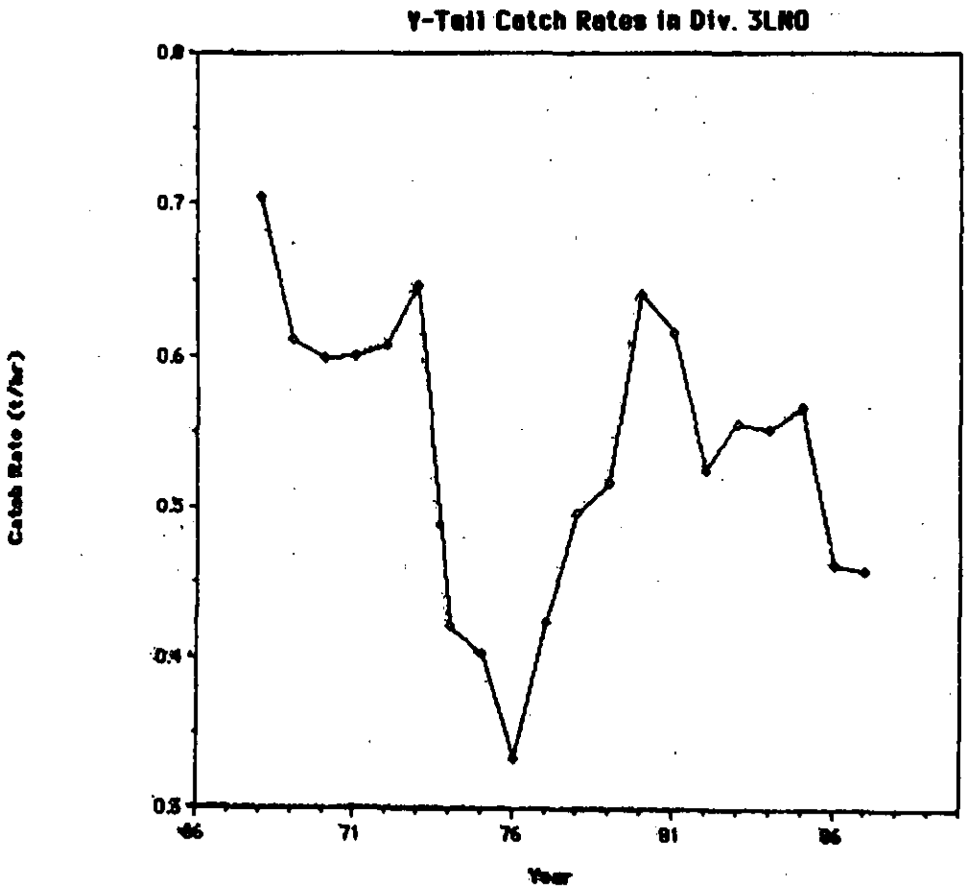



Fig.7. Plot of ytail cpue as calculated in the 1988 assessment.

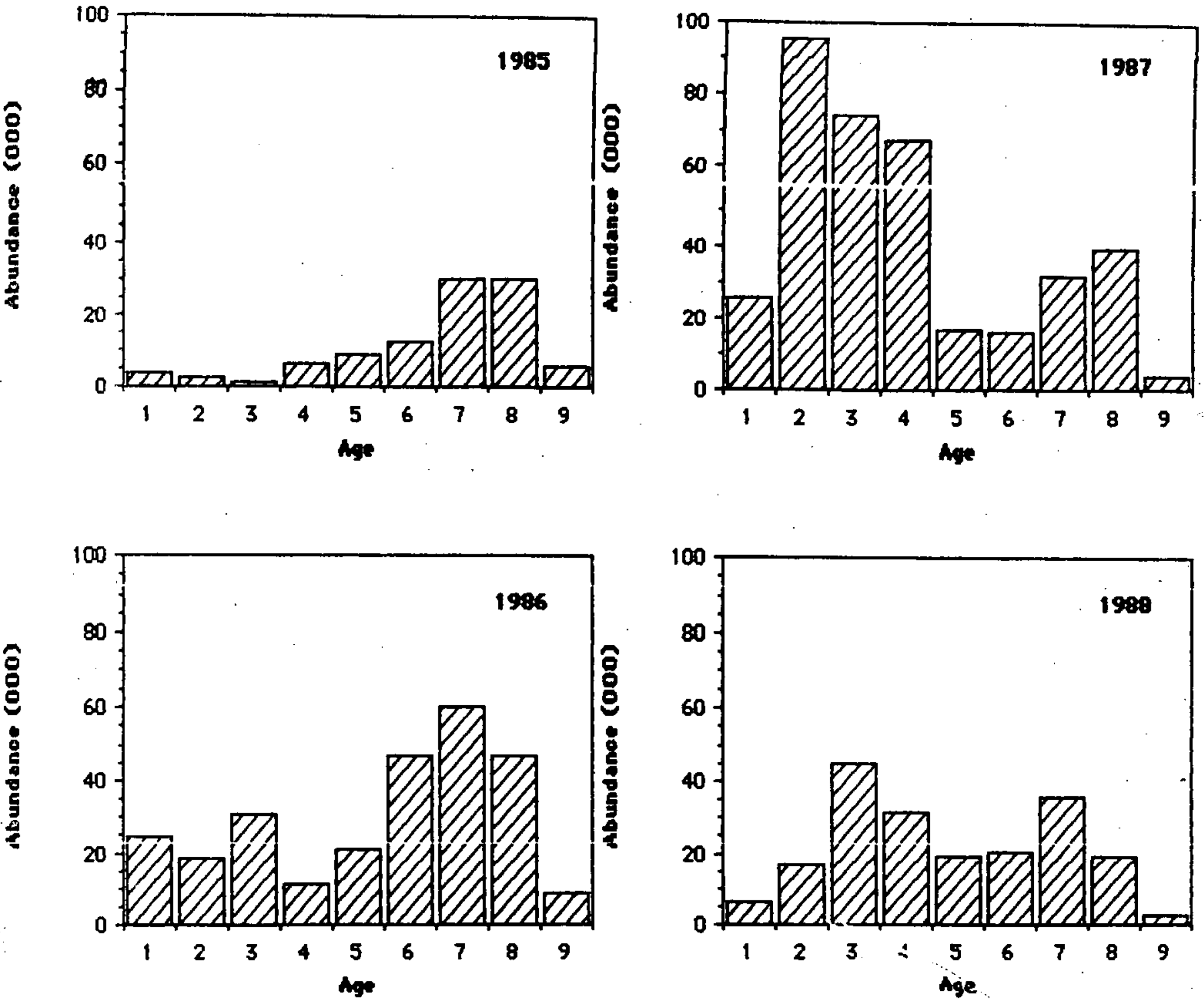



FIG.8. Abundance of yellowtail from selected strata in juvenile surveys, Div. 3NO

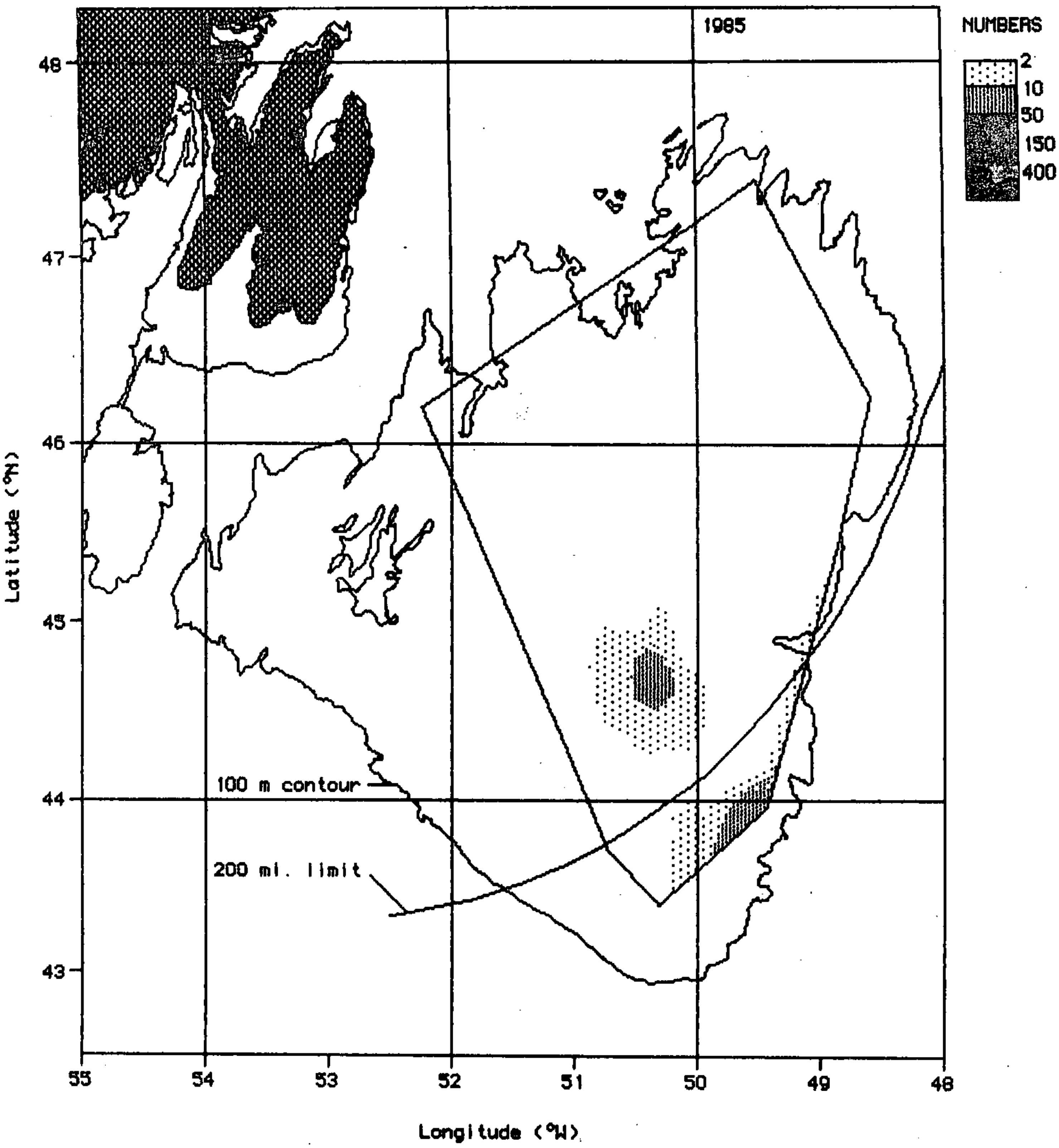



Figure 9 : Distribution of age 1 yellowtail flounders on the Grand Banks.

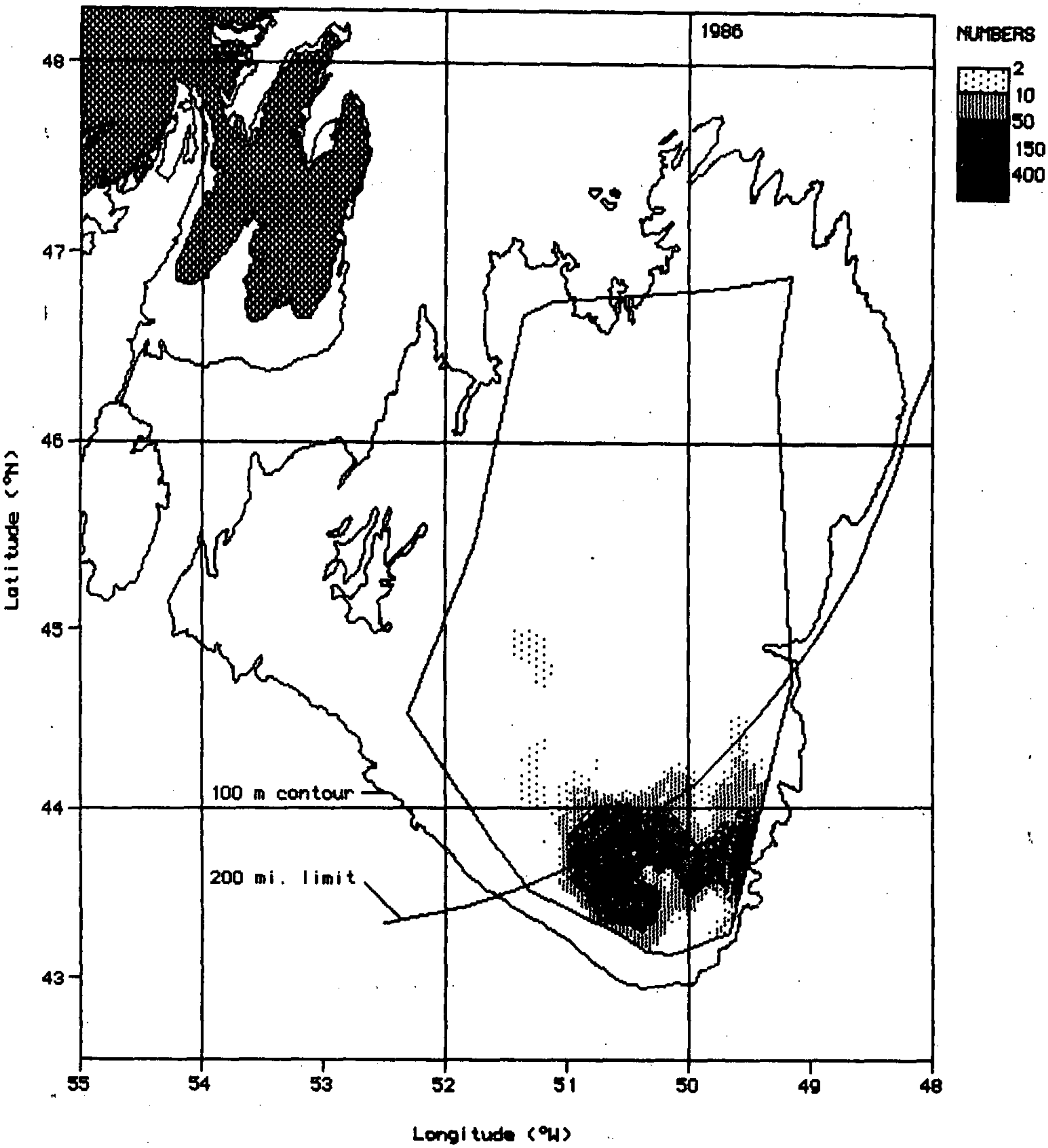



Figure 10 : Continued

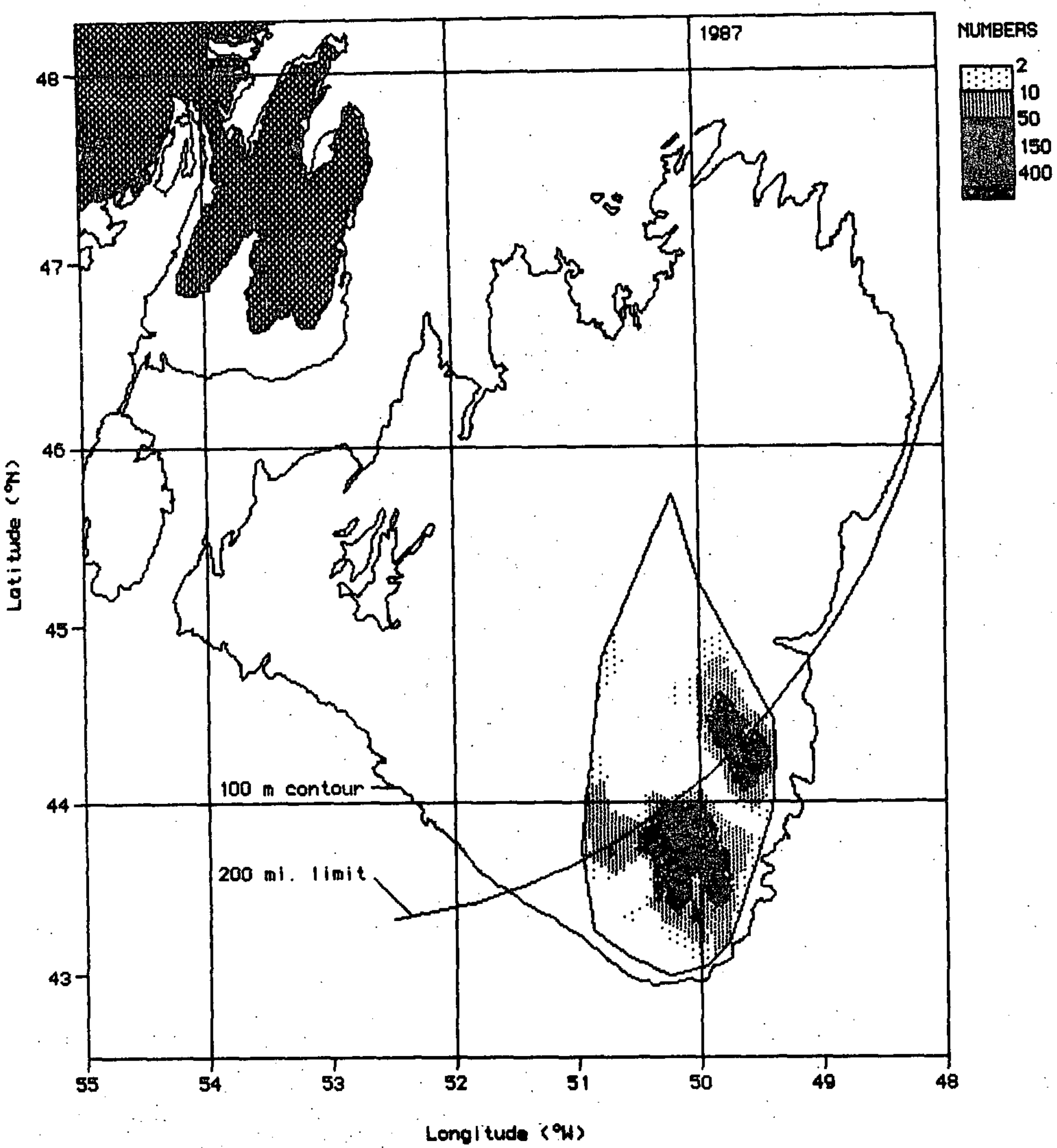



Figure ii: Continued

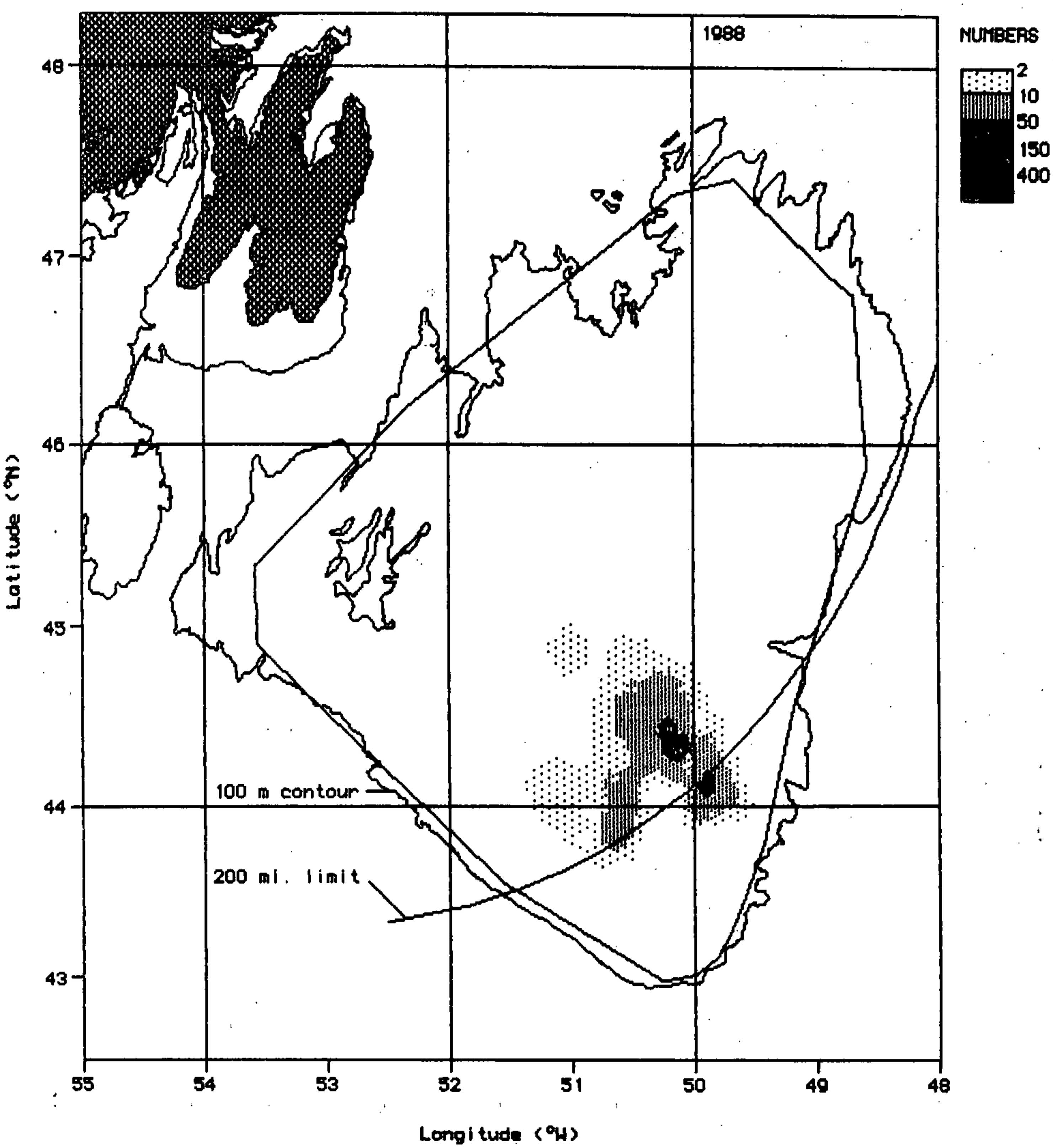



Figure 12: Continued

# YELLOWTAIL FLOUNDER: 1988 JUVENILE SURVEY

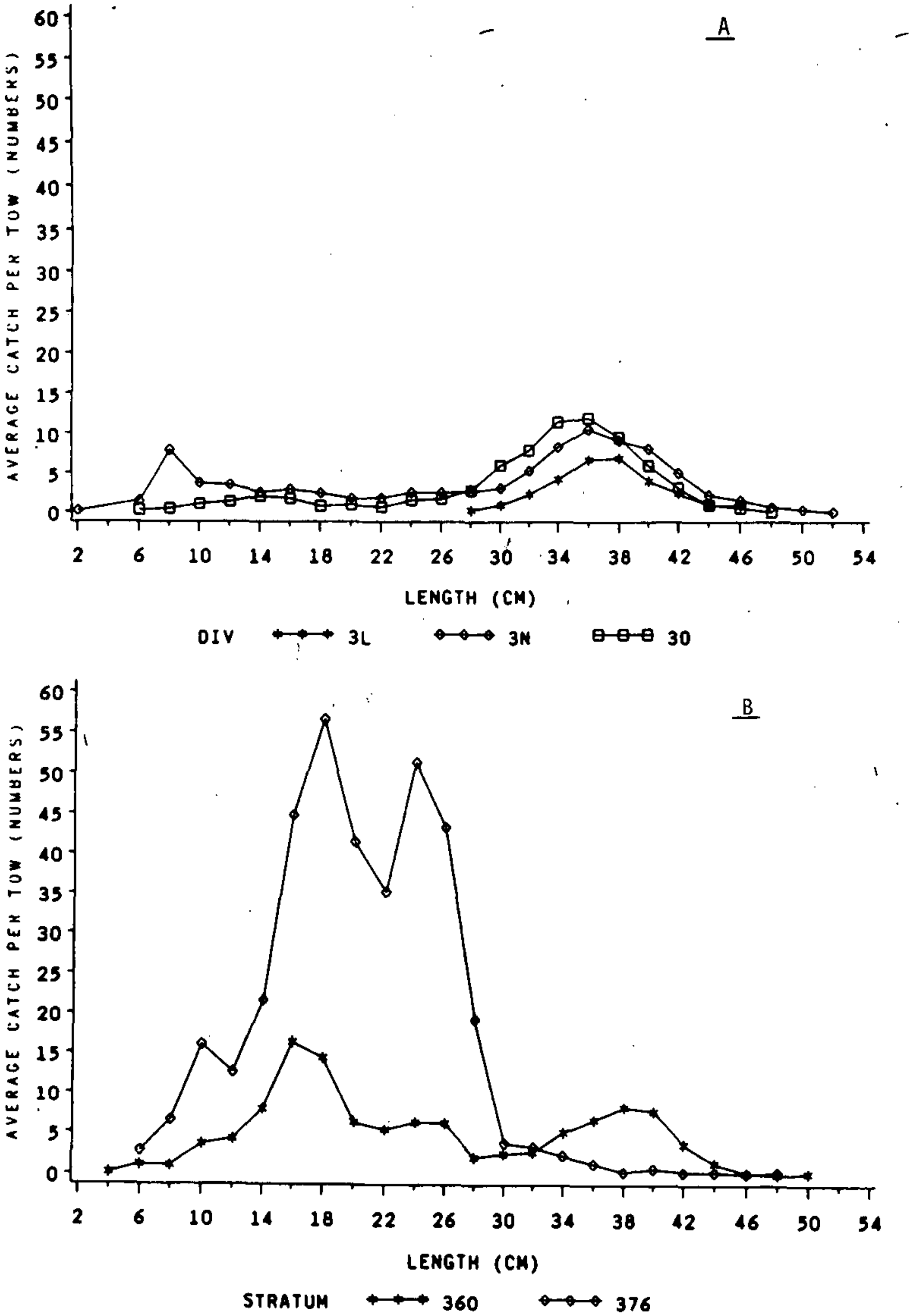



Fig.13 A. Length frequency distribution of yellowtail in Div.3L,3N,3O; strata 360 and 376 not included.
B. Length frequency distribution of yellowtail in strata 360 and 376