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An Assessment of the Yellowtail Flounder Stock in Div. 3LNO

by

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Introduction

TAC regulation

This stock has been managed under quotas since 1973, when a precautionary level of 50,000 t was established. In 1976, the TAC was reduced from 35,000 t to 9,000 t (Table 1a), following a series of large catches and a drop in stock biomass. After this, the TAC increased steadily to 23,000 t in 1982, and has been at a level of 15,000 t from 1985-87, based on recent average catches up to 1984.

Catch history

The nominal catch from this stock increased from negligible amounts in the early 1960's to a peak of just over 39,000 t in 1972 (Table 1a, Fig. 1). Vessels from USSR and Canada took almost all the catch up to and including 1975, with only Canada taking significant catches in the 1976-81 period. With the entrance of South Korea into the fishery in 1982, catches by non-Canadian vessels began to increase to the point in 1986 where Canada caught 14,000 t and other nations took 15,000 t. Overall, the nominal catch in 1986 was about the same as in 1985, about double the 1984 level and triple the 1983 value. Catches by most nations were lower in 1986 than 1985, with the exception of Canada which took 800 t more, and Portugal, which reported 5,500 t in 1986 and no catch of yellowtail in 1985 (Table 1b). Brodie (1986) contains further details on nominal catches and catch estimates for several nations in the 1982-85 period.

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). The catches from this division in 1985 and 1986 of 23-24 thousand t are close to the highest on record and can be attributed to the increased fishing activity on the tail of the Bank, outside Canada's 200 mile limit, much of which is prime yellowtail habitat (Fig. 3). Catches in Div. 3L have averaged about 2,800 t annually since 1976, and catches in Div. 3Ø have ranged from 600 to 2300 t over the same period.

Given the offshore nature of the fishery and the size of the vessels participating, catches occur in all months with peak catches often coming in the fall (Table 3). It should be noted that monthly breakdowns of the catch are not available for many countries in the 1984-86 period.

Assessment

Sampling

Length frequency information was available from the Canadian and U.S.A. fisheries for yellowtail in 1986 and while the American data was not processed in time for inclusion in this assessment, it agreed in general with comparable Canadian data. The level of sampling of the Canadian catch remains high, as can be seen in Table 4, which contains information on both length frequency and otolith samples.

Numbers caught at age in 1986

These were calculated in the usual manner by applying quarterly age-length keys (sexes separate) to monthly length frequencies for each NAFO Div. The total catch-at-age was then obtained by combining male and female numbers at age for all 3 divisions. Table 6 shows the catch-at-age and associated statistics for 1986 and Tables 7 and 8 show the catch at age series from 1968-86. No adjustments were required for the catch at age in 1984 to account for revised catch estimates, as there was less than a 0.8% change in the provisional and final catch for 1984. While a change of 5% occurred in the reported catch in 1985 from last year to this year, the figure is still provisional and did not warrant adjustment of the catch at age.

As in 1985, the 1978 and 1979 year classes dominated the 1986 commercial catch comprising about 75% of the catch both by number and weight (Tables 7 and 9). The 1978 year class, in terms of percent numbers, is the second highest in the 19 year series at age 8 in 1986, the highest at age 7 in 1985, and the sixth highest at age 6 in 1984. The 1979 year class showed up just as strongly at age 7 in 1986, but not quite as large at age 6 in 1985. The catch at ages 4 and 5 has remained at very low levels in the 1982-86 period, comprising only 2.9% of the catch numbers in 1986, the lowest value in the series. Although no estimates of discarding are available by length or age group for this stock, Kulka (1986) indicates that the overall discard rate of yellowtail has remained constant at 4-5% from 1981-85.

Although the catch numbers indicate that there does not appear to be any strong year-classes about to enter this fishery, it should be noted that the apparently strong 1978 and 1979 year classes did not show up in significant numbers at ages 4 and 5 in the commercial catch.

Weights at age

These were determined in the usual manner using the method described in Brodie, 1985. Those for 1986 are shown in Table 6, while Table 8 contains the 1968-86 values. The weights were lower in 1986, although not unusually so. Table 9 gives the calculated catch biomass, obtained by summing the yearly products of numbers and weights at age. The 1986 value was only 2.6% higher than the nominal catch, and most other values are within 6% of the catches.

Natural mortality

The value of 0.3, used in recent assessments of this stock was retained.

Research vessel survey data

A) Spring Biomass surveys

Stratified random trawl surveys have been carried out by Canadian research vessels on the Grand Banks in the spring of the year since 1971. Figure 3 shows the depth stratification scheme within these surveys. The 1985 assessment of this stock contains a detailed account of the Canadian survey series with information on adjustment of survey indices from different survey vessels, survey coverage, and criteria for selecting particular strata for biomass and abundance estimates between years (Brodie 1985).

Tables 10-12 show survey results, in the form of mean weight per tow per stratum and total biomass estimates for Div. 3L, 3N, and 3Ø respectively. Most of the biomass of this stock is found in Div. 3NO, primarily Div. 3N and although the biomass estimates in Div. 3L and 3N dropped from 1986 to 1987 and the estimate for Div. 3Ø increased, there has been little change in the stock biomass over the 1985-87 period, despite the large catches in 1985 and 1986.

Table 13 shows survey information from selected strata in Div. 3L and 3N over the time period 1971-1987. The data suggests a relatively stable population from 1978 to 1982 (Fig. 4). There was no survey in 1983 and the 1984 estimates are much higher than the 1978-82 series indicates, however the 1985, 86, and 87 estimates are close to those observed in the 1978-82 series.

Tables 14 and 15 contain age by age composition for the selected strata from Canadian surveys in 1971 to 1986. These data show that population size and structure was fairly stable from 1978 to 1982. Brodie (1986) postulated that the high estimates in 1984 appeared to be anomalous when compared by the population sizes estimated in 1985 and 1986. However, re-examination of average number per set at age and abundance estimates for 1984 to 1986 shows that both the 1978 and 1979 year classes were strong, and there is

also some indication of this in the 1982 average numbers/age. In the 1984 estimates of abundance at age the large sizes of both these year classes together resulted in large increase in population estimates for that year (Tables 14 and 15). Abundance at age of yellowtail for all strata in Div. 3LNO from research surveys in 1984, 85, and 86, when coverage was very good, also reflects the strength of the 1978 and 1979 year classes (Table 16).

As seen from Tables 14-16 yellowtail do not appear to be fully recruited to the survey trawl gear until age 7. Fish of ages 1-2 are absent in most years while ages 3 and 4 are often present in low numbers. Reliable estiamtes of recruitment to the commercial fishery of juvenile yellowtail, where 4 is the age of first capture, are not possible from this survey data.

B. Juvenile yellowtail biomass surveys

During September of 1985 and 1986 stratified-random trawl surveys, using the WEBBER sampling design to generate independent day and night biomass estimates, were carried out by the Canadian research vessel WILFRED TEMPLEMAN. The scope of these surveys is to determine indices of year-class strength of juvenile yellowtail, ages 1-4 years, and to determine functional relationships between these indices and the estimated number of fish at the age of recruitment from virtual population analysis. 1986 constitutes year two of a time series.

These surveys used a No. 41 (80/104) Yankee shrimp trawl as a standard sampling trawl with the footgear modified to fish on rough bottom. Towing speed is 2.5 knots for 30 minute tows covering a distance of approximately 1.25 miles. Independent day and night biomass estimates were generated to look at diel variability in yellowtail catches (see Walsh, 1986).

The results of these two surveys, in the form of mean weight and number per tow by stratum, along with biomass and abundance estimates are given in Table 17 for Divs. 3LNO. The majority of the biomass of yellowtail is located in or near the Southeast Shoal, Stratum 375, and 376 (Fig. 3). Table 17 also shows the results of independent biomass estimates generated by day and night compared to the entire combined survey in 1985 and 1986. Abundance estimates by night were twice those by day and were higher than the results of the combined surveys, while biomass estimates by night were 1.91 (1985) and 1.68 (1986) times higher than day estimates and marginally higher than the combined survey.

Table 18 shows a comparison of survey information derived from regular groundfish biomass surveys (Spring) and juvenile surveys (Fall) of selected strata in Divs. 3LN. Abundance and biomass estimates were higher in juvenile surveys in 1985 and 1986 than in the regular surveys. Difference in estimates may be attributed to the fact the shrimp gear used in the juvenile surveys is more efficient in catching both juvenile and adult yellowtail than the otter trawl used in the regular surveys. However biomass estimates from selected strata in the Spring regular survey show an increase from 1985 to 1986 while the estimates from the selected strata in the Fall juvenile surveys show a decrease from 1985 to 1986. This difference may be attributed to 1) diel trend in fishing sets or 2) inadequacy of selected strata being applied to the Fall juvenile surveys.

Tables 19-21 contain information on the age composition of 1985 and 1986 juvenile surveys. Mean catch per tow and abundance estimates of juveniles (ages 1-4 years) were much higher in 1986 than in 1985. This can probably be attributed to 1) a more extensive survey in 1986, 2) diel trend in availability of catches of yellowtail and 3) limited distribution of juveniles compared to the adult population (Walsh, 1987). Tables 20-21 contain a comparison of age composition for the selected strata from the Canadian Spring (regular) biomass surveys and the Fall juvenile surveys. Abundance estimates are higher for juvenile surveys than for the regular surveys in both years. Mean catch per tow for ages 1-4 from the juvenile surveys were still low in both years (Table 20). This can be contributed to the fact that the best catch rates were in stratum 360 and 376 which are not included in the selected strata.

Commercial CPUE data

Table 22 contains a summary of catch and effort data from Canadian trawlers (mostly TC4 and 5) in the main species yellowtail fishery in Div. 3LNO. CPUE declined from a level near

0.6 t/hr in the early 1970's to a low of 0.33 t/hr in 1976. Catch rates then increased steadily to 1980-81, remained at a level around 0.55 t/hr from 1982-85, then decreased about 19% in 1986 (Fig. 5). With the strong 1978 and 1979 year classes likely to contribute less to the fishery in 1987 and very little in 1988 (at ages 10 and 9) the decline in CPUE may continue unless recruitment to the fishery is stronger than indicated.

It should be noted that these data are not standardized for differences in gear-TC, division, or month, but that an exercise for the A. plaice stock in Div. 3LNO fished by the same fleet showed little difference between the conventional and standardized CPUE series. It should also be noted that these data presented here represent only the Canadian catch, which is take almost entirely inside the 200 mile limit (Fig. 3). Recent analyses have shown that the abundance of yellowtail, as measured by R.V. surveys, is significantly lower in areas outside the 200 mile limit in Div. 3N and that the estimated 1986 catch rates of some countries fishing outside the 200 mile limit appeared to be much lower in 1986 than 1985.

Without CPUE data from these nations fishing on the tail of the Bank, the Canadian CPUE data may not be an accurate index of total stock abundance in the most recent years, and may in fact underestimate the magnitude of the decline in total CPUE from 1985 to 1986.

Sequential population analysis(SPA)

Recent efforts to use SPA with this stock have met with little success in recent years. After being used for several years as the basis of assessments, the use of SPA was discontinued in 1984, when concern was expressed over the consistently high values of fishing mortality (F) observed at ages 7-10 in many years (NAFO Redbook, 1984, p. 54). Subsequent use of SPA was considered useful for indicating trends in population size but not suitable to form the basis of catch projections. Given this, it was decided to include SPA for this stock simply for illustrative purposes. The SPA shown in Tables 23 and 24 both use a short term (1982-86) average partial recruitment vector and terminal F in 1986 of 0.9 and 1.5 respectively. An attempt to calibrate the SPA with survey data on an age by age basis in 1986 indicated F to be around 0.9 to 1.0, however, the results were inconclusive.

Tables 23 and 24 again indicate that the 1978 and 1979 year classes were strong. Given the high levels of F shown in the SPA, the analysis converges quite rapidly, and both SPA show a relatively stable population size at ages 5+ from about 1974 to 1982, followed by an increase in 1983-85 as the 1978 and 1979 year classes entered the fishery. Both analyses show lower than average population sizes at ages 4-6 in 1986, although the values at ages 4 and 5 are particularly sensitive to changes in the PR, set at .001 and .052 for the 2 ages respectively. As Table 24 indicates, the 1978 and 1979 year-classes show up very strongly, even at an input F of 1.5 in 1986.

Prognosis

The immediate future of this stock will obviously be determined by the strength of the 1980 and 1981 year-classes, as it is unlikely that the 1978 and 1979 year-classes will contribute significantly beyond age 8 (Table 9). There is no evidence from surveys or the commercial fishery that these will be particularly strong. Analysis of the catch history of this stock shows that catches in the 23,000-39,000 t range from 1970-75, when several good year-classes were apparent in the stock, were followed by a rapid decline in abundance, with CPUE declining almost 50% from 1973 to 1976. Catches around 30,000 t (double the TAC) in 1985-86, the 19% decline in CPUE in the Canadian fleet, the apparent decline in CPUE by many other nations fishing outside the 200 mile limit in Div. 3N, and the decline in biomass from 1986-87 in this Div. as measured by surveys are all causes for concern in this assessment.

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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
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	36	14,935	17,000
1985[b]	13,357	-	-	4,212	11,018	28,587	15,000
1986[b]	14,157	-	-	2,620	12,925	29,702	15,000
1987							15,000

[a]South Korean catches reported to NAFO in 1982-84 as unspecified flounder. Breakdown used for these catches is 60% yellowtail, 40% American plaice.

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

Table 1b. Breakdown of provisional catches from Table 1a listed as "other" in 1985 and 1986.

Year	Spain	Portugal	Panama[a]	U.S.A.	Cayman Islands[a]	Other	Total
1985	2,415	-	4,065	3,771	755	12	11,018
1986	336	5,521	3,785	2,562	691	-	12,925

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

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]	5,264	9,179	492	-	14,935
1985[a,b]	3,376	23,118	1,921	172	28,587
1986[a,b]	2,930	24,469	2,303	-	29,702

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

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

Table 3. Breakdown of yellowtail nominal catches (t) by Division and month, for the years 1977-86.

Month	1977	1978	1979	1980	1981	1982[a]	1983[a]	1984[a]	1985[a,b]	1986[a,b]
					3L					
Jan	-	1	-	-	1	-	-	5	-	3
Feb	21	2	-	-	-	-	2	-	-	3
Mar	13	-	165	-	2	-	-	13	382	7
Apr	9	5	195	-	101	3	31	367	434	14
May	113	184	621	715	1,024	24	100	2,163	482	674
June	668	1,230	778	864	309	918	568	1,155	566	584
July	731	473	452	233	503	711	533	1,211	544	531
Aug	790	423	256	65	153	154	611	289	476	427
Sept	127	175	79	11	134	96	253	21	209	567
Oct	163	50	43	9	65	255	227	6	76	99
Nov	15	-	3	-	9	51	165	26	180	12
Dec	-	4	3	1	44	93	62	8	27	9
Total	2,651	2,547	2,595	1,898	2,345	2,305	2,552	5,264	3,376	2,930
					3N					
Jan	-	219	11	-	66	70	364	366	-	175
Feb	14	55	27	-	16	400	349	120	1,271	211
Mar	66	106	109	180	30	144	4	316	662	200
Apr	52	519	1,007	17	189	16	423	2,507	392	439
May	876	384	1,044	431	614	371	556	1,897	1,349	1,492
June	853	788	1,557	896	765	402	369	709	1,346	1,333
July	1,270	750	917	594	2,351	1,202	584	680	958	1,449
Aug	1,099	1,047	1,229	325	3,582	1,965	1,074	183	1,350	1,857
Sept	520	1,265	2,203	374	1,765	1,346	718	16	1,345	3,072
Oct	320	3,136	4,417	2,675	1,972	1,464	521	18	1,403	1,506
Nov	1,730	2,259	1,828	3,389	372	739	447	54	1,916	323
Dec	581	551	207	924	11	180	486	76	402	452
Unknown	-	-	-	-	-	1,073	1,101	2,237	10,724	11,960
Total	7,381	11,079	14,556	9,805	11,733	9,327	6,996	9,179	23,118	24,469
					30					
Jan	-	6	2	-	-	-	24	10	-	16
Feb	13	7	-	-	-	-	13	25	16	21
Mar	4	23	-	-	7	-	6	46	3	38
Apr	45	157	97	-	-	1	37	7	89	67
May	309	922	233	165	38	768	264	56	329	123
Jun	416	123	229	226	158	662	80	44	264	468
July	331	108	54	36	206	31	27	63	102	228
Aug	228	91	58	2	30	1	31	5	77	91
Sept	97	49	70	14	34	40	54	1	87	95
Oct	34	105	253	93	39	23	59	30	106	64
Nov	107	160	120	104	23	96	191	38	101	57
Dec	22	89	84	34	67	20	17	31	24	12
Unknown	-	-	-	-	-	45	122	136	723	1,023
Total	1,606	1,840	1,200	674	602	1,687	925	492	1,921	2,303

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

[b]Provisional. Includes estimates of non-reported catch outside Canadian 200 mile limit. These catches are attributed 90%: 10% to Div. 3N:30.

Table 4. List of commercial samples, by quarter and division, available for the Canadian catch of yellowtail flounder in Divisions 3LNO, 1986, as provided by the Commercial Sampling Section in St. John's.

Division	Quarter 1	2	3	4	Total
3L Can catch(t)	13	1,272	1,525	120	2,930
Samples	-	1	5	-	6
Measured	-	467	2,048	-	2,515
Otoliths	-	66	216	-	282
3N Can catch(t)	117	2,801	5,608	1,676	10,202
Samples	2	13	18	15	48
Measured	1,057	5,991	7,927	6,540	21,515
Otoliths	144	477	482	504	1,607
3O Can catch(t)	23	607	329	66	1,025
Samples	-	-	-	-	-
Measured	-	-	-	-	-
Otoliths	-	-	-	-	-

Table 5. Average weights (kg) and lengths (cm), as well as numbers at age and associated statistics for yellowtail in the commercial fishery in Divisions 3LNO in 1986.

	AVERAGE		CATCH		
AGE	WEIGHT	LENGTH	MEAN	STD. ERR.	C. V.
* 4	0.091	23.396	9	1.00	0.12
* 5	0.263	31.790	1686	153.99	0.09
* 6	0.357	34.731	8734	534.24	0.06
7	0.474	37.707	26984	763.45	0.03
8	0.624	40.840	16780	598.41	0.04
9	0.839	44.478	3423	213.23	0.06
10	1.030	47.180	386	44.61	0.12
*11	1.256	49.969	46	10.94	0.24

TABLE 6. YELLOWTAIL,DIV 3LNO, CATCH NUMBERS (x10^3)

AGE	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
4	573	80	141	169	1943	3734	1375	955	409	1391	691	1061	1142	3245	111	25	116	1	9
5	6202	2993	2776	7534	10128	21280	19800	11240	2529	3211	3654	4783	5130	5077	1501	2081	1440	2113	1686
6	12483	15035	19839	30365	22502	23709	18100	20931	7650	6851	10979	13067	8383	8191	5244	6792	13160	16810	8734
7	9154	12076	20615	22117	19416	17053	11200	12737	5361	7331	11028	14284	7199	9991	8901	7862	14341	25497	26984
8	1421	3150	4557	5869	10553	4713	2400	2536	953	4078	3870	4940	1519	4361	7591	3932	3932	8653	16780
9	47	326	610	2152	4206	862	850	372	74	1433	310	773	224	356	2184	546	281	1305	3423
10	1	40	68	245	1110	300	130	23	15	289	34	109	28	29	307	25	11	59	386
4+	29881	33700	48606	68451	69858	71651	53855	48794	16991	24584	30566	39017	23625	31250	25839	21264	33280	54438	58002

TABLE 7. YELOWTAIL,DIV3LNO, CATCH AT AGE AS PERCENTAGES OF YEARLY TOTALS

AGE	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
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	4.8	10.4	0.4	0.1	0.3	0.0	0.0
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	21.7	16.2	5.8	9.8	4.3	3.9	2.9
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	35.5	26.2	20.3	31.9	39.5	30.9	15.1
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	30.5	32.0	34.4	37.0	43.1	46.8	46.5
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	6.4	14.0	29.4	18.5	11.8	15.9	28.9
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	0.9	1.1	8.5	2.6	0.8	2.4	5.9
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	0.1	0.1	1.2	0.1	0.0	0.1	0.7

TABLE 8. YELLOWTAIL, DIV 3LNO, WEIGHTS AT AGE (KG)

AGE	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
4	0.247	0.247	0.247	0.247	0.247	0.247	0.200	0.184	0.200	0.214	0.249	0.178	0.271	0.228	0.238	0.210	0.206	0.085	0.091
5	0.305	0.305	0.305	0.305	0.305	0.305	0.300	0.298	0.322	0.324	0.315	0.278	0.274	0.308	0.292	0.338	0.303	0.295	0.263
6	0.456	0.456	0.456	0.456	0.456	0.456	0.452	0.450	0.486	0.409	0.430	0.378	0.493	0.349	0.346	0.420	0.386	0.395	0.357
7	0.610	0.610	0.610	0.610	0.610	0.610	0.600	0.569	0.615	0.532	0.557	0.504	0.635	0.496	0.486	0.530	0.511	0.524	0.474
8	0.725	0.725	0.725	0.725	0.725	0.725	0.725	0.743	0.814	0.648	0.740	0.668	0.750	0.661	0.675	0.680	0.702	0.722	0.624
9	0.842	0.842	0.842	0.842	0.842	0.842	0.842	0.953	1.029	0.809	0.981	0.787	0.927	0.909	0.933	0.944	1.040	1.024	0.839
10	1.030	1.030	1.030	1.030	1.030	1.030	1.030	1.111	1.201	0.905	1.235	0.756	1.221	1.186	1.304	1.303	1.207	1.414	1.030

TABLE 9. YELLOWTAIL, DIV 3LNO, CALCULATED CATCH BIOMASS (T)

AGE	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
4	142	20	35	42	480	922	275	176	82	298	172	189	309	740	26	5	24	0	1
5	1892	913	847	2298	3089	6490	5940	3350	814	1040	1151	1330	1406	1564	438	703	436	623	443
6	5692	6856	9047	13846	10261	10811	8181	9419	3718	2802	4721	4939	4133	2859	1814	2853	5080	6640	3118
7	5584	7366	12575	13491	11844	10402	6720	7247	3297	3900	6143	7199	4571	4956	4326	4167	7328	13360	12790
8	1030	2284	3304	4255	7651	3417	1740	1884	776	2643	2864	3300	1139	2883	5124	2674	2760	6247	10471
9	40	274	514	1812	3541	726	716	355	76	1159	304	608	208	324	2037	516	292	1336	2872
10	1	41	70	252	1143	309	134	26	18	262	42	82	34	34	400	32	13	83	398
4+	14380	17754	26391	35997	38009	33078	23706	22456	8781	12104	15397	17648	11800	13358	14167	10950	15933	28291	30093

Table 10. Mean weight of yellowtail per 30 minute tow, by stratum, from research vessel surveys in Div. 3L. 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. Surveys from 1971-82 were conducted by the research vessel A.T. CAMERON, the 1984-86 surveys were conducted by the R.V. A. NEEDLER, and/or R.V. W. TEMPLEMAN.

Depth (fm)	Stratum	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	1985 WT 28-30	1986 WT 48	1987[a] WT 58-60
51-100	328	-	-	-	-	-	-	0.0(3)	-	0.0(5)	-	0.0(2)	0.0(3)	0.0(2)	0.0(4)	0.0(9)	
51-100	341	-	-	0.0(3)	-	-	-	0.1(4)	0.1(4)	0.0(6)	0.0(6)	0.0(2)	0.0(5)	0.0(4)	0.01(9)	0.0(9)	
51-100	342	-	-	-	-	-	-	0.0(2)	0.0(2)	0.0(4)	0.0(4)	-	0.0(3)	0.0(4)	0.0(3)	0.0(3)	
51-100	343	-	-	-	-	-	-	0.0(2)	0.0(3)	0.0(4)	0.0(4)	0.0(2)	0.0(4)	-	0.0(3)	0.0(4)	
101-150	344	-	-	-	-	-	0.0(4)	0.0(4)	0.0(4)	0.0(2)	0.0(3)	0.0(5)	0.0(4)	-	0.0(5)	0.0(8)	
151-200	345	-	-	-	-	-	0.0(4)	0.0(4)	0.0(2)	0.0(4)	0.0(5)	0.0(4)	0.0(4)	-	0.0(5)	0.0(7)	
151-200	346	-	-	-	-	0.0(2)	0.0(2)	0.0(3)	-	0.0(4)	0.0(3)	0.0(3)	0.0(3)	-	0.0(2)	0.0(5)	
101-150	347	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)	-	0.0(5)	0.0(5)	
51-100	348	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)	-	0.0(18)	0.0(12)	
51-100	349	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)	0.1(14)	1.3(14)	
31-50	350	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)	3.7(12)	2.3(11)	
31-50	363	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)	15.2(8)	8.3(10)	
51-100	364	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)	0.0(17)	0.0(17)	
51-100	365	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)	-	0.0(7)	0.0(5)	
101-150	366	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)	-	0.0(6)	0.0(8)	
151-200	368	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)	-	0.0(2)	0.0(2)	
101-150	369	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)	-	0.0(5)	0.0(6)	
51-100	370	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)	-	0.0(8)	0.0(8)	
31-50	371	88.5(3)	6.4(2)	-	0.0(3)	-	-	1.4(3)	0.3(3)	0.5(3)	0.5(3)	0.0(2)	1.1(4)	-	0.4(7)	0.3(6)	
31-50	372	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)	56.5(12)	36.3(14)	
31-50	384	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)	-	4.6(6)	1.6(6)	
51-100	385	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)	-	0.0(15)	0.0(13)	
101-150	386	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)	-	0.0(5)	0.0(6)	
151-200	387	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)	-	0.0(6)	0.0(4)	
151-200	388	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)	-	0.0(2)	0.0(2)	
101-150	389	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)	-	0.0(5)	0.0(5)	
51-100	390	0.3(3)	0.0(3)	0.0(3)	0.0(3)	0.0(3)	-	0.0(2)	0.0(4)	0.0(5)	0.0(3)	0.0(2)	0.8(4)	-	0.3(9)	0.0(8)	
101-150	391	-	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)	-	0.0(2)	0.0(2)	
151-200	392	-	-	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)	-	0.0(2)	0.0(2)	
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)	-	
Mean (no. sets)		30.3(58)	5.4(38)	8.5(32)	0.7(70)	0.7(55)	4.0(64)	4.0(102)	2.0(94)	2.8(140)	3.8(115)	1.1(80)	3.2(103)	13.5(37)	4.7(221)	3.1(211)	(186)
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	13.5	8.5	3.7

Table 11. 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	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	1985 AN 43 WT 29	1986 WT 47	1987[a] WT 58-60
151-200	357	-	-	0.0(2)	-	-	-	0.0(2)	-	0.0(3)	0.0(3)	0.0(2)	0.0(2)	0.0(2)	0.0(2)	0.0(2)	-
101-150	358	-	0.0(4)	0.0(3)	-	-	-	0.0(2)	-	0.0(2)	0.0(3)	0.0(3)	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(3)	0.0(2)	-	0.0(4)	0.0(4)	0.0(3)	0.0(2)	0.0(2)	0.0(2)	0.0(2)	0.0(2)
31-50	360	-	58.3(4)	-	-	12.1(4)	128.6(4)	55.9(4)	43.5(4)	27.6(9)	83.8(11)	78.4(6)	36.7(7)	124.1(7)	54.0(16)	14.1(13)	9.4(15)
31-50	361	45.8(2)	115.8(3)	93.4(4)	151.5(4)	105.3(4)	113.0(5)	141.5(3)	122.8(4)	92.3(8)	128.4(7)	-	118.9(6)	139.9(5)	67.1(7)	44.1(10)	82.8(9)
31-50	362	140.2(2)	132.8(4)	22.1(5)	38.9(4)	33.3(3)	44.1(5)	62.4(5)	28.8(4)	40.3(12)	53.6(11)	104.2(5)	47.2(8)	95.1(7)	36.6(11)	73.2(14)	39.3(12)
31-50	373	73.6(4)	135.1(4)	26.7(4)	24.2(4)	-	23.3(5)	74.5(4)	50.5(5)	22.1(11)	48.1(8)	58.4(5)	23.7(5)	63.5(7)	32.0(9)	17.9(14)	23.1(13)
31-50	374	67.8(2)	42.4(2)	115.4(4)	16.1(2)	62.1(2)	-	22.4(3)	22.0(3)	24.8(4)	39.0(3)	71.7(3)	19.1(4)	35.5(3)	25.3(4)	11.6(6)	5.7(5)
30	375	60.0(3)	69.0(3)	121.9(3)	94.5(3)	80.3(3)	-	62.7(4)	30.6(5)	66.1(5)	57.8(4)	69.3(4)	61.1(5)	176.1(5)	97.8(8)	231.7(8)	142.8(8)
30	376	-	45.4(2)	10.3(3)	-	82.1(2)	126.4(3)	78.3(3)	4.6(2)	86.4(4)	125.3(3)	74.3(4)	63.0(7)	32.5(4)	78.5(7)	88.2(9)	59.4(8)
51-100	377	-	0.0(2)	0.0(2)	0.0(3)	0.0(2)	-	0.0(2)	0.0(2)	0.0(3)	0.0(4)	0.0(3)	0.0(2)	0.0(2)	0.0(2)	0.0(2)	0.0(2)
101-150	378	0.0(2)	0.0(2)	0.0(2)	0.2(3)	-	-	0.0(2)	1.4(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	379	-	-	0.0(2)	0.0(3)	-	-	0.0(2)	0.3(2)	0.0(3)	0.0(3)	0.0(3)	0.0(2)	0.0(2)	0.0(2)	0.0(3)	0.0(2)
151-200	380	-	0.0(2)	0.0(3)	0.0(2)	-	-	0.0(2)	-	0.0(2)	0.0(3)	0.0(3)	-	0.0(2)	0.0(2)	0.0(3)	0.0(2)
101-150	381	0.0(4)	0.5(4)	0.0(3)	0.0(4)	0.0(2)	-	0.0(2)	0.0(3)	0.0(3)	0.5(4)	0.0(3)	0.0(2)	0.0(2)	0.0(2)	0.0(3)	0.0(2)
51-100	382	0.0(3)	0.0(4)	0.0(3)	0.0(3)	-	0.0(2)	0.0(3)	0.0(3)	0.0(3)	0.0(4)	0.0(2)	0.0(2)	0.0(3)	0.0(4)	0.0(4)	0.0(3)
31-50	383	18.6(2)	7.3(2)	0.1(2)	0.0(2)	-	0.0(3)	2.7(3)	0.0(2)	0.0(3)	0.5(4)	1.3(3)	10.0(2)	1.8(3)	0.0(3)	0.0(4)	0.1(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)	63.6(81)	63.0(54)	43.8(60)	83.5(60)	45.3(85)	51.9(101)	-(90)
Biomass ('000 t)		59.7	96.6	46.0	45.4	46.8	71.6	76.2	47.6	50.2	79.7	70.1	54.4	104.6	56.7	65.0	49.6

[a] Preliminary analysis.

Table 12. Mean weight of yellowtail per 30 minute tow, by stratum, from research vessel surveys in Division 30. 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	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, 290,291	1980 ATC 303, 304,305	1981 ATC 317, 318,319	1982 ATC 327, 328,329	1984 AN 27, 28	1985 AN 43	1986 WT 47	1987[a] WT 58-60
51-100	329	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)
31-50	330	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)
31-50	331	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)
51-100	332	-	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)
101-150	333	-	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)
151-200	334	-	-	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)
151-200	335	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)
101-150	336	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)
51-100	337	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)	0.8(5)
31-50	338	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)	2.1(10)
51-100	339	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)
31-50	340	-	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)
31-50	351	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)
31-50	352	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)
31-50	353	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)
51-100	354	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)
101-150	355	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)
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	-	-	-	-	-	-	-	-	-	-	-	-	-
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)	-(100)
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

[a] Preliminary analysis.

Table 13. Average numbers and weights of yellowtail per 30 minute set for selected strata in Divisions 3LN. Abundance and biomass estimates, are given at the bottom of the table.

Stratum		Year 1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987[a]
350	No. sets	3	2	4	3	3	4	4	6	9	10	3	7		6	12	11	11
	Av. No./set	76.00	4.00	0.00	0.33	0.00	0.50	6.50	3.17	2.78	2.30	0.67	1.86		3.33	8.50	5.0	-
	Av. wt./set	32.21	2.26	0.00	0.15	0.00	0.23	3.80	1.51	1.07	1.05	0.33	0.61		1.47	3.68	2.3	0.6
361	No. sets	2	3	4	4	4	5	3	4	8	7	-	6		5	7	10	9
	Av. No./set	121.50	289.33	187.00	295.00	272.11	292.20	361.67	314.25	194.62	303.57	-	347.33		334.20	156.71	98.7	-
	Av. wt./set	45.81	115.82	93.44	151.50	105.27	113.04	141.52	122.78	92.28	128.38	-	118.92		139.90	67.07	44.1	82.8
362	No. sets	2	4	5	4	3	5	5	4	12	11	5	8		7	11	14	12
	Av. No./set	382.00	361.00	54.80	88.50	78.89	96.60	141.64	76.75	94.58	120.45	194.80	125.50		229.57	88.36	167.6	-
	Av. wt./set	140.16	132.79	22.05	38.89	33.30	44.09	62.44	28.75	40.33	53.59	104.20	47.19		95.05	36.64	73.2	39.3
363	No. sets	3	3	4	4	3	4	5	5	8	5	3	5		5	8	10	10
	Av. No./set	250.67	48.00	41.00	1.00	1.67	5.25	65.40	13.20	47.38	77.20	5.67	69.80		56.20	33.25	16.6	-
	Av. wt./set	119.75	21.32	12.47	0.45	0.98	2.52	27.40	6.27	22.33	39.30	3.00	30.40		28.20	15.17	8.3	6.9
372	No. sets	4	3	3	3	3	3	6	7	9	6	4	6		5	12	14	13
	Av. No./set	271.50	55.67	132.00	12.33	19.60	156.67	65.17	44.29	52.11	48.83	31.25	46.50		119.20	129.50	73.9	-
	Av. wt./set	135.28	28.12	39.61	7.10	7.59	44.15	32.13	20.52	24.31	25.00	13.25	19.75		59.40	56.46	36.3	13.9
373	No. sets	4	4	4	4	-	5	4	5	11	8	5	5		7	9	14	13
	Av. No./set	151.25	355.00	51.75	59.50	-	68.20	189.28	112.80	44.55	93.50	109.80	52.40		133.86	68.44	33.5	-
	Av. wt./set	73.60	135.06	26.65	24.21	-	23.31	74.51	50.46	22.08	48.13	58.40	23.70		63.50	31.98	17.9	23.1
375	No. sets	3	3	3	3	3	-	4	5	5	4	4	5		5	8	8	8
	Av. No./set	111.67	149.67	312.33	259.00	157.33	-	141.00	65.20	121.00	103.00	104.25	113.80		379.20	180.37	445.8	-
	Av. wt./set	60.03	68.95	121.87	94.50	80.27	-	62.65	30.64	66.14	57.75	69.25	61.10		176.10	97.78	231.7	142.8
Total	No. sets	21	22	27	25	19	26	31	36	62	51	24	42		40	67	81	76
	Av. No./set	203.98	189.87	102.07	92.25	81.85	102.43	136.44	88.05	75.84	103.27	78.96	102.43		171.61	92.47	109.59	-
	Av. wt./set	90.01	75.10	41.20	41.15	34.80	37.33	56.96	36.54	36.18	48.65	43.16	40.57		76.95	42.34	53.33	-
Abundance (millions nos.)		226.6	210.9	113.4	102.5	75.4	101.5	151.5	97.8	84.2	114.7	76.7	113.8		190.6	102.7	121.7	-
Biomass ('000 t)		100.0	83.4	45.8	45.7	32.1	37.0	63.3	40.6	40.2	54.0	41.9	45.1		85.5	47.0	59.2	44.0

[a] Preliminary analysis.

Table 14. Average number per set at age and totals for yellowtail from Canadian research vessel surveys in Divisions 3LN (selected strata). Estimates from the surveys conducted by the R.V. A. T. CAMERON (from 1971-82) have been adjusted upward by a factor of 1.4.

Age (yrs)	Year 1971	1972	1973	1974	1975[a]	1976[a]	1977	1978	1979	1980	1981[a]	1982	1983	1984	1985	1986
1	-	-	-	-	-	-	-	-	-	-	-	0.01		-	-	-
2	-	-	-	0.11	-	-	-	0.10	0.03	0.01	-	0.67		-	-	-
3	2.02	5.00	0.34	1.13	0.27	1.53	0.11	1.48	0.36	1.92	0.45	2.63		0.15	0.32	0.06
4	23.69	37.51	4.84	10.04	4.58	6.47	1.74	5.18	2.38	4.23	0.80	8.97		1.88	1.13	1.02
5	53.33	73.86	32.03	32.23	22.95	28.90	10.57	19.89	4.98	14.49	3.56	18.42		14.32	5.80	6.76
6	100.28	84.92	41.33	55.29	33.11	39.51	25.75	36.76	19.84	37.39	15.30	26.74		51.02	23.76	17.34
7	90.85	45.81	42.28	27.90	38.26	36.23	68.67	38.14	51.16	53.51	39.14	41.64		71.33	40.94	53.68
8	12.22	14.56	16.14	3.36	9.38	7.34	56.32	19.89	24.37	17.37	41.20	27.03		30.69	18.92	26.13
9	3.89	1.54	5.49	0.49	1.05	0.15	15.68	2.07	2.86	1.20	7.90	6.64		2.38	1.47	3.75
10	0.06	0.08	0.45	-	0.07	0.0	2.38	0.03	0.34	0.04	2.13	0.98		0.03	0.12	0.26
11	-	-	-	-	-	0.01	0.18	-	-	-	0.0	0.13		-	-	-
12	-	-	-	-	-	-	0.03	-	-	-	0.06	-		-	-	-
UNK	-	-	-	-	-	-	-	-	0.03	0.06	0.04	-		-	-	-
Totals	286.34	263.28	142.90	130.55	109.67	120.14	181.43	123.54	106.35	130.22	110.58	133.86		171.80	92.46	109.01

[a]Survey coverage incomplete, see Table 15.

Table 15. Abundance (nos. x 10^{-3}) of yellowtail, by age, from Canadian research vessel surveys in Divisions 3LN (selected strata). Estimates from surveys conducted by the R.V. A. T. CAMERON (from 1971-82) have been adjusted upward by a factor of 1.4.

Age (yrs)	Year 1971	1972	1973	1974	1975[a]	1976[a]	1977	1978	1979	1980	1981[a]	1982	1983	1984	1985	1986
1	-	-	-	-	-	-	-	-	-	-	-	16		-	-	-
2	-	-	-	124	-	-	-	106	34	22	-	752		-	-	-
3	2,239	5,551	369	1,252	243	1,697	130	1,651	402	2,135	439	2,926		169	355	68
4	26,316	41,658	5,381	11,153	4,221	7,188	1,936	5,755	2,645	4,697	778	9,962		2,087	1,259	1,137
5	59,225	82,045	35,573	35,794	21,145	32,089	11,737	22,103	5,540	16,087	3,460	20,460		15,901	6,443	7,512
6	111,386	94,332	45,905	61,410	30,512	43,882	28,595	40,834	22,032	41,536	14,874	29,704		56,668	26,396	19,260
7	100,907	50,878	46,958	30,988	35,261	40,250	76,267	42,361	56,825	59,436	38,033	46,246		79,224	45,470	59,625
8	13,568	16,179	17,925	3,728	8,643	8,154	62,561	22,100	27,068	19,303	40,029	30,028		34,093	21,018	29,019
9	4,326	1,711	6,098	547	963	168	17,411	2,297	3,165	1,330	7,668	7,375		2,647	1,628	4,164
10	58	99	504	-	64	-	2,645	24	377	42	2,072	1,083		32	137	294
11	-	-	-	-	-	23	200	-	-	-	0	141		-	-	-
12	-	-	-	-	-	-	30	-	-	-	48	-		-	-	-
Unknown	-	-	-	-	-	-	-	-	24	56	42	-		-	-	-
Totals																
1+	318,025	292,453	158,713	144,996	101,052	133,451	201,512	137,231	118,112	144,644	107,443	148,693		190,821	102,706	121,079
4+	315,886	286,902	158,344	143,620	100,809	131,754	201,382	135,474	117,676	142,487	107,004	144,999		190,652	102,351	121,011
7+	118,959	68,867	71,485	35,263	44,931	48,595	159,114	66,782	87,459	80,167	87,892	84,873		115,996	68,253	93,102

[a]Survey coverage incomplete, see Table 15.

Table 16. Yellowtail abundance (nos X 10^{-3}) at age from research vessel surveys, Div. 3LNO, all strata, 1984-86.

	Year		
Age	1984	1985	1986
1	-	-	-
2	-	14.0	-
3	404.6	1337.1	102.3
4	3286.7	4232.6	1277.4
5	26782.4	12721.4	10929.2
6	83037.2	52919.6	30174.2
7	127631.1	92692.6	96709.8
8	60957.2	38647.6	44507.7
9	4510.8	2797.5	6684.3
10	69.8	259.1	432.6
UNK	-	29.9	76.2
Total	306679.8	205651.4	190893.7
1+	306679.8	205621.5	190817.5
4+	306275.2	204270.4	190715.2
7+	193168.9	134396.8	148334.4

Table 17. A comparison of average numbers and weights of yellowtail per 30 minute set for Div. 3LNO from juvenile surveys in 1985 and 1986. These surveys are divided into independent day, night and combined categories.

			1985			1986		
Div.	Stratum		Day	Night	Combined	Day	Night	Combined
3O	338	No. of sets	-	-	-	3	-	3
		Av.No./sets	-	-	-	86.67	-	86.67
		Av.Wt./set	-	-	-	41.17	-	41.17
3L	350	No. sets	2	3	5	-	5	6
		Av.No./set	8.00	93.00	59.00	-	9.40	7.83
		Av.Wt/set	3.50	40.17	25.50		4.30	3.58
3O	351	No. sets	2	-	3	5	5	9
		Av.No./set	108.50	-	166.00	142.00	9.40	175.78
		Av.Wt/set	44.00	-	63.67	47.70	4.30	66.00
3O	352	No. sets	-	-	-	7	6	13
		Av.No./set	-	-	-	78.29	365.33	210.77
		Av.Wt./set	-	-	-	37.86	115.47	73.68
3O	353	No. sets	-	-	-	3	2	5
		Av.No./set	-	-	-	97.69	148.50	118.00
		Av.wt./set	-	-	-	60.17	81.63	68.75
3N	360	No. sets	3	-	3	7	7	14
		Av.No./set	57.67	-	57.67	20.57	497.71	259.14
		Av.wt./set	26.83	-	26.83	5.50	34.43	19.96
3N	361	No. sets	4	2	6	4	4	8
		Av.No./set	58.50	182.50	99.83	160.00	217.00	188.50
		Av.wt./set	26.13	63.50	33.58	72.81	50.75	61.78

Table 17 (Cont'd.)

Div.	Stratum	Sets	1985 Day	1985 Night	1985 Combined	1986 Day	1986 Night	1986 Combined
3N	362	No.sets	5	4	9	5	2	7
		Av.no/set	117.80	228.25	166.89	110.80	105.00	109.14
		Av.wt/set	45.00	77.63	59.50	43.56	42.00	43.14
3L	363	No.sets	3	2	5	3	2	5
		Av.no/set	44.00	68.50	53.80	42.81	58.00	48.89
		Av.wt/set	17.67	26.00	21.00	19.95	42.00	22.77
3L	371	No. sets	2	2	4	-	-	-
		Av.no/set	0.00	4.50	2.25	-	-	-
		Av.wt/set	0.00	3.75	1.88	-	-	-
3L	372	No. of sets	5	4	9	4	4	8
		Av.No./sets	86.90	100.75	93.06	33.00	169.60	101.00
		Av.Wt./set	35.08	45.00	39.49	17.13	79.13	48.13
3N	373	No. sets	5	5	10	4	3	7
		Av.No./set	34.80	286.80	160.80	160.50	49.50	112.93
		Av.Wt/set	17.40	133.80	75.60	69.88	22.56	49.60
3N	374	No. sets	2	2	4	-	3	4
		Av.No./set	10.50	21.50	16.00	-	14.67	12.00
		Av.Wt/set	5.25	9.75	7.50	-	7.83	6.38
3N	375	No. sets	4	3	7	2	3	5
		Av.No./set	60.50	452.00	228.29	4.10	391.69	236.65
		Av.Wt./set	36.50	194.33	104.14	1.40	191.05	115.19
3N	376	No. sets	-	-	2	3	-	4
		Av.No./set	-	-	148.50	69.97	-	325.75
		Av.wt./set	-	-	47.75	19.70	-	150.46
3N	383	No. sets	2	2	4	-	-	-
		Av.No./set	0.00	0.00	0.00	-	-	-
		Av.wt./set	0.00	0.00	0.00	-	-	-
3N	384	No. sets	2	2	4	-	-	-
		Av.No./set	69.50	1.00	35.25	-	-	-
		Av.wt./set	44.75	1.00	22.88	-	-	-
	Total	No.sets	41	31	75	50	45	98
		Av.no/set	59.27	157.95	104.92	84.70	204.72	147.90
		Av.wt/set	26.29	65.15	43.35	36.08	61.73	53.05
	Abundance (million nos.)		152.2	313.0	286.1	229.6	546.3	448.0
	3L Biomass		-	-	22.9	-	-	22.7
	3N Biomass		-	-	78.2	-	-	85.4
	3Ø Biomass		-	-	17.1	-	-	52.5
	Total Biomass('000t)		67.5	129.1	118.2	97.8	164.7	160.7

Table 18. A comparison of average numbers and weights of yellowtail per 30 minute set for selected strata in Div. 3LN during Spring biomass surveys and Fall juvenile surveys in 1985 and 1986.

Div.	Stratum		1985 Spring	1985 Fall	1986 Spring	1986 Fall
	350	No. of sets	12	5	11	6
		Av.No./set	8.50	59.00	5.00	7.83
		Av.Wt./set	3.68	25.50	2.30	3.58
	361	No. sets	7	6	10	8
		Av.No./set	156.71	99.83	98.70	188.50
		Av.Wt/set	67.07	38.58	44.10	61.78
	362	No. sets	11	9	14	7
		Av.No./set	88.36	166.89	167.60	109.14
		Av.Wt/set	33.64	59.50	73.20	43.14
	363	No. sets	8	5	10	5
		Av.No./set	33.25	53.80	16.60	48.89
		Av.Wt./set	15.17	21.00	8.30	22.77
	372	No. sets	12	9	14	8
		Av.No./set	129.50	93.06	73.90	101.00
		Av.wt./set	56.46	39.49	36.30	48.13
	373	No. sets	9	10	14	7
		Av.No./set	68.44	160.80	33.50	112.93
		Av.wt./set	31.98	75.60	33.50	49.60
	375	No. sets	8	7	8	5
		Av.No./set	180.37	228.29	445.80	236.65
		Av.wt./set	97.78	104.14	231.70	115.19
		Total No. sets	67	51	81	46
		Total Av. No./set	92.47	123.09	109.59	110.67
		Total Av. Wt./set	42.34	51.71	53.33	47.17
		Abundance (nos.x10^{-3})	102,706	193,773	121,079	174,139
		Biomass (tx10^{-3})	47.0	81.3	59.2	74.2

Table 19. Average number per set at age and abundance (nos. X 10^{-3}) for yellowtail from 1985 and 1986 juvenile surveys in Divisions 3LNO, all strata included.

Age	Average number/set 1985 Survey (75 sets)	Average number/set 1986 Survey (98 sets)	Abundance 1985 Survey	Abundance 1986 Survey
1	1.47	8.02	4,003	24,305
2	0.98	6.31	2,683	19,120
3	1.23	10.22	3,356	30,949
4	4.93	4.02	13,446	12,169
5	4.75	8.20	12,949	24,835
6	14.83	24.87	40,427	75,334
7	44.95	51.27	122,580	155,322
8	28.00	30.56	76,354	92,587
9	3.71	3.94	10,126	11,931
10	0.13	0.26	361	795
11	0.00	0.03	0	88
			0	38
Unknown	0	0.01		
Av.No./set	104.99	147.71		
Total 1+			286,289	447,478
Total 4+			243,603	373,104
Total 7+			176,781	260,765

Table 20. Comparison of average number per set at age of yellowtail from spring biomass surveys and fall juvenile surveys using selected strata in Div. 3LN in 1985 and 1986[a].

Age	1985 Spring (67 sets)	1985 Fall (51 sets)	1986 Spring (81 sets)	1986 Fall (46 sets)
1	0.00	0.49	0.00	0.34
2	0.00	0.34	0.00	1.17
3	0.32	1.25	0.06	1.68
4	1.13	6.17	1.02	2.27
5	5.80	3.85	6.76	5.82
6	23.76	16.70	17.34	20.60
7	40.94	55.37	53.68	47.84
8	18.92	35.10	26.13	27.48
9	1.42	3.85	3.75	3.21
10	0.12	0.08	0.26	0.24
11	0.00	0.00	0.00	0.06
Unknown	0	0	0	0.02
Av. no./set	92.46	123.20	109.01	110.71

[a]Towing distance of each fishing set in the spring surveys was 1.75 miles (at 3.5 knots) while the towing distance in the fall survey was 1.25 miles (at 2.5 knots).

Table 21. Comparison of Abundance (nos. X 10^{-3}) at age of yellowtail from selected strata in Divisions 3LN from Spring and Fall surveys in 1985 and 1986.

Age	1985 Spring	1985 Fall	1986 Spring	1986 Fall
1	0	776	0	537
2	0	530	0	1,847
3	355	1,972	68	2,634
4	1,259	9,704	1,137	3,569
5	6,443	6,054	7,512	9,147
6	26,396	26,264	19,260	32,397
7	45,470	87,085	59,625	75,242
8	21,018	55,205	29,019	43,215
9	1,628	6,058	4,164	5,042
10	137	119	294	377
11	0	0	0	88
Unknown	0	0	0	38
Totals 1+	102,706	193,773	121,079	174,139
4+	102,351	190,489	121,011	169,077
7+	68,253	148,467	93,102	123,964

Table 22. Nominal catch and effort data for yellowtail in NAFO Division 3LNO. Column 2 refers to reported "directed" catch by Canada (N), otter trawlers, mostly TC 4 and 5.

Year	Directed catch (tons)	CPUE (tons/hr)	Total catch (tons)	Total calculated effort (hours)
1968	2,216	0.705	13,340	18,922
1969	3,165	0.610	15,708	25,751
1970	12,444	0.598	26,426	44,191
1971	14,094	0.600	37,342	62,237
1972	14,544	0.607	39,259	64,677
1973	21,225	0.645	32,815	50,876
1974	14,025	0.421	24,313	57,751
1975	13,345	0.402	22,894	56,950
1976	4,889	0.332	8,057	24,268
1977	5,029	0.423	11,638	27,513
1978	9,289	0.496	15,466	31,181
1979	13,273	0.517	18,351	35,495
1980	7,855	0.640	12,377	19,339
1981	10,400	0.614	14,680	23,909
1982	5,530	0.525	13,319	25,370
1983	4,605	0.556	10,473	18,836
1984	6,813	0.551	14,935	27,105
1985[a]	6,841	0.566	28,587	50,507
1986[a]	8,894	0.461	29,336	63,689

[a]Provisional.

Table 23. Results of SPA at F_t=0.9, 3LNO yellowtail.

POPULATION NUMBERS

AGE	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
4	156799	147013	119893	110606	121785	113144	75637	71658	79482	83961	86857	69434	69276	124134	210413	164509	72022	57885	8150
5	109297	115666	108841	88697	81794	88548	80605	54850	52264	58530	61003	63751	50525	50338	89168	155782	121850	53256	42881
6	53827	75631	83112	78242	59224	51877	47282	42672	30960	36541	40596	42047	43111	33014	32922	64765	113615	89029	37634
7	18231	29132	43088	44495	31828	24507	18025	19449	13596	16351	21174	20625	19902	24722	17407	19875	42133	72841	51486
8	2460	5627	11187	14177	13926	6867	3477	3713	3445	5458	5803	6194	2985	8548	9715	5234	7957	18869	32017
9	149	599	1457	4366	5451	1234	1031	510	568	1732	534	968	337	904	2579	663	493	2510	6531
10	2	70	163	555	1382	418	172	32	58	357	50	128	52	57	363	31	21	124	736
4+	340763	373738	367742	341138	315389	286594	226230	192884	180373	202931	216016	203147	186187	241716	362566	410860	358091	294514	179436
5+	183965	226725	247849	230532	193605	173451	150592	121226	100891	118969	129159	133713	116911	117582	152154	246351	286069	236630	171285
6+	74668	111058	139008	141834	111811	84903	69987	66376	48627	60440	68156	69962	66387	67244	62986	90569	164219	183374	128404
7+	20841	35427	55896	63592	52587	33026	22705	23704	17667	23898	27560	27915	23276	34230	30064	25804	50604	94345	90770

POPULATION BIOMASS

AGE	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
4	33392	31362	25568	23583	25758	23701	12938	11307	13695	15381	18603	10587	16071	24097	43252	29844	12807	4251	640
5	27887	30041	28274	22256	20040	20060	17892	12448	14147	15882	16046	14667	11275	12633	22285	45154	31689	13273	9531
6	18342	26376	28183	23531	17941	14602	14162	11440	11121	11518	12682	11191	16303	8510	8945	22109	35405	27078	10058
7	6540	11437	15865	16053	9928	6569	5435	5261	5484	5417	6788	4599	8531	7969	4923	6900	14799	26024	14212
8	955	2238	5256	6619	3797	2231	1121	1245	2028	1372	1998	1344	1306	3292	2276	1365	3314	8396	11634
9	88	282	787	2184	1650	454	242	198	468	383	279	247	146	539	538	176	278	1481	3191
10	1	39	109	361	529	192	74	16	51	118	29	32	36	40	155	15	15	107	442
4+	87205	101775	104041	94586	79644	67811	51864	41915	46993	50071	56424	42667	53669	57080	82374	105563	98306	80610	49708
5+	53813	70413	78473	71004	53885	44109	38926	30608	33299	34691	37821	32080	37597	32983	39122	75719	85499	76360	49067
6+	25926	40372	50199	48747	33846	24049	21034	18159	19152	18809	21776	17413	26322	20350	16838	30565	53811	63087	39536
7+	7584	13997	22016	25217	15904	9447	6872	6720	8030	7291	9094	6221	10019	11840	7893	8456	18406	36008	29478

FISHING MORTALITY

AGE	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
4	0.004	0.001	0.001	0.002	0.019	0.039	0.021	0.016	0.006	0.019	0.009	0.018	0.019	0.031	0.001	0.000	0.002	0.000	0.001
5	0.068	0.031	0.030	0.104	0.155	0.327	0.336	0.272	0.058	0.066	0.072	0.091	0.126	0.125	0.020	0.016	0.014	0.047	0.047
6	0.314	0.263	0.325	0.599	0.582	0.757	0.588	0.844	0.338	0.246	0.377	0.448	0.256	0.340	0.205	0.130	0.145	0.248	0.310
7	0.876	0.657	0.812	0.862	1.234	1.653	1.280	1.431	0.713	0.736	0.929	1.633	0.545	0.634	0.902	0.615	0.503	0.522	0.900
8	1.112	1.051	0.641	0.656	2.124	1.596	1.619	1.577	0.388	2.025	1.491	2.612	0.895	0.898	2.384	2.062	0.854	0.761	0.900
9	0.458	1.000	0.666	0.850	2.268	1.669	3.171	1.877	0.164	3.253	1.124	2.625	1.482	0.612	4.120	3.151	1.082	0.926	0.900
10	1.061	1.046	0.644	0.698	2.162	1.607	1.818	1.609	0.353	2.212	1.454	2.614	0.941	0.867	2.574	2.140	0.866	0.779	0.900

Table 24. Results of SPA at F_t=1.5, 3LNO yellowtail.

POPULATION NUMBERS

AGE	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
4	156799	147013	119893	110606	121785	113144	75637	71658	79482	83960	86857	69355	68178	116918	184207	133290	48520	35241	4892
5	109297	115666	108841	88697	81794	88548	80605	54850	52264	58530	61002	63750	50466	49524	83822	136369	98722	35845	26106
6	53827	75631	83112	78242	59224	51877	47282	42672	30960	36541	40596	42046	43111	32971	32319	60805	99233	71896	24736
7	18231	29132	43088	44495	31828	24507	18025	19449	13596	16351	21174	20625	19902	24722	17375	19429	39199	62187	38793
8	2460	5627	11187	14177	13926	6867	3477	3713	3445	5458	5803	6194	2985	8547	9715	5211	7626	16696	24124
9	149	599	1457	4366	5451	1234	1031	510	568	1732	534	968	337	904	2579	663	476	2265	4921
10	2	70	163	555	1382	418	172	32	58	357	50	128	52	57	363	31	21	111	555
4+	340763	373738	367742	341138	315389	286594	226230	192884	180373	202930	216016	203068	185030	233643	330380	355797	293797	224241	124127
5+	183965	226725	247849	230532	193605	173451	150592	121226	100891	118969	129159	133712	116853	116725	146173	222507	245278	188999	119235
6+	74668	111058	139008	141834	111811	84903	69987	66376	48627	60440	68156	69962	66386	67201	62351	86138	146555	153155	93128
7+	20841	35427	55896	63592	52587	33026	22705	23704	17667	23898	27560	27915	23275	34230	30032	25333	47322	81259	68393

POPULATION BIOMASS

AGE	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
4	33392	31362	25568	23583	25758	23701	12938	11307	13695	15380	18603	10575	15814	22675	37864	24180	8624	2588	384
5	27887	30041	28274	22256	20040	20060	17892	12448	14147	15882	16045	14667	11261	12416	20936	39485	25634	8834	5719
6	18342	26376	28183	23531	17941	14602	14162	11440	11121	11518	12682	11191	16303	8497	8764	20670	30599	21193	6035
7	6540	11437	15865	16053	9928	6569	5435	5261	5484	5417	6788	4599	8531	7969	4909	6689	13473	21062	8527
8	955	2238	5256	6619	3797	2231	1121	1245	2028	1372	1998	1344	1306	3292	2276	1345	3100	6959	6980
9	88	282	787	2184	1650	454	242	198	468	383	279	247	146	539	537	176	260	1245	1915
10	1	39	109	361	529	192	74	16	51	118	29	32	36	40	155	15	15	90	265
4+	87205	101775	104041	94586	79644	67811	51864	41915	46993	50071	56424	42655	53398	55428	75441	92559	81706	61973	29825
5+	53813	70413	78473	71004	53885	44109	38926	30608	33299	34691	37821	32080	37583	32753	37578	68379	73082	59385	29440
6+	25926	40372	50199	48747	33846	24049	21034	18159	19152	18809	21776	17412	26322	20337	16642	28894	47448	50550	23722
7+	7584	13997	22016	25217	15904	9447	6872	6720	8030	7291	9094	6221	10019	11840	7878	8224	16849	29357	17687

FISHING MORTALITY

AGE	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
4	0.004	0.001	0.001	0.002	0.019	0.039	0.021	0.016	0.006	0.019	0.009	0.018	0.020	0.033	0.001	0.000	0.003	0.000	0.002
5	0.068	0.031	0.030	0.104	0.155	0.327	0.336	0.272	0.058	0.066	0.072	0.091	0.126	0.127	0.021	0.018	0.017	0.071	0.078
6	0.314	0.263	0.325	0.599	0.582	0.757	0.588	0.844	0.338	0.246	0.377	0.448	0.256	0.341	0.209	0.139	0.167	0.317	0.517
7	0.876	0.657	0.812	0.862	1.234	1.653	1.280	1.431	0.613	0.736	0.929	1.633	0.545	0.634	0.904	0.635	0.553	0.647	1.500
8	1.112	1.051	0.641	0.656	2.124	1.596	1.619	1.577	0.388	2.025	1.491	2.612	0.895	0.898	2.384	2.094	0.914	0.922	1.500
9	0.458	1.000	0.666	0.850	2.268	1.669	3.171	1.877	0.164	3.253	1.124	2.625	1.482	0.612	4.125	3.154	1.157	1.107	1.500
10	1.061	1.046	0.644	0.698	2.162	1.607	1.818	1.609	0.353	2.212	1.454	2.614	0.941	0.867	2.574	2.170	0.868	0.922	1.500

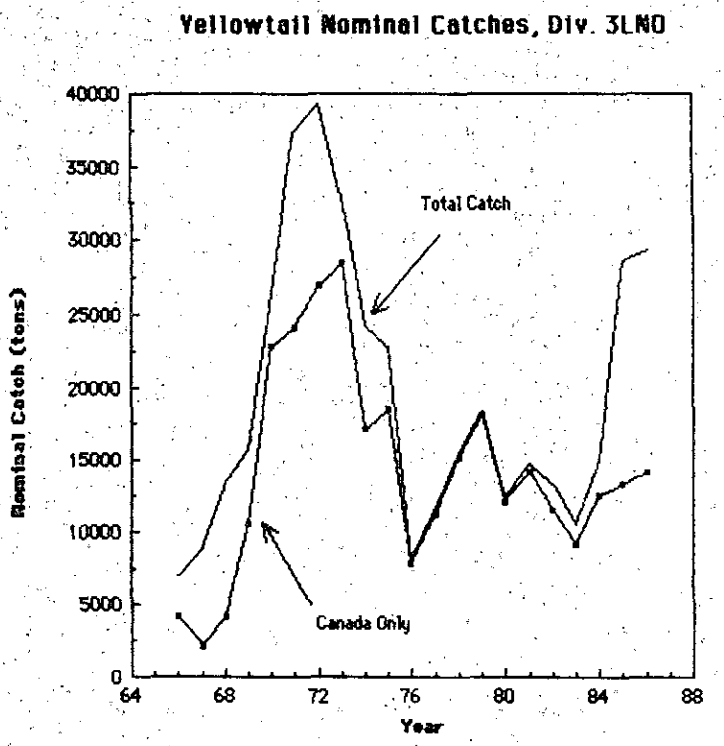

Fig.1. Nominal catches of yellowtail in NAFO Div. 3LNO from 1966-1986.

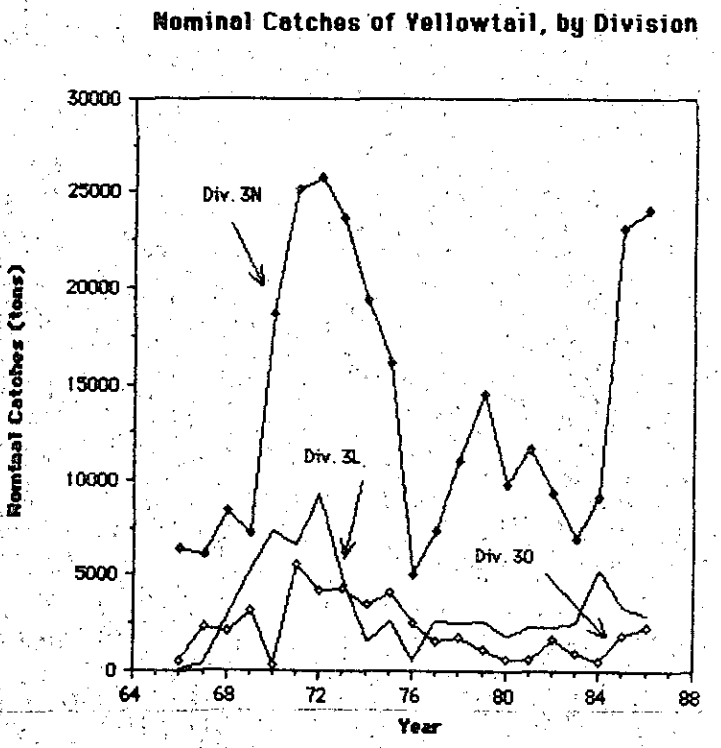

Fig.2. Nominal catches of yellowtail in NAFO Div. 3LNO by Division from 1966-1986.

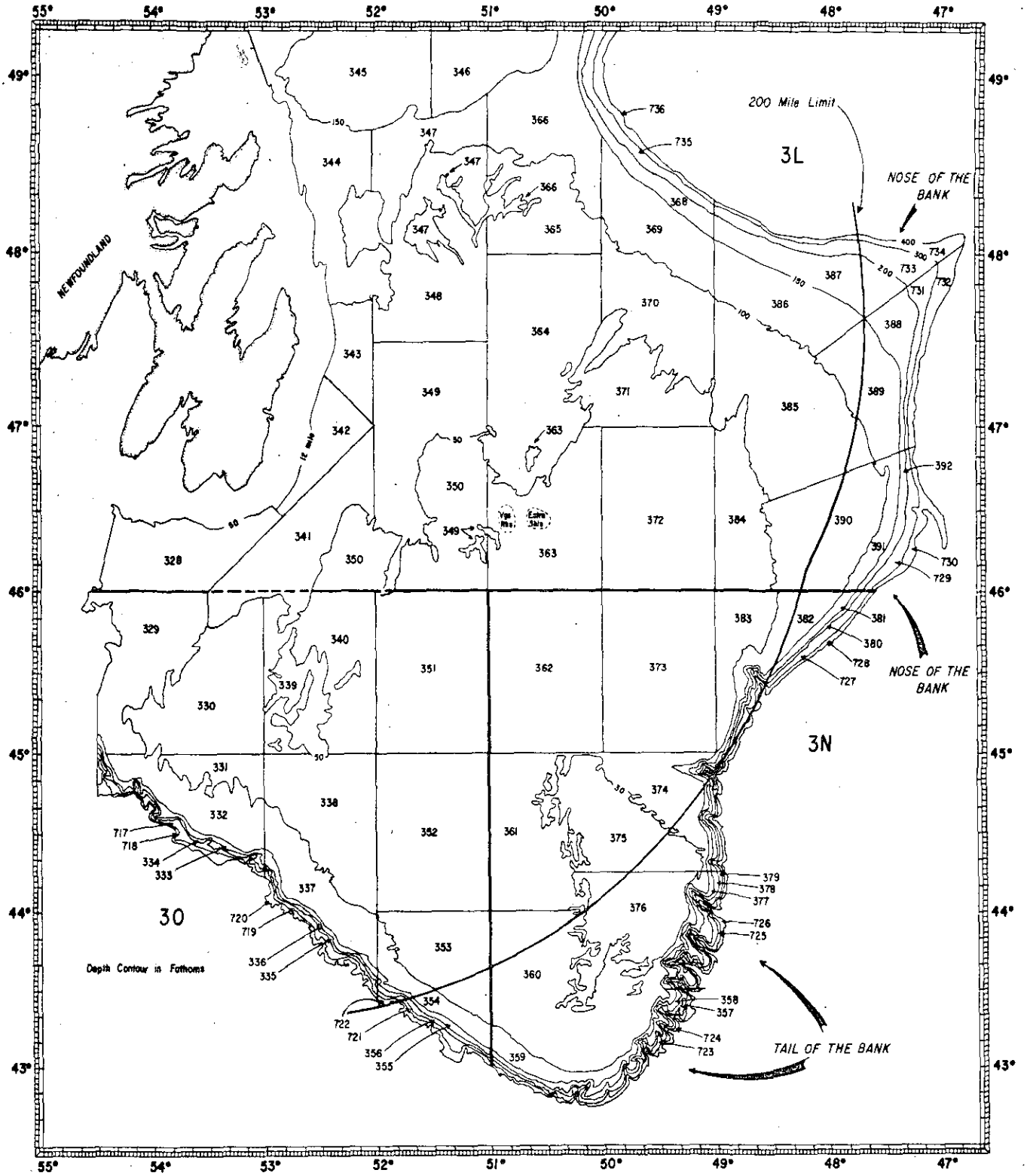

Fig. 3. NAFO Div. 3LNO, showing the Canadian 200 mile limit in relation to the Nose and Tail of the Bank, as well as the stratification scheme used in Canadian groundfish surveys.

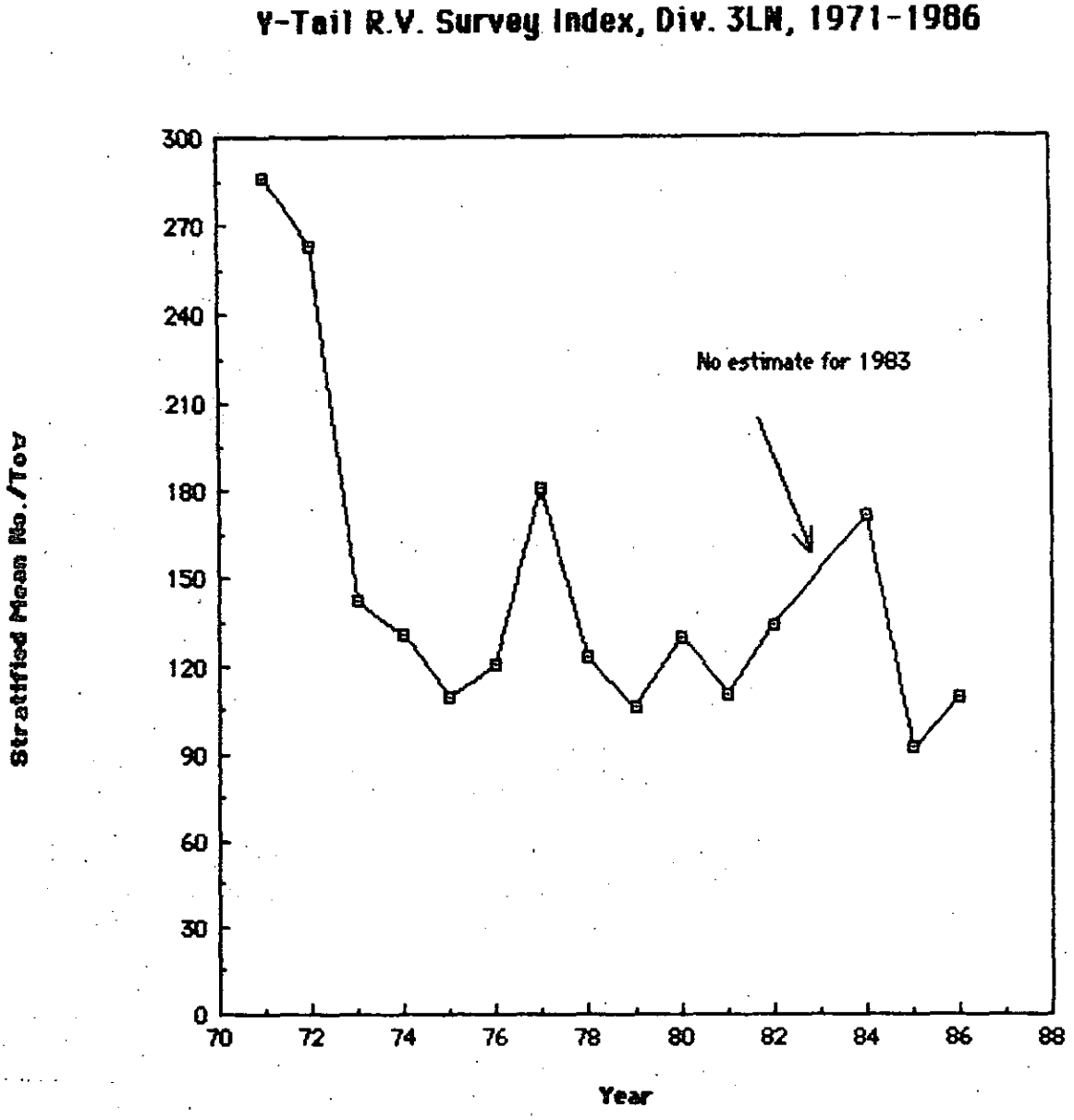

Fig.4. Research vessel survey abundance index for Y-tail in Div. 3LN from 1971-1986.

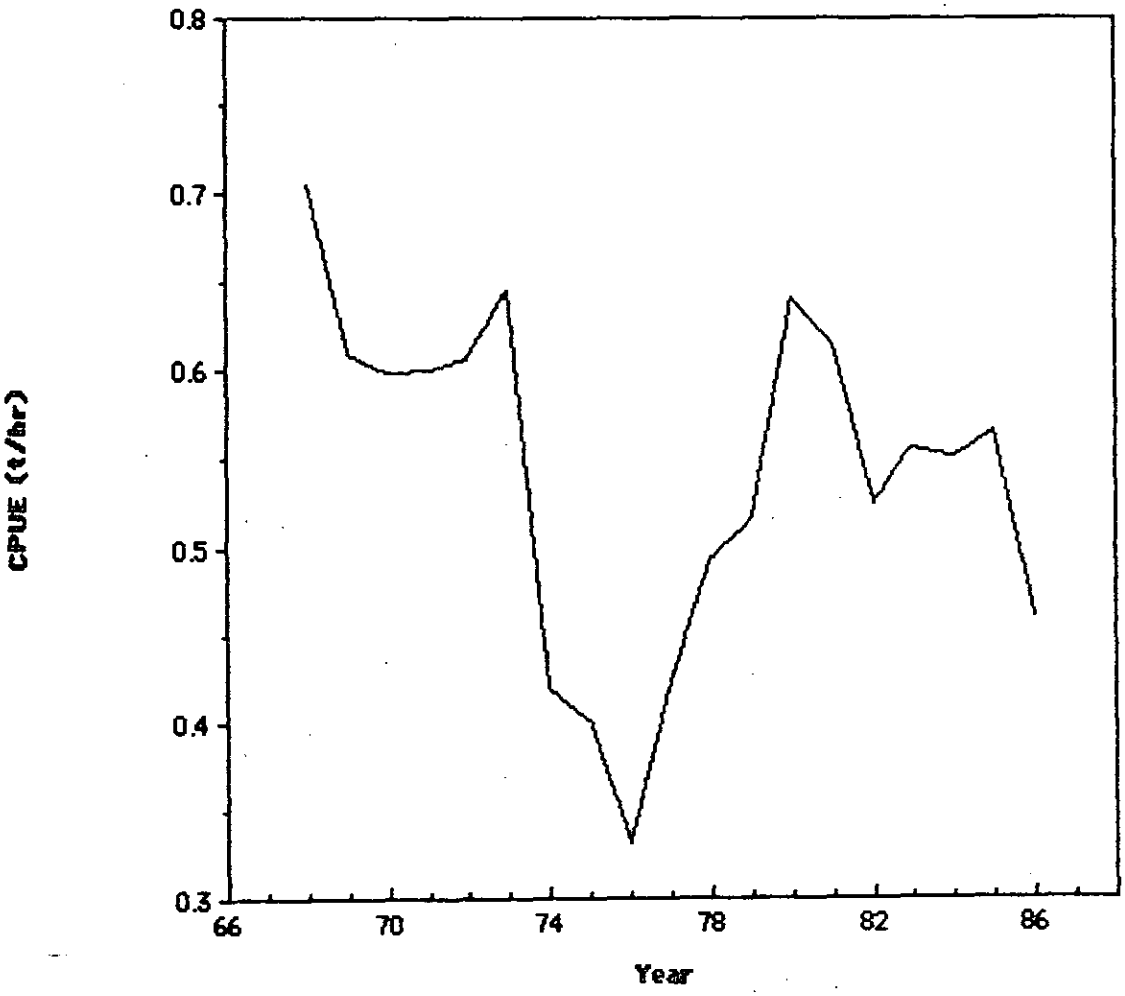

Fig. 5. Catch per unit of effort of yellowtail flounder in NAFO Div. 3LNO from 1968-1986.