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Update on Cooperative Surveys of Yellowtail Flounder in NAFO Division 3NO, 1996-1999

by

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#### Introduction

Cooperative trawl surveys directed at yellowtail flounder have been conducted quarterly in NAFO Divisions 3NO by the Canadian Department of Fisheries and Oceans (DFO) Newfoundland Region and a Newfoundland Based fishing company, Fisheries Products International (FPI) Ltd. since July 1996. While the scientific and technical support for the surveys is the responsibility of DFO, FPI provides the vessel, crew, gear and related operating expenses for the surveys. These surveys are designed to provide data on the spatial distribution and abundance of yellowtail flounder in the survey area. This paper summarizes the results from the ten completed surveys.

## **Methods and Materials**

The surveys are designed to cover an area of approximately 9500 square nautical miles (Fig. 1), corresponding to the area where the yellowtail flounder stock is mainly distributed, and where the FPI fishery operated in most years prior to the 1994 NAFO-imposed moratorium on fishing. The survey area grid is divided into 100 equal-sized blocks, and the same pre-selected position is fished in each block in every survey. These positions were selected at the start of the first survey by FPI, based on their understanding of yellowtail abundance and distribution, and their knowledge of the fishing grounds. Some of the areas in the grid represent well-known fishing grounds for yellowtail, while other areas were not traditionally fished. All aspects of the fishing operation, including vessel, skipper, trawl gear, and tow speed and duration were kept standard within and between surveys, and aspects such as tow direction and time of day have been kept constant for a given tow between surveys where possible.

The vessel used was the Atlantic Lindsey, a 44 m total length, 665 G.R.T., 1500 HP commercial stern trawler in the Newfoundland fleet. The fishing gear used is an Engel (96) 145 Hi-Lift otter trawl, with rockhopper footgear, and is reflective of trawls historically used by FPI in the yellowtail fishery (see Walsh and McCallum 1999 for details). Brodie et al. (1997) gives an in-depth comparison of this trawl used onboard the FPI trawler Atlantic Lindsey with the standard survey gears (Engel 145 Hi-Lift otter trawl, and Campelen 1800 shrimp trawl) as used by the DFO institute, Northwest Atlantic Fisheries Center (NAFC). There are major differences in the footgear, sweep/bridle lengths and mesh size. Unlike trawls used in research vessel (r.v.) surveys, no small mesh liner was used in the codend of this commercial trawl. All trawl components were measured prior to use, to ensure consistency within and between trips. Trawl performance was monitored with SCANMAR during each fishing set, which is one-hour in duration at a speed of 3.0 knots (see Walsh and McCallum 1999).

Catch numbers and weights of all yellowtail flounder in the catch of each set were recorded. By-catch data on other species such as American plaice and cod were also collected, along with biological sampling (size and maturity) data for yellowtail. Some temperature data has been collected using XBT's. To facilitate comparisons, as in the previous analysis (Brodie et al. 1997), the catch data were grouped into quadrants of 5 x 5 blocks, with Q1 corresponding to the northwest quadrant, Q2 the northeast, Q3 the southeast, and Q4 the southwest (Fig. 1). Results

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from the first 10 surveys are compared with data from spring and fall stratified random surveys done by DFO (Walsh et al. 1998), and with the analyses of yellowtail CPUE data presented in Brodie et al. (1997, 1998).

#### **Results and Discussion**

*Catches from first ten surveys:* In the first ten surveys, between 50 to 85 fishing sets were conducted during each survey (Table 1). For each of the three species examined, catch weights per tow in every March survey were lower than in other surveys (Table 1). Catches for all three species are summarized by quadrant (Tables 2,3,4) and NAFO division (Table 5) respectively. Excluding the March surveys, 26 of 28 quadrants yielded a mean CPUE for yellowtail flounder in excess of 400 kg per hour (Table 2). Mean CPUE of yellowtail from all surveys was higher in Div. 3N, quadrants 2 and 3, than in quadrants 1 and 4 in Div. 3O (Table 5, Fig. 2a,b).

Similar data for American plaice and cod are shown in Tables 3 and 4. Mean CPUE for American Plaice was generally highest in quadrants 3 and 4 (Fig. 3) with little difference between Div. 3N and 3O (Fig. 4). For cod, mean CPUE was highest in quadrants 1 and 4 (Fig. 5) concentrating the mean CPUE in Div. 3O (Fig. 6). Other quadrants in Div. 3N had low catches.

Overall, 22 blocks were fished in all ten surveys for yellowtail flounder (Table 6), American plaice (Table 7) and cod (Table 8) respectively. Each table is ranked in ascending order of mean catch. Blocks G04 and F05 ranked highest in consistently producing large catches of yellowtail flounder (Table 6). Catches of American Plaice were highest in blocks C09 and B09 in the southern portion of Div. 30 (Table 7). Average catches of cod were highest in block A05 in Div. 30 (Table 8). To investigate the by-catch of American Plaice, we calculated the ratio of American Plaice to Yellowtail flounder in each of the 22 common blocks fished in all ten surveys (Table 9). Several sets produced by-catch ratios less than 5%, but no block consistently produced by-catch ratio of less than 5%. Furthermore, the overall mean by-catch for all blocks exceeded the 5% by-catch ratio. Excluding the ratios from the March 1999 survey, the majority of catches with a by-catch less than 5% occurred in the central portion of the grid (bounded by F4-H7). Largest by-catch of plaice are found in the southwest corner (quadrant #4) of the grid in Div 30.

Table 10 also gives an indication of the catches of American Plaice compared to the catches of yellowtail. For the four levels of yellowtail catch indicated in the headings, each non-blank cell contains three numbers, with blank cells representing blocks not fished at all in the 6 surveys. The third numeral is the total number of sets in that block (this is the same in all 4 tables). The second numeral is the number of sets which fit the yellowtail catch criterion in the heading. The first numeral represents the number of sets where the catch of American plaice was less than 5% of the yellowtail catch. Five percent was chosen as the cutoff as this is the by-catch limit imposed on the fishery in 1998. Examining the catches in these tables shows a high percentage of sets in the central portion of the grid (E, F, G) with large yellowtail catches and less than 5% by-catch of American plaice. Most other areas had by-catches of American plaice in excess of 5%.

#### Geographic distribution of trawl catches

ACON symbol plots (Black 1993) of trawl catches for yellowtail flounder (Fig. 7a,b) show that large catches, >300kg/trawl, are distributed throughout the region in the May/June, July, and November surveys. During March surveys, large catches of yellowtail are rare. In 1997 a few large catches were located in Quadrant 2 of the study area while in March 98 quadrants 2,3 and 4 each produced some trawl sets with relatively large catches. During the March 1999 survey, large trawl catches were distributed in quadrants, 1,2 and 3 of the study area. This reflects the relative low catch rates represented in NAFO Division 30 in relation to 3N (Tables 5 and 6).

To examine geographic distribution of yellowtail caught, by size groups, the numbers of fish <=30cm and the number >40 cm, were plotted on a set by set basis (Fig. 8a-j). The largest catches of small fish (<=30cm) occurred in quadrant 3 of Div. 3N, where the nursery is located, in most surveys while larger fish were more evenly distributed throughout the area.

American Plaice trawl catches >150 kg/trawl (Fig. 9a,b; Table 7) in March of 1997, 1998 and 1999, were restricted to quadrant 4 in Div. 30. During other seasonal surveys, large catches were present in each of the four quadrants. For Cod (Fig. 10a,b; Table 7), March surveys also typically resulted in no large catches within the study

area. During other sampling times large cod catches appear to be distributed mainly in quadrants 1 and 4 in NAFO Division 3O. These distributions are similarly reflected in the trawl statistics in Tables 1, 3 and 4. Figure 11(a,b) show the distribution of American plaice catches expressed as a percentage of the yellowtail catches for each of the ten grid surveys.

#### Length and Age Composition

Length composition of male and female yellowtail caught during the 10 surveys are shown in Fig. 12 (a,b,c). Generally, less than 2% of fish captured were smaller than 26 cm in length and less than 10% of the catch was composed of individuals less than 30 cm in length (Table 11).

Typically, yellowtail 26-46 cm in length make up the bulk of the length frequencies of the catches and furthermore, females were larger than males in all surveys. The age composition for the surveys was obtained by using the age-length key from the annual research vessel stratified random surveys. Figure 13(a,b,c) and Table 12 indicate that most fish caught were 6-8 years. The age composition of Divisions 3N and 3O were similar, although more smaller 5 year old fish were captured in division 3N in all the surveys examined (Table 12).

*Comparison of results with commercial fishery data:* "No additional analyses of the historic CPUE data were conducted for this paper. In the previous analysis (Brodie et al. 1997), commercial CPUE data from the same class of vessel as the Atlantic Lindsey were examined for Div. 3N, for the years 1970-91. This comparison indicated that the July 1996 survey CPUE for yellowtail was similar to the maximum July CPUE, which occurred in the 1985 fishery. On the other hand, the March 1997 survey CPUE was much lower than any March CPUE value observed in the fishery. The catch rate index calculated previously (Brodie et al. 1993) shows that the March CPUE from the commercial fishery was intermediate between the low values in May-July, and the high values in September-October.

A summary of 16,000 fishing hauls from 15 FPI trawlers fishing for various species in Div. 3NO from 1985-91 was also presented in Brodie et al. (1997). Most of the yellowtail catch from this fleet occurred in quadrants 2 and 3 of Div 3N, with quadrant 3 usually showing the highest CPUE values. The blocks in the central parts of columns G and H (see Fig 1) had the highest overall catches of yellowtail. This analysis also indicated that the northwest corner of the grid, which produced several good catches in the grid surveys, was not a primary fishing area for yellowtail from 1985-91. Some other blocks which have yielded a few good catches in the grid survey, such as rows 2-8 of columns C and D (Div. 3O), were also lightly fished historically. However, other areas which had high CPUE values in the grid surveys, such as Blocks G05, F07, and I03 in Div. 3N, were heavily fished in the past.

It must be stated that the direct comparability of the catch rates in the grid surveys with those from the previous commercial fishery is not known. Tow duration during the commercial fishery was generally around three hours, compared to one hour in the grid surveys. Also, the catch rates in the commercial fishery were obtained by several vessels over longer periods of time. Nonetheless, results from all grid surveys, with the exception of the 3 March trips, suggest widespread distribution of yellowtail CPUE's which are quite high relative to historic CPUE in the fishery."

#### Comparison with Research Vessel Data.

The distribution of yellowtail from the 7 stratified random surveys conducted with the Campelen trawl beginning in the fall of 1995 are shown in Figure 14. The grid, which is not part of the design of these annual research vessel surveys, is superimposed on the plot, indicating that, in general, the majority of the yellowtail distribution seen in the research vessel surveys is located within the boundaries of the grid. During the spring surveys there has been a general decline from 87% of the yellowtail being captured within the grid area in 1996 to 70% in 1998 (Table 13). In 1998, only 68% of the fall survey catch of yellowtail flounder was contained in the grid area. Since the fall of 1997, catches of yellowtail flounder are more widely distributed, especially in the Regulatory Area of Div. 3N, even though a large proportion of catches were located within the grid boundaries (Table 13, Fig. 14). This may reflect a widening of the distribution in response to an increase in the density of the population (Walsh et al. 1999).

#### **Observations on sexual maturity**

Observations of sexual maturity of yellowtail flounder have been collected only in 8 of the ten surveys. There were no samples for the surveys trips conducted in Nov-1998 or May-1998. With the exception of the November-1997 survey in which 13.3% of the females were immature, the proportion of immature females has remained relatively constant at ~30% (Fig. 15). In each of the March surveys, where females could be classified as either 1) immature or 2) spent in the current year and/or maturing for the current year, the proportions were 30% to 70% (Fig. 15, 16). From the July surveys (Trips 1,4, and 8) it appears that 35-65% of the females are spent and maturing for the following year. While the proportion of immature females is relatively constant in all three July surveys, the proportion of females which are pre-spawn showing the presence of clear eggs varies from 2.5% in the July 1998 survey to 28.5% in the July 1997 survey.

# Conclusions

Cooperative surveys between DFO and FPI for yellowtail flounder in Division 3NO indicate a large degree of spatial and temporal variability. Consistently, surveys conducted in March produce lower catches in a limited area. However, surveys which are conducted in July, and less so in November, produce widespread large catches of yellowtail flounder.

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TRIP	Ν	MEAN	STDERR	MAX	MIN
Yellowtail Flo	under				
July-96 Mar-97 May/June-97 Jul-97 Nov-97 Mar-98 May/June-98 July-98 78 Nov-98 Mar-99	83 68 82 85 50 84 73 807. 63 73	702.230 <b>124.759</b> 631.228 664.765 627.375 <b>78.150</b> 655.187 353 60. 558.881 <b>147.815</b>	53.320 <b>73.415</b> 68.643 51.861 131.077 <b>10.130</b> 58.803 207 2678 97.636 <b>16.341</b>	2503.57 <b>4972.44</b> 4607.00 3369.10 <b>5931.00</b> <b>427.74</b> 2872.62 3.27 0.0 <b>5726.06</b> <b>536.40</b>	34.00 0.00 24.50 17.50 3.50 0.00 67.00 00 1.00 0.30
American Plaic	e				
July-96 Mar-97 May/June-97 Jul-97 Nov-97 Mar-98 May/June-98 July-98 78 Nov-98 Mar-99	83 68 82 85 50 84 73 229. 63 <b>73</b>	107.144 <b>20.752</b> 174.548 180.707 131.779 <b>20.255</b> 173.690 354 40. 138.031 <b>17.588</b>	13.700 <b>5.362</b> 15.229 28.807 13.418 <b>4.434</b> 13.008 886 2197 13.315 <b>5.563</b>	942.94 234.50 759.80 1654.40 492.90 246.74 785.46 7.82 12.7 471.60 330.00	3.00 0.00 3.50 0.00 23.30 0.00 33.92 72 13.78 0.00
Cod					
July-96 Mar-97 May/June-97 Jul-97 Nov-97 Mar-98 May/June-98 July-98 78	83 68 82 85 50 84 73 107.	111.882 0.757 48.551 71.166 72.076 3.385 55.344 706 28.	31.653 <b>0.236</b> 8.795 11.962 14.620 <b>1.203</b> 11.058 239 1273	2509.09 <b>10.00</b> 437.40 644.00 411.50 <b>55.00</b> 400.00 3.80 0.0	0.00 <b>0.00</b> 0.00 0.00 <b>0.00</b> <b>0.00</b> <b>0.00</b> 0.00
Nov-98 Mar-99	63 73	43.127 1.975	15.543 1.199	917.70 86.00	0.00

# Table 1.Catches (kg/hr) by species and trip from FPI/DFO cooperative grid surveys grid.<br/>Bold entry's are March surveys for comparison.

TRIP	QUAD	N	MEAN	SUM	STD	MAX	MEDIAN	MIN
Julv-	96							
1	1	22	861.58	18954.73	565.99	2503.57	730.335	224.500
	2	16	607.93	9726.82	443.18	1818.10	472.210	34.000
	3	22	727.69	16009.16	446.35	1921.09	729.215	82.000
Masaala	4	23	591.06	13594.39	451.91	1560.34	526.790	67.000
March	-97 1	14	21 30	298 20	17 56	60.00	20 750	0 000
	2	17	396.86	6746.61	1194.35	4972.44	40.500	0.000
	3	20	40.01	800.25	43.46	148.00	20.000	2.000
	4	17	37.56	638.59	26.05	88.00	29.500	5.000
May/J	une-97	~~		1 - 0 4 0 0	1005 01	4605 00	440.050	
	1	22	.774.99	17049.79	1006.21	4607.00	440.050	204.000
	2	10	661.40	10582.45	492.75	1911.00	482.036	28.500
	3	22	440.33	14309 29	288.17 403 50	920.00 1889 64	435.000	24.500 32 500
Julv-	.97	22	050.12	11009.20	105.50	1009.01	003.500	52.500
	1	23	746.20	17162.49	754.48	3369.10	567.380	90.000
	2	16	662.16	10594.50	243.48	1396.97	589.556	451.130
	3	23	651.14	14976.18	389.38	1669.00	589.500	136.721
	4	23	598.78	13771.85	316.08	1359.84	513.200	17.500
Novem	ber-9/	17	457 40	7777 00	415 57	1522 40	266 500	44 500
	1	1/	457.49	10170 17	413.57 1010 57	1533.48	300.500	44.500
	3	10	661.69	6616.87	681.05	2519.00	481,420	171.500
	4	15	319.74	4796.11	301.86	1016.90	276.000	3.500
March	-98							
	1	19	15.25	289.84	25.18	107.27	5.000	0.000
	2	15	66.63	999.48	91.86	299.60	25.910	0.450
	3	27	128.96	3482.01	108.69	427.74	83.640	7.730
May/J	11ne-98	25	11.31	1/93.31	//.45	310.00	33.410	<b>J</b> ./ <del>1</del> 1
12,0	1	18	648.20	11667.51	650.95	2872.62	435.135	130,080
	2	15	870.79	13061.90	667.84	2398.70	779.700	228.992
	3	20	721.86	14437.19	344.34	1734.08	593.355	289.950
	4	20	433.10	8662.04	191.96	795.80	426.715	67.000
July-	.98	22	700 01	19199 00	C11 10	0670 07		122 000
	1	22 1 E	/80.81 074 26	1/1//.82	644.4Z	20/8.2/	50/./85 0E0 070	133.220
	3	20	869 76	17395 22	358 88	1611 73	830 830	204 340
	4	21	656.51	13786.64	541.99	2383.01	647.230	0.000
Novem	ber-98							
	1	13	458.44	5959.68	318.98	1128.83	476.200	45.000
	2	15	990.25	14853.80	1400.53	5726.06	555.040	47.500
	3	14	715.63	10018.87	399.40	1495.87	672.970	236.810
March	_99	ZT	208.44	43//.10	1/8.UI	032.39	203.1/U	T.000
narch	1	14	84,79	1187.10	102.26	394.40	44,950	11,000
	2	15	185.59	2783.81	173.62	510.93	128.800	0.300
	3	21	231.11	4853.27	152.52	536.40	201.100	25.600
	4	23	85.49	1966.31	55.73	200.61	80.800	5.200

 Table 2.
 Catch statistics by quadrant for yellowtail flounder within FPI/DFO Grid survey area. March surveys are highlighted.

TRIP July-98	QUAD	N	MEAN	SUM	STD	MAX	MEDIAN	MIN	
Marach 07	1 2 3 4	22 16 22 23	64.29 56.02 159.57 133.55	1414.40 896.30 3510.63 3071.62	57.78 45.89 201.36 86.74	232.80 183.50 942.94 420.23	46.000 42.400 95.250 125.500	3.000 8.000 17.000 29.500	
March-97	1 2 3 4	14 17 20 17	3.34 31.58 8.80 38.32	46.80 536.88 176.00 651.46	2.65 63.27 9.84 56.29	7.80 212.44 35.50 234.50	3.500 7.031 4.250 17.000	0.000 0.000 1.000 1.500	
May/June	e-97								
	1 2 3 4	22 16 22 22	131.41 84.34 139.26 318.58	2890.94 1349.42 3063.72 7008.86	78.66 39.59 87.69 164.83	414.50 171.00 389.56 759.80	114.200 75.000 133.050 296.000	49.800 21.000 3.500 104.300	
July-97	1	22	70.00	1622 02	F4 00	011 00	44 440	F (00	
	1 2 3 4	23 16 23 23	99.90 325.58 201.76	1598.38 1598.38 7488.35 4640.49	94.00 453.99 120.43	211.28 321.55 1654.40 498.24	44.440 60.920 103.023 210.787	20.580 0.000 37.030	
November	-97								
	1 2 3 4	17 8 10 15	107.15 135.17 107.27 174 22	1821.63 1081.32 1072.71 2613 30	117.03 53.58 59.98 94.88	492.90 222.60 254.40 329 13	58.830 128.830 83.190 132 500	23.300 72.080 60.400 68.900	
March-98	3	10	1,1,100	2010.00	21100	513.15	1011000	00.200	
	1 2 3 4	19 15 27 23	0.82 4.67 10.93 57.43	15.56 69.99 295.03 1320 84	0.78 5.91 7.53	2.00 17.27 33.45 246 74	0.460 1.360 12.360 35.910	0.000 0.000 0.450 3.180	
May/June	e-98	23	57.45	1320.04	04.01	210.71	33.910	5.100	
-	1 2 3 4	18 15 20 20	141.07 129.38 223.17 186.80	2539.33 1940.74 4463.33 3735.97	93.17 58.15 157.91 79.39	339.20 235.32 785.46 415.52	104.675 120.840 206.400 171.720	39.220 67.840 33.920 87.450	
July-98									
	1 2 3 4	22 15 20 21	84.95 84.09 510.21 216.91	1868.92 1261.37 10204.13 4555.17	79.98 74.44 615.66 116.27	271.78 241.15 2197.82 431.42	43.990 44.520 314.425 227.680	12.720 15.900 25.440 47.700	
November	-98	10	120.04	1010 01	112 05	459 10	00.040	20, 202	
March-99	1 2 3 4	13 15 14 21	139.94 105.99 141.13 157.67	1819.21 1589.79 1975.84 3311.13	113.97 88.94 127.39 97.78	457.13 316.48 411.81 471.60	89.040 68.074 87.715 137.140	39.220 28.500 13.780 47.000	
	1 2 3 4	14 15 21 23	1.20 6.29 8.45 43.27	16.75 94.41 177.53 995.20	0.81 10.78 5.20 79.17	2.60 41.00 18.20 330.00	1.400 1.900 8.200 10.400	0.000 0.300 0.000 1.200	

Table 3.	Catch statistics for American Plaice by quadrant within FPI/DFO Grid survey area.	March surveys are
	highlighted.	

cucciico	, ng/m	$\omega_{I}$	quad, crip c	and ppeered	IIOM III 911	Id barvejb		
TRIP July-96	QUAD	N	MEAN	SUM	STD	MAX	MEDIAN	MIN
ourl so	1	22	226,66	4986.59	521.82	2509.09	76.500	6,000
	2	16	19.06	305.00	18.87	53.00	14.500	0.000
	3	22	42.31	930.80	79.33	295.00	5.000	0.000
	4	23	133.21	3063.79	137.93	520.00	78.000	0.000
March-9	7							
	1	14	0.87	12.20	1.53	5.50	0.000	0.000
	2	17	0.11	1.80	0.37	1.50	0.000	0.000
	3	20	1.02	20.45	2.45	10.00	0.000	0.000
Max/.Tune	<b>≖</b> ∍_97	т,	1.00	17.00	2.1/	10.00	0.000	0.000
They / O dill	1	22	84.62	1861.70	86.53	308.00	44,600	0.000
	2	16	10.72	171.48	11.85	36.00	7.200	0.000
	3	22	5.65	124.23	13.39	51.00	0.000	0.000
	4	22	82.90	1823.73	105.27	437.40	38.400	0.000
July-97	_							
	Ţ	23	112.44	2586.04	110.06	380.00	66.090	0.000
	2	10	24.85	397.65	31.52	133.3U	22.655	0.000
	4	23	114 76	2639 44	156 52	644 00	63 960	0.000
November	т_97	25	114.70	2037.11	130.32	011.00	03.900	0.000
110 1 611000	1	17	28.15	478.50	70.06	293.40	4.800	0.000
	2	8	14.06	112.50	20.54	45.60	0.250	0.000
	3	10	169.86	1698.60	120.64	383.40	166.200	9.000
	4	15	87.61	1314.20	104.28	411.50	48.000	0.000
March-98	8		0.10	2 62	0.55			
	2	15	0.19	3.68	0.66	2.77	0.000	0.000
	2	27	2 07	55 82	7 14	36.95	0.000	0.000
	4	23	9.78	224.87	18.35	55.00	0.450	0.000
May/June	e-98							
	1	18	86.18	1551.26	96.01	297.86	48.300	4.800
	2	15	7.98	119.68	17.98	66.00	0.000	0.000
	3	20	40.46	809.20	114.31	400.00	0.000	0.000
T	4	20	/8.00	1560.00	93.96	297.60	32.700	0.000
JULY-98	1	22	255 03	5610 57	404 25	1273 80	116 310	0 000
	2	15	12.49	187.40	21.12	77.20	0.000	0.000
	3	20	27.65	553.00	86.90	391.20	2.700	0.000
	4	21	97.62	2050.08	152.37	625.68	42.000	0.000
November	r-98							
	1	13	25.15	326.90	48.75	182.40	7.200	0.000
	2	15	24.42	366.29	67.16	263.19	2.000	0.000
	3	14	29.49	412.80	39.33	126.00	12.000	0.000
March-00	4 a	21	/6./1	1011.00	199.52	91/./0	13.200	0.000
	1	14	0.76	10.70	1.27	3,40	0,000	0,000
	2	15	0.49	7.40	1.65	6.40	0.000	0.000
	3	21	0.49	10.30	1.39	5.60	0.000	0.000
	4	23	5.03	115.80	18.02	86.00	0.000	0.000

Table 4. Catch statistics for cod by quadrant within FPI/DFO Grid survey area. March surveys are highlighted.

Catches , kg/hr by quad, trip and species from FPI grid surveys

	10100	lan	
TRIP	NAFO	Ν	MEAN
 Tu]v_00	21	16	749 060
JULY JU	30	10	(44, 010
	30	37	644.010
March-97	3N	44	175.292
	30	24	32.116
May/June-97	3N	47	676.422
± '	30	35	570 539
T:: ] 07	30	33	604 440
July-97	510	49	694.440
	30	36	624.375
November-97	3N	24	901.679
	30	26	374.171
March-98	3N	50	93,114
Haron 90	30	34	55.111 E6 146
	30	34	56.146
May/June-98	3N	44	796.678
	30	29	440.510
July-98	3N	44	925.852
*	30	34	654 003
Navambara 00	20	24	752.740
November-98	31N	36	/53./48
	30	27	299.060
March-99	3N	44	193.136
	30	29	79.052
	Plaic	e	
סזאַד	NDFO	N	MEDN
Tular 00		±v 4.6	100 272
JULY-98	31N	40	108.272
	30	37	105.741
March-97	3N	44	16.827
	30	24	27.948
May/June-97	3N	 47	128 944
May/Guile 57	20	47	120.944
	30	35	235.787
July-97	3N	49	205.783
	30	36	146.574
November-97	3N	24	118 083
Hovenber 97	20	26	144 422
	30	20	144.422
March-98	3N	50	8.066
	30	34	38.181
May/June-98	3N	44	172.532
	30	29	175 447
T.1.1. 09	30	23	280.080
JULY-96	51N	44	280.980
	30	34	162.543
November-98	3N	36	119.617
	30	27	162.584
March_99	3N	44	7 915
Mai cii-55	30	11	22.264
	30	29	32.264
	Cod	1	
	00	1	
TRIP	NAFO	N	MEAN
July-98	3N	46	40.413
	30	37	200.735
March-97	3N	44	0.676
	30	24	0 004
Morr / True - 07	20	21 10	10 640
may/June-9/	3N	4 /	18.649
	30	35	88.704
July-97	3N	49	32.164
	30	36	124.253
November-97	3N	24	99 158
HOVENDEL J/	20	27	47.077
	30	20	4/.0//
March-98	3N	50	1.189
	30	34	6.615
May/June-98	3N	44	32.238
	30	29	90 402
T1- 00	30	43	20.302
JUTA-28	3N	44	25.923
	30	34	213.543
November-98	3N	36	31.664
	30	27	58 411
March-99	20		0.475
Mat CII-33	NIC .	44	0.4/3
	30	29	4.252

# Table 5.Catches (kg) by NAFO division from FPI grid surveys. March surveys are highlighted.<br/>Yellowtail

Block\T	July	March1	May/June	July	Nov.	Mar.	May/June	July	Nov.	Mar.	Mean
rip	1996	997	1997	1997	1997	1998	1998	1998	1998	1999	
A09	123.6	27.5	49	225.1	3.5	57.27	105	0	6	6	60.3
B09	254.2	36	142	582.3	9	59.09	469.1	26	9.5	9.4	159.7
B02	321	0	210	482.3	44.5	0	477.6	325.1	45	11	191.7
A08	326	67.5	585	637.3	103.5	60	335	270.6	97	45.2	252.7
C09	471.9	21.5	638	489.4	360.9	181.3	350.9	647.2	213	34.6	340.9
H08	736.7	7.5	697	631.6	414.4	58.18	695.7	735	237	139	435.2
G03	344.7	81	322	518.5	87	47.73	907.7	1039	696	376	441.9
E08	1168	11	714	506.5	313.9	15.45	594.1	898.1	251	100	457.2
A03	1087	23.7	204	668.5	300.8	6	603.5	835.1	622	394	474.5
H05	322.9	98.44	257	680	1209	95.45	533.9	714.7	464	383	475.8
A05	1411	35.5	422	167	1533	17	307.6	418.7	629	39.5	498.0
C10	1431	88	717	1014	50.5	316	795.8	503.6	59.9	100	507.6
H06	436.4	33	303	600.1	781.7	31.36	725.3	811.8	1323	536	558.2
H04	357.6	205	457	684.7	377.1	141.4	779.7	941.4	1246	433	562.2
A01	1316	7	235	997.6	436.8	26.82	797	2237	742	23.8	681.8
G07	721.7	28.5	697	711.3	548.5	252.3	1734	1042	935	201	687.1
H07	443	67.5	850	1349	288.4	254.8	1228	1063	1092	381	701.7
F07	1921	126.5	752	881	171.5	225.7	1103	1612	508	134	743.5
E02	937.3	18.5	2529	1148	175.8	1.36	1374	959.4	336	50.4	752.9
F04	1032	677.9	833	704	1661	43.18	1172	1869	1736	129	985.8
F05	1818	498.3	936	1397	5931	66.36	2245	2285	590	253	1601.8
G04	868.7	4972	495	451.1	2023	299.6	592.6	899	5726	252	1657.9

Table 6.Catches of yellowtail flounder (kg/hour tow), from common blocks fished in all ten surveys. Data are<br/>ranked in ascending order of mean catch.

Block	July	March1	May/June	July	Nov.	Mar.	May/June	July	Nov.	Mar.	Mean
Trip	1996	997	1997	1997	1997	1998	1998	1998	1998	1999	
H06	17	1	43.9	38.09	84.8	0.45	117.7	25.44	27.6	0	35.6
F05	20	170.6	42.3	22.25	106	17.27	67.84	15.9	37.1	16.8	51.6
G03	47.5	18	91	39.15	72.08	1.36	178.1	54.06	74.2	12.5	58.8
H04	42	15	78	75.28	72.08	5.45	82.68	40.78	184	7.8	60.3
H05	31	7.031	72	122.1	181.3	4.55	137.8	42.4	45.6	1.9	64.6
E02	85.6	6	171	69.96	23.3	0	196	62.54	39.2	2.2	65.6
B02	45	0	81	158.7	51	0	245.5	66.2	57.5	2.6	70.7
F04	8	76.28	68.5	38.09	222.6	9.55	120.8	33.92	272	4.8	85.5
G04	39	212.4	67.5	30.57	169.6	15.45	103.9	44.52	164	41	88.8
H08	124	3.5	182	155.4	82.68	15	244.7	33.92	90.6	12.8	94.5
E08	92	3.5	198	106	82.68	6.36	100.2	274.5	184	8.6	105.6
F07	92.5	23	193	100.8	83.7	7.73	206.7	232.1	157	4.8	110.1
A01	232.8	3.5	103	114.3	41	0.45	285.7	218.9	185	0.4	118.5
A03	84.5	7.8	186	39.63	196.1	2	269.6	213.4	239	1.8	124.0
A05	110	3.5	162	35	492.9	2	119.2	152.6	204	0.3	128.2
A08	220.5	65	468	111.1	76.32	32.27	190.8	100.7	50.5	6.5	132.2
H07	36	8.5	289	40.2	80.56	2.73	785.5	201.4	74.2	8.8	152.7
G07	80	3	203	86.8	69.96	451.7	367.3	382.7	111	8.2	176.3
A09	114	56	408	498.2	132.5	133.6	161.7	227.7	163	174	206.9
C10	293	85	363	349.5	329.1	89.12	217.3	309.7	214	38.2	228.7
C09	144	42	564	264.8	296.8	138.3	217.3	307.1	472	8	245.4
B09	420.2	45	519	326.9	176.1	246.7	169.6	200.1	267	105	247.7

 Table 7.
 Catches of American Plaice (kg/hour tow), from common blocks fished in all ten surveys. Data are ranked in ascending order of mean catch.

Block\T	July	March1	May/June	July	Nov.	Mar.	May/June	July	Nov.	Mar.	Mean
rip	1996	997	1997	1997	1997	1998	1998	1998	1998	1999	
H08	0	0	0	0	9	0	0	4.2	0	0	1.3
H05	21.5	0	0	14.92	0	0	0	0	0	0	3.6
G03	2.5	0	11	24	0.5	0	0	0	0	0	3.8
F05	4	0	1.8	5.33	0	0	0	0	30	0	4.1
G04	28	0	3.28	31.98	22	0	0	13.2	1.2	0	10.0
H04	26	0	10.8	24.5	44.4	0	0	0	0	0	10.6
F04	8	0	20.4	21.32	45.6	0	0	36	8.4	0	14.0
F07	30	0	19.8	14.39	78.6	0.91	0	0	0	0	14.4
C10	33	0	0	16	20.4	55	47.4	31.2	0	0	20.3
A08	14	1	28.5	15	18	43.64	82.8	24	0	2.4	22.9
E02	156	0	18	35.71	0	0	50.4	15	0	0	27.5
B09	89	0	0	86.99	6	1.36	66	33	30	0	31.2
C09	54	0	26.5	14	109.2	52.73	4.8	43.2	13.2	0	31.8
A09	78	0	34.8	25	0	0	196.2	19.2	0	86	43.9
B02	168	1.2	75.6	38	0.5	0	63.6	116.8	3.6	0	46.7
H06	5.5	0	0	10	383.4	0	18	0	58.8	1.5	47.7
H07	190.8	0	34.8	148.2	122.4	0.91	4.8	0.6	126	5.6	63.4
G07	190	0.7	16.1	22.39	312	0	0	59.4	71.4	0	67.2
A03	274	0	175	271.6	4.8	0	28.8	16.8	12	0	78.3
A01	506	0	51	101.3	0	0	5.4	141	1.5	2.4	80.9
E08	145.2	0	252	65.03	66	1.82	201	43.8	206	0	98.1
A05	2509	0	260	232.9	19.2	0	297.9	1209	182	0	471.0

 Table 8:
 Catches of cod (kg/hour tow), from common blocks fished in all ten surveys. Data are ranked in ascending order of mean catch.

$Block \backslash T$	July	March1	May/June	July	Nov.	Mar.	May/June	July	Nov.	Mar.	Mean
rip	1996	997	1997	1997	1997	1998	1998	1998	1998	1999	
H06	0.039	0.03	0.145	0.063	0.108	0.014	0.162	0.031	0.021	0	0.061
G04	0.045	0.043	0.136	0.068	0.084	0.052	0.175	0.05	0.029	0.163	0.084
F05	0.011	0.342	0.045	0.016	0.018	0.26	0.03	0.007	0.063	0.067	0.086
F04	0.008	0.113	0.082	0.054	0.134	0.221	0.103	0.018	0.157	0.037	0.093
H04	0.117	0.073	0.171	0.11	0.191	0.039	0.106	0.043	0.147	0.018	0.102
E02	0.091	0.324	0.068	0.061	0.133	0	0.143	0.065	0.117	0.044	0.105
H05	0.096	0.071	0.281	0.18	0.15	0.048	0.258	0.059	0.098	0.005	0.125
H07	0.081	0.126	0.34	0.03	0.279	0.011	0.64	0.189	0.068	0.023	0.179
F07	0.048	0.182	0.256	0.114	0.488	0.034	0.187	0.144	0.309	0.036	0.18
G03	0.138	0.222	0.283	0.076	0.829	0.028	0.196	0.052	0.107	0.033	0.196
A01	0.177	0.5	0.437	0.115	0.094	0.017	0.358	0.098	0.249	0.017	0.206
A05	0.078	0.099	0.384	0.21	0.321	0.118	0.388	0.365	0.324	0.008	0.229
H08	0.168	0.467	0.261	0.246	0.2	0.258	0.352	0.046	0.383	0.092	0.247
E08	0.079	0.318	0.277	0.209	0.263	0.412	0.169	0.306	0.736	0.086	0.285
G07	0.111	0.105	0.291	0.122	0.128	1.79	0.212	0.367	0.119	0.041	0.329
A03	0.078	0.329	0.912	0.059	0.652	0.333	0.447	0.256	0.384	0.005	0.345
B02	0.14		0.386	0.329	1.146		0.514	0.204	1.278	0.236	0.529
A08	0.676	0.963	0.8	0.174	0.737	0.538	0.57	0.372	0.521	0.144	0.55
C09	0.305	1.953	0.884	0.541	0.822	0.763	0.619	0.475	2.213	0.231	0.881
C10	0.205	0.966	0.506	0.345	6.517	0.282	0.273	0.615	3.568	0.38	1.366
B09	1.653	1.25	3.658	0.561	19.57	4.176	0.362	7.696	28.15	11.17	7.825
A09	0.923	2.036	8.329	2.214	37.86	2.334	1.54		27.17	29	12.38

 Table 9.
 Ratio of American plaice catch to Yellowtail flounder catch, by block, from common blocks fished in all ten surveys.

Table 10. Categorization of American Plaice catch to yellowtail catch for various levels of yellowtail catch. The third numeral in each cell is the total number of sets in that block (this is the same in all 4 tables). The second numeral is the number of sets which fit the yellowtail catch criterion in the heading. The first numeral represents the number of sets where the catch of American Plaice was less than 5% of the yellowtail catch. Blank cells were not fished in any of the 10 surveys.

	Yellov	vtail Catch >1	.00 Kg							
Trip	А	В	С	D	Е	F	G	Н	Ι	J
1	0, 7, 10	0, 5, 6	1, 5, 7	1, 6, 8	3, 7, 9	1, 1, 1	0, 5, 9		0, 6, 9	
2	0, 5, 7	0, 5, 10	0, 6, 8	0, 5, 8	0, 7, 10	2, 6, 9		0, 6, 9		0, 4, 9
3	1, 8, 10	1, 6, 7	0, 6, 9	0, 4, 6	3, 5, 5	3, 7, 8	1, 7, 10		1, 7, 9	
4		0, 5, 9	3, 7, 8	0, 5, 7	3, 6, 7	3, 9, 10	4, 10, 10	3, 10, 10		0, 1, 6
5	0, 7, 10		2, 7, 9	2, 7, 7	2, 5, 7	6, 9, 10	4, 8, 9	1, 8, 10	0, 6, 9	
6		2, 7, 9		1, 5, 9	0, 5, 8	3, 8, 9	4, 7, 8	4, 8, 10		0, 2, 7
7	0, 7, 9	0, 6, 9	0, 6, 9	1, 7, 9	0, 7, 9	3, 10, 10	2, 9, 10	3, 9, 10	1, 8, 9	
8	0, 6, 10	0, 9, 9	0, 6, 9	0, 6, 8	0, 8, 10	1, 6, 8	0, 7, 7	1, 8, 10	0, 6, 9	0, 4, 8
9	0, 3, 10	0, 4, 10	0, 8, 10	0, 7, 9	0, 6, 8	1, 7, 8	0, 7, 9	1, 7, 8	0, 6, 9	0, 4, 8
10	0, 1, 9	0, 2, 9	0, 7, 10	0, 7, 7	0, 7, 8	1, 6, 7	1, 6, 7	0, 7, 7	1, 7, 9	0, 4, 8

	Yellow	vtail Catch >3	00 Kg							
Trip	А	В	С	D	Е	F	G	Н	Ι	J
1	0, 6, 10	0, 5, 6	1, 4, 7	1, 6, 8	3, 7, 9	1, 1, 1	0, 5, 9		0, 4, 9	
2	0, 4, 7	0, 4, 10	0, 5, 8	0, 1, 8	0, 6, 10	2, 6, 9		0, 6, 9		0, 2, 9
3	1, 7, 10	1, 6, 7	0, 2, 9	0, 0, 6	2, 3, 5	3, 6, 8	1, 7, 10		0, 6, 9	
4		0, 2, 9	2, 5, 8	0, 4, 7	3, 5, 7	2, 8, 10	4, 8, 10	2, 8, 10		0, 1, 6
5	0, 6, 10		1, 6, 9	1, 6, 7	2, 5, 7	6, 8, 10	3, 7, 9	1, 7, 10	0, 5, 9	
6		1, 6, 9		1, 5, 9	0, 5, 8	3, 6, 9	4, 6, 8	4, 8, 10		0, 1, 7
7	0, 6, 9	0, 3, 9	0, 5, 9	0, 5, 9	0, 5, 9	1, 6, 10	1, 8, 10	2, 7, 10	1, 7, 9	
8	0, 4, 10	0, 6, 9	0, 4, 9	0, 6, 8	0, 6, 10	0, 5, 8	0, 5, 7	1, 6, 10	0, 4, 9	0, 4, 8
9	0, 0, 10	0, 2, 10	0, 6, 10	0, 6, 9	0, 4, 8	1, 7, 8	0, 6, 9	1, 4, 8	0, 5, 9	0, 1, 8
10	0, 0, 9	0, 0, 9	0, 6, 10	0, 4, 7	0, 5, 8	0, 5, 7	0, 3, 7	0, 4, 7	0, 6, 9	0, 3, 8

	Yellowtail Catch >500 Kg										
Trip	А	В	С	D	Е	F	G	Н	Ι	J	
1	0, 5, 10	0, 4, 6	1, 3, 7	1, 5, 8	3, 7, 9	0, 0, 1	0, 3, 9		0, 3, 9		
2	0, 3, 7	0, 0, 10	0, 1, 8	0, 0, 8	0, 5, 10	2, 4, 9		0, 6, 9		0, 1, 9	
3	0, 5, 10	1, 4, 7	0, 2, 9	0, 0, 6	1, 1, 5	3, 4, 8	0, 4, 10		0, 4, 9		
4		0, 0, 9	1, 3, 8	0, 3, 7	2, 3, 7	2, 8, 10	4, 7, 10	1, 4, 10		0, 0, 6	
5	0, 3, 10		1, 3, 9	1, 4, 7	1, 3, 7	6, 7, 10	3, 6, 9	0, 4, 10	0, 2, 9		
6		1, 5, 9		1, 4, 9	0, 4, 8	3, 6, 9	3, 5, 8	3, 6, 10		0, 0, 7	
7	0, 5, 9	0, 2, 9	0, 5, 9	0, 3, 9	0, 3, 9	1, 6, 10	0, 7, 10	1, 5, 10	1, 5, 9		
8	0, 2, 10	0, 5, 9	0, 1, 9	0, 2, 8	0, 5, 10	0, 5, 8	0, 5, 7	1, 5, 10	0, 2, 9	0, 2, 8	
9	0, 0, 10	0, 1, 10	0, 2, 10	0, 6, 9	0, 3, 8	1, 5, 8	0, 4, 9	0, 1, 8	0, 3, 9	0, 0, 8	
10	0, 0, 9	0, 0, 9	0, 5, 10	0, 2, 7	0, 4, 8	0, 3, 7	0, 2, 7	0, 3, 7	0, 5, 9	0, 2, 8	

Table 10 (continued)

	Yellowtail Catch >700 Kg										
Trip	А	В	С	D	Е	F	G	Н	Ι	J	
1	0, 5, 10	0, 4, 6	1, 1, 7	1, 5, 8	3, 6, 9	0, 0, 1	0, 0, 9		0, 3, 9		
2	0, 1, 7	0, 0, 10	0, 1, 8	0, 0, 8	0, 5, 10	2, 3, 9		0, 4, 9		0, 0, 9	
3	0, 2, 10	1, 2, 7	0, 1, 9	0, 0, 6	0, 0, 5	2, 3, 8	0, 2, 10		0, 3, 9		
4		0, 0, 9	1, 3, 8	0, 0, 7	1, 1, 7	2, 7, 10	4, 5, 10	1, 3, 10		0, 0, 6	
5	0, 2, 10		1, 1, 9	1, 3, 7	1, 2, 7	6, 6, 10	2, 3, 9	0, 2, 10	0, 1, 9		
6		1, 2, 9		1, 4, 9	0, 1, 8	3, 5, 9	2, 4, 8	2, 4, 10		0, 0, 7	
7	0, 2, 9	0, 0, 9	0, 3, 9	0, 2, 9	0, 2, 9	1, 5, 10	0, 5, 10	1, 5, 10	1, 4, 9		
8	0, 0, 10	0, 2, 9	0, 1, 9	0, 0, 8	0, 3, 10	0, 2, 8	0, 4, 7	1, 2, 10	0, 2, 9	0, 1, 8	
9	0, 0, 10	0, 0, 10	0, 0, 10	0, 2, 9	0, 0, 8	0, 2, 8	0, 3, 9	0, 0, 8	0, 2, 9	0, 0, 8	
10	0, 0, 9	0, 0, 9	0, 4, 10	0, 0, 7	0, 1, 8	0, 0, 7	0, 0, 7	0, 1, 7	0, 3, 9	0, 1, 8	

 Table 11.
 Length composition of yellowtail flounder (Sexes combined)

Trip	Percentage < 26cm	Percentage < 30 cm	Percentage >= 40cm
July 1996	1.9	6.3	26.4
March 1997	1.6	6.7	21.1
May 1997	1.1	5.8	26.9
July 1997	1.2	7.7	24.8
November 1997	0.2	2.7	31.5
March 1998	1.6	9.0	25.4
May 1998	0.9	6.2	24.5
July 1998	1.8	10.3	21.6
November 1998	0.8	5.8	24.6
March 1999	0.6	6.7	22.4

				'					
Age	Jul-96	May-97	Jul-97	Nov-97	Mar-98	May-98	Jul-98	Nov-98	Mar-99
0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0.08	0	0
2	0	0	0	0	0	0	0.5	0	0
3	3.29	0.619	0.758	0.115	0.01	0.91	1.36	0.37	0
4	32.06	14.783	18.254	2.883	1.74	9.76	31.08	10.8	1.52
5	115.08	116.59	176.99	66.43	25.02	139.83	360.54	115.49	36.53
6	443.98	450.2	559.3	451.1	72.89	627.86	1072.97	634.12	160.8
7	638.02	535.4	538.2	726.9	51.61	400.12	548.11	619.76	168.35
8	356.79	344.35	326.86	497.3	44.79	309.6	422.51	405.7	92.04
9	11.07	9.478	9.693	24.768	1.8	15.68	16.9	17.89	3.32
Unknown	0.78	0.882	0.715	0.229	0	0	0	0.34	0
Total	1601.07	1472.302	1630.77	1769.725	197.86	1503.76	2454.05	1804.46	462.57
Div.	K	r	r						
	· /		p p	) )	۱ (	)		) )	
Age	, Jul-96	May-97	Jul-97	) Nov-97	Mar-98	) May-98	Jul-98	) Nov-98	Mar-99
Age 0	, Jul-96	<b>May-97</b>	<b>Jul-97</b> 0	) Nov-97 0	<b>Mar-98</b>	) <u>May-98</u> 0	<b>Jul-98</b>	) Nov-98 0	<b>Mar-99</b> 0
Age 0 1	Jul-96	May-97 0 0	<b>Jul-97</b> 0 0	) Nov-97 0 0	Mar-98 0 0	) May-98 0 0	<b>Jul-98</b> 0 0 0.1	) Nov-98	<b>Mar-99</b> 0 0
Age 0 1 2	<b>Jul-96</b> 0 0 0 0	May-97 0 0 0 0 0 0	<b>Jul-97</b> 0 0 0 0	) Nov-97 0 0 0	Mar-98 0 0 0 0 0 0	May-98 0 0 0 0 0 0	<b>Jul-98</b> 0 0 0.1 0.31	) Nov-98 0 0 0	Mar-99 0 0 0
Age 0 1 2 3	Jul-96 0 0 0 0 0 0 0 0 0	May-97 0 0 0 0 0.096	<b>Jul-97</b> 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Nov-97 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Mar-98 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	May-98 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	<b>Jul-98</b> 0 0 0.1 0.31 0.34	> Nov-98 0 0 0 0 0.01	Mar-99 0 0 0 0 0 0 0 0
Age 0 1 2 3 4	Jul-96 0 0 0 0 0 0.84	May-97 0 0 0 0.096 0.771	Jul-97 0 0 0 0.084 1.432	Nov-97 0 0 0 0 0 0.007 0.653	Mar-98 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	May-98 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Jul-98 0 0.1 0.31 0.34 3.65	Nov-98           0           0           0           0           0           0           0           0           1.23	Mar-99 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
Age 0 1 2 3 4 5	Jul-96 0 0 0 0 0 0 0.84 10.04	May-97 0 0 0 0 0 0 0 0 771 9.522	Jul-97 0 0 0 0.084 1.432 19.976	Nov-97 0 0 0 0.007 0.653 13.079	Mar-98 0 0 0 0 0 0 0.31 2.95	May-98 0 0 0 0 0 0 0 0.21 7.04	Jul-98 0 0.1 0.31 0.34 3.65 57.85	Nov-98 0 0 0 0 0 0 0 0 1.23 17.89	Mar-99 0 0 0 0 0 0 0 1 3
Age 0 1 2 3 4 5 6	Jul-96 0 0 0 0 0 0 0 0 84 10.04 209.93	May-97 0 0 0 0.096 0.771 9.522 211.32	Jul-97 0 0 0 0.084 1.432 19.976 275.99	Nov-97 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Mar-98 0 0 0 0 0 0 0 0 0 0 3 1 2.95 38.13	May-98 0 0 0 0 0 0 0 0 21 7.04 188.61	Jul-98 0 0.1 0.31 0.34 3.65 57.85 470.75	Nov-98 0 0 0 0 0 0 0 0 0 0 0 1.23 17.89 191.99	Mar-99 0 0 0 0 0 0.1 3 38.18
Age 0 1 2 3 4 5 6 7	Jul-96 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	May-97 0 0 0 0.096 0.771 9.522 211.32 485.7	Jul-97 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Nov-97 0 0 0 0 0 0.007 0.653 13.079 143.11 317.2	Mar-98 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	May-98 0 0 0 0 0 0 0 0 0 0 0 2 0 2 1 7.04 188.61 262.54	Jul-98 0 0.1 0.31 0.34 3.65 57.85 470.75 459.33	Nov-98 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Mar-99 0 0 0 0 0 0 0 0 1 3 3 8.18 87.75
Age 0 1 2 3 4 5 6 7 8	Jul-96 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	May-97 0 0 0 0.096 0.771 9.522 211.32 485.7 306.48	Jul-97 0 0 0.084 1.432 19.976 275.99 566.4 374.1	Nov-97 0 0 0 0.007 0.653 13.079 143.11 317.2 211.65	Mar-98 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	May-98 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Jul-98 0 0.1 0.31 0.34 3.65 57.85 470.75 459.33 391.17	Nov-98 0 0 0 0 0 0 0 0 0 0 0 0 0	Mar-99 0 0 0 0 0 0 0 0 0 0 0 1 3 8.18 87.75 43.3
Age 0 1 2 3 4 5 6 7 8 9	Jul-96 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	May-97 0 0 0 0.096 0.771 9.522 211.32 485.7 306.48 6.519	Jul-97 0 0 0 0.084 1.432 19.976 275.99 566.4 374.1 9.508	Nov-97 0 0 0 0 0 0 0 0 0 0 0 0 0	Mar-98 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 1 2.95 38.13 46.94 32.79 0.84	May-98 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Jul-98 0 0.1 0.31 0.34 3.65 57.85 470.75 459.33 391.17 12.41	Nov-98 Nov-98 0 0 0 0 0 0 0 0 0 0 0 1.23 17.89 191.99 292.11 155.13 6.01	Mar-99 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
Age 0 1 2 3 4 5 6 7 8 9 Unknown	Jul-96 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	May-97 0 0 0.096 0.771 9.522 211.32 485.7 306.48 6.519 0	Jul-97 0 0 0 0.084 1.432 19.976 275.99 566.4 374.1 9.508 0.247	Nov-97 0 0 0 0 0 0 0 0 0 0 0 0 0	Mar-98 0 0 0 0 0 0 0 0 0 0 0 3 8.13 46.94 32.79 0.84 0	May-98 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 88.61 262.54 211.62 4.62 0	Jul-98 0 0.1 0.31 0.34 3.65 57.85 470.75 459.33 391.17 12.41 0	Nov-98           0           0           0           0           0           0           0           0           0           0           0           0           0           0           0           0           0           17.89           191.99           292.11           155.13           6.01           0	Mar-99 0 0 0 0 0 0 0 0 0 0 1 3 8 1.1 3 8 7.75 4 3.3 1.1 0

**Table 12:** Age composition of yellowtail from selected cooperative surveys by NAFO Division. Data are mean numbers of fish per hour tow.

 Table 13
 Percentage of yellowtail catches from annual Campelen surveys in the FPI/DFO survey grid

 Weights are in kilograms

Year	Survey	nos. in grid	wgt in grid	nos in survey	weight in survey	% Nos. in grid	% Wgt in grid
95	fall	7273	1759.13	9971	2351.38	73	75
96	spring	14695	3877.67	16937	4619.32	87	84
96	fall	17911	4060.94	20053	4317.04	89	94
97	spring	12059	2806.88	15010	3882.13	80	72
97	fall	19080	5065.24	29744	7990.11	64	63
98	spring	14841	4015.73	21334	5822.04	70	69
98		23090	6072.72	34074	9284.43	68	65



Figure 1. Location of grid used in cooperative surveys directed at yellowtail flounder in NAFO Div. 3NO. Quadrants are groups of 5x5 blocks.

















Distribution of Yellowtail Flounder Catches (Weight in kg) From Cooperative Trawls conducted 96/7 to 97/11)



Distribution of Yellowtail Flounder Catches (Weight in kg) From Cooperative Trawls conducted 98/3 to 99/3



Distribution of Yellowtail Flounder catches (fish<=30cm) from Atlantic Lindsey trip 1.



Distribution of Yellowtail Flounder catches (fish>40cm) from Atlantic Lindsey trip 1.



Distribution of Yellowtail Flounder catches (fish<=30cm) from Atlantic Lindsey trip 2.



Distribution of Yellowtail Flounder catches (fish>40cm) from Atlantic Lindsey trip 2.



Distribution of Yellowtail Flounder catches (fish<=30cm) from Atlantic Lindsey trip 3.



Distribution of Yellowtail Flounder catches (fish>40cm) from Atlantic Lindsey trip 3.



Distribution of Yellowtail Flounder catches (fish<=30cm) from Atlantic Lindsey trip 4.



Distribution of Yellowtail Flounder catches (fish>40cm) from Atlantic Lindsey trip 4.



Distribution of Yellowtail Flounder catches (fish<=30cm) from Atlantic Lindsey trip 5.



Distribution of Yellowtail Flounder catches (fish>40cm) from Atlantic Lindsey trip 5.



Distribution of Yellowtail Flounder catches (fish<=30cm) from Atlantic Lindsey trip 6.



Distribution of Yellowtail Flounder catches (fish>40cm) from Atlantic Lindsey trip 6.



Distribution of Yellowtail Flounder catches (fish<=30cm) from Atlantic Lindsey trip 7.



Distribution of Yellowtail Flounder catches (fish>40cm) from Atlantic Lindsey trip 7.



Distribution of Yellowtail Flounder catches (fish<=30cm) from Atlantic Lindsey trip 8.



50 250

1000

2500 +

Distribution of Yellowtail Flounder catches (fish>40cm) from Atlantic Lindsey trip 8.



Distribution of Yellowtail Flounder catches (fish<=30cm) from Atlantic Lindsey trip 9.



250 • 1000 2500 + + 0 100 m 200 m 200 mile limit Nafo line

Distribution of Yellowtail Flounder catches (fish>40cm) from Atlantic Lindsey trip 9.



Distribution of Yellowtail Flounder catches (fish<=30cm) from Atlantic Lindsey trip 10.



1000

2500 +

Distribution of Yellowtail Flounder catches (fish>40cm) from Atlantic Lindsey trip 10.



Distribution of American Plaice Catches (Weight in kg) From Cooperative Trawls conducted 96/7 to 97/11



Distribution of American Plaice Catches (Weight) From Cooperative Trawls conducted 98/3 to 99/3



Distribution of Cod Catches (Weight in kg) From Cooperative Trawls conducted 96/7 to 97/11



Distribution of Cod Catches (Weight in kg) From Cooperative Trawls conducted 98/3 to 99/3



Ratio of American Plaice to Yellowtail Catches, Atlantic Lindsey trips 1-5.



Ratio of American Plaice to Yellowtail Catches, Atlantic Lindsey trips 6-10.



Fig. 12a. Length composition of yellowtail flounder caught in the Atlantic Lindsey surveys.







Fig 13a. Age composition of yellowtail flounder caught in the Atlantic Lindsey surveys



Fig 13c.









+ 0

Distribution of Yellowtail Flounder (number per set) from stratified random surveys conducted with a Campelen trawl in Div. 3LNO in 1995-1998. Grid used in cooperative surveys is overlaid for illustration.

ЗN



Fig. 15 Percentage of mature and immature yellowtail flounder caught on Atlantic Lindsey Trips 1-10.



Fig. 16. Distribution of maturity stages of female yellowtail flounder caught on Atlantic Lindsey trips 1-10.