Northwest Atlantic Fisheries Organization

Serial No. N4272 **NAFO SCR Doc. 00/42**

SCIENTIFIC COUNCIL MEETING – JUNE 2000

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

by

D. Maddock Parsons, W.B. Brodie, D. Power and S.J. Walsh

Northwest Atlantic Fisheries Center, Science Branch, Department of Fisheries and Oceans
P.O. Box 5667, St. John's, Newfoundland, Canada A1C 5X1

Introduction

Cooperative trawl surveys directed for yellowtail flounder have been conducted 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 are 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 twelve 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. Twelve surveys were conducted, 1 in 1996, 4 each in 1997 and 1998, and 3 in 1999.

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

from the first 12 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 twelve surveys: In the twelve 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, 33 of 36 quadrants yielded a mean CPUE for yellowtail flounder in excess of 400 kg per hour (Table 2). Mean CPUE of yellowtail from 11 of 12 surveys was higher in Div. 3N, quadrants 2 and 3, than in quadrants 1 and 4 in Div. 3O (Table 5, Fig. 2a ,3a). Overall yellowtail CPUE was highest in July of 1998, and lowest in May-June of 1999. Recent grid surveys showed lower CPUEs, although March 1999 CPUEs were higher than previous surveys conducted in March.

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. 2b) with little difference between Div. 3N and 3O (Fig. 3b). For cod, mean CPUE was highest in quadrants 1 and 4 (Fig. 2c) concentrating the mean CPUE in Div. 3O (Fig. 3c). Other quadrants in Div. 3N had low catches.

Overall, 15 common blocks were fished in all twelve surveys. Data for yellowtail flounder are given in Table 6, American plaice in Table 7 and cod in Table 8. Yellowtail mean CPUE is lowest in March for common blocks and generally highest in the July surveys. American plaice catch rates were highest in May and June of most years. Average cod catches were lowest in March and highest in July surveys. To investigate the by-catch of American plaice, the ratio of American plaice to yellowtail flounder was calculated in each of the 15 common blocks fished in all twelve surveys (Table 9). Several sets produced by-catch ratios less than 5% (highlighted), 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-catches of plaice are found in the southwest corner (quadrant 4) of the grid in Div 3O.

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 12 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 Canadian 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. 4) show that large catches, >300kg/trawl, were distributed throughout the region in the May/June, July, and November surveys. During March surveys, large catches of yellowtail were 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 3O in relation to 3N (Tables 5 and 6).

American plaice trawl catches >150 kg/trawl (Fig. 5; Table 7) in March of 1997, 1998 and 1999, were restricted to quadrant 4 in Div. 3O. During other seasonal surveys, large catches were present in each of the four quadrants. For Cod (Fig. 6; 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.

Length Composition: Length composition of male and female yellowtail caught during the 12 surveys are shown in Fig. 7 (a,b). Generally, less than 3% of fish captured were smaller than 26 cm in length and less than 11% of the catch was composed of individuals less than 30cm in length (Table 11). Typically, yellowtail 26-46 cm in length make up the bulk of the length frequencies of the catches and furthermore, female frequencies tended toward larger sizes than male frequencies in all surveys. Otoliths were not collected during the grid surveys and therefore age compositions were not calculated. Age-length keys applied to these surveys in previous years were from r.v. surveys and were not applied for this report.

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 of results with research vessel data: The distribution of yellowtail from the 9 stratified random research vessel surveys conducted by DFO with the Campelen trawl in 1995-99 is shown in Fig. 8. The grid, which is not part of the design of the r.v. surveys, is superimposed on these plots, indicating that most of the yellowtail caught in the r.v. surveys is located within the boundaries of the grid. However, there is a declining trend in the percentage of yellowtail found in the grid (Table 12). In the first four surveys (fall 95 to spring 97), between 80 and 90% of yellowtail were located within the grid, compared with between 61 and 72% in the 5 surveys since then. Within the grid, r.v. survey catch rates of yellowtail were quite similar in all 5 fall surveys, between 73 and 86 kg per 15 minute tow on average. In the spring surveys, catch per tow in the grid area has shown an increasing trend, from 81 kg per tow in 1996 to 85, 98, and 120 kg per tow in 1997, 98, and 99. These data are consistent with observed increases in the area of distribution of yellowtail flounder in recent years, as seen in both the survey and commercial fishery data. These increases in the range of distribution are also consistent with increases in stock size in the late 1990's (Brodie et al. 1998).

Observations on sexual maturity of yellowtail: In all surveys thus far, with the exception of November 1998, observations on sexual maturity of yellowtail have been collected. These were generally obtained at sea by sampling 2 fishing sets per day, although the March 1998 data were collected from port samples. Fig. 9 indicates that about 70 to 80 % of the female yellowtail caught were mature, and that there was a slight increasing seasonal trend in the 4 surveys in 1997 and the 3 in 1999. The July 1999 survey had the highest percentage of mature females in the time series. A closer look at the data from the 4 July surveys (Fig. 10) showed that most mature females had spawned prior to the survey, although in 1996 spawning had not been completed in the grid area by July, as evidenced by the higher number of females with hydrated eggs (Mat B and Mat C stages). By comparison, the July 1997 survey had

the highest percentage of females judged to be maturing following a recent spawning (Sp. P Mat AN), and the lowest percentage of females with hydrated eggs, suggesting that spawning may have been earlier in 1997.

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 produced lower catches in a limited area. However, surveys which were conducted in July, and less so in November, produced widespread large catches of yellowtail flounder. Catch rates of yellowtail in the grid surveys were generally lower since mid 1998, but evidence from r.v. surveys and the commercial fishery suggests yellowtail distribution has increased since 1997.

References

Black, G.A. 1993. ACON data visualization software : user manual - version 7.14. Unpublished manuscript. 179 p. (G.Black, Dept. of Fisheries and Oceans, P.O.Box 550, Halifax, N.S., Canada B3J 2S7).

Brodie, W.B., D. Maddock Parsons, C. McFadden, D. Orr and S.J. Walsh. 1998. Results of surveys directed at yellowtail flounder in NAFO Divisions 3NO, conducted on a Canadian commercial trawler, 1996-1998. NAFO SCR Doc. 98/73, No. N3065.

Brodie, W.B., S.J. Walsh and D.B. Atkinson 1998. The effect of stock abundance on range contraction of yellowtail flounder on the Grand Bank of Newfoundland in the Northwest Atlantic from 1975 to 1995. J. Sea Res. 39:139-152

Brodie, W.B., S.J.Walsh, , and D.Orr. 1997. Results of surveys directed at yellowtail flounder in NAFO Divisions 3NO, conducted on a Canadian commercial trawler. NAFO SCR Doc. 97/31, Ser. No. N2863, 23 p.

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

Walsh, S.J. and B.R. McCallum 1999 The efficiency of the Engel 145 high lift otter trawl used in the DFO/FPI grid surveys for yellowtail flounder on the Grand Bank. NAFO SCR Doc 99/??

Walsh, S.J., M. J. Veitch , M. Simpson and D. Maddock Parsons 1999. Distribution, Abundance, Size and Age Composition of Yellowtail Flounder (*Pleuronectes ferruginea*) on the Grand Bank, NAFO Divisions 3LNO, as derived from the Canadian Annual Bottom Trawl Surveys. NAFO Scr. Doc 99/44:72pp.

Walsh, S.J, W.B. Brodie, M.Veitch, D. Orr, C. McFadden, and D. Maddock Parsons 1998 An Assessment of the Grand Bank Yellowtail Flounder Stock in NAFO Divisions 3LNO. NAFO SCR Doc. 98/72:78p

Table 1. Catches (kg/hr) by species and trip from FPI/DFO cooperative grid surveys.

Species	Trip	N	Mean	StdDev	Max	Min
Yellowtail flounder	**Jul96**	83	702.23	485.77	2503.57	34.00
	Mar97	68	124.76	605.40	4972.44	0.00
	May/Jun97	82	631.23	621.59	4607.00	24.50
	Jul97	85	664.76	478.13	3369.10	17.50
	Nov97	50	627.37	926.85	5931.00	3.50
	Mar98	84	78.15	92.85	427.74	0.00
	May/Jun98	73	655.19	502.41	2872.62	67.00
	Jul98	78	807.35	531.74	2678.27	0.00
	Nov98	63	558.88	774.96	5726.06	1.00
	Mar99	73	147.81	139.62	536.40	0.30
	May/Jun99	78	505.40	405.31	2289.80	57.60
	Jul99	64	583.62	341.75	1489.00	8.00
American plaice	**Jul96**	83	107.14	124.81	942.94	3.00
	Mar97	68	20.75	44.22	234.50	0.00
	May/Jun97	82	174.55	137.91	759.80	3.50
	Jul97	85	180.71	265.59	1654.40	0.00
	Nov97	50	131.78	94.88	492.90	23.30
	Mar98	84	20.25	40.64	246.74	0.00
	May/Jun98	73	173.69	111.14	785.46	33.92
	Jul98	78	229.35	361.10	2197.82	12.72
	Nov98	63	138.03	105.69	471.60	13.78
	Mar99	73	17.59	47.53	330.00	0.00
	May/Jun99	78	173.54	158.81	890.10	21.20
	Jul99	64	151.72	175.80	975.20	8.50
Cod	**Jul96**	83	111.88	288.37	2509.09	0.00
	Mar97	68	0.76	1.95	10.00	0.00
	May/Jun97	82	48.55	79.64	437.40	0.00
	Jul97	85	71.17	110.28	644.00	0.00
	Nov97	50	72.08	103.38	411.50	0.00
	Mar98	84	3.39	11.03	55.00	0.00
	May/Jun98	73	55.34	94.48	400.00	0.00
	Jul98	78	107.71	249.40	1273.80	0.00
	Nov98	63	43.13	123.37	917.70	0.00
	Mar99	73	1.98	10.25	86.00	0.00
	May/Jun99	78	72.10	140.96	1005.90	0.00
	Jul99	64	192.85	773.21	6067.20	0.00

Table 2. Catch statistics by quadrant for yellowtail flounder within FPI/DFO grid survey area.

Trip	Quad	N	Mean	Sum	StdDev	Max	Median	Min
Jul96	1	22	861.58	18954.73	565.99	2503.57	730.34	224.50
	2	16	607.93	9726.82	443.18	1818.10	472.21	34.00
	3	22	727.69	16009.16	446.35	1921.09	729.15	82.00
	4	23	591.06	13594.39	451.91	1560.34	526.79	67.00
Mar97	1	14	21.30	298.20	17.56	60.00	20.75	0.00
	2	17	396.86	6746.61	1194.35	4972.44	40.50	0.00
	3	20	40.01	800.25	43.46	148.00	20.00	2.00
	4	17	37.56	638.59	26.05	88.00	29.50	5.00
May/Jun97	1	22	774.99	17049.79	1006.21	4607.00	440.05	204.00
	2	16	661.40	10582.45	492.75	1911.00	482.04	28.50
	3	22	446.33	9819.17	288.17	920.00	435.00	24.50
	4	22	650.42	14309.29	403.50	1889.64	663.50	32.50
Jul97	1	23	746.20	17162.49	754.48	3369.10	567.38	90.00
	2	16	662.16	10594.50	243.48	1396.97	589.56	451.13
	3	23	651.14	14976.18	389.38	1669.00	589.50	136.72
	4	23	598.78	13771.85	316.08	1359.84	513.20	17.50
Nov97	1	17	457.49	7777.29	415.57	1533.48	366.50	44.50
	2	8	1522.31	12178.47	1910.54	5931.00	909.65	87.00
	3	10	661.69	6616.87	681.05	2519.00	481.42	171.50
	4	15	319.74	4796.11	301.86	1016.90	276.00	3.50
Mar98	1	19	15.25	289.84	25.18	107.27	5.00	0.00
	2	15	66.63	999.48	91.86	299.60	25.91	0.45
	3	27	128.96	3482.01	108.69	427.74	83.64	7.73
	4	23	77.97	1793.31	77.45	316.00	55.41	9.74
May/Jun98	1	18	648.20	11667.51	650.95	2872.62	435.14	130.08
	2	15	870.79	13061.90	667.84	2398.70	779.70	228.99
	3	20	721.86	14437.19	344.34	1734.08	593.36	289.95
	4	20	433.10	8662.04	191.96	795.80	426.72	67.00
Jul98	1	22	780.81	17177.82	644.42	2678.27	567.79	133.22
	2	15	974.26	14613.88	516.81	2284.75	858.87	301.76
	3	20	869.76	17395.22	358.88	1611.73	830.83	204.34
	4	21	656.51	13786.64	541.99	2383.01	647.23	0.00
Nov98	1	13	458.44	5959.68	318.98	1128.83	476.20	45.00
	2	15	990.25	14853.80	1400.53	5726.06	555.04	47.50
	3	14	715.63	10018.87	399.40	1495.87	672.97	236.81
	4	21	208.44	4377.18	178.01	632.59	203.17	1.00
Mar99	1	14	84.79	1187.10	102.26	394.40	44.95	11.00
	2	15	185.59	2783.81	173.62	510.93	128.80	0.30
	3	21	231.11	4853.27	152.52	536.40	201.10	25.60
	4	23	85.49	1966.31	55.73	200.61	80.80	5.20
May/Jun99	1	17	665.21	11308.50	670.96	2289.80	457.53	132.00
	2	17	306.77	5215.10	169.38	692.10	255.00	95.60
	3	22	474.70	10443.30	181.29	905.80	456.67	173.80
	4	22	566.09	12454.00	383.63	1464.50	474.30	57.60
Jul99	1	19	616.11	11706.10	383.02	1489.00	624.04	124.50
	2	12	530.83	6369.90	258.69	915.00	534.16	163.00
	3	11	534.73	5882.00	300.62	1087.20	467.12	196.20
	4	22	608.80	13393.60	376.94	1438.50	610.25	8.00

Table 3. Catch statistics by quadrant for American plaice within FPI/DFO grid survey area.

Trip	Quad	N	Mean	Sum	StdDev	Max	Median	Min
Jul96	1	22	64.29	1414.40	57.78	232.80	46.00	3.00
	2	16	56.02	896.30	45.89	183.50	42.40	8.00
	3	22	159.57	3510.63	201.36	942.94	95.25	17.00
	4	23	133.55	3071.62	86.74	420.23	125.50	29.50
Mar97	1	14	3.34	46.80	2.65	7.80	3.50	0.00
	2	17	31.58	536.88	63.27	212.44	7.03	0.00
	3	20	8.80	176.00	9.84	35.50	4.25	1.00
	4	17	38.32	651.46	56.29	234.50	17.00	1.50
May/Jun97	1	22	131.41	2890.94	78.66	414.50	114.20	49.80
	2	16	84.34	1349.42	39.59	171.00	75.00	21.00
	3	22	139.26	3063.72	87.69	389.56	133.05	3.50
	4	22	318.58	7008.86	164.83	759.80	296.00	104.30
Jul97	1	23	70.99	1632.83	54.29	211.28	44.44	5.60
	2	16	99.90	1598.38	94.00	321.55	60.92	20.58
	3	23	325.58	7488.35	453.99	1654.40	103.02	0.00
	4	23	201.76	4640.49	120.43	498.24	210.79	37.03
Nov97	1	17	107.15	1821.63	117.03	492.90	58.83	23.30
	2	8	135.17	1081.32	53.58	222.60	128.83	72.08
	3	10	107.27	1072.71	59.98	254.40	83.19	60.40
	4	15	174.22	2613.30	94.88	329.13	132.50	68.90
Mar98	1	19	0.82	15.56	0.78	2.00	0.46	0.00
	2	15	4.67	69.99	5.91	17.27	1.36	0.00
	3	27	10.93	295.03	7.53	33.45	12.36	0.45
	4	23	57.43	1320.84	64.01	246.74	35.91	3.18
May/Jun98	1	18	141.07	2539.33	93.17	339.20	106.68	39.22
	2	15	129.38	1940.74	58.15	235.32	120.84	67.84
	3	20	223.17	4463.33	157.91	785.46	206.40	33.92
	4	20	186.80	3735.97	79.39	415.52	171.72	87.45
Jul98	1	22	84.95	1868.92	79.98	271.78	43.99	12.72
	2	15	84.09	1261.37	74.44	241.15	44.52	15.90
	3	20	510.21	10204.13	615.66	2197.82	314.43	25.44
	4	21	216.91	4555.17	116.27	431.42	227.68	47.70
Nov98	1	13	139.94	1819.21	113.97	457.13	89.04	39.22
	2	15	105.99	1589.79	88.94	316.48	68.07	28.50
	3	14	141.13	1975.84	127.39	411.81	87.72	13.78
	4	21	157.67	3311.13	97.78	471.60	137.14	47.00
Mar99	1	14	1.20	16.75	0.81	2.60	1.40	0.00
	2	15	6.29	94.41	10.78	41.00	1.90	0.30
	3	21	8.45	177.53	5.20	18.20	8.20	0.00
	4	23	43.27	995.20	79.17	330.00	10.40	1.20
May/Jun99	1	17	73.51	1249.60	33.08	142.50	72.60	24.40
	2	17	56.14	954.30	28.22	129.30	47.70	21.20
	3	22	265.00	5829.90	195.43	890.10	218.92	38.60
	4	22	250.11	5502.40	136.66	644.10	228.18	41.30
Jul99	1	19	55.13	1047.40	46.48	204.60	50.46	8.50
	2	12	39.24	470.90	34.04	123.00	30.74	8.50
	3	11	322.51	3547.60	246.42	975.20	277.69	55.10
	4	22	211.10	4644.20	163.39	714.80	164.14	27.30

Table 4. Catch statistics by quadrant for cod within FPI/DFO grid survey area.

Trip	Quad	N	Mean	Sum	StdDev	Max	Median	Min
Jul96	1	22	226.66	4986.59	521.82	2509.09	76.50	6.00
	2	16	19.06	305.00	18.87	53.00	14.50	0.00
	3	22	42.31	930.80	79.33	295.00	5.00	0.00
	4	23	133.21	3063.79	137.93	520.00	78.00	0.00
Mar97	1	14	0.87	12.20	1.53	5.50	0.00	0.00
	2	17	0.11	1.80	0.37	1.50	0.00	0.00
	3	20	1.02	20.45	2.45	10.00	0.00	0.00
	4	17	1.00	17.00	2.47	10.00	0.00	0.00
May/Jun97	1	22	84.62	1861.70	86.53	308.00	44.60	0.00
	2	16	10.72	171.48	11.85	36.00	7.20	0.00
	3	22	5.65	124.23	13.39	51.00	0.00	0.00
	4	22	82.90	1823.73	105.27	437.40	38.40	0.00
Jul97	1	23	112.44	2586.04	110.06	380.00	66.09	0.00
	2	16	24.85	397.65	31.52	133.30	22.66	0.00
	3	23	18.52	426.02	30.42	148.17	10.00	0.00
	4	23	114.76	2639.44	156.52	644.00	63.96	0.00
Nov97	1	17	28.15	478.50	70.06	293.40	4.80	0.00
	2	8	14.06	112.50	20.54	45.60	0.25	0.00
	3	10	169.86	1698.60	120.64	383.40	166.20	9.00
	4	15	87.61	1314.20	104.28	411.50	48.00	0.00
Mar98	1	19	0.19	3.68	0.66	2.77	0.00	0.00
	2	15	0.00	0.00	0.00	0.00	0.00	0.00
	3	27	2.07	55.82	7.14	36.95	0.00	0.00
	4	23	9.78	224.87	18.35	55.00	0.45	0.00
May/Jun98	1	18	86.18	1551.26	96.01	297.86	48.30	4.80
	2	15	7.98	119.68	17.98	66.00	0.00	0.00
	3	20	40.46	809.20	114.31	400.00	0.00	0.00
	4	20	78.00	1560.00	93.96	297.60	32.70	0.00
Jul98	1	22	255.03	5610.57	404.25	1273.80	116.31	0.00
	2	15	12.49	187.40	21.12	77.20	0.00	0.00
	3	20	27.65	553.00	86.90	391.20	2.70	0.00
	4	21	97.62	2050.08	152.37	625.68	42.00	0.00
Nov98	1	13	25.15	326.90	48.75	182.40	7.20	0.00
	2	15	24.42	366.29	67.16	263.19	2.00	0.00
	3	14	29.49	412.80	39.33	126.00	12.00	0.00
	4	21	76.71	1611.00	199.52	917.70	13.20	0.00
Mar99	1	14	0.76	10.70	1.27	3.40	0.00	0.00
	2	15	0.49	7.40	1.65	6.40	0.00	0.00
	3	21	0.49	10.30	1.39	5.60	0.00	0.00
	4	23	5.03	115.80	18.02	86.00	0.00	0.00
May/Jun99	1	17	137.19	2332.20	234.39	1005.90	76.20	0.00
	2	17	20.34	345.80	41.30	135.80	0.00	0.00
	3	22	20.36	448.00	37.42	142.10	0.00	0.00
	4	22	113.55	2498.00	134.51	510.20	61.02	0.00
Jul99	1	19	501.85	9535.20	1384.48	6067.20	94.40	0.00
	2	12	28.00	336.00	45.78	115.20	0.00	0.00
	3	11	44.60	490.60	67.74	219.60	15.60	0.00
	4	22	90.03	1980.60	151.03	609.70	28.80	0.00

Table 5. Catches (kg/hr) by NAFO Division from FPI grid surveys.

		Yellowtail		American plaice		Cod	
Trip	**NAFO**	**N**	**Mean**	**N**	**Mean**	**N**	**Mean**
Jul96	**3N**	46	749.06	46	108.27	46	40.41
	3O	37	644.01	37	105.74	37	200.73
Mar97	**3N**	44	175.29	44	16.83	44	0.68
	3O	24	32.12	24	27.95	24	0.90
May/Jun97	**3N**	47	676.42	47	128.94	47	18.65
	3O	35	570.54	35	235.79	35	88.70
Jul97	**3N**	49	694.44	49	205.78	49	32.16
	3O	36	624.37	36	146.57	36	124.25
Nov97	**3N**	24	901.68	24	118.08	24	99.16
	3O	26	374.17	26	144.42	26	47.08
Mar98	**3N**	50	93.11	50	8.07	50	1.19
	3O	34	56.15	34	38.18	34	6.62
May/Jun98	**3N**	44	796.68	44	172.53	44	32.24
	3O	29	440.51	29	175.45	29	90.40
Jul98	**3N**	44	925.85	44	280.98	44	25.92
	3O	34	654.00	34	162.54	34	213.54
Nov98	**3N**	36	753.75	36	119.62	36	31.66
	3O	27	299.06	27	162.58	27	58.41
Mar99	**3N**	44	193.14	44	7.91	44	0.48
	3O	29	79.05	29	32.26	29	4.25
May/Jun99	**3N**	46	470.91	46	175.18	46	18.62
	3O	32	554.97	32	171.18	32	148.98
Jul99	**3N**	31	601.43	31	157.66	31	40.07
	3O	33	566.88	33	146.14	33	336.37

Table 6. Catches of yellowtail flounder (kg/hr) from common blocks fished in all twelve surveys.

Block	**Jul96**	**Mar97**	**May97**	**Jul97**	**Nov97**	**Mar98**	**May/ Jun98**	**Jul98**	**Nov98**	**Mar99**	**May/ Jun99**	**Jul99**
A01	1315.9	7.0	234.9	997.6	436.8	26.8	797.0	2236.8	741.9	23.8	1981.5	1489.0
A03	1086.9	23.7	204.0	690.8	300.8	6.0	603.5	835.1	621.8	394.4	378.2	520.2
A05	1410.5	35.5	421.8	167.0	1533.5	17.0	323.0	418.7	628.9	39.5	195.4	720.2
A09	123.6	27.5	49.0	225.1	3.5	57.3	105.0	0.0	6.0	6.0	57.6	13.0
B02	321.0	0.0	210.0	482.3	44.5	0.0	477.6	379.3	45.0	11.0	168.0	124.5
B09	254.2	36.0	142.0	582.3	9.0	59.1	469.1	26.0	9.5	9.4	214.0	101.0
C09	471.9	21.5	638.0	489.4	360.9	181.3	350.9	647.2	213.2	34.6	492.3	1360.8
C10	1430.9	88.0	716.5	1014.1	50.5	316.0	795.8	503.6	59.9	100.4	1464.5	528.2
E08	1167.9	11.0	714.0	506.5	313.9	15.5	594.1	898.1	250.6	100.2	1069.3	883.6
F05	1818.1	498.3	935.6	1397.0	5931.0	66.4	2245.0	2284.8	589.8	252.5	182.9	170.5
G03	344.7	81.0	322.0	518.5	87.0	47.7	907.7	1039.3	695.6	375.7	172.2	667.3
G04	868.7	4972.4	610.2	451.1	2023.2	299.6	592.6	899.0	5726.1	251.7	410.4	538.9
G07	721.7	28.5	638.9	711.3	548.5	1231.4	1734.1	1042.1	934.5	201.1	481.3	589.4
H04	357.6	205.0	457.0	684.7	377.1	141.4	779.7	941.4	1245.7	432.8	191.0	419.6
H08	736.7	7.5	697.4	631.6	414.4	58.2	695.7	735.0	236.8	138.7	294.2	220.9
Mean	828.7	402.9	466.1	636.6	829.0	168.2	764.7	859.1	800.4	158.1	516.9	556.5

Table 7. Catches of American plaice (kg/hr) from common blocks fished in all twelve surveys.

Block	Jul96	Mar97	May97	Jul97	Nov97	Mar98	May/ Jun98	Jul98	Nov98	Mar99	May/ Jun99	Jul99
A01	232.8	3.5	102.7	114.3	41.0	0.5	285.7	218.9	184.9	0.4	118.7	204.6
A03	84.5	7.8	186.0	41.0	196.1	2.0	269.6	213.4	238.7	1.8	142.5	56.5
A05	110.0	3.5	162.2	35.0	492.9	2.0	125.2	152.6	204.1	0.3	96.6	104.4
A09	114.0	56.0	408.1	498.2	132.5	133.6	161.7	227.7	163.0	174.0	150.4	336.8
B02	45.0	0.0	81.0	158.7	51.0	0.0	245.5	77.2	57.5	2.6	72.6	56.0
B09	420.2	45.0	519.4	326.9	176.1	246.7	169.6	200.1	267.5	105.0	315.6	276.2
C09	144.0	42.0	564.0	264.8	296.8	138.3	217.3	307.1	471.6	8.0	644.1	435.7
C10	293.0	85.0	362.5	349.5	329.1	89.1	217.3	309.7	213.7	38.2	405.6	85.1
E08	92.0	3.5	198.0	106.0	82.7	6.4	100.2	274.5	184.4	8.6	201.6	187.8
F05	20.0	170.6	42.3	22.3	106.0	17.3	67.8	15.9	37.1	16.8	21.2	26.0
G03	47.5	18.0	91.0	39.2	72.1	1.4	178.1	54.1	74.2	12.5	55.0	15.9
G04	39.0	212.4	83.3	30.6	169.6	15.5	103.9	44.5	163.8	41.0	47.7	8.5
G07	80.0	3.0	185.7	86.8	70.0	68.3	367.3	382.7	111.3	8.2	233.4	265.3
H04	42.0	15.0	78.0	75.3	72.1	5.5	82.7	40.8	183.7	7.8	42.8	79.5
H08	124.0	3.5	181.9	155.4	82.7	15.0	244.7	33.9	90.6	12.8	494.5	317.2
Mean	125.9	44.6	216.4	153.6	158.0	49.4	189.1	170.2	176.4	29.2	202.8	163.7

Table 8. Catches of cod (kg/hr) from common blocks fished in all twelve surveys.

Block	Jul96	Mar97	May97	Jul97	Nov97	Mar98	May/ Jun98	Jul98	Nov98	Mar99	May/ Jun99	Jul99
A01	506.0	0.0	51.0	101.3	0.0	0.0	5.4	141.0	1.5	2.4	66.8	94.4
A03	274.0	0.0	175.2	280.6	4.8	0.0	28.8	16.8	12.0	0.0	125.6	107.4
A05	2509.1	0.0	260.0	232.9	19.2	0.0	312.8	1208.7	182.4	0.0	1005.9	6067.2
A09	78.0	0.0	34.8	25.0	0.0	0.0	196.2	19.2	0.0	86.0	58.2	6.0
B02	168.0	1.2	75.6	38.0	0.5	0.0	63.6	136.3	3.6	0.0	84.6	64.5
B09	89.0	0.0	0.0	87.0	6.0	1.4	66.0	33.0	30.0	0.0	303.7	84.5
C09	54.0	0.0	26.5	14.0	109.2	52.7	4.8	43.2	13.2	0.0	63.0	48.6
C10	33.0	0.0	0.0	16.0	20.4	55.0	47.4	31.2	0.0	0.0	65.3	56.4
E08	145.2	0.0	252.0	65.0	66.0	1.8	201.0	43.8	205.8	0.0	0.0	217.2
F05	4.0	0.0	1.8	5.3	0.0	0.0	0.0	0.0	30.0	0.0	0.0	0.0
G03	2.5	0.0	11.0	24.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
G04	28.0	0.0	4.1	32.0	22.0	0.0	0.0	13.2	1.2	0.0	0.0	0.0
G07	190.0	0.7	14.8	22.4	312.0	0.0	0.0	59.4	71.4	0.0	142.1	98.4
H04	26.0	0.0	10.8	24.5	44.4	0.0	0.0	0.0	0.0	0.0	135.8	0.0
H08	0.0	0.0	0.0	0.0	9.0	0.0	0.0	4.2	0.0	0.0	0.0	0.0
Mean	273.8	0.1	61.2	64.5	40.9	7.4	61.7	116.7	36.7	5.9	136.7	456.3

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

Block	Jul96	Mar97	May97	Jul97	Nov97	Mar98	May/ Jun98	Jul98	Nov98	Mar99	May/ Jun99	Jul99	Mean
G04	0.04	0.04	0.14	0.07	0.08	0.05	0.18	0.05	0.03	0.16	0.12	0.02	0.08
F05	0.01	0.34	0.05	0.02	0.02	0.26	0.03	0.01	0.06	0.07	0.12	0.15	0.09
H04	0.12	0.07	0.17	0.11	0.19	0.04	0.11	0.04	0.15	0.02	0.22	0.19	0.12
A01	0.18	0.50	0.44	0.11	0.09	0.02	0.36	0.10	0.25	0.02	0.06	0.14	0.19
G03	0.14	0.22	0.28	0.08	0.83	0.03	0.20	0.05	0.11	0.03	0.32	0.02	0.19
G07	0.11	0.11	0.29	0.12	0.13	0.06	0.21	0.37	0.12	0.04	0.48	0.45	0.21
A05	0.08	0.10	0.38	0.21	0.32	0.12	0.39	0.36	0.32	0.01	0.49	0.14	0.24
E08	0.08	0.32	0.28	0.21	0.26	0.41	0.17	0.31	0.74	0.09	0.19	0.21	0.27
A03	0.08	0.33	0.91	0.06	0.65	0.33	0.45	0.26	0.38	0.00	0.38	0.11	0.33
H08	0.17	0.47	0.26	0.25	0.20	0.26	0.35	0.05	0.38	0.09	1.68	1.44	0.47
B02	0.14		0.39	0.33	1.15		0.51	0.20	1.28	0.24	0.43	0.45	0.51
C09	0.31	1.95	0.88	0.54	0.82	0.76	0.62	0.47	2.21	0.23	1.31	0.32	0.87
C10	0.20	0.97	0.51	0.34	6.52	0.28	0.27	0.61	3.57	0.38	0.28	0.16	1.17
B09	1.65	1.25	3.66	0.56	19.57	4.18	0.36	7.70	28.15	11.17	1.47	2.73	6.87
A09	0.92	2.04	8.33	2.21	37.86	2.33	1.54		27.17	29.00	2.61	25.91	12.72

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

Yellowtail Catch >100 Kg

	A	B	C	D	E	F	G	H	I	J
1	0, 9, 12	0, 6, 7	1, 5, 7	2, 8, 10	5, 9, 11	1, 2, 2	0, 7, 11	1, 1, 1	0, 8, 11	
2	0, 7, 9	0, 7, 12	0, 8, 10	0, 5, 8	1, 8, 11	2, 8, 11		0, 8, 11		0, 5, 10
3	1, 10, 12	1, 8, 9	1, 8, 11	1, 6, 8	4, 6, 6	5, 9, 10	2, 9, 12	0, 0, 1	1, 9, 11	
4		0, 7, 11	3, 8, 9	1, 7, 9	4, 8, 9	4, 10, 11	4, 12, 12	3, 12, 12		0, 1, 7
5	0, 9, 12		2, 9, 11	2, 9, 9	2, 5, 7	6, 11, 12	5, 10, 11	1, 9, 11	0, 6, 10	
6		2, 9, 11		1, 7, 11	1, 7, 10	4, 10, 11	4, 8, 9	4, 9, 11		0, 4, 9
7	0, 9, 11	0, 8, 11	0, 8, 11	1, 9, 11	0, 8, 10	4, 11, 11	2, 11, 12	3, 10, 11	1, 9, 10	
8	0, 7, 11	0, 11, 11	0, 8, 11	0, 8, 10	0, 10, 12	1, 7, 9	0, 8, 8	1, 10, 12	0, 7, 10	0, 6, 10
9	0, 3, 12	0, 6, 12	0, 10, 12	0, 9, 11	0, 8, 10	1, 9, 10	0, 8, 10	1, 9, 10	0, 8, 11	0, 5, 9
10	0, 2, 11	0, 4, 11	0, 9, 12	0, 9, 9	2, 9, 10	1, 8, 9	2, 8, 9	0, 8, 8	1, 8, 10	0, 5, 9

Yellowtail Catch >300 Kg

	A	B	C	D	E	F	G	H	I	J
1	0, 8, 12	0, 6, 7	1, 4, 7	2, 8, 10	5, 9, 11	1, 1, 2	0, 5, 11	1, 1, 1	0, 6, 11	
2	0, 6, 9	0, 4, 12	0, 7, 10	0, 1, 8	1, 7, 11	2, 7, 11		0, 8, 11		0, 3, 10
3	1, 9, 12	1, 6, 9	1, 4, 11	0, 0, 8	3, 4, 6	5, 8, 10	2, 8, 12	0, 0, 1	0, 7, 11	
4		0, 3, 11	2, 6, 9	1, 6, 9	4, 6, 9	3, 9, 11	4, 10, 12	2, 9, 12		0, 1, 7
5	0, 7, 12		1, 7, 11	1, 8, 9	2, 5, 7	6, 8, 12	4, 8, 11	1, 7, 11	0, 4, 10	
6		1, 8, 11		1, 7, 11	1, 7, 10	4, 8, 11	4, 6, 9	4, 9, 11		0, 1, 9
7	0, 8, 11	0, 5, 11	0, 7, 11	0, 7, 11	0, 6, 10	2, 7, 11	1, 10, 12	1, 7, 11	1, 8, 10	
8	0, 5, 11	0, 7, 11	0, 6, 11	0, 8, 10	0, 8, 12	0, 6, 9	0, 6, 8	1, 6, 12	0, 5, 10	0, 5, 10
9	0, 0, 12	0, 2, 12	0, 8, 12	0, 8, 11	0, 6, 10	1, 9, 10	0, 7, 10	1, 6, 10	0, 7, 11	0, 1, 9
10	0, 0, 11	0, 0, 11	0, 8, 12	0, 6, 9	2, 7, 10	0, 7, 9	1, 5, 9	0, 5, 8	0, 7, 10	0, 3, 9

Yellowtail Catch >500 Kg

	A	B	C	D	E	F	G	H	I	J
1	0, 7, 12	0, 5, 7	1, 3, 7	2, 7, 10	5, 9, 11	0, 0, 2	0, 3, 11	1, 1, 1	0, 4, 11	
2	0, 4, 9	0, 0, 12	0, 2, 10	0, 0, 8	1, 6, 11	2, 5, 11		0, 7, 11		0, 1, 10
3	0, 6, 12	1, 4, 9	0, 2, 11	0, 0, 8	2, 2, 6	4, 5, 10	1, 5, 12	0, 0, 1	0, 5, 11	
4		0, 0, 11	0, 3, 9	0, 3, 9	3, 4, 9	3, 9, 11	4, 8, 12	1, 4, 12		0, 0, 7
5	0, 4, 12		1, 3, 11	1, 6, 9	1, 3, 7	6, 7, 12	3, 6, 11	0, 4, 11	0, 2, 10	
6		1, 6, 11		1, 6, 11	1, 6, 10	4, 8, 11	3, 5, 9	3, 7, 11		0, 0, 9
7	0, 7, 11	0, 3, 11	0, 7, 11	0, 4, 11	0, 3, 10	2, 7, 11	1, 9, 12	1, 5, 11	1, 5, 10	
8	0, 3, 11	0, 6, 11	0, 2, 11	0, 3, 10	0, 7, 12	0, 6, 9	0, 6, 8	1, 5, 12	0, 2, 10	0, 2, 10
9	0, 0, 12	0, 1, 12	0, 3, 12	0, 7, 11	0, 5, 10	1, 7, 10	0, 5, 10	0, 1, 10	0, 3, 11	0, 0, 9
10	0, 0, 11	0, 0, 11	0, 7, 12	0, 4, 9	2, 6, 10	0, 4, 9	0, 2, 9	0, 4, 8	0, 5, 10	0, 2, 9

Yellowtail Catch >700 Kg

	A	B	C	D	E	F	G	H	I	J
1	0, 7, 12	0, 5, 7	1, 1, 7	2, 7, 10	5, 8, 11	0, 0, 2	0, 0, 11	0, 0, 1	0, 4, 11	
2	0, 1, 9	0, 0, 12	0, 1, 10	0, 0, 8	1, 6, 11	2, 3, 11		0, 5, 11		0, 0, 10
3	0, 2, 12	1, 2, 9	0, 1, 11	0, 0, 8	1, 1, 6	3, 4, 10	0, 2, 12	0, 0, 1	0, 3, 11	
4		0, 0, 11	0, 2, 9	0, 0, 9	1, 1, 9	2, 7, 11	4, 5, 12	1, 3, 12		0, 0, 7
5	0, 3, 12		1, 1, 11	1, 3, 9	1, 2, 7	6, 6, 12	2, 3, 11	0, 2, 11	0, 1, 10	
6		1, 2, 11		1, 4, 11	0, 1, 10	4, 6, 11	2, 4, 9	2, 5, 11		0, 0, 9
7	0, 3, 11	0, 1, 11	0, 5, 11	0, 3, 11	0, 2, 10	1, 5, 11	0, 6, 12	1, 5, 11	1, 4, 10	
8	0, 0, 11	0, 2, 11	0, 2, 11	0, 1, 10	0, 5, 12	0, 3, 9	0, 4, 8	1, 2, 12	0, 2, 10	0, 1, 10
9	0, 0, 12	0, 0, 12	0, 1, 12	0, 2, 11	0, 0, 10	0, 3, 10	0, 4, 10	0, 0, 10	0, 2, 11	0, 0, 9
10	0, 0, 11	0, 0, 11	0, 5, 12	0, 1, 9	1, 2, 10	0, 0, 9	0, 0, 9	0, 1, 8	0, 3, 10	0, 1, 9

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

	Percentage of yellowtail		
Trip	<26cm	<30cm	>=40cm
Jul96	1.56	5.21	26.60
Mar97	2.40	10.26	21.43
May/Jun97	1.62	7.44	25.56
Jul97	1.07	6.50	26.30
Nov97	0.21	2.76	28.52
Mar98	1.56	9.32	24.60
May/Jun98	0.62	4.68	28.23
Jul98	1.33	8.06	22.74
Nov98	0.66	5.25	23.02
Mar99	0.56	6.55	22.74
May/Jun99	0.71	6.09	26.96
Jul99	0.32	3.64	27.43

Table 12. Numbers and weights of yellowtail caught in grid area during DFO stratified random surveys in Div. 3LNO.

Yr/season	**Yellowtail in grid area**		**Yellowtail in survey**		**Pct of total catch in grid**	
	Numbers	Weight (kg)	Numbers	Weight (kg)	% nos	%wt
95F	19842	4528	22276	4997	89.1%	90.6%
96S	14695	3878	16937	4619	86.8%	84.0%
96F	7038	1899	8640	2141	81.5%	88.7%
97S	12059	2807	15010	3882	80.3%	72.3%
97F	10640	2928	17349	5037	61.3%	58.1%
98S	14841	4016	21134	5822	70.2%	69.0%
98F	8987	2507	12512	3696	71.8%	67.8%
99S	21718	5147	34998	9895	62.1%	52.0%
99F	12778	2946	18570	4978	68.8%	59.2%

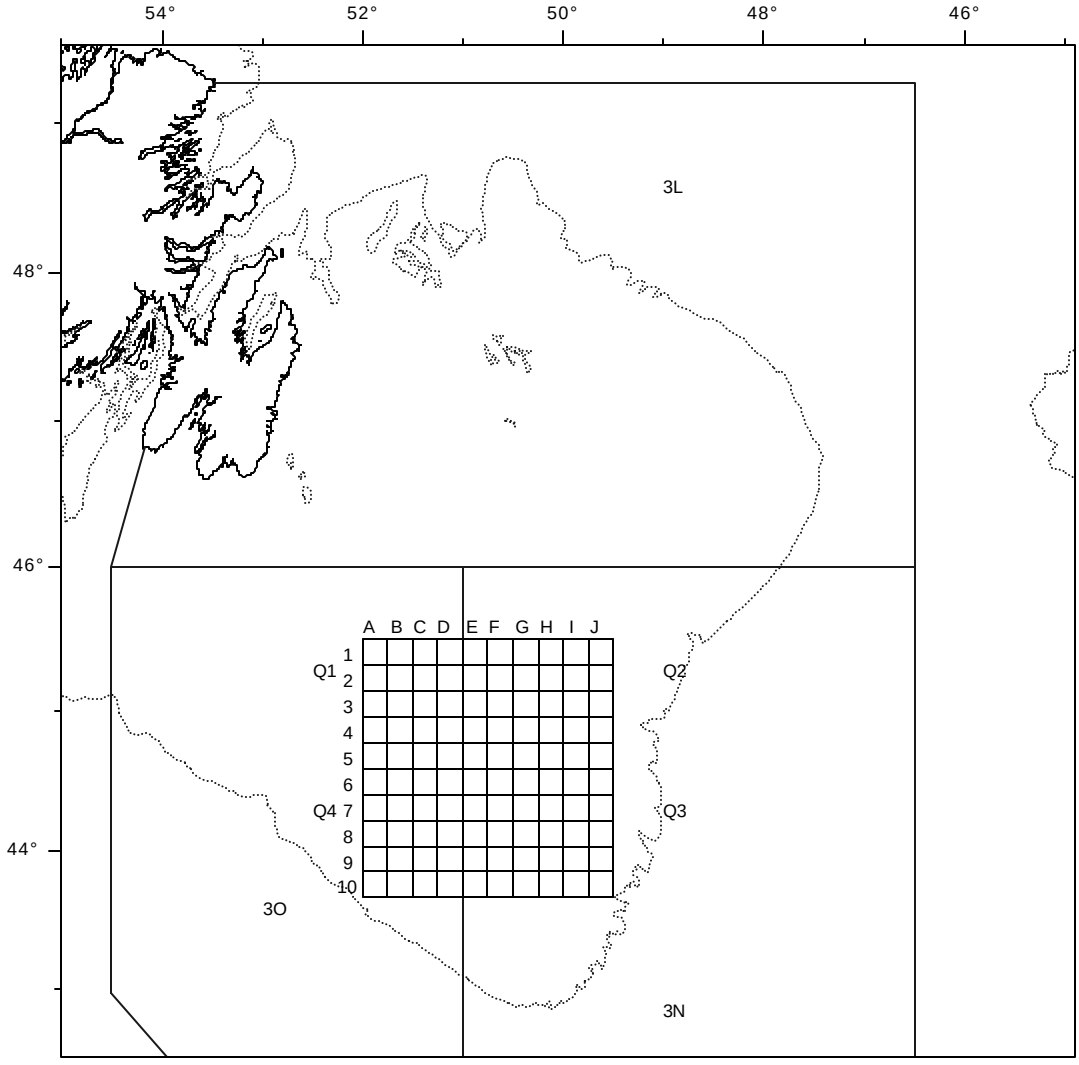
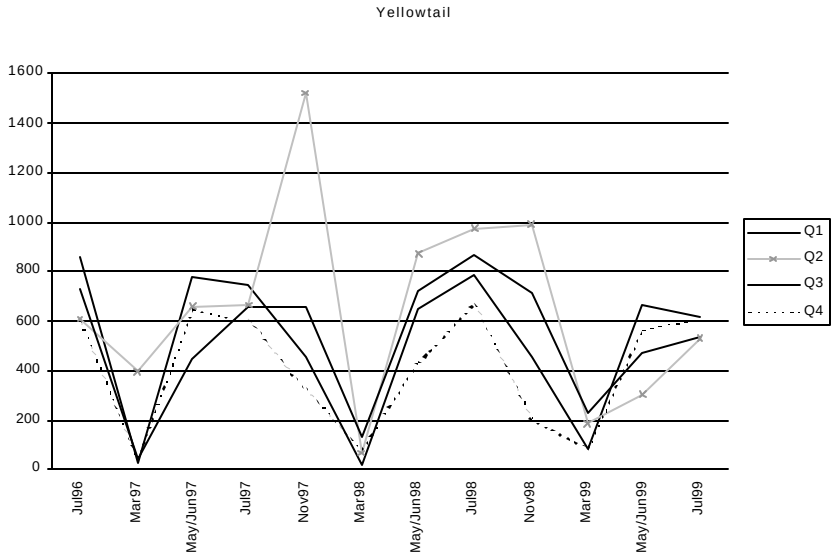
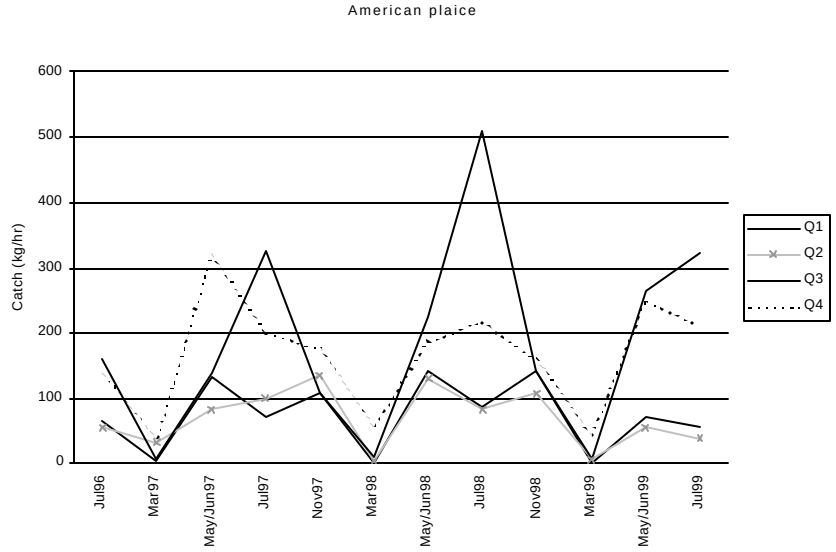


Figure 1: Location of grid used in cooperative surveys directed at yellowtail flounder in NAFO Div. 3NO. Quadrants are groups of 5x5 blocks.

a.



b.



c.

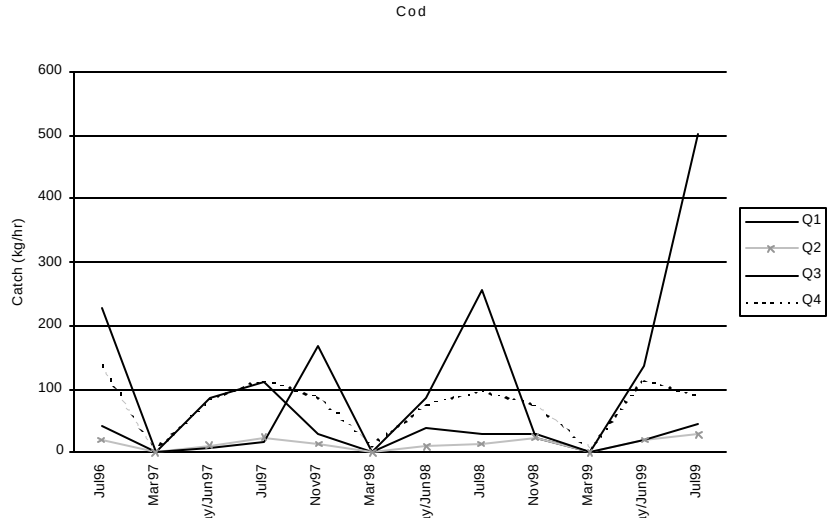
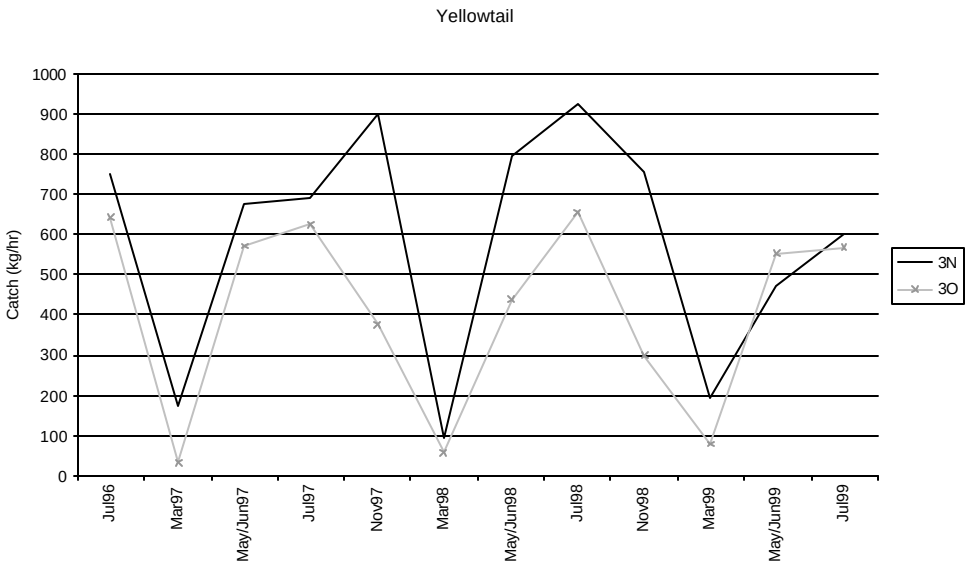
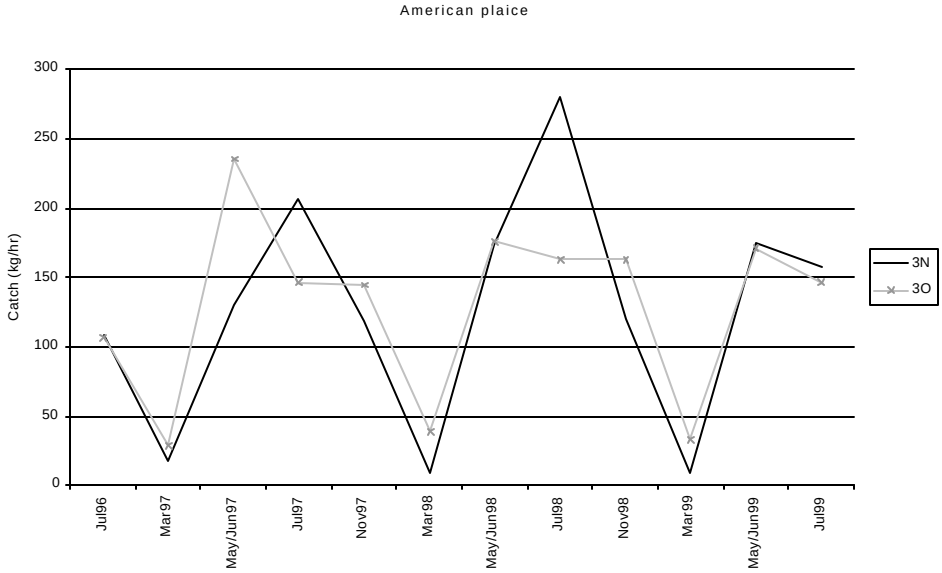


Figure 2. Catch (kg/hr) of yellowtail, American plaice and cod by quadrant, caught in cooperative surveys from 1996-1999.

a.



b.



c.

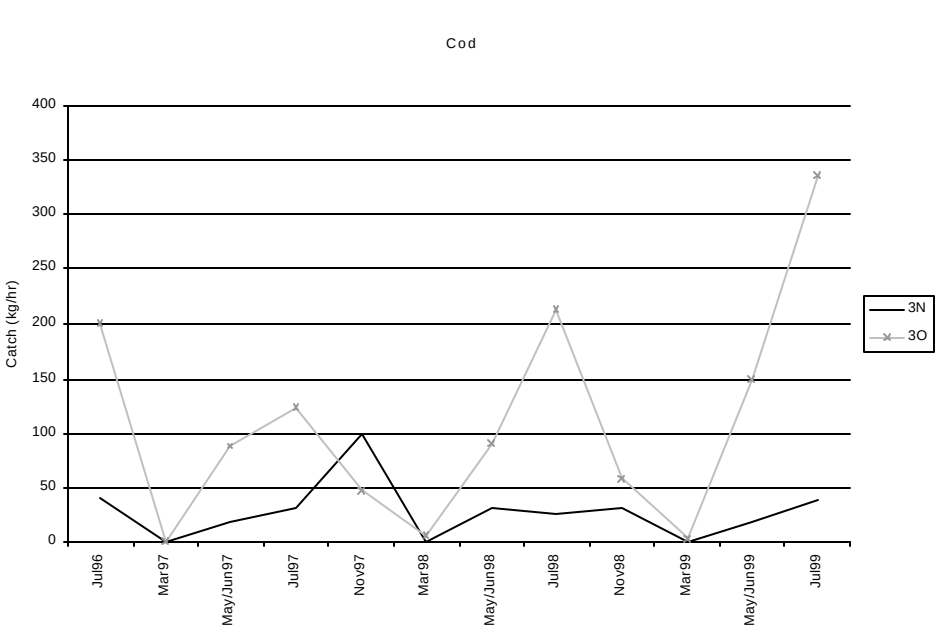


Figure 3. Catch (kg/hr) of yellowtail, American plaice and cod by NAFO Division, caught in cooperative surveys from 1996-1999

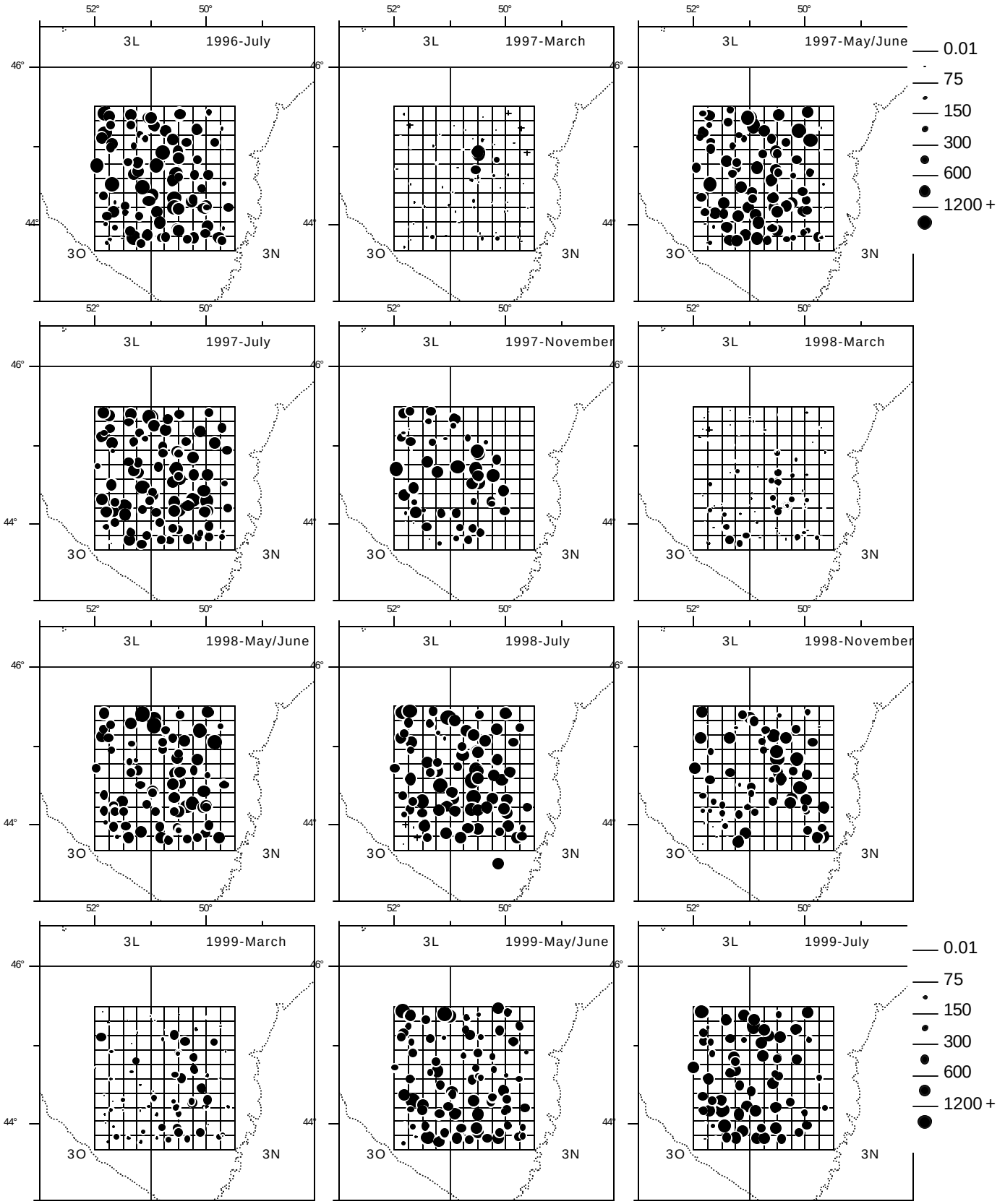


Fig. 4. Distribution of YELLOWTAIL FLOUNDER Catches (Kg. per standard 3 Nm. tow) from industry grid surveys conducted in various seasons from 1996 to 1999.

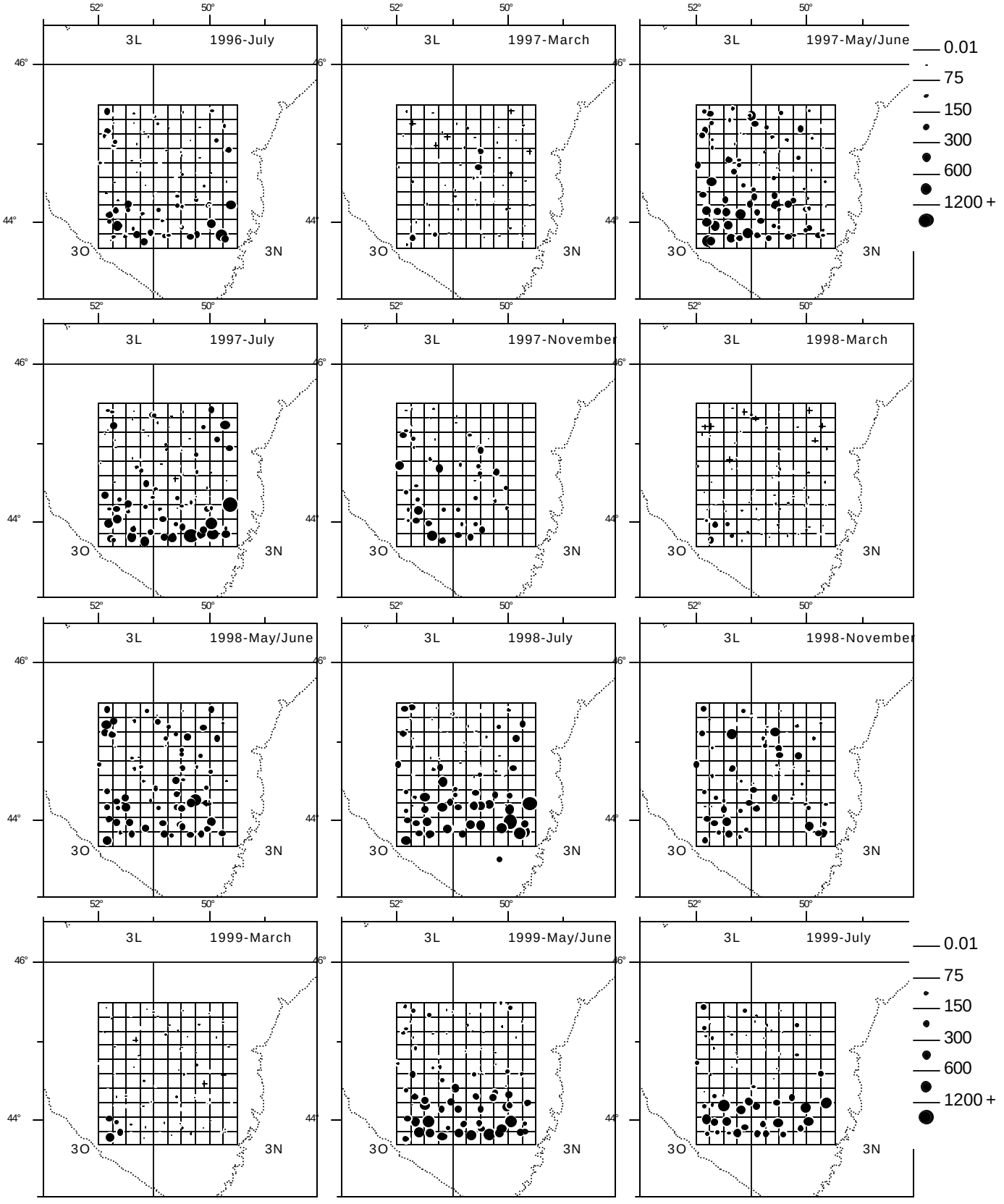


Fig. 5. Distribution of AMERICAN PLAICE Catches (Kg. per standard 3 Nm. tow) from industry grid surveys conducted in various seasons from 1996 to 1999.

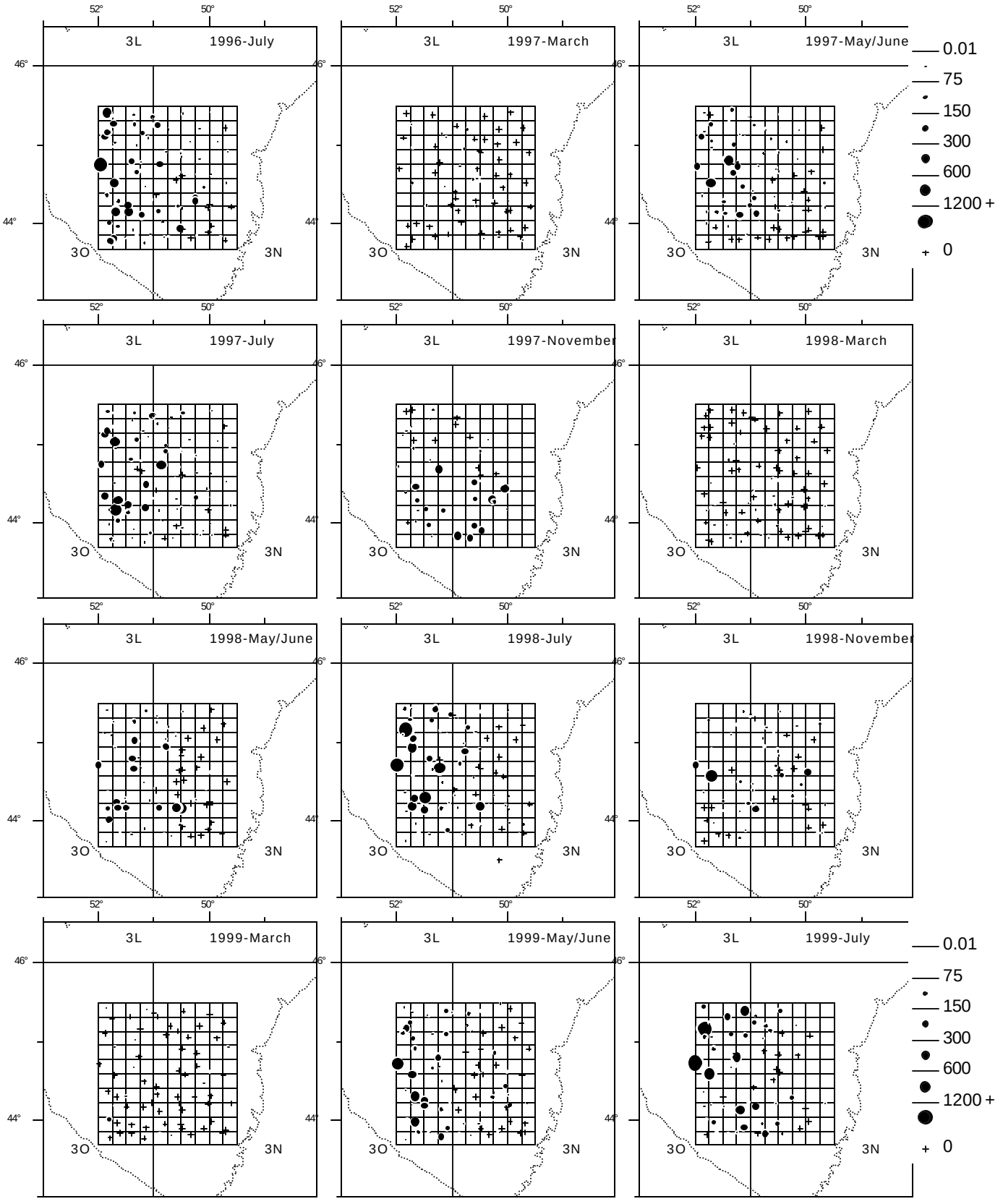


Fig. 6. Distribution of COD Catches (Kg. per standard 3 Nm. tow) from industry grid surveys conducted in various seasons from 1996 to 1999.

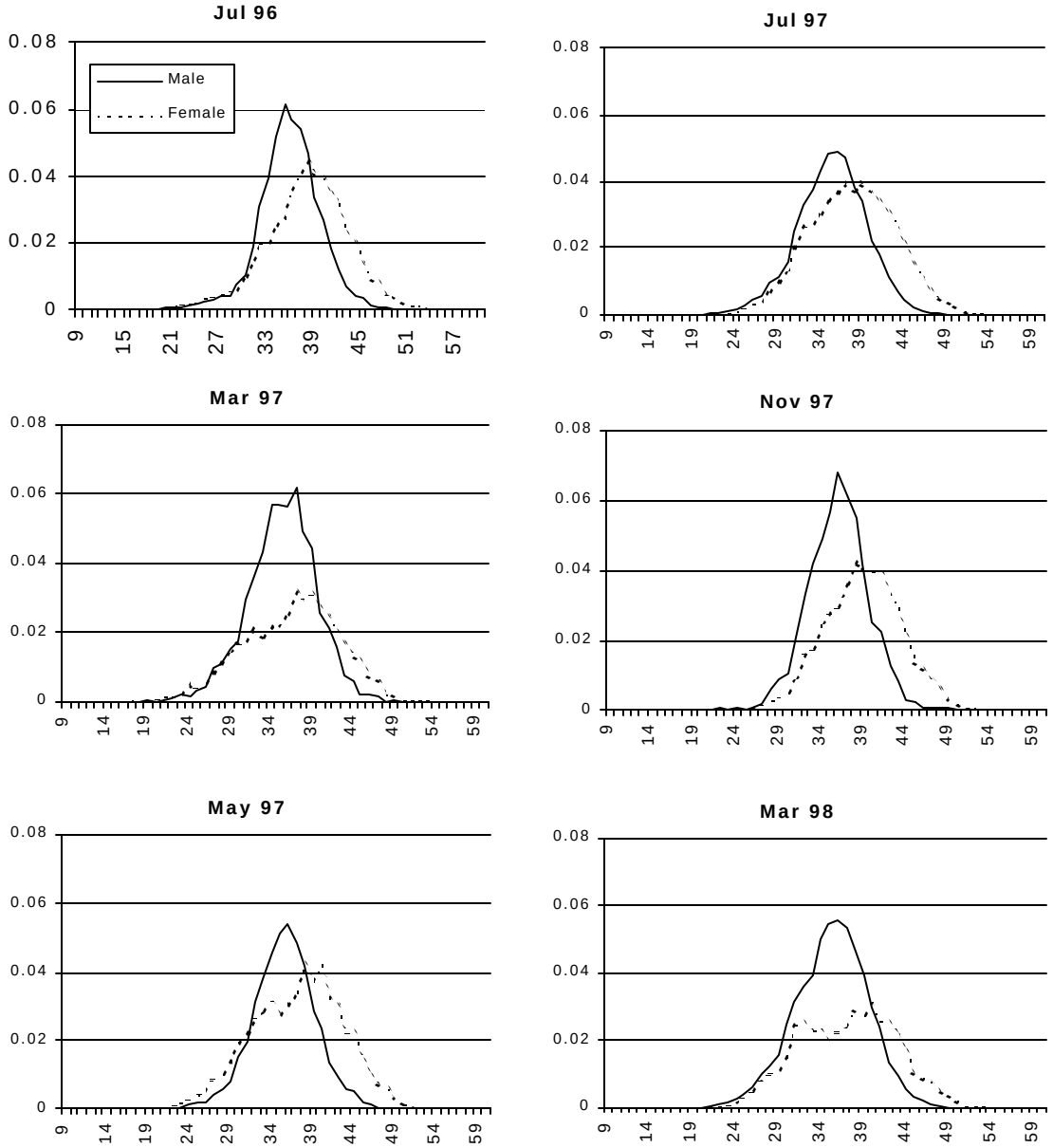


Figure 7a. Length compostion of yellowtail flounder caught in the Atlantic Lindsey surveys.

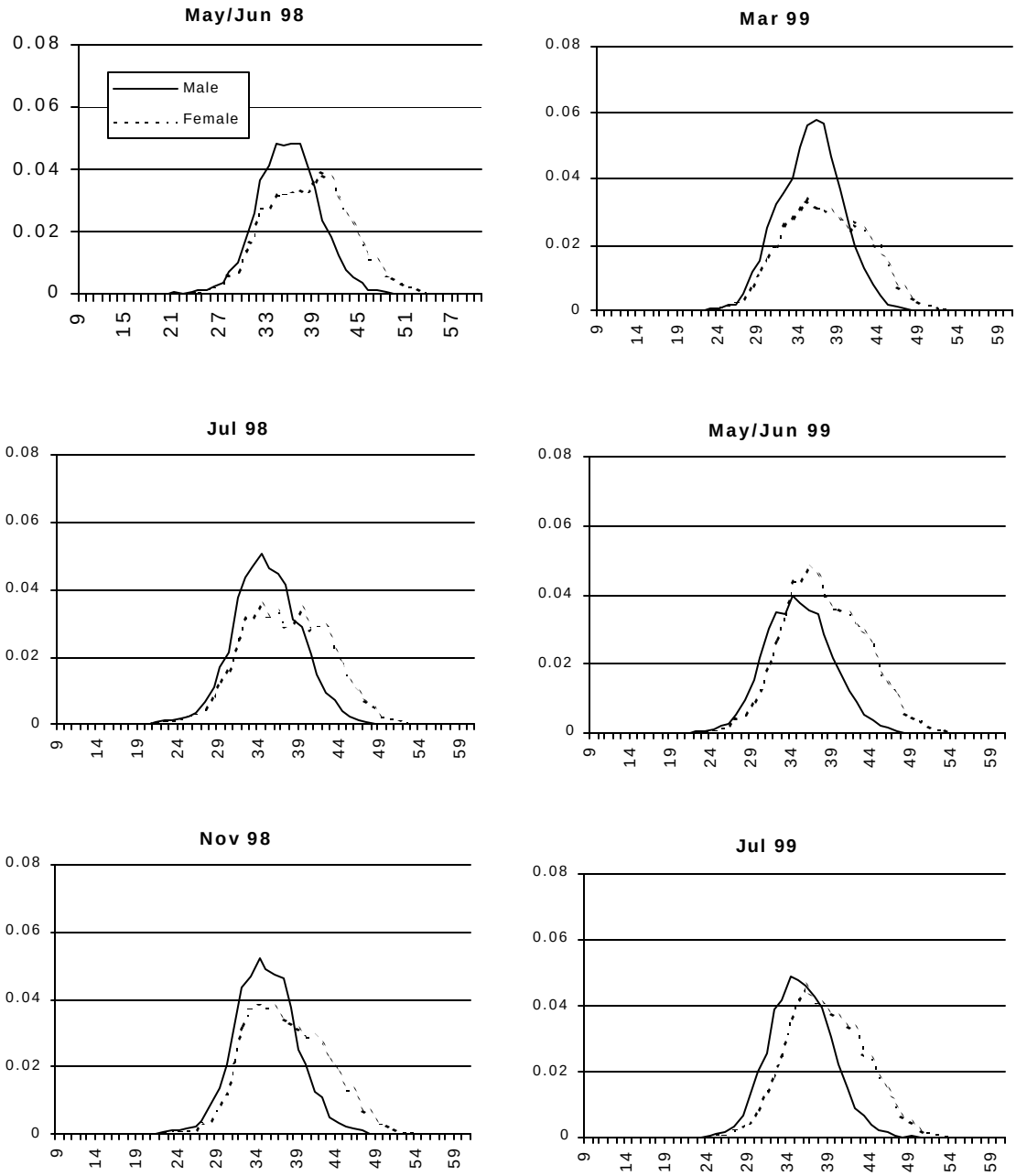


Figure 7b. Length compostion of flounder caught in the Atlantic Lindsey surveys.

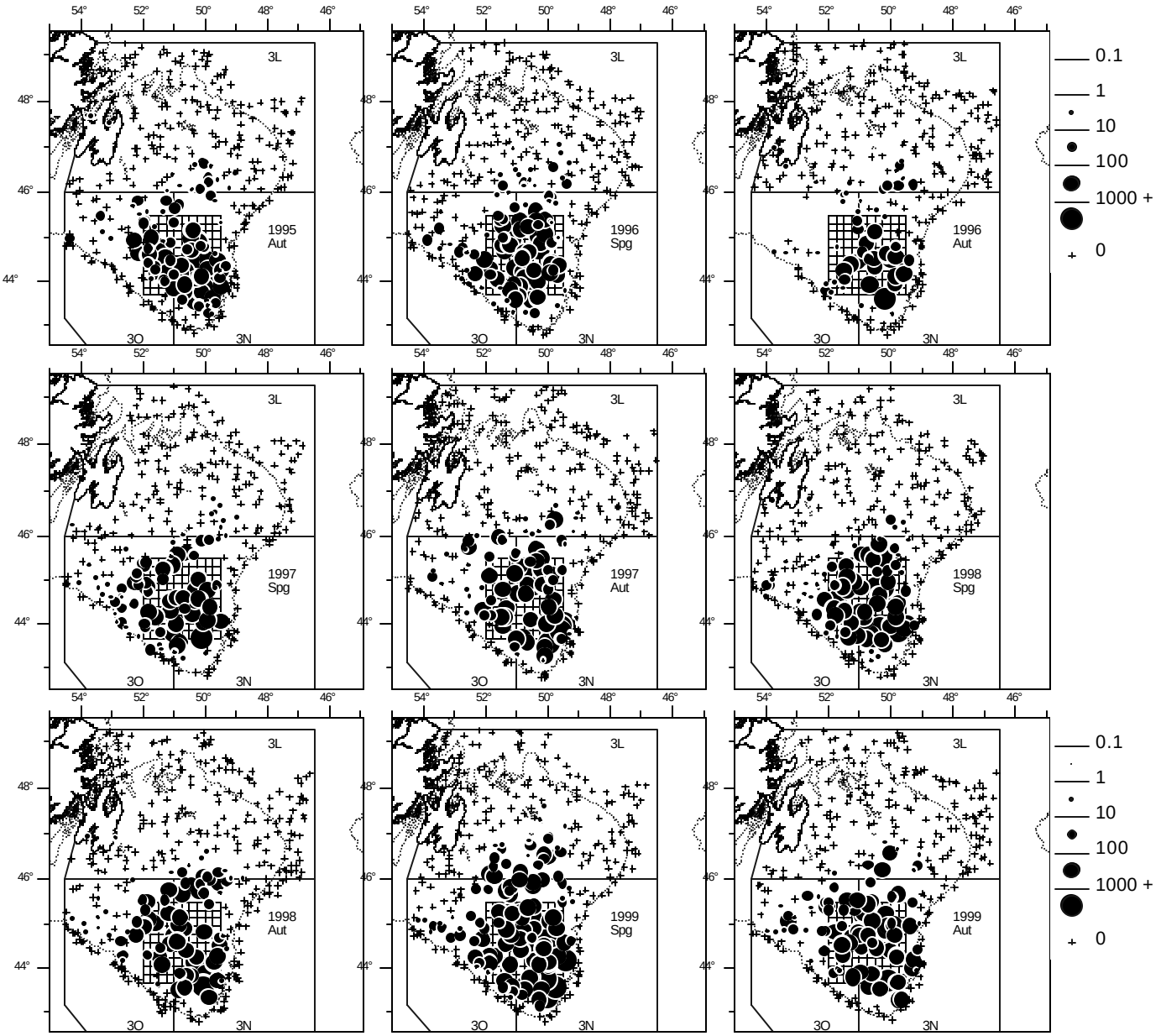


Fig. 8. Distribution of Yellowtail Flounder Catches (Number per standard 0.75Nm. tow) from stratified random spring and autumn surveys conducted with a Campelen 1800 trawl in Div. 3LNO from 1995-1998. Grid used in industry surveys is depicted for illustration

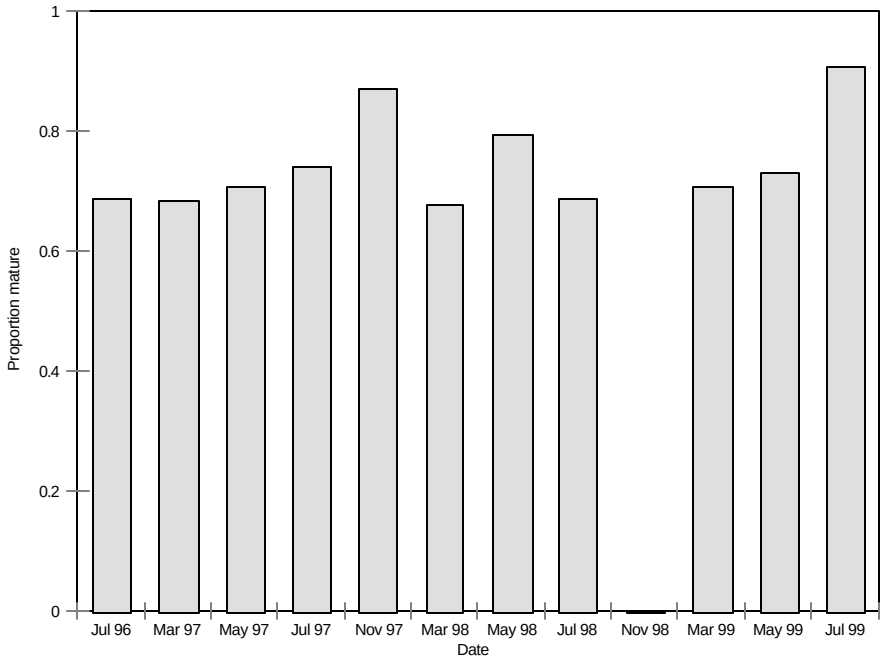


Figure 9. Proportion of mature yellowtail flounder from FPI/DFO cooperative grid surveys.

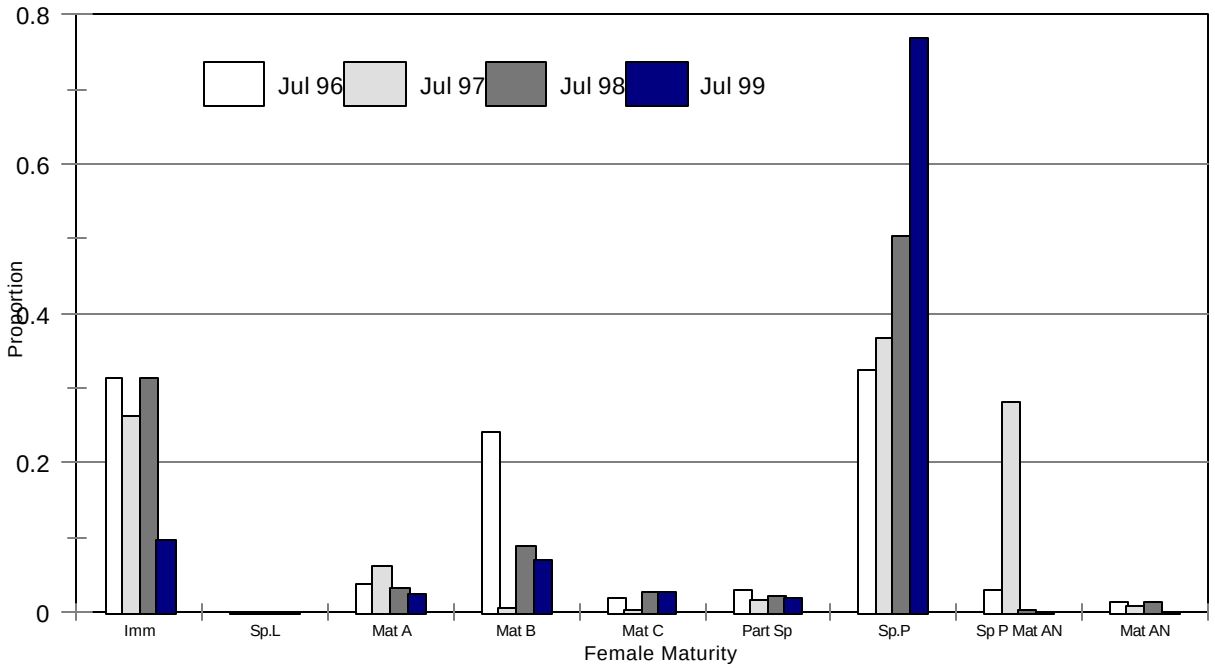


Figure 10. Yellowtail maturities from FPI/DFO cooperative grid surveys conducted in July.