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Distribution of Juvenile and Adult Yellowtail Flounder

on the Grand Bank, NAFO Division 3LNO

by

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**Introduction**

Yellowtail flounder (*Limanda ferruginea*) is distributed mainly on the shallow plateau of the Grand Banks in depths of 37-82 m and in bottom temperatures from -1.0 to 7.7° but favoring water temperatures ~3°C (Pitt 1970). Recent dedicated surveys (1985-89) using a small mesh shrimp trawl has described the distribution of juvenile yellowtail (up to age 4) in the same areas as the adult population, concentrated mainly in and around the Southeast Shoals in NAFO Div. 3N (Walsh 1988; Brodie et al. 1989).

The fishery for this stock is conducted almost exclusively by large offshore otter trawlers, with the majority of the catch coming from NAFO Div. 3N. Canadian trawlers fish almost exclusively inside the 200 mile limit on the southern part of the Grand Bank, while the area outside, known as the "Tail of the Bank" is fished by the fleets of many countries (Brodie et al. 1990).

The aim of this paper is to compare the distribution of juvenile yellowtail flounder with adult commercial size yellowtail flounder using data collected from juvenile flatfish surveys and from the commercial fleet. Details of juvenile flatfish surveys are presented in the assessment documented (Brodie et al. 1990).

**Results**

Table 1 shows the distribution of average catches of ages 1-4 yr old juvenile yellowtail on the Grand Bank during the years 1985-89. Most of the catches of these age groups were consistently located in strata 376 and 375, the Southeast Shoals, stratum 360, the Tail of the Bank, and strata 361 and 352 to the west of the Shoals. All strata with the exception of 352 (Div. 30) are located in Div. 3N (Fig. 1). Although adult yellowtail were found in small amounts in NAFO Div. 3L 1 year old juveniles were absent from catches in the surveys. The 1989 survey showed that ages 2 and 3 year juveniles were concentrated in strata 376, 375, 360 and 352 (Table 2). The largest average catches of age 4 yellowtail of the strong 1985 year-class were heavily concentrated in strata 376 and 360 (Table 1; Fig. 3). Average catches of age 5+ were concentrated in stratum 376 and to a lesser degree stratum 361 (Table 2; Fig. 3).

Length frequencies of yellowtail flounder catches during the 1989 survey shows that catch rates are highest for yellowtail size 8-36 cm, in strata 376 and 360 of Div. 3N which lie mostly outside the 200 mile limit (Fig. 1). Figure 5 compares the catch distribution rates in each NAFO Division, with data from strata 376, 360 and 353 removed. Catches of yellowtail, less the 32 cm are low (highest in Div. 3N) while catches of larger fish are comparable with those found in strata 375, 360 and 353.

Table 3 outlines the distribution of catches of yellowtail flounder by the Canadian commercial offshore fleet for the combined period of 1986-88 (Fig. 6). Greatest catches (>50%) were taken from areas around the Southeast Shoals (Unit 316) and to a lesser extent in the areas North of the Shoals in Unit 315 (21%) and Unit 328 (13%). Percent discards by the Canadian fleet in 1988 (the latest data available) showed that the discarding of undersize yellowtail did not exceed 3% anywhere on the Bank with the highest being in the area of the Shoals in Unit area 319 (2.4%) (Fig. 7).

Table 4 (Brodie et al. 1990) outlines the distribution of catch at age for Canada, USA, and Spain in 1989. Some 90% of the Spanish catch numbers are of ages 3-5 (1984, 1985, and 1986 year-classes) compared to about 1.3% in the Canadian catch and 4% in the USA data. This is consistent with data from the 1989 juvenile survey from strata 376 and 360 which shows that these areas are part of the yellowtail nursery.

#### Discussion

Juvenile yellowtail flounder are concentrated in and around the Southeast Shoals in areas fished heavily by the Canadian fleet inside the 200 mile limit and by non-Canadian fleets outside of the 200 mile limit. The largest concentrations of juvenile (1-4 yr olds) are found in strata 376 and 360 of Div. 3N which is located mainly outside the 200 mile limit and are reflected in the catches of the Spanish fleet. Discarding of undersize yellowtail by the Canadian fleet appears to be of little consequence. These fleets seldom land yellowtail less than 28 cm (age 4) because of fish plant requirements. Selectivity values were derived for American plaice in 130 mm diamond mesh codends using the trouser trawl method in experiments conducted in March, 1990, on the Grand Banks. A selection range (25% to 75%) of 27 cm to 35 cm was calculated with an L50 of 31 cm and a selection factor of 2.4 (Walsh, 1990, unpubl.). Since the body shape of plaice and yellowtail are closely similar then one can expect the same values to apply to yellowtail. A 25% selectivity value of 27 cm for this mesh size of 130 mm, which is the Canadian regulated minimum mesh size, explains why discards are low in the Canadian fishery. This large mesh size coupled with the main distribution of 1 to 4 year olds located mainly outside the 200 mile limit ensures a low fishing mortality being exerted on juveniles by the Canadian fleet. However, fishing pressures exerted by the foreign effort on these incoming year-classes, not yet recruited to the Canadian gear, is cause of some concern.

#### Acknowledgements

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#### References

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Table 1. Average catch per tow of juvenile and adult yellowtail on the Grand Banks, NAFO Div. 3LNO in juvenile surveys 1985-89.

Div.	Stratum	Category	1985	1986	1987	1988	1989
3Ø	330	No. of sets	-	-	-	2	7
		Age 1				0	0.00
		Age 2				0	0.00
		Age 3				0	0.03
		Age 4				0.29	0.11
3Ø	331	No. of sets	-	-	-	2	2
		Age 1				0	0.00
		Age 2				0	0.00
		Age 3				0	0.07
		Age 4				0	0.49
3Ø	338	No. of sets	-	3	-	6	6
		Age 1		0		0.01	0.05
		Age 2		0		0.20	1.63
		Age 3		0.75		0.64	1.84
		Age 4		1.50		0.43	4.30
3Ø	340	No. of sets	-	1	-	3	6
		Age 1				0	0.00
		Age 2				0	0.00
		Age 3				0	0.00
		Age 4				0	0.29
3L	350	No. of sets	5	6	-	5	8
		Age 1	0.0	0		0.0	0.00
		Age 2	0.0	0		0.0	0.00
		Age 3	0.0	0		0.0	0.00
		Age 4	0.0	0		0.0	0.00
3Ø	351	No. of sets	3	9	-	7	8
		Age 1	0.0	0.22		0.05	0.02
		Age 2	0.33	0.13		0.66	0.11
		Age 3	1.69	0.34		4.41	0.02
		Age 4	2.51	0.28		2.78	0.19
3Ø	352	No. of sets	1	13	1	11	14
		Age 1		1.28		1.20	0.35
		Age 2		1.55		6.61	6.65
		Age 3		2.15		12.86	10.30
		Age 4		6.49		6.87	19.85
3Ø	353	No. of sets	-	5	1	4	3
		Age 1		0.95		0.03	0.00
		Age 2		0.81		0.55	0.01
		Age 3		1.21		0.91	0.40
		Age 4		0.79		1.15	2.46
3N	360	No. of sets	3	14	19	20	19
		Age 1	0.48	71.80	15.54	1.84	1.14
		Age 2	2.37	47.79	72.18	7.96	3.85
		Age 3	1.30	71.62	49.35	38.45	46.33
		Age 4	1.65	13.94	30.55	17.81	214.34
3N	361	No. of sets	6	8	8	6	9
		Age 1	1.12	1.99	1.64	4.09	1.39
		Age 2	0.62	5.97	5.93	12.33	12.83
		Age 3	0.83	8.41	5.51	24.58	21.03
		Age 4	9.30	10.07	9.04	14.64	42.45
3N	362	No. of sets	9	7	2	6	8
		Age 1	0.0	0.14	0	0.0	0.02
		Age 2	0.78	0.0	0.19	0.78	0.48
		Age 3	1.34	0.04	0.31	1.34	0.55
		Age 4	5.43	1.49	0.13	5.43	1.05

Table 1 (Cont'd.).

Div.	Stratum	Category	1985	1986	1987	1988	1989
3L	363	No. of sets	5	5	-	6	7
		Age 1	0.0	0.0		0.0	0.00
		Age 2	0.0	0.0		0.0	0.00
		Age 3	0.0	0.0		0.0	0.00
		Age 4	0.0	0.0		0.0	0.02
3L	371	No. of sets	4	-	-	5	4
		Age 1	0.0			0.0	0.00
		Age 2	0.0			0.0	0.00
		Age 3	0.0			0.0	0.00
		Age 4	0.0			0.0	0.00
3L	372	No. of sets	9	8	-	8	8
		Age 1	0.0	0		0	0.00
		Age 2	0.12	0		0	0.23
		Age 3	4.70	0		0	0.44
		Age 4	18.26	0.09		0.01	0.32
3N	373	No. of sets	10	7	-	8	8
		Age 1	0.0	0.14		0.0	0.00
		Age 2	0.0	0		0.0	0.09
		Age 3	0.21	0		0.21	0.09
		Age 4	1.19	0.08		1.19	0.32
3N	374	No. of sets	4	4	1	4	3
		Age 1	0.25	0.25		0	0.00
		Age 2	0.25	0.31		0	0.00
		Age 3	0.49	0.19		0.24	0.00
		Age 4	0.76	0.04		0.26	0.00
3N	375	No. of sets	7	5	7	9	8
		Age 1	3.29	0.40	32.04	20.60	7.12
		Age 2	1.00	3.97	166.52	31.38	24.29
		Age 3	0.96	5.72	81.64	20.81	26.46
		Age 4	7.83	6.75	59.82	11.99	48.00
3N	376	No. of sets	2	4	10	12	9
		Age 1	19.14	2.30	94.31	7.12	13.67
		Age 2	8.07	9.23	270.56	29.45	64.67
		Age 3	2.94	28.38	276.54	129.75	117.73
		Age 4	15.49	11.92	288.76	116.92	317.54
3N	383	No. of sets	4	-	-	4	3
		Age 1	0			0	0
		Age 2	0			0	0
		Age 3	0			0	0
		Age 4	0			0	0
3L	384	No. of sets	4	-	-	5	4
		Age 1	0			0	0.00
		Age 2	0			0	0.00
		Age 3	0			0	0.00
		Age 4	0			0	0.00
3Ø	332	No. of sets					4
		Age 1					0.00
		Age 2					0.00
		Age 3					0.00
		Age 4					0.21
3L	328	No. of sets					3
		Age 1					0
		Age 2					0
		Age 3					0
		Age 4					0

Table 1 (Cont'd.).

Div.	Stratum	Category	1985	1986	1987	1988	1989
30	329	No. of sets					4
		Age 1					0
		Age 2					0
		Age 3					0
		Age 4					0
30	337	No. of sets					2
		Age 1					0
		Age 2					0
		Age 3					0
		Age 4					0
30	339	No. of sets					2
		Age 1					0
		Age 2					0
		Age 3					0
		Age 4					0
3L	341	No. of sets					4
		Age 1					0
		Age 2					0
		Age 3					0
		Age 4					0
3L	342	No. of sets					2
		Age 1					0
		Age 2					0
		Age 3					0
		Age 4					0
3L	343	No. of sets					2
		Age 1					0
		Age 2					0
		Age 3					0
		Age 4					0
3L	348	No. of sets					7
		Age 1					0
		Age 2					0
		Age 3					0
		Age 4					0
3L	349	No. of sets					5
		Age 1					0
		Age 2					0
		Age 3					0
		Age 4					0
30	354	No. of sets					2
		Age 1					0
		Age 2					0
		Age 3					0
		Age 4					0
3N	359	No. of sets					2
		Age 1					0
		Age 2					0
		Age 3					0
		Age 4					0
		Age 4					0
3L	364	No. of sets					11
		Age 1					0
		Age 2					0
		Age 3					0

Table 1 (Cont'd.).

Div.	Stratum	Category	1985	1986	1987	1988	1989
3L	365	No. of sets					4
		Age 1					0
		Age 2					0
		Age 3					0
		Age 4					0
3L	370	No. of sets					6
		Age 1					0
		Age 2					0
		Age 3					0
		Age 4					0
3N	382	No. of sets					2
		Age 1					0
		Age 2					0
		Age 3					0
		Age 4					0
3L	385	No. of sets					5
		Age 1					0
		Age 2					0
		Age 3					0
		Age 4					0
3L	390	No. of sets					4
		Age 1					0
		Age 2					0
		Age 3					0
		Age 4					0

Table 2. Average catch-at-age of 5+ yellowtail in selected strata on the southern Grand Bank from the 1989 survey.

Age	Stratum 352 14 sets	Stratum 360 19 sets	Stratum 361 9 sets	Stratum 375 8 sets	Stratum 376 9 sets
5	12.26	78.33	25.06	42.27	181.75
6	39.48	19.03	37.92	34.56	118.00
7	89.47	7.27	91.58	57.17	66.03
8	24.26	2.60	48.51	39.68	23.31
9	1.82	0.12	6.09	5.29	3.65
10	0.07	0.00	0.11	0.06	0.28
Average catch/tow of age 5+	155.4	107.4	209.3	179.1	393.0

Table 3. Percent composition of catches of yellowtail flounder by the Canadian commercial fleet for the combined years 1986-88.

Unit area	Catch (MT)	% Catch
331	1.2	0
330	6.7	0
325	0.5	0
332	9.6	0
329	98.0	0.3
326	14.3	0
335	3.0	0
334	13.5	0
328	5548.6	14.9
333	349.0	0.9
327	179.7	0.4
315	7808.6	20.9
320	79.2	2.1
316	19284.0	51.5
319	152.7	0.4
317	2.3	0
310	135.9	0.4
314	1473.1	3.9
311	109.6	0.3
313	795	2.1
312	291	0.8
<b>Total</b>	<b>37,445.5</b>	

Table 4. Comparison of yellowtail catch at age ('000) from the Canadian, Spanish, and USA fisheries in Div. 3LNO in 1989 (from Brodie et al. 1990).

Age	Canada		USA		Spain	
	Catch	%	Catch	%	Catch	%
1					1	0.01
2					198	1.6
3					1,448	11.7
4					6,635	53.4
5	131	1.3	29	4.0	3,163	25.5
6	986	10.1	273	37.7	850	6.8
7	3,978	40.6	290	40.0	95	0.8
8	4,150	42.3	113	15.6	27	0.2
9	541	5.5	19	2.6	7	0.06
10	16	0.2	1	0.1		
<b>Total</b>	<b>9,802</b>		<b>725</b>		<b>12,424</b>	
<b>Catch (t)</b>	<b>5,007</b>		<b>319</b>		<b>1,126</b>	

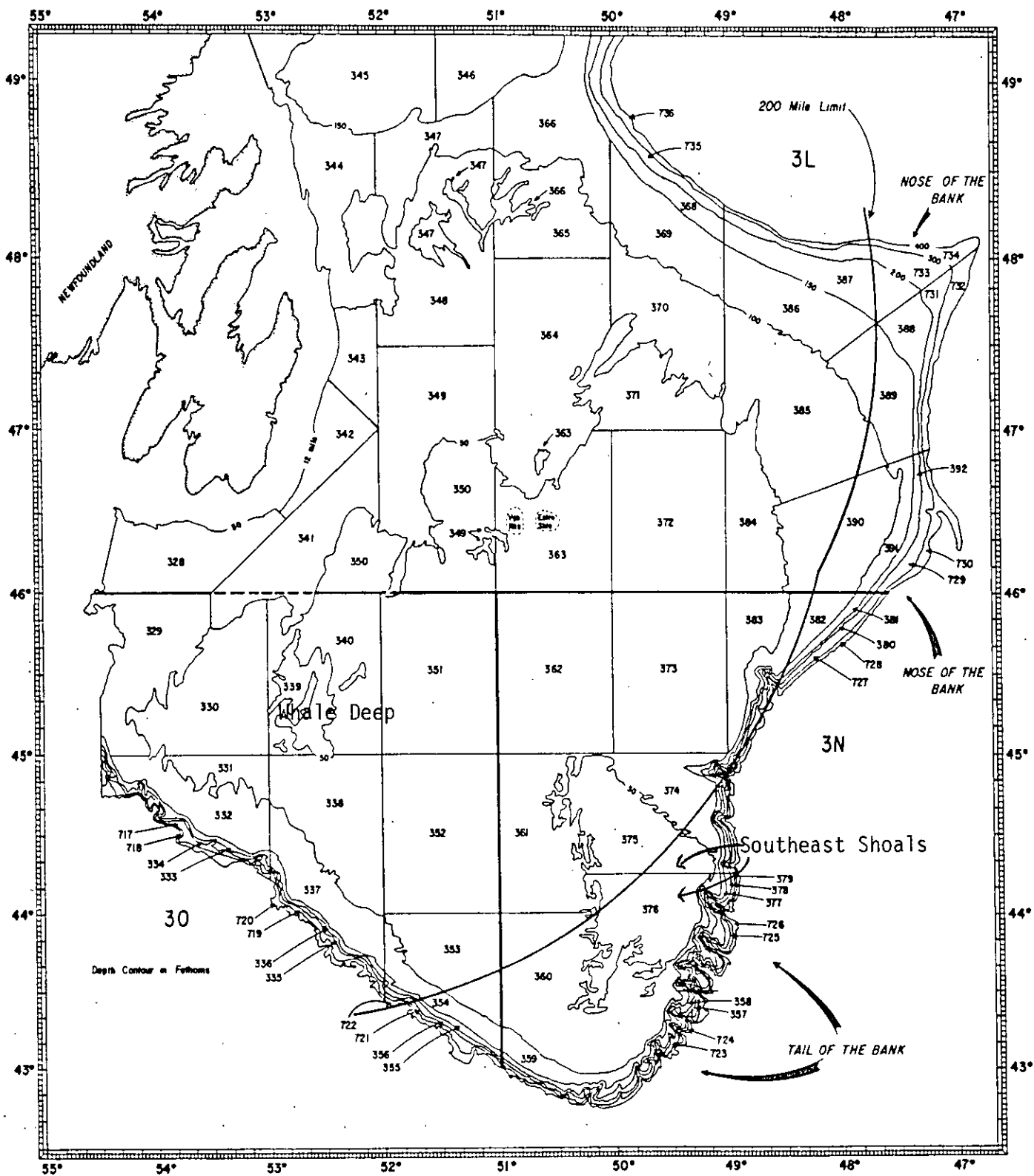


Fig. I. Depth stratification chart of the Grand Bank, NAFO Div. 3LNO



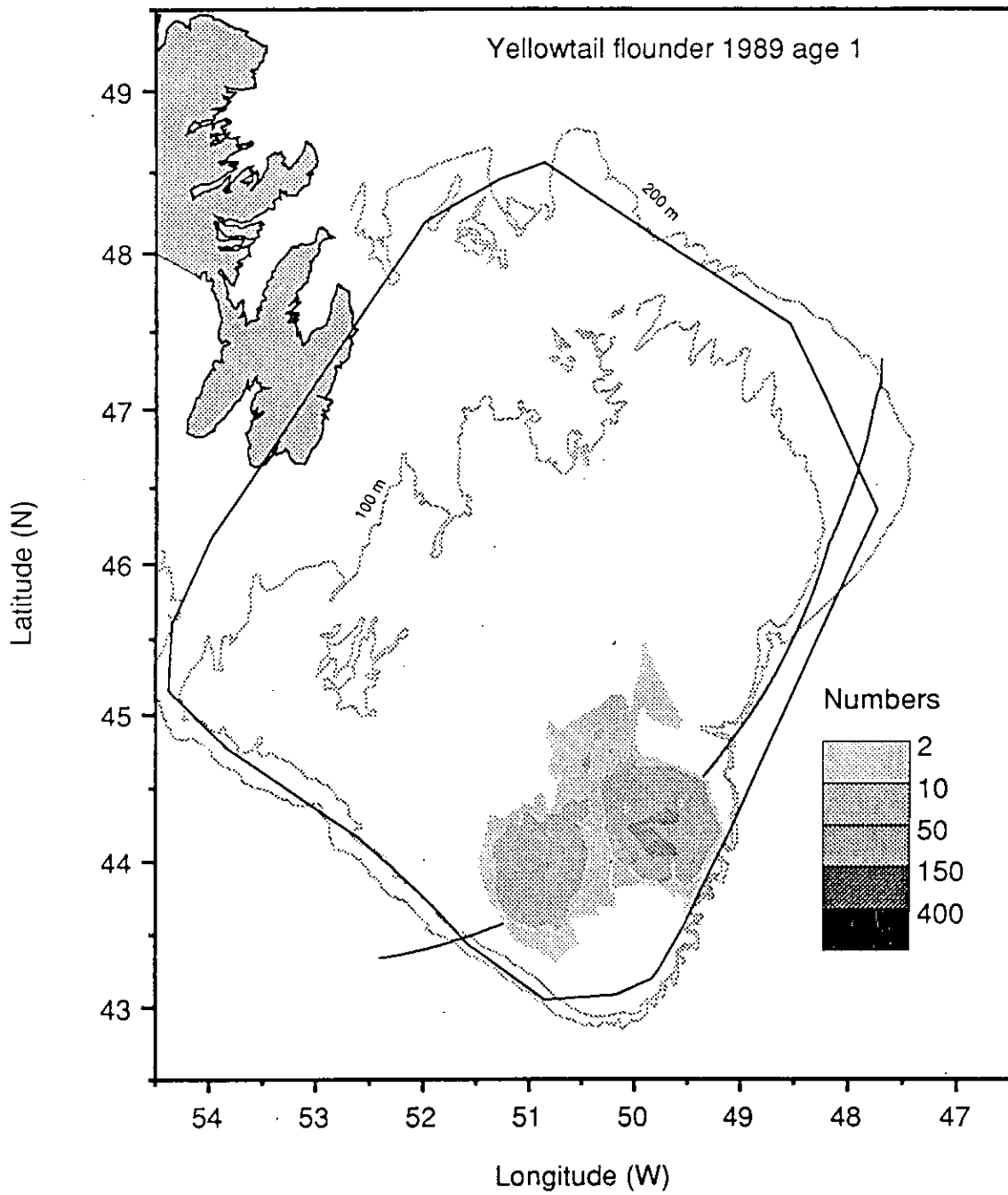


Fig.2 Distribution of 1 year old yellowtail flounder on the Grand Banks from the 1989 juvenile survey.

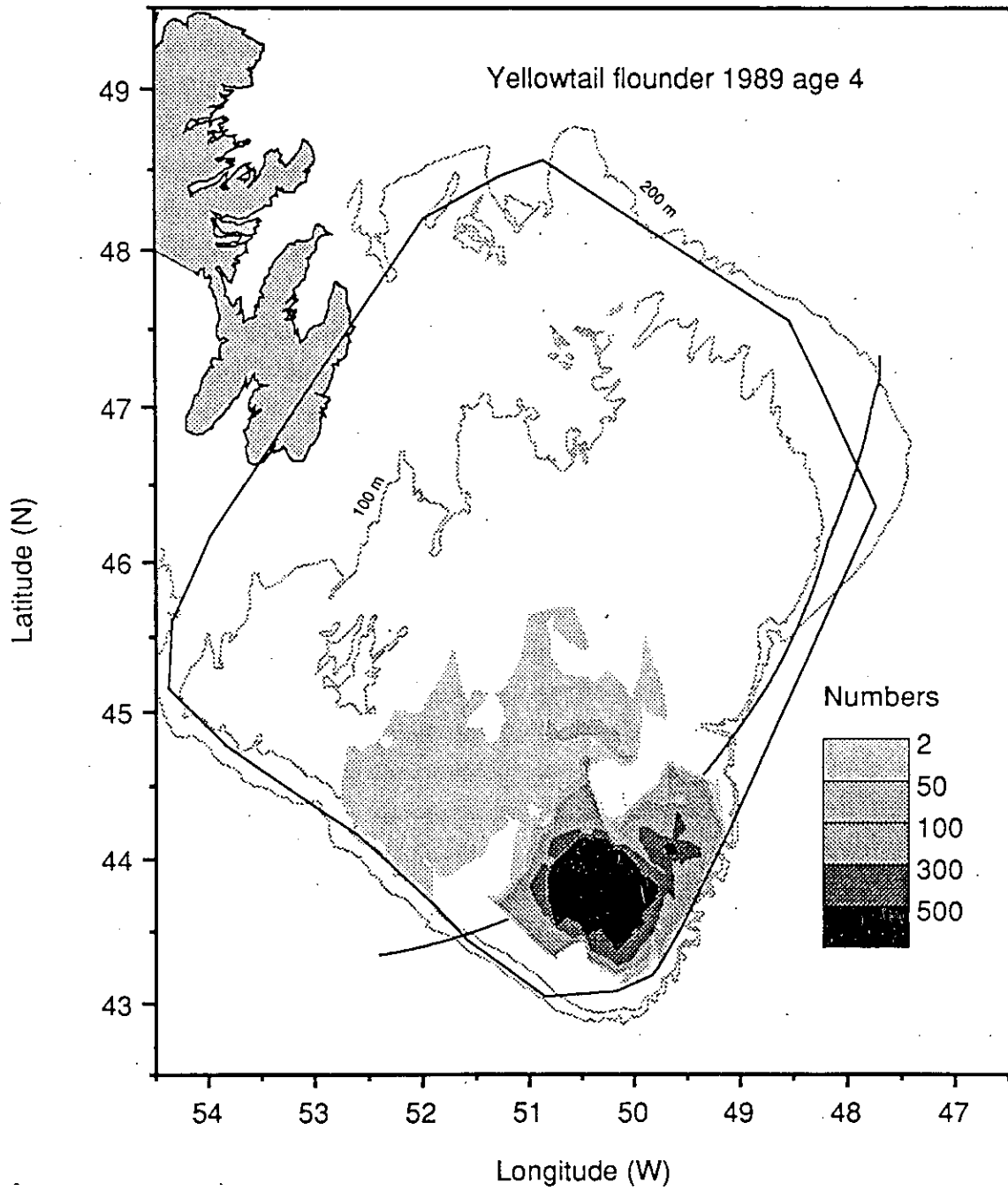


Fig.3 Distribution of 4 year old yellowtail flounder on the Grand Banks from the 1989 juvenile survey.

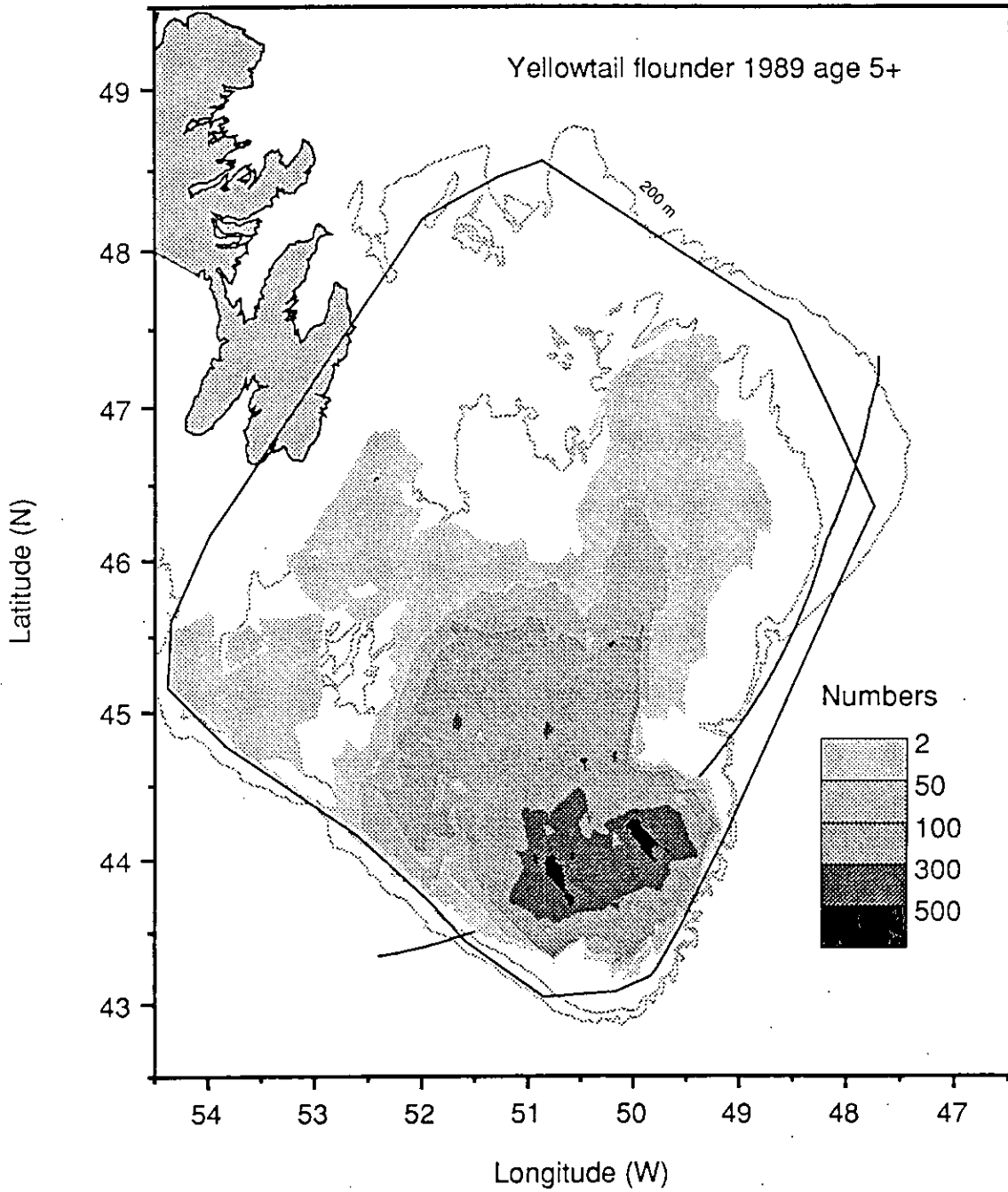
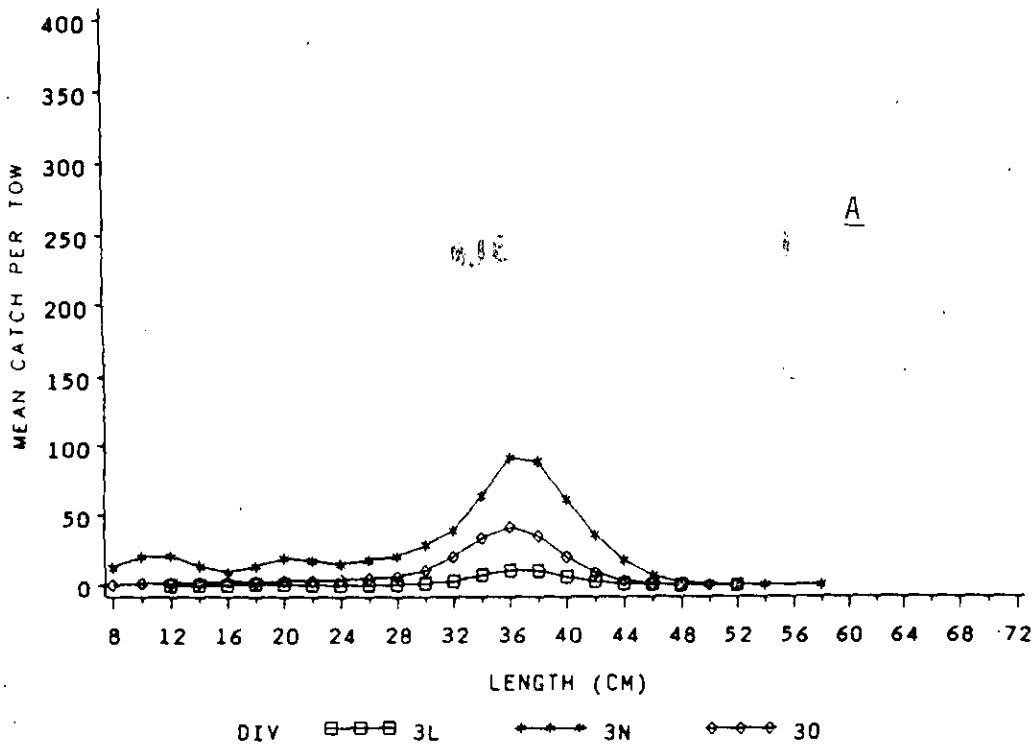


Fig.4 Distribution of 5+ year old yellowtail flounder on the Grand Banks from the 1989 juvenile survey.



YELLOWTAIL FLOUNDER: 1989 JUVENILE SURVEY

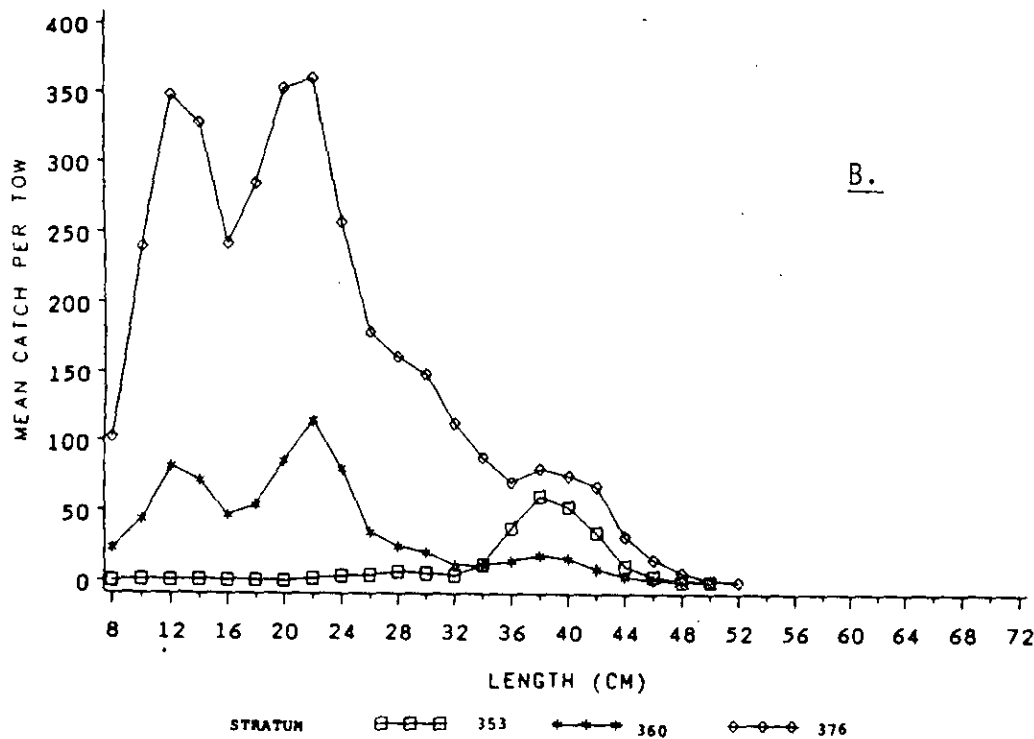


Fig. 5A: length frequency distribution of yellowtail in Div. 3L, 3N, 30  
 Strata 353, 369 and 376 are not included.

Fig. 5B. Length frequency distribution of yellowtail in Strata 353, 360 and 376

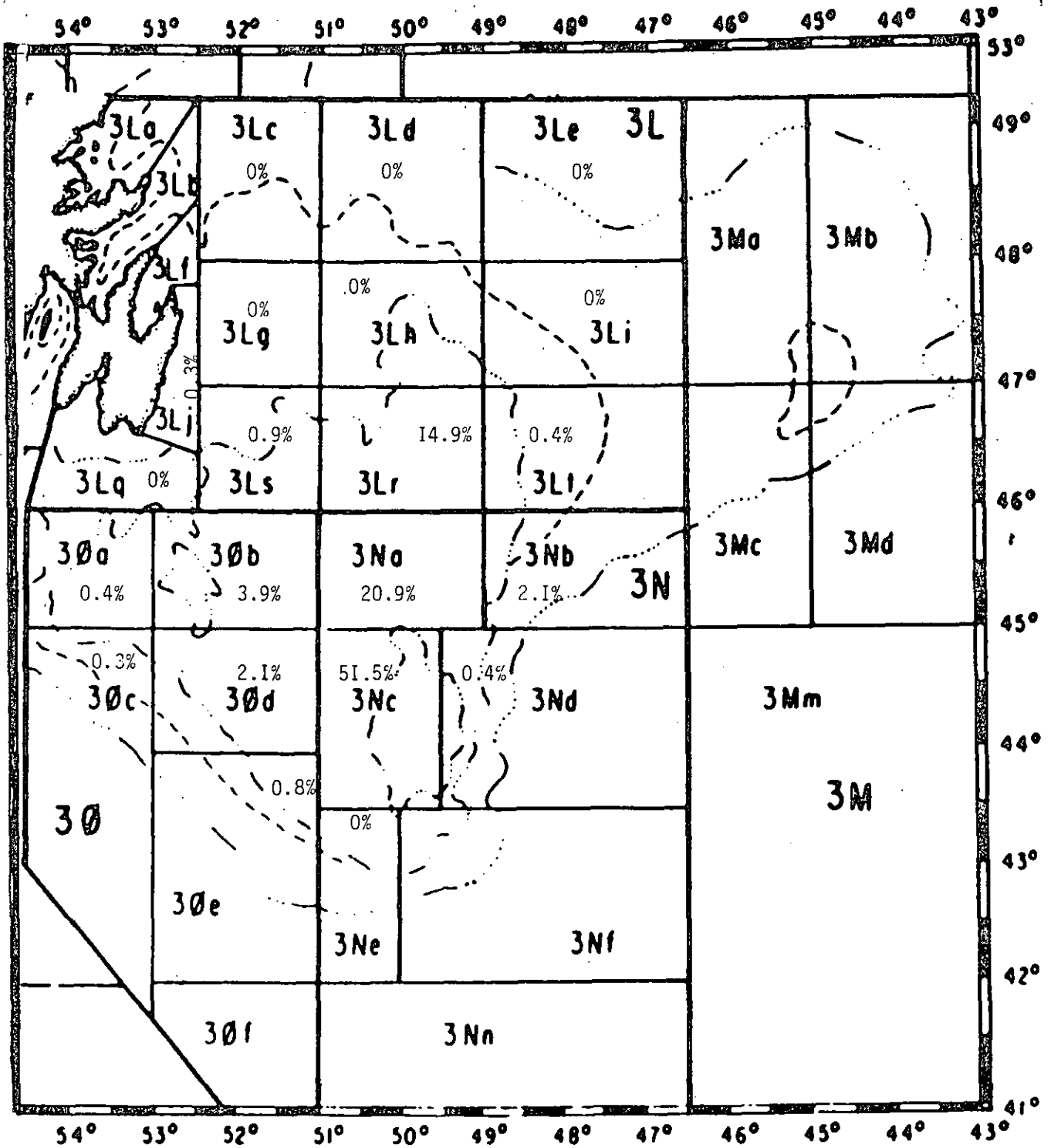


Fig. 6 Distribution of percent catch of yellowtail flounder by the Canadian commercial fleet for the combined years 1986-88

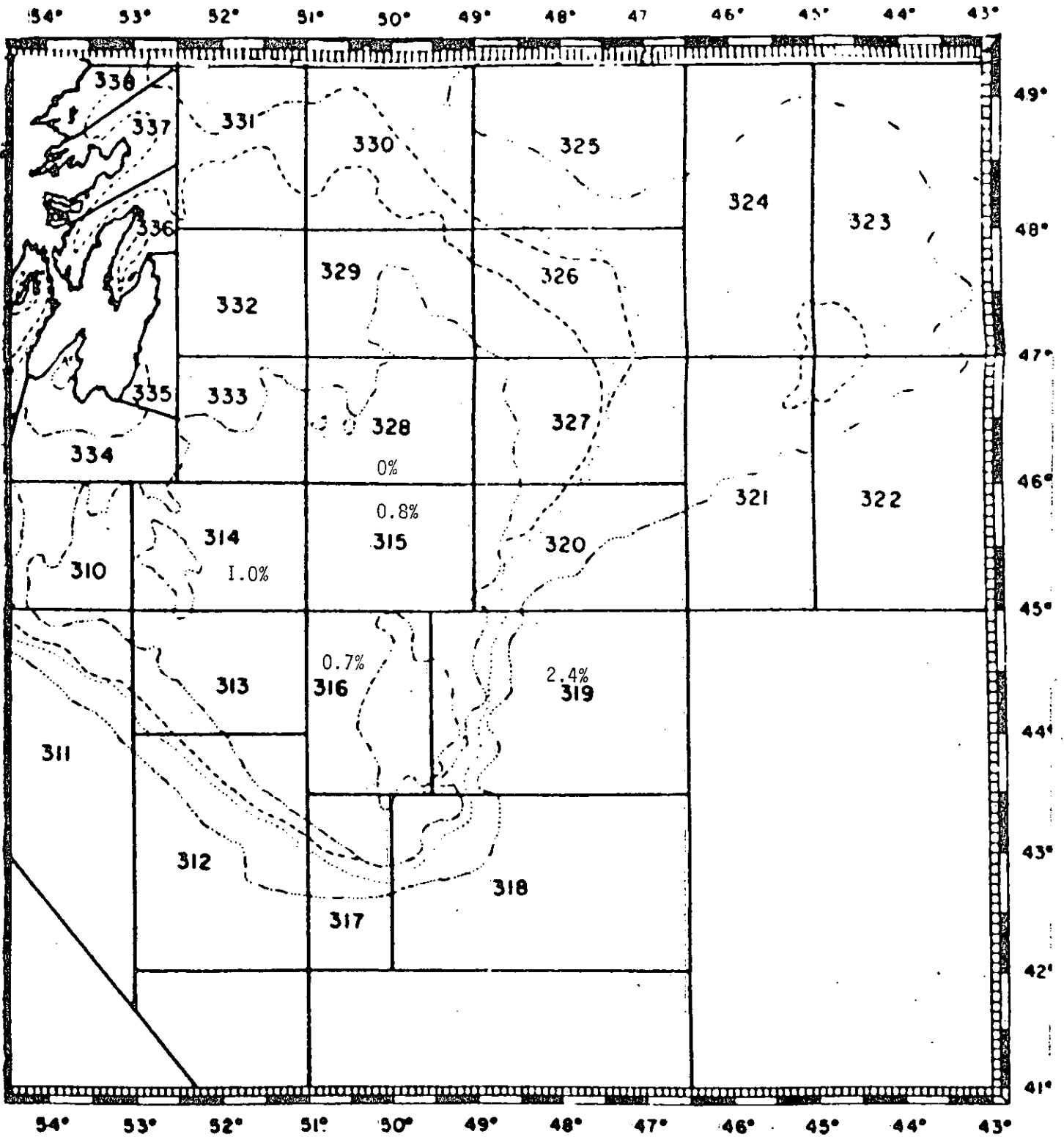


Fig. 7 Distribution of discards (percentage) of under-sized yellowtail by the Canadian fleet in Divs. 3LNO - 1988