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Summary of Discarding and Estimates of the Total Removals by Canadian trawlers in the  
American Plaice Fishery of Divisions 3LN0 during 1978 and 1979

by

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INTRODUCTION

A limited amount of data collected during 1976 and 1977 indicated that the discarding of small American plaice in Divisions 3LN0 by Canadian (Newfoundland) trawlers was significant (Stevenson, 1978). During 1978 and 1979 a survey aimed at monitoring the discarding of American plaice in these divisions was greatly intensified. The program involved sending pairs of observers out on Canadian (Newfoundland) based trawlers during regular 10 to 12 day fishing trips to determine the numbers and weights of fish discarded at sea and to obtain length and age data on these fish.

The survey was carried out onboard 8 trawlers fishing American plaice in Divisions 3LN0 in 1978 and 6 in 1979. Results obtained on these trips are applied to the total Canadian (Newfoundland) otter trawl fishery and estimates of total catch removals by weight, number, size and age composition made for each year. These estimates are compared to actual Canadian (Newfoundland) landings (by weight) and to estimates of these landings in terms of numbers, size and age compositions based on the results of the survey trips. Factors suitable for converting numbers at age for landings derived from port sampling to numbers at age for catches are presented for both years.

METHODS

Set and catch details were collected on a set by set basis onboard the trawlers. The discard portions of the catches were actually weighed, while the market portions were estimated for each set. These estimates were adjusted on the basis of actual turnout weights at the end of each trip.

Length frequencies of market and discarded fish were determined separately and whenever possible corresponding market and discard frequencies were completed for a particular set. Average weights were obtained for each sample completed by actual weighings. 126 discard and 130 market samples were collected in 1978, while 77 discard and 81 market samples were collected in 1979. A summary of sampling by Division is given in Table 1.

In arriving at catch estimates for the total Canadian (Newfoundland) fishery, sets were first of all combined for each month within a unit area and discard rates by weight and number calculated. Figures 1a and 1b show the months and unit areas for which data were available. Monthly discard rates were applied to the Canadian (Newfoundland) landings for the corresponding months to give monthly catch estimates for the fishery. These monthly catch estimates were combined to give a weighted catch estimate for a particular unit area. Unit area catch estimates were then combined to arrive at final weighted catch estimates for each division.

In arriving at estimated catch length frequencies for the Canadian (Newfoundland) fishery, market and discard frequencies were weighted by set and combined separately for

each month within a unit area. These market and discard frequencies were then combined on the basis of discard rates to give estimated catch frequencies, which were applied to the estimated Canadian (Newfoundland) catches for each month within a unit area. Monthly frequencies were combined to give weighted catch frequencies for each unit area. Unit area frequencies were then combined to give a final weighted Canadian (Newfoundland) catch frequency for each division.

Age keys used in estimating age compositions were composite keys, combining otoliths collected from discarded fish at sea with otoliths collected from landings onshore for a particular division and time of year. For 1978, half-yearly keys were used to arrive at age compositions by division. For 1979, because of a scarcity of discard sampling in the first half of the year, quarter 3 keys were applied to quarters 1, 2 and 3 frequencies and quarter 4 keys were applied to quarter 4 frequencies.

## RESULTS AND DISCUSSION

Discard rates (by weight) and estimates of 1978 and 1979 Canadian (Newfoundland) American plaice otter trawl catches by division are summarized in Table 2. The overall discard rate in Divisions 3LNO was 8.6% in 1978, with the highest rate occurring in Division 3L (11.5%). In 1979 the overall 3LNO discard rate was 14.0%, with the highest rate occurring in Division 3N (18.6%). Division 3L and 3O discard rates for both years are quite similar, while Division 3N discard rates differ significantly between years. A limited amount of sampling coverage in Division 3N during 1978 could possibly have led to an underestimation of the discard rate in that division for that year. The catch estimates indicate that over 4,100 t of undersized American plaice were discarded in Divisions 3LNO in 1978 and over 6,700 t in 1979.

Estimates of numbers of 3LNO American plaice landed and caught by Canadian (Newfoundland) otter trawlers based on discard survey results are presented in Table 3. In terms of numbers, 22.0% and 30.9% of the 3LNO American plaice caught were discarded in 1978 and 1979 respectively. This amounted to almost 17 million undersized fish being discarded in 1978 and almost 29 million in 1979.

Percentage length compositions of 1978 and 1979 American plaice catches, with the discarded and market portions indicated, are given in Figures 2a and 2b. A higher proportion of males than females were discarded in all divisions for both years. Discarding generally begins at around 38-40 cm, although most discarding occurs below 34 cm. This is a direct result of the fact that 33-34 cm is the minimum acceptable commercial size for American plaice at most Newfoundland processing plants.

A comparison of 3LNO American plaice catch and landing age composition estimates for 1978 and 1979 for the Canadian (Newfoundland) otter trawl fishery is presented in Tables 4a and 4b. These estimates are based wholly on the results of the discard survey trips. In 1978, 93% of the males discarded and 91% of the females discarded were between ages 6 and 10. The majority of the discards were ages 7 and 8 for both males and females. In 1979, 89% of the males discarded and 85% of the females discarded were between ages 5 and 9, with the majority being ages 6 and 7 for both sexes. Catch/landing ratios by age group are also presented in Table 4. These ratios are in a form suitable for converting numbers at age derived from port sampling to total removals at age based on the comparison of catch and landing age compositions derived from discard trips.

## CONCLUSIONS

Results of discard survey trips indicated that the discarding of undersized American plaice by Canadian (Newfoundland) trawlers in Divisions 3LNO was substantial during 1978 and 1979. Estimates derived from these trips indicated 8.6% by weight (22.0% by number) of the catch discarded during 1978 and 14.0% by weight (30.9% by number) discarded during 1979. This amounted to about 17 million fish weighing some 4,100 t being discarded in 1978 and about 29 million fish weighing some 6,700 t in 1979. Thus, by not taking the discard portion of the catches into account, the numbers of younger fish actually removed from the stock by fishing would be seriously underestimated. It is essential that a program aimed specifically at monitoring the discarding of undersized American plaice in Divisions 3LNO be continued in future years.

Table 1. Summary of Div. 3LNO American Plaice sampling onboard Canada (N) otter trawlers during 1978 and 1979 discard surveys.

Year: <u>1978</u>		Number of vessels: <u>8</u>		Tonnage class: 5(500-999 t)		
Div.	<u>Discards</u>			<u>Market</u>		
	Male	Female	# Samples	Male	Female	# Samples
3L	8924	7644	110	7840	12,078	113
3N	148	147	6	410	602	6
30	450	591	10	624	1,306	11
Total	9522	8382	126	8874	13,986	130
Year: <u>1979</u>		Number of vessels: <u>6</u>		Tonnage Class: 5(500-999 t)		
3L	3182	2755	33	3028	6,678	35
3N	3069	2565	31	3118	4,940	31
30	702	679	13	924	2,512	15
Total	6953	5999	77	7070	14,130	81

Table 2. Comparison of total Canadian (N) American plaice OT landings with catch estimates derived from 1978 and 1979 discard survey results.

Div.	1978			
	Total Can (N) OT Landings (MT)	Estimated Can (N) OT Catch (MT)	% of catch Discarded	Observed No. Sets (Hrs. fishing)
3L	25,302	28,602	11.5	131 (321)
3N	12,488	12,827	2.6	7 (20)
30	6,078	6,553	7.3	11 (29)
3LNO combined	43,868	47,982	8.6	149 (370)

Div.	1979			
	Total Can (N) OT Landings (MT)	Estimated Can (N) OT Catch (MT)	% of catch Discarded	Observed No. Sets (Hrs. fishing)
3L	23,249	26,689	12.9	35 (98)
3N	13,759	16,894	18.6	63 (175)
30	4,433	4,587	3.4	24 (65)
3LNO combined	41,441	48,170	14.0	122 (338)

Table 3. Estimates of numbers of 3LNO American Plaice landed and caught by Can (N) otter trawlers as derived from 1978 and 1979 discard survey results ( $\times 10^3$ ).

Div.	1978						MALE +
	MALE			FEMALE			FEMALE
	<u>Est. # Landed</u>	<u>Est. # Caught</u>	<u>% Discarded</u>	<u>Est. # Landed</u>	<u>Est. # Caught</u>	<u>% Discarded</u>	<u>% Discarded</u>
3L	13,219	20,978	37.0	23,835	30,497	21.8	28.0
3N	6,736	7,351	8.4	10,143	10,716	5.4	6.6
30	1,620	2,096	22.7	4,515	5,395	16.3	18.1
3LNO combined	21,575	30,425	29.1	38,493	46,608	17.4	22.0

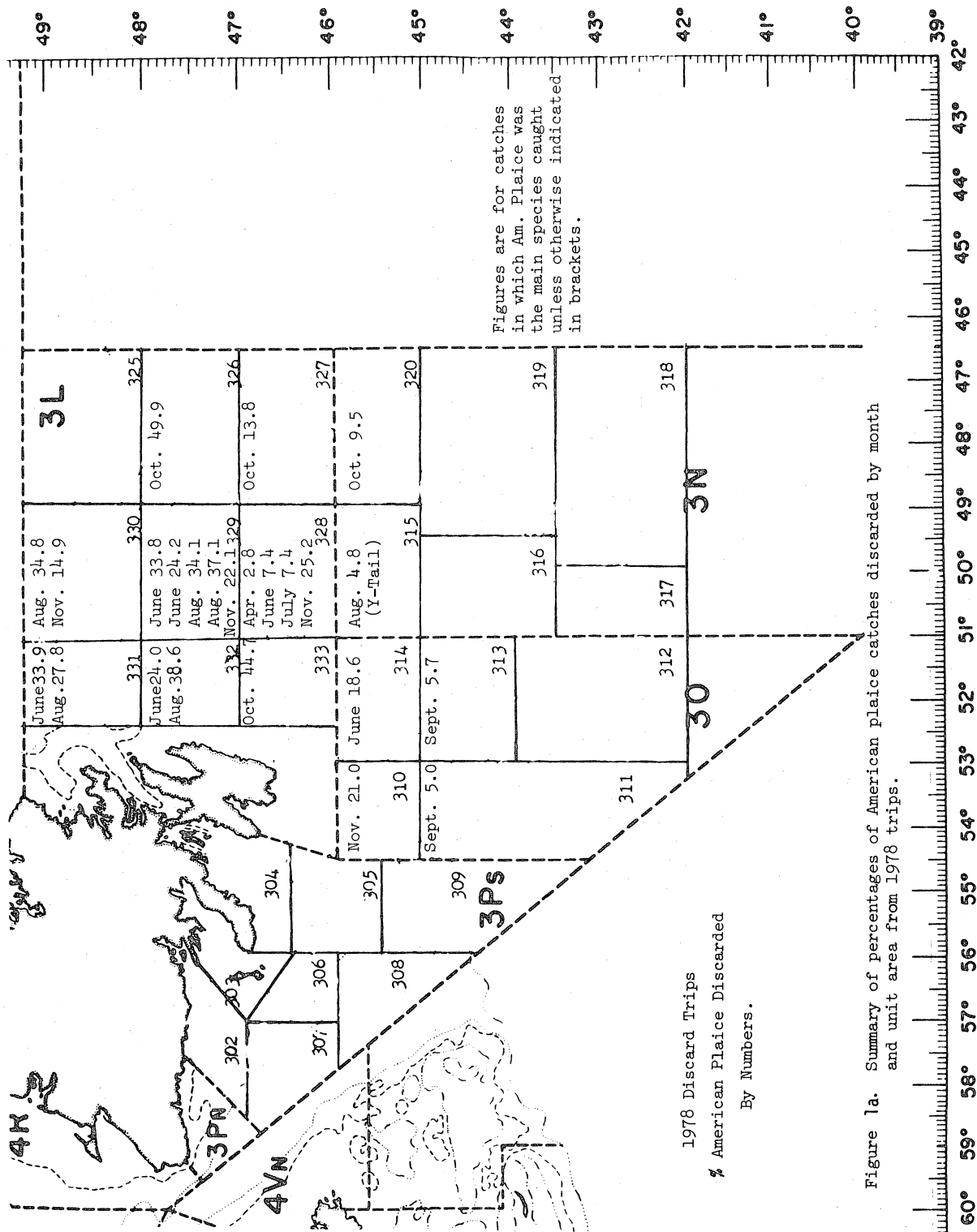
1979							
3L	15,701	24,138	35.0	20,238	26,731	24.3	29.4
3N	9,401	17,208	45.4	12,794	18,078	29.2	37.1
30	1,825	2,179	16.2	4,308	4,655	7.5	10.3
3LNO combined	26,927	43,545	38.2	37,340	49,464	24.5	30.9

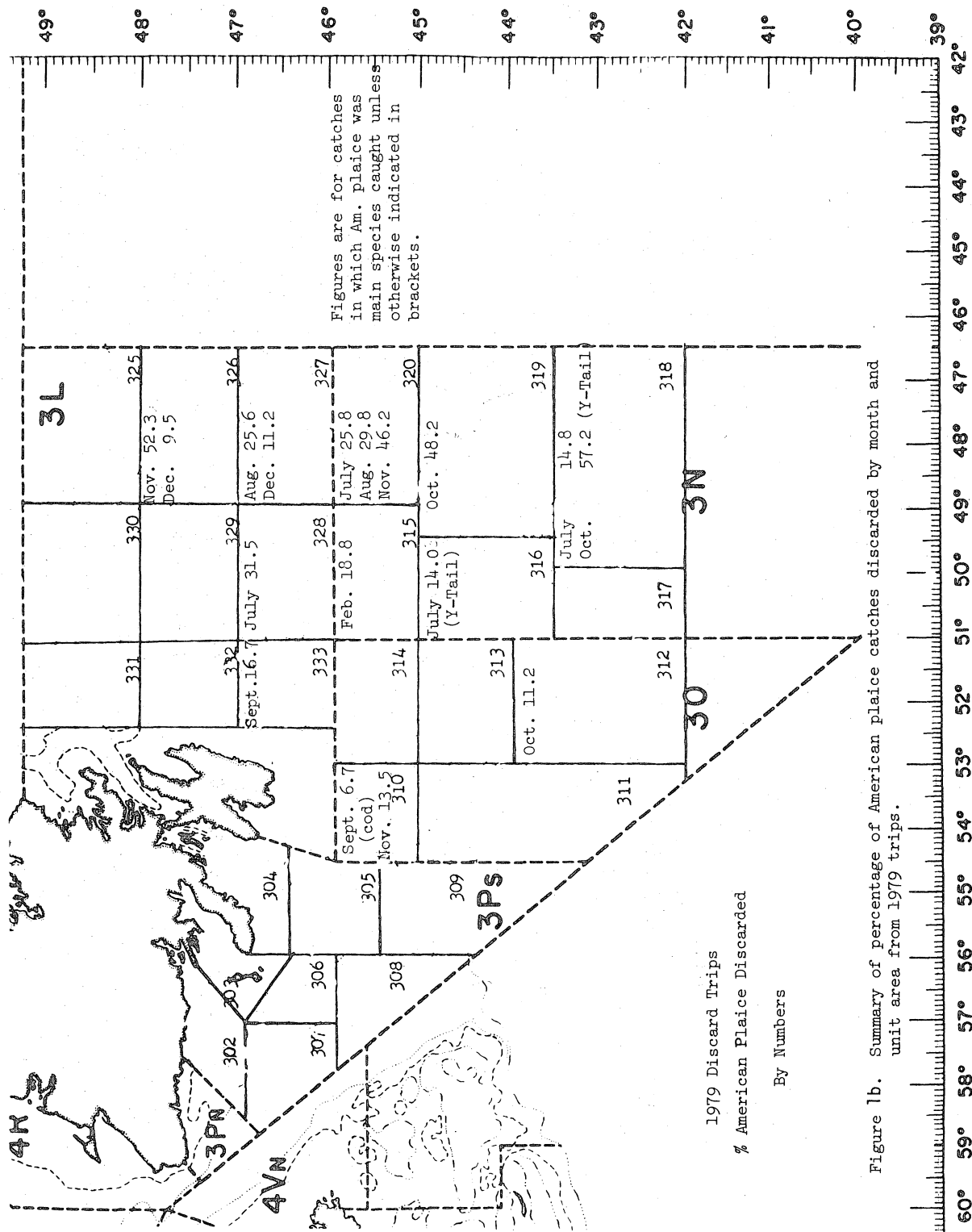
Table 4a. 1978 Div. 3LNO American Plaice catch and landing age composition estimates for Canada (N) other trawl fishery based on discard survey results (numbers X 10<sup>3</sup>).

Age	Males					
	3L		3N		3P	
	Catch	Catch Landings	Catch	Catch Landings	Catch	Catch Landings
3	41	(41)	9	(9)	50	(50)
4	288	26.18	267	1.42	555	2.79
5	1141	8.21	983	1.33	2153	2.45
6	2869	3.54	2165	1.11	5119	1.84
7	4812	1.70	1942	1.03	7033	1.45
8	4897	1.40	1242	1.01	6525	1.31
9	3490	1.25	545	1.01	4896	1.21
10	3883	1.09	126	1.00	2359	1.08
11	1938	1.08	53	1.00	1138	1.07
12	837	1.01	17	1.00	408	1.02
13	230	1.00	2	1.00	126	1.01
14	41	1.00	51	1.00	52	1.00
15	1	1.00	11	1.00	11	1.00
16						
Total	20,978	13,219	7351	6736	30,425	21,575
Females						
3	2	(2)	10	10.00	2	(2)
4	37	(37)	88	2.41	47	47.00
5	200	40.00	538	1.34	422	4.49
6	685	11.42	1806	1.08	1455	2.43
7	2136	3.20	2226	1.04	4233	1.70
8	4169	1.82	2144	1.01	6797	1.47
9	5363	1.29	2324	1.01	8257	1.20
10	6111	1.19	1637	1.01	8450	1.16
11	4605	1.05	684	1.00	6079	1.05
12	3031	1.01	375	1.00	4260	1.03
13	1959	1.00	211	1.00	2776	1.01
14	1147	1.00	133	1.00	1716	1.01
15	646	1.01	119	1.00	1099	1.01
16	243	1.01	60	1.00	522	1.00
17	99	1.00	27	1.00	207	1.00
18	41	1.00	6	1.00	130	1.00
19	21	1.00	2	1.00	74	1.00
20	1	1.00			50	1.00
21					23	1.00
22					9	1.00
Total	30,497	23,835	10,716	10,143	46,608	38,493
WT. (MT)	28,602	25,302	12,827	12,488	47,982	43,868

Table 4b. 1979 Div. 3LN0 American plaice catch and landing age composition estimates for Canada (N) other trawl fishery based on discard survey results (numbers X 10<sup>3</sup>).

Age	Males						Females					
	3L			3N			30			3LN0		
	Catch	Landings	Catch	Landings	Catch	Landings	Catch	Landings	Catch	Landings	Catch	Landings
3												
4	107			14			2		155	14		(155)
5	644	143		645			22	4	813	792		58.07
6	1992	541		2396			242	160	3864	3097		4.88
7	5726	2753		3995			401	286	7807	5996		2.52
8	6810	5185		1767			613	527	101,22	7479		1.69
9	3417	2538		854			483	443	9346	3823		1.25
10	3363	2742		496			225	216	4754	3454		1.24
11	1405	1169		241			128	126	4099	1536		1.19
12	567	523		27			39	39	1785	589		1.16
13	59	59		16			18	18	633	93		1.07
14	14	14					4	4	93	18		1.00
15	20	20					2	2	18	22		1.00
16	14	14							22	14		1.00
17									14			
Total	24,138	15,701		9401			2179	1825	435,25	26,927		
Females												
3												
4	35			30			3		217	31		(217)
5	112	1		638			6		660	765		21.29
6	420	127		2252			118	58	3092	2715		4.04
7	1806	405		2676			495	367	5779	4626		2.13
8	3483	1583		2432			1034	951	7149	6961		1.55
9	4595	3578		1328			988	957	8434	6253		1.21
10	4853	3968		1464			769	758	7252	5605		1.16
11	3939	3377		891			643	623	6172	5315		1.10
12	4101	3840		852			372	369	5635	5315		1.06
13	1625	1589		398			157	155	2395	2369		1.01
14	1128	1135		366			51	51	1651	1671		0.99
15	271	271		146			16	16	468	468		1.00
16	205	206		103			3	3	324	325		1.00
17	134	134		44					181	181		1.00
Total	26,731	20,238		18,078			4655	4308	49,464	37,340		
W.C. (WT)	26,689	23,249		16,894			4587	4433	48,170	41,441		
W&F												







1978 AMERICAN PLAICE  
NAFO DIVISIONS 3L, 3N and 3Ø

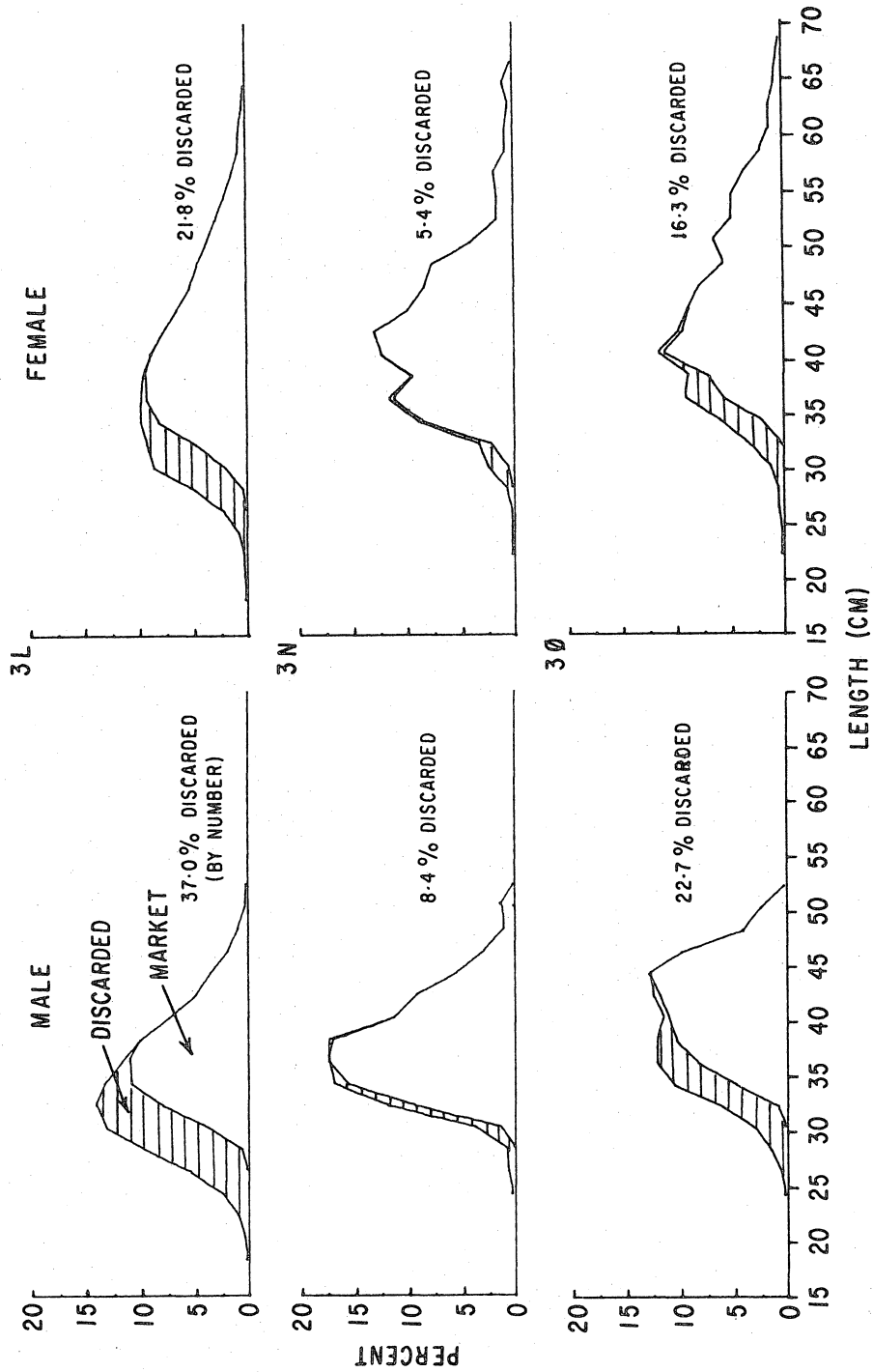


Fig. 2a. Composite length compositions of market and discarded American plaice on Canada (N) trawlers in 1978.

1979 AMERICAN PLAICE  
NAFO DIVISIONS 3L, 3N and 3Ø

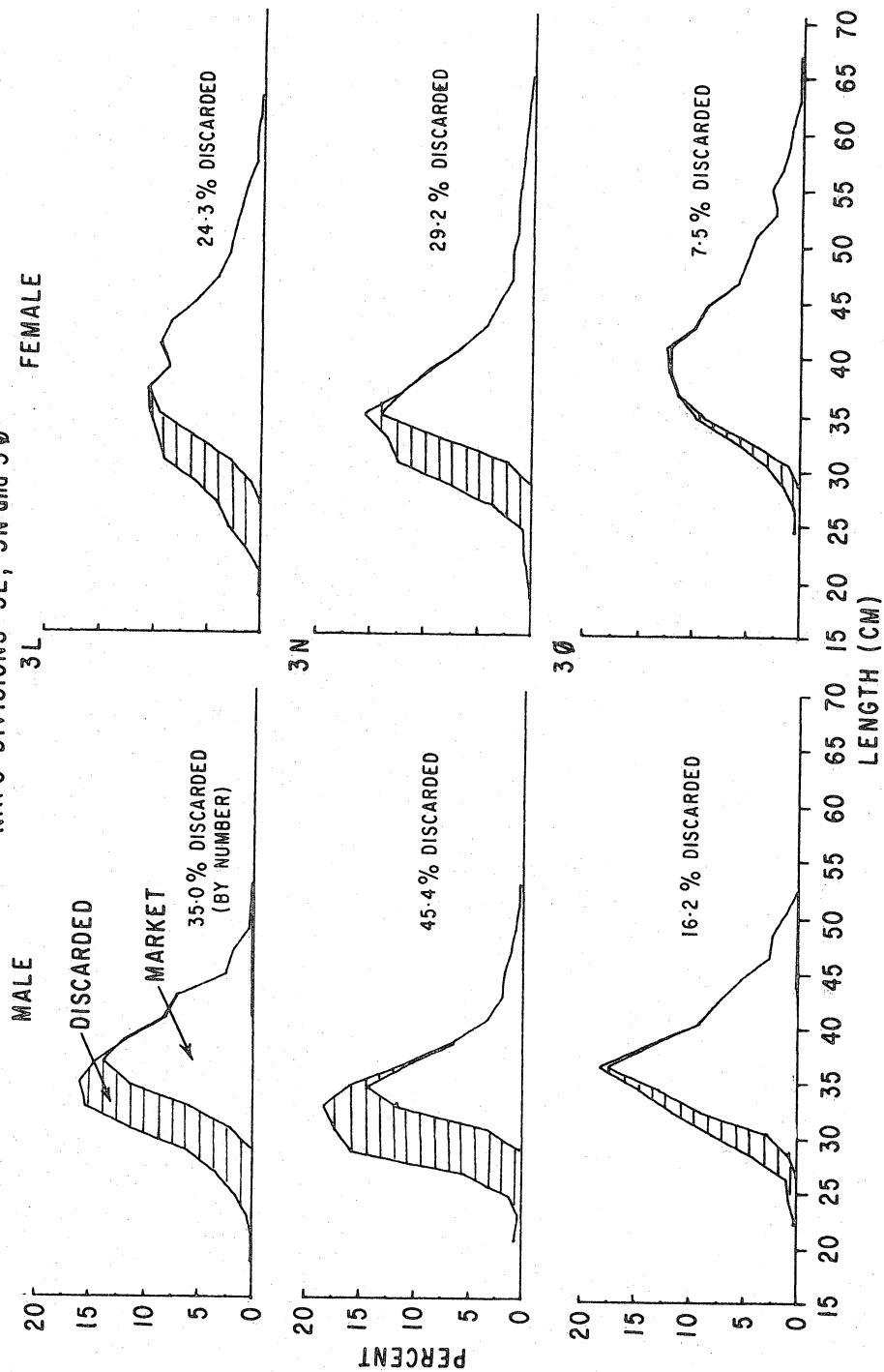


Fig. 2b. Composite length compositions of market and discarded American plaice on Canada (N) trawlers in 1979.