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Estimates of Discarding by the Newfoundland Offshore Fleet in 1985 With Reference to Trends Over the Past 5 Years

by

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ABSTRACT

The rate of discarding by the Newfoundland offshore fleet (greater than 90 ft LOA) has increased steadily since 1981 to a level of 9.9% in 1985 (all species). This increasing trend is consistent for commercial, semi, and non-commercial species. The total estimated discards, commercial or otherwise, were estimated at 20,500 t, an increase of 40% from 1984. The species contributing most to this increase were cod (7,897 t), skate (3,183 t), haddock (2,190 t), plaice (2,197 t), redfish (1,200 t) and wolffish (1,171 t). The discard rate for primary commercial species increased to 7.5% from 4.9% in 1984, attributable mainly to cod and haddock. Skate and wolffish continued to dominate in the semi or non-commercial fractions which amount to 5,287 t.

Dumping and discarding of both discarded species and by-catch in the 2J3KL cod fishery was once again identified as a major contributor to the upward trend in discarding. The species most affected were the smaller stock overlapping the spring 3K cod fishery such as redfish and plaice. However, a significant rise in the observed rate for 2J3KL cod to 8.4% meant that nearly one in five fish caught, mainly 3- to 6-yr-olds, were discarded.

Other problem fisheries in terms of discarding of non-commercial sizes were 4Vn cod (19.8% discard rate), 3NO haddock (62.6%), 3LNO plaice (5.2%) and 3Ps plaice (10%). These and the 3K fisheries were the major contributors to the upward trend observed over the past 5 years. Also, estimates of discarding for all species, particularly those from 2J3KL must be considered as minimum given hearsay evidence of more extensive discarding on vessels not carrying observers.

INTRODUCTION

Landing statistics alone are used to estimate total removals attributable to the Newfoundland offshore fleet when assessing the status of various stocks. However, these data underestimate true fishing mortality because they exclude fish discarded at sea as part of the catch. In past years the occurrence of discarding was thought to be minimal for most stocks and therefore, not a significant contributor to fishing mortality. Also, difficulties associated with the attainment of such data meant their exclusion from official statistics. For example, fishing log records seldom included estimates of discards.

Since 1981, Canadian fisheries observers stationed on vessels of the Newfoundland offshore fleet have provided the opportunity to study the practice of discarding on domestic vessels. Based on the direct observation of these fishery observers, discarding of non-marketable portions of the catches or non-selective dumping had been increasing prior to 1985 (Kulka 1986). The observed increases were a result of selective discarding of larger proportions of small fish, the dumping of less desirable species in large mixed catches, or the dumping of target species where catches were too large to handle. The result was an increasing proportion of caught weight not included in the official statistics.

Considering that there exists no reliable source of information other than that provided by Canadian observers, and that discarding appears to be increasing for certain fisheries, the study was extended to a 5th year. The aim for 1985 is to quantify temporal and areal patterns of discarding, examine the relationship of size of discarded fish to size distribution of the catch where data were available, relate 1985 patterns to past years and provide a detailed view of discarding for semi or potentially commercial offshore species.

METHODS

In 1985, information on discarding was obtained by Canadian fishery observers for 8% of the offshore fishing activity (Newfoundland landings from vessels greater than 90 ft LOA.) Set, catch, and discard data were collected using standard methods (Kulka and Firth 1985) facilitating the quantification of fleet discard practices. In addition, length and age data for certain species collected from both the landed and discarded components of the catch permitted estimates of total numbers discarded and allowed for an examination of the size structure of the discarded component.

Observer and landing data were compiled by species, month, and NAFO division. The kept component of observed catch was compared to the actual landed weights supplied by the regional Statistics Branch of Fisheries and Oceans in order to determine percent of fishery observed. The proportion of observed kept weight to total landed weight was then applied to the observed weight of discards, weighted by month and NAFO Div., to derive discard estimates for both directed and by-catch species using methods outlined in Kulka (1984).

RESULTS AND DISCUSSION

Estimates of discards and total removals for the Newfoundland offshore fleet compiled by month and NAFO Div., and corresponding aggregates, are presented in Tables 1 through 6. In all, 19 fisheries for cod, haddock, redfish, American plaice, yellowtail, and witch were observed. Table 7 provides a 5 year summary of discard rates for the major commercial stocks.

Rates increased from the previous year, for 9 of 18 stocks observed in 1985, 7 by a considerable margin. Figure 1 illustrates trend lines for key stocks where discarding has been increasing or where rates have been relatively high over the past 5 years. Table 9 provides a summary of catches and discards from semi or non-commercial species for each of the fisheries where they were incidentally captured.

Discarding patterns in 1985, as in previous years (Kulka 1986) varied depending on species, fishing area and season. Overall, discarding as a percent of total removals continued to increase for both commercial and non-commercial species. The estimate of total removals discarded for all species at 9.8% was nearly double the 1981 rate. The following sections set forth observed patterns for the various stocks as they contributed to the overall rate. Temporal and areal trends are discussed and data on discarded sizes are presented for selected stocks.

Cod

Table 7 indicates that the discard rate for 3 of 7 observed cod stocks namely, 2GH, 2J3KL, and 4Vn exceeded 5% in 1985 and all had increased from the previous year. Cod landings from 2GH continued to be minimal but a substantial portion of the 158 t catch was discarded. The rate in 4Vn at nearly 20%, was more than double from the previous year and 20 times the rates prior to 1984. Increased size of catches in 1984 and 1985 may have been a key factor contributing to the higher observed level of discarding. Most of the estimated 612 t or 900,000 fish were discarded during the peak period of the fishery in February and March when catch rates were very high.

The most significant fishery in terms of discarding of both directed species and by-catch was for 2J3KL cod. Eighty percent of dumping or discarding of 2J3KL cod occurred during the January-July 3KL directed fishery. Most of the remaining 20% occurred in September in 3L or as by-catch in the 3K redfish or 3L plaice fishery. Although the 1985 landings for this stock dropped by about 10% from the previous 3 years, the estimated amount of discarded cod increased substantially to 6458 t or 8.4% of the total catch by weight (Fig. 1). This rate, more than double the previous year and nearly six times higher than in 1981, represents about 10 million fish or about 1 in 5 that were caught. In terms of numbers, this equates to about 1% of the 4-7 yr-olds in the population, or 19% of the catch (Table 8).

The mean size of discarded 2J3KL cod has increased steadily from a 0.5 kg average in 1982 to 0.67 kg in 1985 in spite of a slight decrease in the average size of fish caught. This would appear to suggest that the "cut off" length or minimum size kept had increased. However, frequencies of landed fish from individual vessels in 1985 indicated a "cut off" length of either 41 or 46 cm (16 or 18"), similar to previous years. In fact, while the overall minimum length landed was 28 cm, only 2% were less than 41 cm (Fig. 2). Compared to 1983 (Kulka 1985) the range of discarded sizes is similar but the mode has increased. The proportion of discarded fish larger than 41 cm increased from 47% in 1983 to 63% in 1985 thus explaining the greater total weight of discards in 1985.

The practice of dumping and discarding of cod has increased steadily over the past 5 years partly as a result of larger catches. Maximum production rates (gutting and packing

fish into the hold) could be sustained even with a greater proportion of fish being discarded because of the large volume in each set. Kulka (1986) contended that discard estimates derived from observed vessels must be regarded as minimum because discarding was thought to be more extensive on the unobserved (and therefore undeterred) vessels which made up 94% of the fleet. Reports of radio communications citing dumping and discarding indicated this to be the case again in 1985, hence the data presented here must also be regarded as minimum estimates.

Haddock

The Newfoundland offshore fleet landed 1913 t of haddock from all areas fished in 1985, more than double the previous year. However, in a directed fishery centered in 3Ø, average size of the catch was only 41 cm (26 to 58 cm range). Most observed vessels had a policy of discarding fish less than about 40-45 cm. As a result, nearly 63% of the 3499 t caught in 3NO was discarded (Table 2), an amount equivalent to 3.5 million fish. Assuming a similar rate in other areas fished, principally 3Ps and 4Vs, total discards for haddock against a 1913 t landing would be approximately 3200 t. These observations represent the first year of coverage on vessel directing for this species.

Redfish

Table 3 indicates that discard rates for 3 of 4 observed redfish stocks in 1985 either dropped or remained at a level less than 5%. The exception was 2+3K redfish where the 7.2% rate of discarding by weight constituted an increase from the previous year (Fig. 1). However, about 5% of the 1135 t of discarded 2+3K redfish originated from the directed fishery. Most of the remaining 95% consisted of redfish by-catch taken with the 2J3KL cod directed fishery. As in 1983 and 1984 (Kulka 1986), observer narrative reports suggested that the discarding of by-caught redfish was likely greater for unobserved vessels directing for cod. In 1985, it was estimated from the observed portion of the directed cod fishery that about 1850 t of redfish was by-caught, much of which was likely discarded. This is considerably less than the 6700 t estimated for 1984 (Kulka 1986) but is still a substantial amount of unrecorded removals.

Plaice/Yellowtail

Table 4 indicates that rates of discarding were relatively high for all 3 of the observed plaice stocks. The most dramatic increase was for 2+3K plaice, at 45%, nearly double the previous year. However, the amount of fish was very small (109 t or 450,000 discarded fish). Much of it came from the 2J3KL cod fishery as by-catch. The estimated total by-catch of plaice with 2J3KL cod was 1150 t. Discarding of this by-catch was likely higher on unobserved vessels than the observed 109 t. Therefore, the actual amount discarded from the 2J3KL cod fishery was likely closer to 1150 t.

Similar to 1984, the 1972 t or 6.1 million plaice and the 513 t or 1.9 million yellowtail discarded in 1985 from 3LNO constituted mainly unmarketable sizes taken with the respective fisheries. Discarded plaice ranged from 12 to 50 cm with a mean of 32 cm, smaller than in 1984 but very similar to 1983 (Kulka 1986). Yellowtail were 16-40 cm with a mean size of 31 cm, similar to previous years.

Discard rates for 3LNO plaice were fairly consistent among NAFO Divisions (Table 4) but tended to be quite variable among months. Rates exceeding 10% were observed in January, April, May, July and September and were lowest in the late fall. This pattern contrasted somewhat with the previous years where monthly rates were generally consistent and discarding was significantly higher in 3N (Kulka 1986).

Other Flatfish

Sufficient numbers of observations were made for only 2 of 6 flatfish stocks. For both 3Ps and 3NO witch, discard rates were less than 5% (Table 6). Observations corresponded to peak periods of the fishery and were consistent between 3N and 3O. At 20 t for 3NO and 9 t for 3Ps, witch discards were insignificant in 1985.

Other Species

Two species groups, skate and wolffish, comprised 84% of the discarded non- or semi-commercial species (Table 9). Skate, mainly thorny, was a significant and sometimes dominant by-catch particularly in the plaice and cod fisheries. Amount caught and discarded in 1985 was 3183 t, about 17% more than in 1984 (Kulka 1986). However, the biggest change was for wolffish which increased by 3 times to 1171 t. As in previous years, the 3 wolffish species were discarded in varying amounts: spotted 7.5%, striped 26%, and northern 99.9%.

Other common species in order of discarded weight were lumpfish, eelpouts, pollock, white hake, dogfish, sculpins, and grenadiers.

Discarded semi and non-commercial species amounted to 5278 t for the Newfoundland offshore fisheries, a 30% increase over 1984 (Kulka 1986). This increase was due to relatively greater proportions of the minor species taken in the directed fisheries, particularly wolffish. In all, 25% of total discarded biomass composed these minor species.

CONCLUSIONS

The estimate of total discards for the 1985 offshore Newfoundland groundfish fishery amounted to 20,500 t or 9.8% of the total catch weight. Except for 1984, this rate has increased steadily from the 1981 level of 5.1%. Much of this increase over the past 5 years can be attributed to increased dumping and discarding in the large 2J3KL cod fishery. It appears that as cod catch rates have increased, both the directed species and commercial by-catch have been discarded in increasingly greater amounts.

As in past years, all estimates of discarding from observed vessels must be regarded as minimum because of deterrence brought about by the surveillance aspects of observer duties. Heresay evidence in the form of radio communications from other vessels continue to support this hypothesis. Selectively discarded fish are generally unmarketable or mixed with large amounts of more valuable items in the catch. Therefore it would appear that only changes in market conditions would result in greater retention of the catches. Although on the rise, discard rates are still quite low for most stocks. The impact of exclusion of these discard data from assessments of the stock while unknown is still likely to be minimal in most cases.

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Table 1. Estimates of discarded cod in Newfoundland fisheries in 1985. All weights are in metric tons.

Month	Area	Observed kept	Observed discards	% Observed discards	% Landed weight observed	Est. discards	Landed weight	Estimated total removals
Stock 2GH								
July	2H(2GH)	0	-	-	0	-	71	71
Aug.	2H(2GH)	0.81	23.91	96.72	81.0	23.91	1	25
Sept.	2H(2GH)	0.65	22.61	97.21	1.81	22.61	36	59
Oct.	2H(2GH)	0	0.91	-	100	0.91	0	1
Nov.	2H(2GH)	0	1.58	-	100	1.58	0	2
1985	2GH	1.46	-	31.65	1.35	50	108	158
Stock 2J+3KL								
Jan.	3K	129.95	15.43	10.61	4.55	338.76	2853	3192
	3L	0	-	-	0	-	10	-
	2J+3KL	129.95	-	10.61	4.54	339.95	2863	3203
Feb.	2J	0	-	-	0	-	1	-
	3K	551.35	13.93	2.46	9.79	142.22	5629	5771
	3L	130.55	19.44	12.96	29.21	66.56	447	514
	2J+3KL	681.90	-	3.32	11.22	208.81	6077	6286
Mar.	2J	0	-	-	0	-	13	-
	3K	1765.07	97.69	5.24	20.43	478.19	8640	9118
	3L	35.44	2.71	7.10	6.17	43.89	574	618
	2J+3KL	1800.51	-	5.36	19.51	522.82	9227	9750
Apr.	2J	0	-	-	0	-	266	-
	3K	230.98	27.79	10.74	2.11	1314.78	10928	12243
	3L	54.43	6.79	11.09	5.76	117.89	945	1063
	2J+3KL	285.41	-	10.77	2.35	1464.77	12139	13604
May	3K	400.01	50.11	11.13	5.71	877.03	7001	7878
	3L	60.03	15.66	20.69	1.65	946.43	3628	3674
	2J+3KL	460.04	-	14.64	4.33	1823.46	10629	12453
June	2J	0	-	-	0	-	160	-
	3K	54.86	5.35	8.89	1.28	417.68	4283	470
	3L	36.47	3.35	8.41	1.36	246.27	2681	2927
	2J+3KL	91.33	-	8.70	1.23	679.20	7124	7803
July	2J	12.19	0.92	7.02	1.62	56.68	751	808
	3K	1.97	0.36	15.45	0.68	52.63	288	341
	3L	41.42	5.65	12.00	3.70	153.05	1122	1275
	2J+3KL	55.58	-	10.84	2.57	262.36	2161	2423
Aug.	2J	-	0.20	-	-	-	31	-
	3K	0	-	-	0	-	47	-
	3L	0	-	-	0	-	1998	-
	2J+3KL	0	-	100.0	0	-	2076	-
Sept.	2J	-	0.28	-	-	-	21	21
	3K	0	-	-	0	-	58	-
	3L	40.00	5.23	11.56	1.02	515.16	3940	4455
	2J+3KL	40.00	-	11.56	1.00	525.49	4019	4544
Oct.	2J	0	-	-	0	-	10	-
	3K	-	0.50	-	-	-	48	48
	3L	119.34	4.42	3.57	3.10	144.48	3901	4046
	2J+3KL	119.34	-	3.57	3.01	146.63	3959	4106
Nov.	2J	9.06	0.10	1.09	64.70	0.15	14	14
	3K	19.41	0	0	10.22	0	190	190
	3L	216.47	5.82	2.62	4.35	133.91	4987	5121
	2J+3KL	245.21	-	2.52	4.72	134.06	5191	5325

Table 1 (Cont'd.)

Month	Area	Observed kept	Observed discards	% Observed discards	% Landed weight observed	Est. discards	Landed weight	Estimated total removals
Stock 2J+3KL (Cont'd)								
Dec.	3K	3.14	0	0	0.85	0	369	369
	3L	50.60	1.67	3.19	1.04	161.13	4882	5043
	2J+3KL	53.47	-	2.98	1.02	161.13	5251	5412
1985	2J	21.25	-	6.92	1.68	94.12	1267	1361
	3K	3156.74	-	8.26	7.83	3630.74	40334	43969
	3L	785.02	-	8.54	2.70	2718.40	29115	31833
	2J+3KL	3963.01	-	8.37	5.60	6458.27	70716	77174
Stock 3NO								
Feb.	3N	10.52	0.88	7.72	15.94	5.52	66	72
	30	135.76	5.95	4.03	14.11	42.16	962	1004
	3NO	146.28	-	4.43	14.23	47.68	1028	1076
Mar.	3N	5.96	0.91	13.25	3.73	2.44	16	18
	30	451.98	10.18	2.20	27.40	37.16	1650	1687
	3NO	457.94	-	2.32	27.49	39.60	1666	1706
Apr.	3N	0.26	0	0	0.37	0	70	70
	30	90.62	0.53	0.58	4.77	11.11	1900	1911
	3NO	90.88	-	0.58	4.61	11.49	1970	1981
May	3N	75.88	3.70	4.65	5.27	70.26	1441	11511
	30	0	-	-	0	-	940	-
	3NO	75.88	-	4.65	3.19	116.10	2381	2497
June	3N	10.60	0.24	2.21	0.88	27.22	1202	1229
	30	0	-	-	0	-	338	-
	3NO	10.60	-	1.11	0.69	34.87	1540	1575
July	3N	5.83	0.57	8.91	1.01	56.71	580	637
	30	0	-	-	0	-	34	-
	3NO	5.83	-	8.91	0.95	60.03	614	674
Aug.	3N	0	-	-	0	-	683	-
	30	0	-	-	0	-	21	-
	3NO	0	-	-	0	-	704	-
Sept.	3N	0.12	0	0	0.04	0	287	287
	30	0	-	-	0	-	62	-
	3NO	0.12	0	0	0.03	0	349	349
Oct.	3N	11.13	1.01	8.32	1.86	54.36	599	653
	30	0	-	-	0	-	55	-
	3NO	11.13	-	8.32	1.70	59.35	654	713
Nov.	3N	4.00	0.01	0.25	0.25	4.04	1616	1620
	30	0	-	-	0	-	102	-
	3NO	4.00	-	0.25	0.23	4.30	1718	1722
Dec.	3N	0	-	-	0	-	78	-
	30	0	-	-	0	-	50	-
	3NO	0	-	-	0	-	128	-
1985	3N	124.3	-	4.46	1.87	309.80	6638	6948
	30	678.36	-	1.07	12.88	56.81	5264	5321
	3NO	-	-	3.26	6.74	401.49	11902	12304

Table 1 (Cont'd.)

Month	Area	Observed kept	Observed discards	% Observed discards	% Landed weight observed	Est. discards	Landed weight	Estimated total removals
Stock 3Ps								
Feb.	3Ps	5.04	0.14	2.70	0.50	28.44	1024	1052
Mar.	3Ps	312.86	23.83	7.62	28.73	82.88	1089	1172
Apr.	3Ps	242.45	3.61	1.47	25.10	14.40	967	981
May	3Ps	0	-	-	0	-	3	-
June	3Ps	0	-	-	0	-	5	-
July	3Ps	0	-	-	0	-	14	-
Aug.	3Ps	0.07	0	0	7	0	1	1
Sept.	3Ps	0	-	-	0	-	1	-
Nov.	3Ps	0	-	-	0	-	36	-
Dec.	3Ps	0	-	-	0	-	788	-
1985	3Ps	560.42	-	3.92	14.27	160.28	39.28	4088
Stock 4RS +3Pn								
Feb.	4R	0	-	-	0	-	138	-
	4RS+3Pn	0	-	-	0	-	138	-
Mar.	3PN(4RS+3Pn)	62.52	0.20	0.32	17.10	1.17	366	367
Apr.	4R	23.94	0.96	3.86	12.21	7.86	196	204
	3Pn	86.67	5.59	6.06	45.62	12.25	190	202
	4RS+3Pn	110.61	-	4.93	28.66	20.11	386	406
May	4R	0	-	-	0	-	215	-
	4S	0	-	-	0	-	4	-
	3Pn	0	-	-	0	-	71	-
	4RS+3Pn	0	-	-	0	-	290	-
June	4R	0	-	-	0	-	6	-
	3Pn	0	-	-	0	-	2	-
	4RS+3Pn	0	-	-	0	-	8	-
July	4R	0	-	-	0	-	4	-
	3Pn	0.11	0	0	1.22	0	9	9
	4RS+3Pn	0.11	0	0	0.85	0	13	13
Aug.	4R	0	-	-	0	-	12	-
	3Pn	0.10	0	0	0.06	0	166	166
	4RS+3Pn	0.10	0	0	0.06	0	178	178
Sept.	4R	0	-	-	0	-	8	-
	4S	0	-	-	0	-	1	-
	3Pn	0	-	-	0	-	87	-
	4RS+3Pn	0	-	-	0	-	96	-
Oct.	4R	0	-	-	0	-	19	-
	4S	0	-	-	0	-	3	-
	3Pn	0	-	-	0	-	3	-
	4RS+3Pn	0	-	-	0	-	25	-
Nov.	4R	0	-	-	0	-	8	-
	4S	0	-	-	0	-	1	-
	4RS+3Pn	0	-	-	0	-	9	-

Table 1 (Cont'd.)

Month	Area	Observed kept	Observed discards	% Observed discards	% Landed weight observed	Est. discards	Landed weight	Estimated total removals
Stock 4RS+3Pn (Cont'd.)								
Dec.	4R(4RS+3Pn)	0	-	-	0	-	1	-
1985	4R	23.94	-	3.86	3.94	24.34	607	631
	4S	0	-	0	0	0	9	9
	3Pn	149.40	-	1.65	16.71	14.98	894	909
	4RS+3Pn	173.34	-	2.10	11.48	32.30	1510	1542
Jan.	4Vn	283.50	1.50	0.53	25.99	5.77	1091	1097
Feb.	4Vn	26.97	14.36	34.74	2.89	496.24	932	1428
Mar.	4Vn	0	-	-	0	-	365	-
Apr.	4Vn	0	-	-	0	-	9	-
May	4Vn	0	-	-	0	-	10	-
June	4Vn	0.57	0	0	2.04	0	28	28
July	4Vn	1.35	0	0	2.11	0	64	64
Aug.	4Vn	0	-	-	0	-	17	-
Sept.	4Vn	0	-	-	0	-	31	-
Oct.	4Vn	0	-	-	0	-	13	-
Nov.	4Vn	0	-	-	0	-	4	-
Dec.	4Vn	0	-	-	0	-	13	-
1985	4Vn	312.39	-	19.18	12.12	611.67	2577	3189
Stock 4VsWX								
Feb.	4Vs(4VsWx)	339.91	18.17	5.07	46.63	38.97	729	768
Mar.	4Vs(4VsWX)	309.74	7.66	2.41	27.27	28.09	1136	1164
Apr.	4Vs(4VsWX)	310.31	11.84	3.68	25.99	45.56	1194	1240
May	4Vs(4VsWX)	0	-	-	0	-	440	-
June	4Vs(4VsWX)	4.92	0	0	7.45	0	66	66
July	4Vs(4VsWX)	37.45	0	0	11.89	0	315	315
Aug.	4Vs(4VsWX)	0	-	-	0	-	81	-
Sept.	4Vs(4VsWX)	0	-	-	0	-	348	-
Oct.	4Vs(4VsWX)	0	-	-	0	-	444	-
Nov.	4Vs(4VsWX)	0	-	-	0	-	762	-
Dec.	4Vs(4VsWX)	0	-	-	0	-	167	-
1985	4Vs(4VsWX)	1002.33	-	3.17	17.64	186.02	5682	5868

Table 2. Estimates of discarded haddock in Newfoundland fisheries in 1985. All weights are in metric tons.

Month	Area	Observed kept	Observed discards	% Observed discards	% Landed weight observed	Est. discards	Landed weight	Estimated total removals
Stock 3NO								
Feb.	3N	0.05	0	0	2.50	0	2	2
	3O	13.02	1.47	10.14	10.33	14.23	126	140
	3NO	13.07	-	10.02	10.21	14.23	128	142
Mar.	3N	0	-	-	0	-	1	-
	3O	140.43	139.33	49.80	36.00	386.95	390	777
	3NO	140.43	-	49.80	35.92	387.94	391	779
Apr.	3N	0	-	-	0	-	3	-
	3O	3.80	10.76	73.90	0.95	1129.80	399	1529
	3NO	3.80	-	73.90	0.95	1138.30	402	1540
May	3N	0	-	-	0	-	1	-
	3O	0	-	-	0	-	65	-
	3NO	0	-	-	0	-	66	-
June	3N	0	-	-	0	-	2	-
	3O	0	-	-	0	-	5	-
	3NO	0	-	-	0	-	7	-
July	3N(3NO)	0	-	-	0	-	4	-
Aug.	3N	0	-	-	0	-	12	-
	3O	0	-	-	0	-	1	-
	3NO	0	-	-	0	-	13	-
Sept.	3N	0	-	-	0	-	25	-
	3O	0	-	-	0	-	49	-
	3NO	0	-	-	0	-	74	-
Oct.	3N	0	-	-	0	-	1	-
	3O	0	-	-	0	-	165	-
	3NO	0	-	-	0	-	166	-
Nov.	3N	0	-	-	0	-	25	-
	3O	0	-	-	0	-	32	-
	3NO	0	-	-	0	-	57	-
Dec.	3O(3NO)	0	-	-	0	-	1	-
1985	3N	0.05	-	0	0.07	0	76	76
	3O	157.25	-	62.59	12.75	2063	1233	3296
	3NO	157.30	-	62.59	12.02	2190	1309	3499

Table 3. Estimates of discarded redfish in Newfoundland fisheries in 1985. All weights are in metric tons.

Month	Area	Observed kept	Observed discards	% Observed discards	% Landed weight observed	Est. discards	Landed weight	Estimated total removals
Stock 2+3K								
Jan.	3K(2+3K)	273.41	2.03	0.74	25.41	7.99	1076	1084
Feb.	3K(2+3K)	322.27	3.22	0.99	25.36	12.70	1271	1284
Mar.	3K(2+3K)	127.64	34.04	21.05	9.01	377.90	1417	1795
Apr.	3K(2+3K)	3.14	0.76	19.49	0.24	310.54	1283	1594
May	3K(2+3K)	69.73	0.65	0.92	5.56	11.69	1254	1266
June	2J	0	-	-	0	-	24	-
	3K	92.10	1.50	1.60	0.09	18.93	1162	1181
	2+3K	92.10	-	1.60	0.09	19.32	1186	1205
July	2H	0	-	-	0	-	113	-
	2J	35.94	0	0	7.68	0	468	468
	3K	80.10	0	0	6.86	0	1167	1167
	2+3K	116.04	-	-	0	-	1748	1748
Aug.	2H	0	47.89	-	-	-	20	67.89
	2J	0	0.02	-	-	-	73	73
	3K	0	-	-	0	-	1820	-
	2+3K	0	-	100.0	-	47.91	1913	1961
Sept.	2J	0	0.06	-	-	-	13	13
	3K	0	-	-	0	-	1315	0
	2+3K	0	-	100.00	0	-	1328	1328
Oct.	3K(2+3K)	22.3	0	0	2.79	0	799	799
Nov.	3K(2+3K)	127.87	0.51	0.40	15.96	3.19	801	804
Dec.	3K(2+3K)	108.75	0.64	0.59	16.53	3.87	658	662
1985	2H	0	-	-	0	0	133	133
	2J	35.94	-	-	6.22	-	578	578
	3K	1227.31	-	7.68	8.18	1077.30	14023	15100
	2+3K	1263.25	-	7.15	8.03	1135.02	14734	15869
Jan.	3L(3LN)	0	-	-	0	-	70	-
Feb.	3L(3LN)	0	-	-	0	-	39	-
Mar.	3L(3LN)	19.70	0	0	30.78	0	64	64
Apr.	3L(3LN)	0	0.04	-	0	-	125	125
May	3L(3LN)	0.05	0.04	44.4	0.14	29.60	37	67
June	3L(3LN)	0	-	-	0	-	92	-
July	3N(3LN)	0	-	-	0	-	75	-
Aug.	3L	0	-	-	0	-	45	-
	3N	0	-	-	0	-	1	-
	3LN	0	-	-	0	-	46	-
Sept.	3L(3LN)	0	-	-	0	-	242	-
Oct.	3L	2.62	0	0	0.45	0	586	586
	3N	0	-	-	0	-	2	-
	3LN	2.62	-	0	0.45	0	588	588

Table 3 (Cont'd.)

Month	Area	Observed kept	Observed discards	% Observed discards	% Landed weight observed	Est. discards	Landed weight	Estimated total removals
Stock 3LN								
Nov.	3L	11.49	0.32	2.74	4.35	7.35	264	271
	3N	0	-	-	0	-	4	-
	3LN	11.49	-	2.64	4.29	7.46	268	283
Dec.	3L(3LN)	0	-	-	0	-	9	-
1985	3L	33.86	-	3.74	2.05	64.03	1648	1712
	3N	0	-	0	0	0	82	82
	3LN	33.86	-	3.73	2.05	64	1655	1719
Mar.	3Pn(3P)	0.47	0.02	4.08	6.71	0.30	7	
Apr.	3Ps(3P)	7.91	0.23	2.83	87.89	0.26	9	
May	3Pn	0	-	-	0	-	1	-
	3Ps	0	-	-	0	-	79	-
	3P	0	-	-	0	-	80	-
June	3Pn	0	-	-	0	-	41	-
	3Ps	0	-	-	0	-	90	-
	3P	0	-	-	0	-	131	-
July	3Pn	20.28	2.41	10.62	11.52	20.92	176	197
	3Ps	0.08	0	0	0.03	0	298	298
	3P	20.36	-	4.25	4.30	20.95	474	494
Aug.	3Pn	28.80	0.14	0.48	7.48	1.87	385	387
	3Ps	17.01	0.30	1.73	7.15	4.20	238	242
	3P	45.81	-	0.95	7.35	5.98	623	629
Sept.	3Pn	0	-	-	0	-	157	-
	3Ps	0	-	-	0	-	228	-
	3P	0	-	-	0	-	385	-
Oct.	3Pn	0	-	-	0	-	119	-
	3Ps	0	-	-	0	-	40	-
	3P	0	-	-	0	-	159	-
Nov.	3Pn	0	-	-	0	-	110	-
	3Ps	0	-	-	0	-	29	-
	3P	0	-	-	0	-	139	-
Dec.	3Pn	0	-	-	0	-	167	-
	3Ps	0	-	-	0	-	17	-
	3P	0	-	-	0	-	184	-
1985	3Pn	49.55	-	5.03	4.26	61.65	1163	1225
	3Ps	24.99	-	0.81	2.43	8.41	1028	1036
	3P	75.54	-	3.10	3.45	70.05	2191	2261
Feb.	4Vn	8.81	0.07	0.79	51.82	0.14	17	17
Apr.	4Vn	0	-	-	0	-	2	-
May	4Vn	0	-	-	0	-	18	-
June	4Vn	1.11	0	0	0.26	0	429	429
July	4Vn	1.91	0	0	11.51	0	166	166
Aug.	14Vn	04.46	0.02	0.02	13.27	0.15	789	789

Table 3 (Cont'd.)

Month	Area	Observed kept	Observed discards	% Observed discards	% Landed weight observed	Est. discards	Landed weight	Estimated total removals
Stock 4Vn								
Sept.	4Vn	0	-	-	0	-	121	-
Oct.	4Vn	0	-	-	0	-	28	-
Nov.	4Vn	0	-	-	0	-	30	-
Dec.	4Vn	0	-	-	0	-	97	-
1985	14Vn	16.29	-	0.03	6.85	0.52	1697	1698

Table 4. Estimates of discarded plaice in Newfoundland fisheries in 1985. All weights are in metric tons.

Month	Area	Observed kept	Observed discards	% Observed discards	% Landed weight observed	Est. discards	Landed weight	Estimated total removals
Stock 2+3K								
Jan.	3K(2+3K)	0	0.38	-	0	-	1	1
Feb.	3K(2+3K)	0.70	0.11	13.58	35.00	0.31	2	2
Mar.	3K(2+3K)	0.78	0.56	41.79	26.00	2.15	3	5
Apr.	3K(2+3K)	0	0.09	-	0	-	7	7
May	3K(2+3K)	0.54	0.77	58.78	1.08	71.30	50	121
June	3K(2+3K)	0.04	0	0	0.33	0	12	12
July	2J	0.93	0.20	17.70	3.72	5.38	25	30
	3K	0.03	0.04	57.14	1.50	2.67	2	5
	2+3K	0.96	-	-	3.56	7.95	27	35
Aug.	2H(2GH)	0	3.99	-	0	3.99	5	9
	2J	0	-	-	0	-	2	-
	3K	0	-	-	0	-	8	-
	2+3K	0	-	-	0	3.99	15	19
Sept.	2H(2GH)	0	-	-	0	-	4	-
	2J	0	-	-	0	-	2	-
	3K	0	-	-	0	-	2	-
	2+3K	0	-	-	0	-	8	-
Nov.	3K(2+3K)	2.93	0.01	0.34	48.83	0.02	6	6
Dec.	3K(2+3K)	0	0.10	-	0	-	4	4
1985	2H(2GH)	0	-	0	0	0	9	9
	2J	0.93	-	1.77	3.21	6.24	29	35
	3K	5.02	-	50.41	5.18	98.80	97	196
	2+3K	5.95	-	44.56	4.41	108.72	135	244
Stock 3LNO								
Feb.	3L	3.06	0.12	3.77	12.75	0.94	24	25
	3N	176.52	18.40	9.44	14.55	126.44	1213	1339

Table 4 (Cont'd.)

Month	Area	Observed kept	Observed discards	% Observed discards	% Landed weight observed	Est. discards	Landed weight	Estimated total removals
Feb.	30	55.45	3.57	6.05	9.90	36.05	560	596
	3LNO	235.03	-	8.34	13.01	163.43	1797	1960
Mar.	3L	972.69	25.15	2.52	34.21	73.51	2843	2917
	3N	44.77	4.08	8.35	19.81	20.60	226	247
	30	53.97	3.94	6.80	27.12	14.53	199	214
	3LNO	1071.43	-	3.22	32.79	108.64	3268	3377
Apr.	3L	35.13	0.10	0.28	4.37	2.29	803	805
	3N	12.65	0.01	0.08	1.68	0.60	753	754
	30	17.35	0.26	1.48	3.07	8.48	566	575
	3LNO	65.13	-	0.53	3.07	11.37	2122	2133
May	3L	16.36	0.11	0.67	1.05	10.44	1552	1562
	3N	29.82	0	0	2.37	0	1260	1260
	30	0	-	-	0	-	713	-
	3LNO	46.18	-	0.37	1.31	13.09	3525	3538
June	3L	72.72	4.45	5.77	3.46	128.45	2099	2227
	3N	52.40	3.07	5.53	2.44	125.67	2145	2271
	30	0	-	-	0	-	372	-
	3LNO	125.12	-	5.65	2.71	276.39	4616	4892
July	3L	56.82	7.87	12.17	4.33	181.60	1311	1493
	3N	44.48	3.06	6.44	2.48	123.42	1794	1917
	30	0	-	-	0	-	78	-
	3LNO	101.30	-	8.95	3.18	312.68	3183	3496
Aug.	3L	0	-	-	0	-	1292	-
	3N	0	-	-	0	-	1701	-
	30	0	-	-	0	-	123	-
	3LNO	0	-	-	0	-	3116	-
Sept.	3L	86.49	9.41	9.81	3.07	306.40	2816	3122
	3N	1.38	0	0	0.13	0	1023	1023
	30	0	-	-	0	-	331	-
	3LNO	87.87	-	7.40	2.11	332.81	4170	4503
Oct.	3L	196.16	10.02	4.86	4.94	202.90	3972	4175
	3N	84.05	3.02	3.47	5.52	54.70	1522	1577
	30	0	-	-	0	-	105	-
	3LNO	280.21	-	4.49	5.00	262.52	5599	5862
Nov.	3L	41.71	3.45	7.64	2.32	148.60	1796	1945
	3N	13.31	0.65	4.66	1.13	57.33	1174	1231
	30	0	-	-	0	-	207	-
	3LNO	55.02	-	6.48	1.73	220.28	3177	3397
Dec.	3L	82.10	4.93	5.66	5.98	82.45	1373	1455
	3N	0	-	-	0	-	282	-
	30	0	-	-	0	-	27	-
	3LNO	82.10	-	5.67	0.49	101.00	1682	1783
1985	3L	1563.24	-	5.77	7.86	1216.65	19881	21098
	3N	459.38	-	4.38	3.51	599.57	13093	13693
	30	126.77	-	4.10	3.86	146.25	3281	3568
	3LNO	2149.39	-	5.16	5.93	1971.66	36255	38227
Stock 3Ps								
Feb.	3Ps	34.00	1.48	4.35	100	1.48	33	35
Mar.	3Ps	698.80	83.87	10.71	27.39	306.17	2551	2857
Apr.	3Ps	46.25	1.37	2.88	21.11	6.49	219	225

Table 4 (Cont'd.)

Month	Area	Observed kept	Observed discards	% Observed discards	% Landed weight observed	Est. discards	Landed weight	Estimated total removals
May	3Ps	0	-	-	0	-	2	-
June	3Ps	0	-	-	0	-	15	-
Sept.	3Ps	0	-	-	0	-	7	-
Oct.	3Ps	0	-	-	0	-	32	-
Nov.	3Ps	0	-	-	0	-	315	-
Dec.	3Ps	0	-	-	0	-	7	-
1985	3Ps	779.05	-	10.08	24.49	356.50	3181	3538

Table 5. Estimates of discarded yellowtail in Newfoundland fisheries in 1985. All weights are in metric tons.

Month	Area	Observed kept	Observed discards	% Observed discards	% Landed weight observed	Est. discards	Landed weight	Estimated total removals
Stock 3LNO								
Feb.	3N	364.87	24.71	6.34	27.64	89.40	1320	1409
	30	4.28	0.34	7.36	26.75	1.27	16	17
	3LNO	369.15	-	6.35	27.02	90.67	1336	1426
Mar.	3L	143.06	10.06	3.34	37.45	26.90	382	409
	3N	55.78	4.36	7.25	8.43	51.74	662	713
	30	1.27	0.21	14.20	42.33	0.50	3	4
	3LNO	200.11	-	7.02	19.11	79.14	1047	1126
Apr.	3L	19.21	0.02	0.10	43.66	0.45	434	435
	3N	8.10	0.22	2.64	2.28	9.64	355	365
	30	1.48	0	0	1.76	0	84	84
	3LNO	28.79	-	1.13	3.30	10.09	873	884
May	3L	0	-	-	0	-	482	-
	3N	52.54	0	0	4.28	0	1228	1228
	30	0	-	-	0	-	317	-
	3LNO	52.54	-	0	2.59	0	2027	2027
June	3L	26.21	0.61	2.27	4.64	13.15	565	578
	3N	0	-	-	0	-	1066	-
	30	0	-	-	0	-	233	-
	3LNO	26.21	-	2.27	1.41	43.38	1864	1907
July	3L	26.71	0.75	2.73	4.91	15.28	544	559
	3N	5.39	0.22	9.80	0.92	23.84	584	608
	30	0	-	-	0	-	60	-
	3LNO	32.10	-	3.34	2.70	41.20	1188	1229
Aug.	3L	0	-	-	0	-	475	-
	3N	0	-	-	0	-	942	-
	30	0	-	-	0	-	33	-
	3LNO	0	-	-	0	-	1450	-
Sept.	3L	0.71	0.11	13.41	0.34	32.54	210	243
	3N	3.00	0.04	1.32	0.38	10.50	786	797
	30	0	-	-	0	-	25	-
	3LNO	3.17	-	4.13	0.36	44.12	1021	1065

Table 5 (Cont'd.)

Month	Area	Observed kept	Observed discards	% Observed discards	% Landed weight observed	Est. discards	Landed weight	Estimated total removals
Oct.	3L	1.95	0.21	9.72	2.57	8.20	76	84
	3N	9.34	0.89	8.70	1.41	63.20	663	726
	30	0	-	-	0	-	24	-
	3LNO	11.29	-	8.84	1.48	73.72	763	837
Nov.	3L	0	-	-	0	-	182	-
	3N	22.98	1.03	4.29	1.85	55.53	1239	1295
	30	0	-	-	0	-	25	-
	3LNO	22.98	-	4.30	1.59	64.81	1446	1511
Dec.	3L	0	-	-	0	-	27	-
	3N	0	-	-	0	-	211	-
	30	0	-	-	0	-	4	-
	3LNO	0	-	-	0	-	242	-
1985	3L	217.85	-	4.18	6.45	147.42	3377	3524
	3N	522.00	-	4.27	5.76	403.65	9056	9460
	30	7.03	-	1.69	0.85	14.16	824	838
	3LNO	746.88	-	3.72	5.63	512.55	13257	13770

Table 6. Estimates of discarded witch in Newfoundland fisheries in 1985. All weights are in metric tons.

Month	Area	Observed kept	Observed discards	% Observed discards	% Landed weight observed	Est. discards	Landed weight	Estimated total removals
Stock 3NO								
Feb.	3N	4.60	0	0	6.39	0	72	72
	30	10.59	0.30	2.75	3.38	8.87	313	322
	3NO	15.19	0.30	1.93	3.95	7.60	385	393
Mar.	3N	0.18	0	0	3.60	0	5	5
	30	277.78	1.33	0.48	44.09	3.02	630	633
	3NO	277.96	1.33	0.48	43.77	3.02	635	638
Apr.	3N	0.13	0	0	2.60	0	5	5
	30	89.40	0.32	0.36	6.82	4.70	1310	1315
	3NO	89.53	0.32	0.36	6.81	4.70	1315	1320
May	3N	0	-	-	0	-	3	-
	30	0	-	-	0	-	207	-
	3NO	0	-	-	0	-	210	-
June	3N	0	-	-	0	-	3	-
	30	0	-	-	0	-	2	-
	3NO	0	-	-	0	-	5	-
July	3N(3NO)	0	-	-	0	-	1	-
Aug.	3N	0	-	-	0	-	13	-
	30	0	-	-	0	-	1	-
	3NO	0	-	-	0	-	14	-
Sept.	3N	0	-	-	0	-	4	-
	30	0	-	-	0	-	26	-
	3NO	0	-	-	0	-	30	-

Table 6 (Cont'd.)

Month	Area	Observed kept	Observed discards	% Observed discards	% Landed weight observed	Est. discards	Landed weight	Estimated total removals
Oct.	3N	0	-	-	0	-	5	-
	3O	0	-	-	0	-	15	-
	3NO	0	-	-	0	-	20	-
Nov.	3N	0	-	-	0	-	2	-
	3O	0	-	-	0	-	5	-
	3NO	0	-	-	0	-	7	-
1985	3N	4.91	-	0	4.35	0	113	113
	3O	377.77	-	0.73	15.06	18.48	2509	2527
	3NO	382.68	-	0.76	14.59	19.57	2622	2642
Stock 3Ps								
Feb.	3Ps	0.23	0	0	1.92	0	12	12
Mar.	3Ps	42.32	0.74	1.72	59.61	1.24	71	72
Apr.	3Ps	3.46	0.25	6.74	3.98	6.30	87	93
May	3Ps	0	-	-	0	-	4	-
July	3Ps	0	-	-	0	-	2	-
Aug.	3Ps	0	-	-	0	-	3	-
Sept.	3Ps	0	-	-	0	-	1	-
Nov.	3Ps	0	-	-	0	-	17	-
Dec.	3Ps	0	-	-	0	-	3	-
1985	3Ps	46.01	-	4.24	23.01	8.87	200	209

Table 7. Patterns of discarding for Newfoundland offshore fisheries, 1981-85.

Species	Stock	1981		1982		1983		1984		1985	
		% Observed discards	% of landed weight observed	% Observed discards	% of landed weight observed	% Observed discards	% of landed weight observed	% Observed discards	% of landed weight observed	% Observed discards	% of landed weight observed
Cod	2GH	5.9	97	1.1	6	-	-	4.6	16	31.7	2
	2J+3KL	1.5	12	2.2	8	3.7	12	3.8	13	8.4	6
	3NO	7.5	4	3.5	5	2.7	5	4.7	5	3.3	7
	3Ps	0.4	3	0.4	9	1.9	6	1.5	19	3.9	14
	4RS+3Pn	0.6	13	-	0	0.3	10	3.3	17	2.1	12
	4Vn	0.6	6	-	0	1.4	11	8.2	7	19.8	12
	4VsW	0.1	4	0.4	7	1.1	16	2.1	3	3.2	18
Haddock	3NO	-	-	-	-	-	-	-	-	62.6	12
Redfish	2+3K	1.4	8	2.6	14	10.4	26	6.0	13	7.2	16
	3LN	0.4	7	1.0	7	1.5	24	11.6	19	3.7	2
	3O	-	-	-	-	-	-	0	11	-	-
	3P	0.7	15	0.4	20	2.0	17	0.5	29	3.1	4
	4RST	0	69	-	0	0.3	8	0	33	-	-
	4Vn	0.4	13	0.1	6	0.4	5	0.5	7	0.1	7
	4VsW	-	-	-	-	-	-	0	29	-	-
White hake	3+4	14.1	5	-	-	-	-	-	-	-	-
Plaice	2+3K	0.9	3	12.6	14	11.8	20	25.0	16	44.6	4
	3LNO	4.6	11	4.1	8	6.1	12	5.6	5	5.2	6
	3Ps	6.5	1	10.0	5	1.8	5	12.5	20	10.1	25
Yellowtail	3LNO	4.2	9	5.5	6	4.6	9	4.8	5	3.7	6
Turbot	2+3KL	2.3	6	7.8	7	2.8	34	1.4	35	-	-
Witch	2J+3KL	0.6	2	3.4	8	1.8	18	29.0	4	-	-
	4RS	0	1	-	-	0.5	3	-	-	-	-
	3Ps	0	10	-	-	17.0	4	0.7	7	4.2	23
	4VsW	3.4	12	-	-	-	-	-	-	-	-
	3NO	0.7	9	3.70	3	2.6	22	1.9	13	0.8	20
Shrimp	2HJ	0.5	94	0.4	9	-	-	-	-	-	-
All	All	2.6	13	3.2	7	4.5	8	4.9	11	7.7	8

Table 8. Estimates for discarded 2J3KL cod by age-group.

Age	Discards		Offshore catch		Population	
	Numbers	Percent	Numbers caught	Percent discarded	Numbers[a]	Percent discarded
3	0.2	2	0.2	100	N/A	N/A
4	3.4	34	3.4	100	402.8	0.9
5	5.3	53	15.5	34	293.9	1.8
6	1.0	10	15.3	7	166.9	0.6
7	0.1	1	12.0	1	137.6	0.1
8+	0	0	7.0	0	-	0

N/A = not available

[a]Baird and Bishop (1986). Numbers are expressed in millions.

Table 9. Patterns of discarding for semi or non-commercial species.

Discarded by-catch species	Directed fishery	Major areas	Major seasons	Total estimated discards	Total estimated kept	Percent discarded
Skate	Cod			849.6	2.5	99.7
	Haddock			11.5	0	100
	Redfish			451.8	0	100
	Plaice			1041.1	0	100
	Witch			278.7	0	100
	Yellowtail			335.5	0	100
	G. halibut			214.3	0	100
	ALL			3182.6	2.5	99.9
Wolffish	Cod			313.7	271.7	53.6
	Redfish			430.0	6.2	98.6
	Witch			7.4	9.8	43.0
	Plaice			134.5	520.4	20.6
	Yellowtail			0	2.8	0
	G. halibut			285.7	45.6	86.2
	ALL			1171.3	856.5	57.8
White Hake	Cod			9.3	3.5	72.5
	Redfish			9.3	0.3	97.3
	Haddock			6.9	1.4	82.8
	Witch			17.5	0.1	99.8
	Plaice			6.3	0.1	99.2
	ALL			133.0	5.3	96.2
Halibut	Cod			1.0	146.5	0.7
	Redfish			0.1	7.3	1.9
	Haddock			0	8.8	0
	Witch			0	58.4	0
	Plaice			0	58.0	0
	Yellowtail			0	0.5	0
	ALL			1.1	279.6	0.4
Other	ALL			790	-	-
TOTAL	ALL			5278	1143.9	82.2

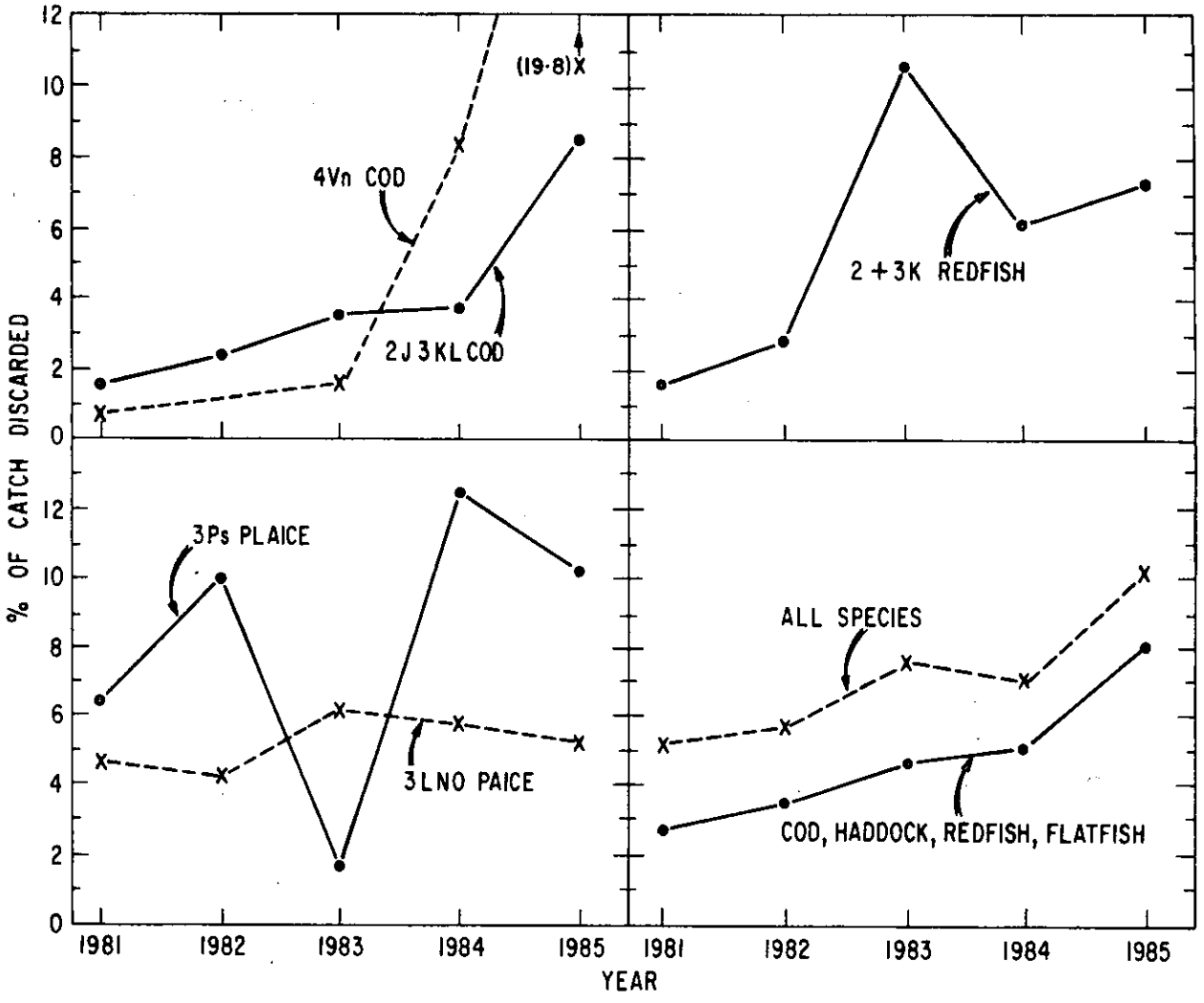

Fig. 1. Trends in discard rates, 1981-85 for stocks showing significantly high rates or upward changes.

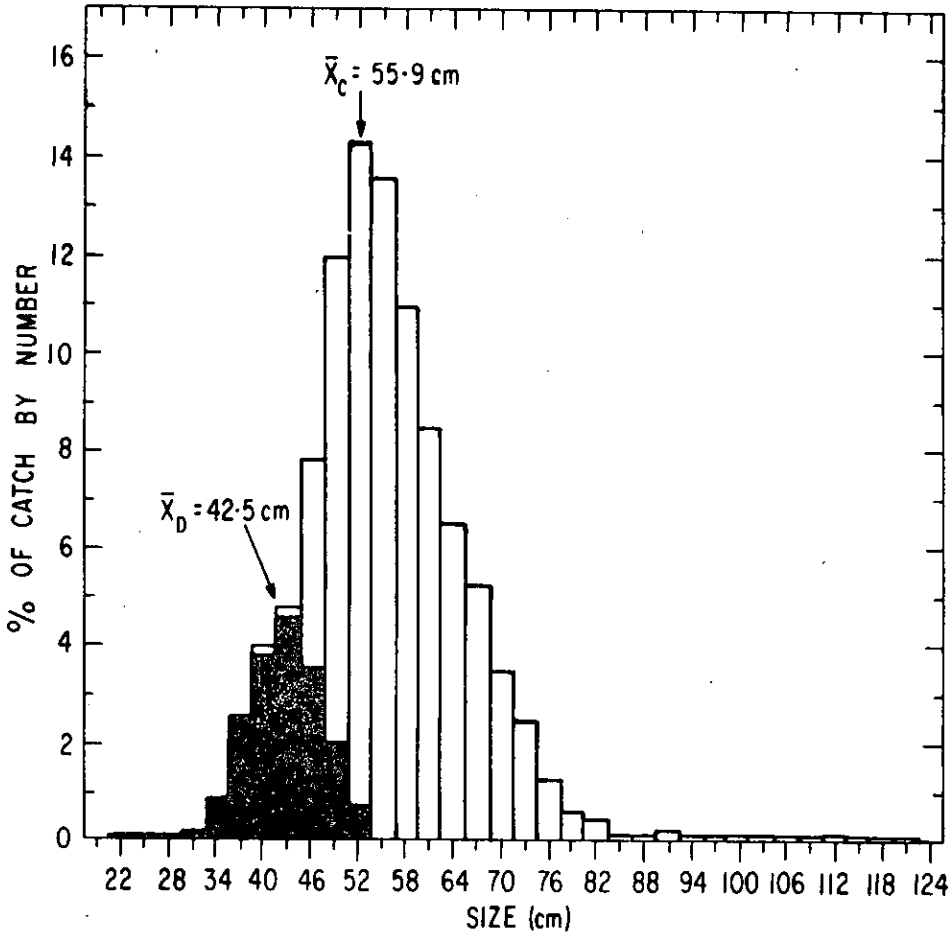

Fig. 2. Percent of catch by numbers for 2J3KL cod. The black area represents discarded portion.