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Estimates of Discarding by Newfoundland Offshore  
Vessels in 1981

by

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Abstract

Discarded fish generally go unrecorded in official statistics. Using direct observations at sea by observers, estimates of the amounts of discarding in the various domestic Newfoundland offshore fisheries were examined to pinpoint problem areas. In all cases, estimates of discards did not exceed 10% except for bycatch of turbot and redfish juveniles in the shrimp fishery. The estimates presented should be regarded strictly as minimum values because of the enforcement aspects of the observers' job. The presence of observers tended to deter or reduce discarding. Highest estimates of discards were seen in the 3NO cod fishery (7.5%), 3LNO American plaice (4.6%), 3LNO yellowtail (4.2%), wolfish (28% overall) and skate (99%). Most of the fish discarded were small which meant that larger numbers per unit weight were thrown back. Indications are that the problem may be more intense in the absence of observers.

Résumé

Les statistiques ne font habituellement pas mention des poissons que les pêcheurs rejettent à la mer. En vue de cerner les problèmes engendrés par cette pratique, on a analysé des estimations, établies à partir d'observations directes en mer, du nombre de prises rejetées dans les diverses pêches au large de Terre-Neuve par les bateaux canadiens. Sauf dans le cas des prises fortuites de jeunes flétans du Groenland et de jeunes sébastes dans la pêche à la crevette, la quantité totale de poissons rejetés ne dépassait pas 10 % des prises. Il faut toutefois considérer cette quantité comme un strict minimum : en présence des observateurs, les pêcheurs avaient tendance soit à ne rejeter aucun poisson, soit à en rejeter moins. Les estimations les plus élevées se rapportent à la morue dans 3NO (7.5 %), à la plie canadienne dans 3LNO (4.6 %), à la limande à queue jaune dans 3LNO (4.2 %), ainsi qu'au loup (28 % au total) et à la raie (99 %). La plupart des poissons rejetés étaient de petite taille; cela signifie que le poids total rejeté représentait un grand nombre d'individus. Il appert que ces pourcentages seraient plus élevés en l'absence d'observateurs.

## Introduction

Assessments of fish stocks have most often lacked input on discards. This situation can lead to biased results where discarding occurs. Dumped fish are usually dead or dying before going back over the side due to the rough treatment received in the net and on deck, hence, are lost to the population but are not recorded in the catches. Also, it is most often the younger year-classes which fall into this category and this intensifies the problem with larger numbers per unit of weight lost.

Historically there are no records of the size of the problem except for those very haphazardly recorded in daily log records. There are indications that dumping was quite high particularly in certain fisheries. Obtaining information on discarding is very difficult even though fishermen are required to keep a daily log with this information included. Discards are often not recorded or are greatly underestimated. Also, it is difficult to keep track of discards during the processing procedures. Certainly, no attempt would be made by the crew to weigh the fish which are to be dumped because it is of no immediate consequence to their commercial operation.

To obtain such data it is necessary to place independent observers on the vessels. The first data from the Newfoundland offshore fishery was collected by pairs of biological technicians aboard 6 to 8 trawlers in 1978, 1979, and 1980 as described by Stevenson (1980 and 1981). These technicians were able to collect detailed data including actual weighed discards and their size-age compositions, however, they were restricted in time and area, covering the Div. 3LNO plaice fishery during certain months.

The Newfoundland Region Observer Program presented an opportunity to collect considerable data from a wide range of fisheries over entire seasons in order to pinpoint and quantify problem areas. Previously Stevenson (1978) examined log records for Subareas 2 and 3, but for the above stated reasons these data would constitute underestimates. The observers are able to provide data from eyeball observations for a wide range of fisheries with less bias than is present in log records, however they are usually unable to weigh the discards as was done by Stevenson (1981) for the Div. 3LNO plaice fishery.

This paper presents a summary of discard estimates in the 1981 Newfoundland offshore fisheries.

## Methods

A part of the standard procedure for observers is to estimate the amount of discards by species for each set observed. This is accomplished by noting the number of crew discarding at any given time, observing each one in turn for a portion of the time involved in processing a set and keeping tallies of each species being thrown over the side. The estimates of discarding for each individual crew member can then be adjusted to the total processing time and added together. When amounts of discards are small, they can be directly weighed. These data were then compiled by fishery by month and compared to the landed weight values supplied by the Economics Branch, Newfoundland Region. Total discards for each fishery were then estimated. Complications arise when significant amounts of bycatch are discarded. To avoid this problem the

directed and bycatch fishery were examined separately when adjusting observed catches and discards to landed weight in the cases where significant proportions were taken as by-catches in other fisheries. Months not observed or months with very low coverage are assumed to have no discarding. In addition length measurement data of cod, plaice and yellowtail were taken whenever possible in order to get an idea of removals by number.

## Results and Discussion

Estimates of discarding of the major species are presented in Tables 1 through 9 and all values of weight are rounded to the nearest MT (ie. less than 0.5 MT is recorded as 0). Observed kept (Col. 3 on all tables except Table 9) represents the observed kept weight in the directed fishery, for those sets where kept and discard weights were visually estimated. Observed discard (Col. 4) gives the corresponding discard weight, Col. 5. is the percent by weight discarded (observed)\*; Col. 6 indicates what portion (total observed kept over total landed weight) of the kept catch was directly observed; Col. 7 shows the estimate of total discards obtained by adjusting the observed discards to the landed weight; Col. 8 indicates the total landed weight for that category and Col. 9 specifies the estimated total catch by combining both kept and discarded portions of the catch. In certain cases observed kept weight exceeded the recorded landed weight. For these situations, observed kept weights were used to estimate total removals.

In all cases the observer estimates of discards did not exceed 10% except for bycatch of turbot and redfish dumped in the shrimp fishery. Note that all discard estimates presented should be regarded strictly as minimum values for three reasons. First, the individuals collecting the data act both as enforcement and biological observers and this tends to be a deterrent on the discarding practises of the crew since this procedure is strictly speaking, illegal. It is quite possible that larger amounts of commercial sized fish go over the side in the absence of an observer particularly where catches exceed easily handled lots. Secondly, where estimates followed by actual weighing of discards have been made by observers the estimates more often tend to be smaller. Thirdly, in months where discards were not observed, zero discards were assumed. The following sections summarize the data from the tables.

### Cod

Seven cod stocks were examined for which coverage ranged from 4 to 100%. All but three of these fisheries had an observed discard rate of less than 1%. The highest rate occurred in Div. 2GH at 5.9% but over the year represented only 2 MT (about 4,000 individuals with an average weight of about 0.5 kg) in a 52 MT fishery. In this case landings were reported at 35 MT.

Observations of the Div. 2J+3KL cod fishery indicated a minimum discard rate of only 1.5% but in terms of numbers of individuals this amounted to about 1.6 million fish (861 MT), mostly 2-4 year olds, with an average weight of 0.55 kg. Table 1 shows that no observations were made in November and December where discarding likely occurred.

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\*Observed discards (Col. 4) are rounded to the nearest MT. In cases where catches and corresponding discards are small, i.e. less than 0.5 t, they are recorded as zero in Col. 4, even if Col. 5 indicates a positive percent discarded.

The other area of major discarding in the cod fishery occurred in Div. 3NO where 7.5% or 376 MT were estimated as dumped. A small portion of this occurred in the American plaice fishery in the spring. No measurements of discarded fish were made for this area but using the average discarded fish weight recorded for Div. 2J+3KL the estimated numbers would be about 600-700,000, mostly of unmarketable size.

### Redfish

Catches from six redfish stocks were examined and none showed significant levels of discarding. In the winter Div. 2+3K fishery most of the redfish discarded were bycatch in the cod fishery. Very little dumping of directed redfish occurred except in the summer Div. 3Ø fishery. Most other discards of this species were bycatch in other fisheries.

### White Hake

This species was generally taken as bycatch in the cod fishery particularly in Div. 3NO and SA 4. Fourteen percent or 64 MT were discarded. No estimates of numbers removed is available.

### American Plaice/Yellowtail

In Div. 2+3K the discard rate was lowest at 0.9% or an estimated 32 MT. Only 3% of this fishery was observed with most of the March fishery being missed making this estimated discard tonnage tenuous. Better coverage in the Div. 3LNO fishery was obtained (11%) but again the last two months were missed. The overall estimated discard rate was 4.6% but excludes November and December. This discard level is somewhat lower than the 13.1% recorded by Stevenson (1982) but his observations were more restricted in time and area. The major portion of his experiments occurred in the summer and fall corresponding to the highest rates in the present paper. Again, it should be stressed that the values given in this paper should be regarded as minimum estimates because of the surveillance aspects of the observers job. Regardless, the estimated 1936 MT discarded in the Div. 3LNO fishery represents a minimum of 9.8 million individuals, mostly 3-5 year olds removed from the population but not recorded.

The yellowtail discards in Div. 3LNO were also small at 4.2% or 578 MT. At an average weight of 0.24 kg for discarded yellowtail the numbers of fish removed would be 2.4 million.

### Shrimp

Significant amounts of shrimp were not discarded but dumped redfish and turbot bycatches were often quite substantial. In Div. 2H all redfish bycatch (48MT) was discarded most of these fish being small, an average of about 15 cm. This would represent approximately one million individuals. In Div. 2HJ, 136 MT (86%) of turbot were discarded but no frequencies were recorded for this species.

### Other Species

Substantial amounts of semi or non commercial species were discarded in the various fisheries. Two percent or 5 MT of halibut was discarded, 28% or 570 MT of catfish (wolfish species), 0.03% or 2 MT of haddock, no pollock, 100% or 87 MT of grenadier, 99% or 1860 MT of skate, 28 MT of squid, 5 MT of Argentine, 60 MT of capelin and 5 MT of snow crab were dumped. Most of these amounts are quite small but skate seems to be one group that has potential as a commercial species.

A total of about 14,000 MT of all species were estimated as discarded in 1981, about half of which were of commercial value. As previously mentioned this should be regarded only as a minimum estimate. In addition, most of these fish were undersized, yielding more individuals per weight discarded and resulting in a larger discard problem. The presence of observers acts as an effective deterrent but with only about 20% overall coverage of the Newfoundland offshore fleet, indications are that the problem is still quite large in the absence of observers, in spite of the regulations in place.

### References

Stevenson, S.C. 1978. A descriptive report on the discarding of fish by the Canadian offshore fishery in ICNAF Subareas 2 and 3. ICNAF Res. Doc. 78/VI/67.

1980. Summary of discarding and estimates of the total removals by Canadian trawlers during the 1978 and 1979 Divisions 3LNO American plaice fishery. NAFO SCR Doc. 80/VI/86.

1981. Summary of discarding and estimates of total removals by Canadian trawlers during the 1980 Divisions 3LNO American Plaice fishery. NAFO SCR Doc. 81/VI/55.

1982. Summary of discarding and estimates of total removals by Canadian trawlers during the 1981 Divisions 3LNO American plaice fishery. CAFSAC Res. Doc. 82/19.

Table 1. Estimates of discarding in the offshore Newfoundland cod fisheries.

Month	Division	Observed kept (MT)	Observed discards	% Observed discards	% Observed fished	Est. discards	Landed weight	Estimated total removals
July	2H	18	1	5.7	100	1	8	19
Aug.	2H	8	1	9.0	47	1	17	18
Sept.	2H	1	0	9.3	50	0	2	2
Oct.	2H	6	0	0.1	100	0	1	6
Nov.	2H	1	0	0	9	0	7	7
1981	2H	34	2	5.9	97	2	35	52
Jan.	2J	2,214	19	0.9	31	61	7,081	7,142
	3K	372	7	2.0	14	50	2,635	2,685
	3L	872	1	0.1	17	5	4,486	4,491
	2J+3KL	3,458	27	0.8	24	116	14,202	14,318
Feb.	2J	1,155	34	2.9	13	256	8,695	8,951
	3K	1,536	23	1.5	12	186	12,450	12,366
	3L	60	1	1.7	22	5	277	282
	2J+3KL	2,751	58	2.1	13	447	21,422	21,869
Mar.	3K	19	0	0	5	0	353	353
	3L	30	1	1.1	7	5	424	429
	2J+3KL	49	1	0.7	6	5	777	782
Apr.	2J	0	0	0	0	0	1	1
	3K	50	5	9.8	6	83	851	934
	3L	44	1	0.5	3	8	1,503	1,511
	2J+3KL	94	5	5.7	4	135	2,355	2,490
May	2J	0	0	0	0	0	5	5
	3K	5	0	0	1	0	761	761
	3L	150	1	0.1	8	3	1,864	1,867
	2J+3KL	155	1	0.1	6	3	2,630	2,633
June	2J	11	0	0	17	0	64	64
	3K	18	0	0	3	0	599	599
	3L	215	3	1.5	6	51	3,382	3,433
	2J+3KL	244	3	1.2	6	51	4,045	4,096
July	2J	7	1	8.9	41	2	17	19
	3K	1	0	0	1	0	420	420
July	3L	81	3	3.6	10	28	782	812
	2J+3KL	89	4	4.1	7	50	1,219	1,269
Aug.	2J	4	0	4.5	3	7	159	166
	3K	6	0	0.2	3	0	178	178
	3L	26	0	0	5	0	546	546
	2J+3KL	36	0	0.8	4	7	883	890

For Tables 1-8 all values are rounded to the nearest MT or percentage except for the % observed discards values. Estimated discards for each line, including summary lines, are calculated by dividing % observed fished into the amount of observed discards. Total removals are the sum of landed weight plus the amount of estimated discards.

Table 1. (cont'd.)

Month	Division	Observed kept (MT)	Observed discards	% Observed discards	% Observed fished	Est. discards	Landed weight	Estimated total removals
Sept.	2J	0	0	0	0	0	66	66
	3K	8	0	1.9	32	0	25	25
	3L	10	0	1.5	1	14	950	964
	2J+3KL	18	0	1.7	2	18	1,041	1,059
Oct.	2J	0	0	0	0	0	17	17
	3K	0	0	0	0	0	26	26
	3L	38	0	1.2	3	18	1,513	1,531
	2J+3KL	38	0	1.2	3	19	1,556	1,577
Nov.	3K	0	0	0	0	0	68	68
	3L	0	0	0	0	0	3,062	3,062
	2J+3KL	0	0	0	0	0	3,130	3,130
Dec.	2J	0	0	0	0	0	9	9
	3K	0	0	0	0	0	571	571
	3L	0	0	0	0	0	3,360	3,360
	2J+3KL	0	0	0	0	0	3,940	3,940
1981	2J+3KL	6,932	105	1.5	12	861	57,200	58,061
Jan.	3NO	0	0	0	0	0	119	119
Feb.	3NO	0	0	0	0	0	3	3
Mar.	3NO	0	0	0	0	0	40	40
Apr.	3N	12	0	0	38	0	32	32
	3O	1	0	0	3	0	30	30
	3NO	13	0	0	21	0	62	62
May	3N	15	1	7.1	7	15	210	235
	3O	1	0	0	4	0	24	24
	3NO	16	1	6.4	7	15	234	259
June	3N	18	10	34.9	4	142	406	548
	3O	2	0	0	1	0	335	335
	3NO	20	10	19.2	3	142	741	883
July	3N	54	1	1.7	5	18	1,074	1,092
	3O	0	0	0	0	0	335	335
	3NO	54	1	1.7	4	24	1,409	1,433
Aug.	3N	36	3	7.2	12	22	305	327
	3O	0	0	0	0	0	61	61
	3NO	36	3	7.2	10	26	366	392
Sept.	3N	49	0	0	14	0	348	348
	3O	2	0	0	4	0	54	54
	3NO	51	0	0	13	0	402	402
Oct.	3N	0	0	0	0	0	0	0
	3O	3	0	0	0	0	93	93
	3NO	3	0	0	3	0	93	93
Nov.	3NO	0	0	0	0	0	978	978
Dec.	3NO	5	0	6.7	1	34	510	544
1981	3NO	198	15	7.5	4	376	4,957	5,333

Table 1. (cont'd.)

Month	Division	Observed kept (MT)	Observed discards	% Observed discards	% Observed fished	Est. discards	Landed weight	Estimated total removals
June	3M	0	0	0	0	0	2	2
Jan.	3Ps	71	0	0	5	0	1,328	1,328
Feb.	3Ps	16	0	0.2	7	0	231	231
Mar.	3Ps	3	0	0	1	0	223	223
Apr.	3Ps	4	0	0	4	0	91	91
May	3Ps	2	0	0	2	0	113	113
June	3Ps	1	0	0	1	0	338	338
July	3Ps	1	0	0	1	0	159	159
Aug.	3Ps	1	0	0	1	0	360	360
Sept.	3Ps	4	0	0	5	0	77	77
Oct.	3Ps	1	0	0	1	0	23	23
Nov.	3Ps	1	0	0	3	0	42	42
Dec.	3Ps	1	0	10.3	0	14	136	150
1981	3Ps	106	0	0.4	3	14	3,121	3,315
Jan.	4R	131	0	0	11	0	1,207	1,207
	4S	1	0	0	100	0	0	1
	4RS3Pn	132	0	0	11	0	1,207	1,208
Feb.	4R	0	0	0	0	0	693	693
	4S	0	0	0	0	0	1	1
	3PN	28	1	1.6	17	3	165	168
	4RS3PN	28	1	1.6	3	14	859	873
Mar.	4RS3Pn	0	0	0	0	0	312	312
Apr.	4RS3Pn	0	0	0	0	0	3	3
June	4RS3Pn	2	0	0	100	0	1	2
July	4RS3Pn	1	0	0	6	0	5	5
Sept.	4RS3Pn	0	0	0	0	0	77	77
Oct.	4R	1	0	0	50	0	2	2
	3Pn	1	0	0	50	0	2	2
	4RS3Pn	2	0	0	50	0	4	4
Nov.	4R	6	0	0	0	0	15	15
	4S	3	0	0	100	0	1	3
	3Pn	0	0	0	0	0	6	6
	4R3Pn	9	0	0	41	0	22	24
1981	4RS3Pn	174	1	0.6	13	8	2,490	2,498
Mar.	4T	0	0	0	0	0	2	2



Table 1. (cont'd.)

Month	Division	Observed kept (MT)	Observed discards	% Observed discards	% Observed fished	Est. discards	Landed weight	Estimated total removals
Jan.	4Vn	158	1	0.5	6	14	2,753	2,767
Mar.	4Vn	1	0	1.4	16	0	8	8
Apr.	4Vn	0	0	0	0	0	2	2
May	4Vn	2	0	0	100	0	0	2
June	4Vn	2	0	0	12	0	14	14
July	4Vn	3	0	0	12	0	25	25
Aug.	4Vn	0	0	0	0	0	62	62
Nov.	4Vn	0	0	0	0	0	8	8
1981	4Vn	166	1	0.6	6	17	2,872	2,889
Feb.	4VWX	0	0	0	0	0	179	179
Mar.	4VWX	11	0	0	1	0	1,349	1,349
Apr.	4VWX	10	0	0	2	0	530	530
May	4VWX	78	0	0.3	11	2	705	707
June	4VWX	0	0	0	0	0	3	3
July	4VWX	0	0	0	0	0	5	5
Aug.	4VWX	0	0	0	0	0	5	5
Sept.	4VWX	0	0	0	0	0	1	1
Oct.	4VWX	0	0	0	0	0	19	19
Nov.	4VWX	9	0	0	3	0	198	198
Dec.	4VWX	0	0	0	0	0	86	86
1981	4VWX	108	0	0.1	4	2	3,080	3,082

Table 2. Estimates of discarding in the offshore Newfoundland redfish fisheries.

Month	Division	Observed kept (MT)	Observed discards	% Observed discards	% Observed fished	Est. discards	Landed weight	Estimated total removals
Jan.	2J	21	1	3.2	40	2	52	54
	3K	9	1	13.2	8	14	108	122
	2+3K	30	2	6.6	19	16	160	176
Feb.	2J	6	1	20.2	13	10	47	57
	3K	34	2	5.5	11	18	315	333
	2+3K	40	3	7.7	11	28	362	390
Mar.	3K	10	0	0	2	0	497	497
Apr.	3K	144	1	0.8	13	9	1,069	1,078
May	3K	35	0	0	7	0	521	521
June	2J	10	0	0	21	0	47	47
	3K	224	0	0.1	8	3	2,737	2,740
	2+3K	234	0	0.1	8	3	2,784	2,787
July	2J	108	1	1.3	29	5	374	379
	3K	15	0	1.6	1	43	2,686	2,731
	2+3K	123	2	1.6	4	48	3,060	3,108
Aug.	2J	56	3	5.5	10	31	566	597
	3K	119	0	0	14	0	866	866
	2+3K	175	3	2.1	12	31	1,432	1,463
Sept.	2J	0	0	0	0	0	2	0
	3K	2	0	2.6	2	2	91	93
	2+3K	2	0	2.2	2	2	93	95
Oct.	3K	0	0	0	0	0	6	6
Nov.	3K	0	0	0	0	0	23	23
Dec.	3K	0	0	0	0	0	56	56
1981	2+3K	793	11	1.4	8	137	10,063	10,200
Jan.	3L	63	0	0.7	28	2	225	227
Feb.	3L	1	0	10.4	1	3	25	28
Mar.	3L	18	0	0	14	0	132	132
Apr.	3L	42	2	5.0	10	20	401	421
May	3L	298	0	0	2.3	0	1,300	1,300
	3N	0	0	0	0	0	11	11
	3LN	298	0	0	23	0	1,311	1,311
June	3L	0	0	0	0	0	166	166
	3N	0	0	0	0	0	18	18
	3LN	0	0	0	0	0	184	184
July	3L	0	0	0	0	0	12	12
	3N	0	0	0	0	0	21	21
	3LN	0	0	0	0	0	33	33
Aug.	3L	8	0	0	93	0	9	9
Sept.	3L	2	0	0	15	0	13	13
Oct.	3L	0	0	0	0	0	87	87
	3N	0	0	0	0	0	8	8
	3LN	0	0	0	0	0	95	95
Nov.	3L	0	0	0	0	0	1,801	1,801
Dec.	3L	0	0	0	0	0	1,608	1,608

Table 2. (cont'd.)

Month	Division	Observed kept (MT)	Observed discards	% Observed discards	% Observed fished	Est. discards	Landed weight	Estimated total removals
1981	3LN	432	2	0.4	7	25	5,837	5,862
Jan.	3Ø	0	0	0	0	0	1	1
May	3Ø	11	0	0.6	11	1	103	104
June	3Ø	89	0	0	7	0	1,347	1,347
July	3Ø	50	1	2.4	10	12	488	500
Aug.	3Ø	49	2	3.2	24	7	202	202
Sept.	3Ø	0	0	0	0	0	19	19
1981	3Ø	199	3	0.9	9	20	2,160	2,180
June	3M	236	0	0	64	0	368	368
Nov.	3M	0	0	0	0	0	149	149
1981	3M	236	0	0	46	0	517	517
Jan.	3Ps	0	0	0	0	0	6	6
Feb.	3P	55	1	1.0	6	9	911	920
Mar.	3P	0	0	0	0	0	784	784
Apr.	3P	2	0	0	2	0	116	116
May	3P	41	0	0.3	55	0	75	75
June	3P	305	1	0.2	39	2	782	784
July	3P	172	1	0.4	18	4	962	966
Aug.	3P	65	1	2.0	6	20	1,016	1,036
Sept.	3P	0	0	0	0	0	39	39
Oct.	3P	181	1	0.3	36	2	496	497
Nov.	3P	1	0	0	1	0	241	241
Dec.	3P	0	0	0	0	0	121	121
1981	3P	822	5	0.7	15	37	5,549	5,586
Jan.	4R	11	0	0	15	0	72	72
Feb.	4RS	0	0	0	0	0	81	81
Mar.	4RST	0	0	0	0	0	65	65
June	4R	242	0	0	84	0	288	288
	4S	185	0	0	89	0	207	207
	4T	3	0	0	100	0	0	3
	4RST	430	0	0	87	0	495	498
Sept.	4R	43	0	0	100	0	0	43
Oct.	4R	217	0	0	72	0	301	301
Nov.	4RS	5	0	0	71	0	7	7
1981	4RST	706	0	0	69	0	1,021	1,067*

\*46 MT observed but not reported in June and September.

Table 2 (cont'd)

Month	Division	Observed kept (MT)	Observed discards	% Observed discards	% Observed fished	Est. discards	Landed weight	Estimated total removals
Jan.	4V	0	0	0	0	0	21	21
Feb.	4VN	1	0	0	11	0	9	9
Mar.	4VW	1	0	0	1	0	83	83
Apr.	4VW	1	0	0	1	0	35	35
May	4VW	35	0	0	22	0	156	156
June	4V	53	0	0	25	0	215	215
July	4V	168	0	0	14	0	1,209	1,209
Aug.	4V	40	0	1.0	3	13	1,336	1,340
Sept.	4V	0	0	0	0	0	101	101
Oct.	4V	22	0	0	100	0	3	22
Nov.	4V	14	0	0	5	0	280	280
Dec.	4V	0	0	0	0	0	98	98
1981	4VW	335	0	0.4	9	13	3,546	3,559

Table 3. Estimates of discarding in the offshore Newfoundland white hake fisheries.

Month	Division	Observed kept (MT)	Observed discards	% Observed discards	% Observed fished	Est. discards	Landed weight	Estimated total removals
Jan.	3KL	0	0	0	0	0	1	1
	3NO	0	0	0	0	0	8	8
	3Ps	2	2	67	2	38	56	94
	4R	0	0	0	0	0	3	3
	4Vn	1	0	0	0	0	5	5
Feb.	3P	11	1	8.5	22	5	51	56
	4RS	0	0	0	0	0	15	15
	4VX	0	0	0	0	0	1	1
Mar.	3+4	0	0	0	0	0	123	123
Apr.	3+4	0	0	0	0	0	32	32
May	3+4	0	0	0	0	0	10	10
June	3+4	5	0	1.8	11	1	44	45
July	3+4	3	1	22.3	10	7	30	37
Aug.	3+4	1	0	27.3	3	12	42	54
Sept.	3+4	0	0	0	0	0	3	3
Oct.	3+4	1	0	17.1	21	1	5	6
Nov.	3+4	0	0	0	0	0	16	16
Dec.	3+4	0	0	0	0	0	9	9
1981	3+4	24	4	14.1	5	64	454	518

Table 4. Estimates of discarding in the offshore Newfoundland American plaice fisheries.

Month	Division	Observed kept (MT)	Observed discards	% Observed discards	% Observed fished	Est. discards	Landed weight	Estimated total removals
Jan.	2J	4	0	7.8	15	2	26	28
	3K	108	2	1.6	16	11	665	676
	2+3K	112	2	1.9	16	13	691	704
Feb.	2J	1	0	15.3	33	0	3	3
	3K	1	0	22.9	1	0	497	497
	2+3K	2	0	19.1	1	0	500	500
Mar.	3K	24	0	0	1	0	4,381	4,381
Apr.	2J	0	0	0	0	0	3	3
	3K	33	1	3.0	7	14	497	511
	2+3K	33	1	3.0	7	15	500	515
May	2J	0	0	0	0	0	1	1
	3K	3	0	0.6	3	1	111	112
	2+3K	3	0	0.6	3	1	112	113
June	2H	1	0	1.2	100	0	1	1
	3K	1	0	2.1	8	0	12	12
	2+3K	1	0	1.7	8	0	13	13
July	3K	1	0	4.7	5	1	23	24
Aug.	2H	9	0	4.1	100	0	8	8
	2J	0	0	4.3	100	0	1	1
	3K	1	0	0	100	0	1	1
	2+3K	10	0	4.2	100	0	10	10
Sept.	2+3K	0	1	100	100	1	1	2
Oct.	2+3K	0	1	100	-	1	4	5
Nov.	3K	0	0	0	0	0	7	7
Dec.	3K	0	0	0	0	0	47	47
1981	2+3K	185	5	0.9	3	167	6,289	6,456
Jan.	3L	25	0	1.0	22	1	114	115
	3N	0	0	0	0	0	318	318
	3O	0	0	0	0	0	90	90
	3LNO	25	0	0.2	5	1	522	523
Feb.	3L	1	0	5.8	2	3	49	52
	3N	0	0	0	0	0	22	22
	3O	0	0	0	0	0	6	6
	3LNO	1	0	3.7	1	3	77	80
Mar.	3L	300	12	4.0	13	96	2,388	2,484
	3N	0	0	0	0	0	136	136
	3O	0	0	0	0	0	68	68
	3LNO	300	12	3.7	12	96	2,592	2,688
Apr.	3L	299	6	2.1	6	112	5,350	5,462
	3N	92	3	3.6	26	13	353	366
	3O	33	0	6.7	100	1	16	33
	3LNO	424	9	2.2	7	126	5,719	5,861

Table 4. (cont'd.)

Month	Division	Observed kept (MT)	Observed discards	% Observed discards	% Observed fished	Est. discards	Landed weight	Estimated total removals
May	3L	1,194	71	6.0	18	406	6,763	7,169
	3N	94	6	6.4	12	49	770	819
	3O	4	0	0	11	0	36	36
	3LNO	1,292	77	6.0	17	455	7,569	8,023
June	3L	645	34	5.3	12	286	5,434	5,720
	3N	140	8	5.7	14	58	1,017	1,075
	3O	6	0	0	4	0	163	163
	3LNO	791	42	5.3	12	344	6,614	6,958
July	3L	320	15	4.7	16	96	2,039	2,135
	3N	389	16	4.1	17	96	2,344	2,440
	3O	51	3	5.9	15	20	336	385
	3LNO	760	34	4.5	16	212	4,719	4,961
Aug.	3L	287	15	5.2	14	111	2,117	2,228
	3N	82	2	2.7	5	45	1,663	1,708
	3O	0	0	0	0	0	81	81
	3LNO	369	17	4.6	10	178	3,861	4,039
Sept.	3L	33	0	0	0	0	2,079	2,079
	3N	206	0	0	0	0	1,098	1,098
	3O	18	1	3.1	9	6	200	206
	3LNO	257	1	0.4	7	13	3,377	3,390
Oct.	3L	4	1	9.9	1	179	1,802	1,981
	3N	1	0	9.8	1	88	902	1,018
	3O	21	1	5.6	7	16	281	297
	3LNO	26	2	9.5	1	283	2,985	3,268
Nov.	3L	0	0	0	0	0	2,226	2,226
	3N	0	0	0	0	0	486	486
	3O	0	0	0	0	0	335	335
	3LNO	0	0	0	0	0	3,047	3,047
Dec.	3L	0	0	0	0	0	792	792
	3N	0	0	0	0	0	65	65
	3O	0	0	0	0	0	0152	152
	3LNO	0	0	0	0	0	1,009	1,009
1981	3LNO	4,545	206	4.6	11	1,936	42,091	44,027
Jan.	3Ps	55	5	9.6	13	40	415	455
Feb.	3Ps	1	0	0	2	0	52	52
Mar.	3Ps	0	0	0	0	0	204	204
Apr.	3Ps	44	3	7.1	18	17	245	262
May	3Ps	2	0	0.2	3	0	74	74
June	3Ps	0	0	0	0	0	18	18

Table 4. (cont'd.)

Month	Division	Observed kept (MT)	Observed discards	% Observed discards	% Observed fished	Est. discards	Landed weight	Estimated total removals
July	3Ps	0	0	.33	4	1	3	4
Aug.	3Ps	0	0	0	0	0	14	14
Sept.	3Ps	29	0	0.1	27	1	109	110
Oct.	3Ps	0	0	0	0	0	43	43
Nov.	3Ps	37	3	8.4	17	18	218	236
Dec.	3Ps	0	0	0	0	0	186	186
1981	3Ps	168	11	6.5	1	104	1,581	1,685
Feb.	3Pn	1	0	0	100	0	1	1



Table 5. Estimates of discarding in the offshore Newfoundland yellowtail fisheries.

Month	Division	Observed kept (MT)	Observed discards	% Observed discards	% Observed fished	Est. discards	Landed weight	Estimated total removals
Feb.	3N	0	0	0	0	0	16	16
Mar.	3LNO	0	0	0	0	0	39	39
Apr.	3LNO	0	0	0	0	0	290	290
May	3L	51	2	4.7	5	45	950	995
	3N	56	5	8.7	11	46	528	568
	3O	3	0	0	14	0	21	21
	3LNO	110	7	6.7	7	100	1,499	1,599
June	3L	51	2	4.1	18	12	290	302
	3N	56	5	8.2	14	31	384	415
	3O	1	0	0	0	0	84	84
	3LNO	108	7	6.2	14	47	758	805
July	3L	64	3	4.3	13	22	502	524
	3N	406	13	3.2	18	73	2,291	2,364
	3O	45	1	2.7	22	6	206	212
	3LNO	516	17	3.3	17	99	2,999	3,098
Aug.	3L	0	0	0	0	0	155	155
	3N	368	11	3.1	10	110	3,582	3,692
	3O	0	0	0	0	0	29	29
	3LNO	368	11	3.1	10	115	3,766	3,881
Sept.	3LNO	116	0	0	6	0	1,929	1,929
Oct.	3L	3	0	11.0	5	7	65	72
	3N	1	0	10.5	1	207	1,971	2,178
	3O	2	0	7.9	6	3	40	43
	3LNO	6	0	9.7	1	217	2,076	2,293
Nov.	3LNO	0	0	0	0	0	404	404
Dec.	3LNO	0	0	0	0	0	120	120
1981	3LNO	1,224	44	4.2	9	578	13,896	14,474

Table 6. Estimates of discarding in the offshore Newfoundland turbot fisheries.

Month	Division	Observed kept (MT)	Observed discards	% Observed discards	% Observed fished	Est. discards	Landed weight	Estimated total removals
Jan.	2J	4	0	9.6	14	3	27	30
	3K	30	1	4.7	11	12	266	278
	3L	11	1	5.9	34	2	32	34
	2+3KL	45	2	5.4	14	18	325	343
Feb.	2J	1	0	15.4	15	0	3	3
	3K	0	0	87.3	1	51	59	110
	3L	0	0	0	0	0	2	2
	2+3KL	1	0	37.5	1	51	64	105
Mar.	3K	50	0	0	5	0	978	978
	3L	11	0	0	22	0	50	50
	2+3KL	61	0	0	6	0	1,028	1,028
Apr.	3K	141	1	0.9	6	20	2,215	2,235
	3L	0	0	45.5	1	-	236	236
	2+3KL	141	1	0.9	6	20	2,451	2,471
May	3K	30	0	0.5	3	6	1,177	1,183
	3L	30	0	0.1	13	0	231	231
	2+3KL	60	0	0.3	4	7	1,408	1,415
June	2H	6	0	0.1	29	0	19	19
	2J	12	0	0	40	0	30	30
	3K	0	0	12.7	1	15	119	134
	3L	0	0	47.1	1	11	27	38
	2+3KL	18	0	1.2	10	26	175	202
July	2G	2	0	16.1	100	0	2	2
	2H <sup>a</sup>	1	0	18.1	12	1	8	9
	2J	4	1	16.2	44	1	9	10
	3K	0	0	0	0	0	24	24
	3L	0	0	0	0	0	1	1
	2+3KL	7	1	5.0	16	2	44 <sup>b</sup>	46
Aug.	2H	4	0	0	67	0	6 <sup>b</sup>	6
	2J	9	1	9.5	7	12	122	134
	3K	1	0	0	4	0	27	27
	2+3KL	14	1	7	9	11	155	166
Sept.	2H	1	0	0	100	0	1	1
	2J	0	0	0	0	0	88	88
	3K	0	0	0	0	0	1	1
	3L	1	0	0	2	0	46	46
	2+3KL	2	0	0	15	0	135	135
Oct.	2+3KL	0	0	0	0	0	84	84
Nov.	2+3KL	0	0	0	0	0	88	88
Dec.	2+3KL	0	0	0	0	0	95	95
1981	2+3KL	349	8	2.3	6	137	6,052	6,189

<sup>a</sup><sup>b</sup> Note the considerable discard of turbot in the shrimp fishery (see Table 9).

MT landed from shrimp fisheries by-catch.

Table 7. Estimates of discarding in the offshore Newfoundland witch fisheries.

Month	Division	Observed kept (MT)	Observed discards	% Observed discards	% Observed fished	Est. discards	Landed weight	Estimated total removals
Jan.	2J	1	0	3.4	33	0	3	3
	3K	14	0	1.4	31	1	45	46
	3L	9	0	0.6	20	0	44	44
	2J+3KL	24	0	1.2	26	1	92	93
Feb.	2J+3KL	1	1	48.0	2	-	52	52
Mar.	3KL	20	0	0	2	0	885	885
Apr.	3KL	17	0	1.8	1	9	526	535
May	3KL	5	0	0	2	0	230	230
June	3KL	3	0	2.0	5	1	58	59
July	3KL	2	0	0	6	0	32	32
Aug.	3KL	3	0	3.3	4	0	7	7
Sept.	3L	0	0	0	0	0	2	2
Oct.	3L	0	0	0	0	0	2	2
Nov.	3KL	0	0	0	0	0	106	106
Dec.	2J+3KL	0	0	0	0	0	96	96
1981	2J+3KL	75	1	0.6	2	12	2,088	2100
Jan.	4RS	4	0	0	100	0	2	4
Feb.	4RS	0	0	0	0	0	18	18
Mar.	4RS	0	0	0	0	0	252	250
Oct.	4R	0	0	0	0	0	2	2
1981	4RS	4	0	0	1	0	274	274
Jan.	3Ps	16	0	0.1	43	0	37	37
Feb.	3Ps	0	0	0	0	0	18	18
Mar.	3Ps	0	0	0	0	0	41	41
Apr.	3Ps	0	0	0	0	0	12	12
June	3Ps	0	0	0	0	0	3	3
July	3Ps	0	0	0	0	0	3	3
Aug.	3Ps	0	0	0	0	0	14	20
Nov.	3Ps	0	0	0	0	0	2	2
Dec.	3Ps	0	0	0	0	0	35	35
1981	3Ps	16	0	0	10	0	165	165
Mar.	4VWX	2	0	0	4	0	46	46
May	4VWX	1	0	0	25	0	4	4
July	4VWX	1	0	26.0	9	3	11	14
Aug.	4VWX	0	0	0	0	0	20	20
Nov.	4VWX	6	0	0	0	0	4	4
Dec.	4VWX	0	0	0	0	0	1	1
1981	4VWX	10	0	3.4	12	3	86	89

Table 7. (cont'd.)

Month	Division	Observed kept (MT)	Observed discards	% Observed discards	% Observed fished	Est. discards	Landed weight	Estimated total removals
Apr.	3NO	12	0	0	6	0	192	192
May	3N	0	0	0	0	0	36	36
June	3NO	0	0	0	0	0	4	4
July	3NO	6	0	1.7	50	0	12	12
Aug.	3N	7	0	0.5	32	0	22	22
Sept.	3NO	0	0	0	0	0	10	10
Oct.	3NO	1	0	4.8	0	0	1	1
Nov.	3NO	0	0	0	0	0	21	21
Dec.	3NO	0	0	0	0	0	4	4
1981	3NO	26	0	0.7	9	0	302	302

Table 8. Estimates of discarding in the offshore Newfoundland shrimp fisheries.

Month	Division	Observed kept (MT)	Observed discards	% Observed discards	% Observed fished	Est. discards	Landed weight	Estimated total removals
June	2H	2	0	4.8	100	0	2	2
July	2H	89	0	0	100	0	43	89
	2J	13	0	0	100	0	6	13
	2HJ	102	0	0	100	0	49	102
Aug.	2H	117	0	0.3	100	0	108	117
	2J	2	0	0	25	0	8	8
	2HJ	119	0	0.3	100	0	116	125
Sept.	2H	140	2	1.3	100	2	140	142
	2J	1	0	2.9	50	0	2	2
	2HJ	141	2	1.4	99	2	142	144
Oct.	2H	160	1	0.5	100	1	126	161
	2J	0	0	0	0	0	1	1
	2HJ	160	1	0.5	100	1	127	162
Nov.	2H	23	0	0	15	0	149	149
1981	2HJ	547	3	0.5	94	3	583	684

Table 9. Estimates of discarding of **bycatch** in the Newfoundland offshore shrimp fishery.

Directed species	Discard species	Month	Div.	Obs. kept	Obs. bycatch discards	% Observed discards	% Obs. fished	Bycatch landed weight	Obs. directed	Bycatch removal
Shrimp	Redfish	July	2H	0	9	100	100	0	89	9
		Aug.	2H	0	20	100	100	0	117	20
		Sept.	2H	0	15	100	100	0	140	15
		Oct.	2H	0	13	100	100	0	126	13
		1981	2H	0	48	100	100	0	472	48
Shrimp	Turbot	July	2H	8	55	88	100	8	63	55
			2J	1	11	90	25	4	48	44
		Aug.	2H	3	26	91	100	3	29	26
		Sept.	2H	2	3	64	100	2	5	5
		Oct.	2H	3	6	63	100	3	3	6
		1981	2HJ	17	101	86	94	20	148	136