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## **Discards of Atlantic Cod, Haddock, and Yellowtail Flounder from the 2008 Canadian Scallop Fishery on Georges Bank**

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## **ABSTRACT**

Discards of Atlantic cod, haddock and yellowtail flounder from the 2008 Canadian scallop fishery on Georges Bank were estimated from 23 trips that were monitored by at-sea observers. Data were insufficient to determine spatial differences in discard rates per hour but temporal trends were accounted for using a 3-month moving window calculation. Discards were estimated by applying the monthly discard rate per hour obtained by the 3-month moving window calculation to the total monthly effort in hours of the scallop fleet. Total annual estimated discards in 2008 were highest for yellowtail flounder, at 117 mt, while those for Atlantic cod and haddock were 36 mt and 33 mt, respectively.

## **RÉSUMÉ**

Les rejets de morue, d'aiglefin et de limande à queue jaune dans la pêche canadienne du pétoncle sur le banc Georges en 2008 ont été estimés d'après les résultats de 23 sorties de pêche au cours desquelles un observateur était présent. Les données étaient insuffisantes pour cerner des différences spatiales mais on a tenu compte des tendances temporelles en utilisant un calcul sur un créneau mobile de trois mois. Les rejets ont été estimés par application du taux mensuel de rejets à l'heure découlant du calcul effectué à l'aide du créneau mobile de trois mois, à l'effort mensuel total de la flottille de pétoncliers. Parmi les rejets annuels totaux estimés pour 2008, ce sont les rejets de limande à queue jaune qui étaient les plus importants (117 tm), les rejets de morue et d'aiglefin s'élevant respectivement à 36 tm et 33 tm.



## INTRODUCTION

Incidental catch that is not landed, i.e., is not recorded in the fishery statistics records, is designated as “discards”. Canadian management measures established in 1996 prohibit the landing of groundfish (except monkfish) by the Canadian scallop fishery on Georges Bank. All incidental catches of Atlantic cod, haddock and yellowtail flounder in 2008 were therefore discarded. Discards of Atlantic cod, haddock and yellowtail flounder from the Canadian scallop fishery for 1960-2004 were estimated by Van Eeckhaute et al. (2005) and updated for 2005 - 2006 (Gavaris et al, 2007) and for 2007 (Gavaris et al, 2008). This analysis reports the Canadian scallop fishery discard estimates for 2008 and makes a correction for the application of the conversion factor between wet fish and freezer trawlers for years 2005-2007.

## DATA AND METHODS

### Prorating

Following Gavaris et al (2007), discards of Atlantic cod, haddock and yellowtail flounder in the Canadian scallop fishery on Georges Bank were estimated by applying 3-month moving window discard rates in kg/hour, obtained from observed trips (trips monitored by DFO accredited at-sea observers), to total monthly effort of the scallop fleet in hours.

$$\text{discards} = \text{total scallop effort} \times (\text{observed discards} / \text{observed scallop effort})$$

This approach is dependent on the assumption that the population density of the incidentally caught species experienced by observed trips, i.e. the *(observed discards / observed scallop effort)* ratio, is representative for the whole scallop fishery. Therefore, results can be sensitive to inadequate sampling of the spatial/temporal variation in the population density of the incidentally caught species.

Effort refers to hours towed, with usually 2 dredges being towed at the same time. As there is no adjustment for the number of dredges or size of dredges, it is assumed that the amount of gear used on observed trips is representative of the amount of gear used in typical operations. Effort information for observed trips may be obtained from observer records or from fishery statistics. Since the total fleet effort must be obtained from fishery statistics, effort from fishery statistics was also used for the observed trip effort to ensure consistency.

The fishery statistics effort represents the hours fished for an entire observed trip. Discards from observed trips are only reported for the portion of the fishing activity that was witnessed. It is therefore necessary to prorate witnessed discards to the discards for an entire observed trip. The number of dredge hauls that are observed and the total number of dredge hauls that are made on the trip are recorded. The total discards for a trip are obtained by prorating the witnessed discards by the ratio of total number of dredges to observed number of dredges recorded for the trip.

Scallop fishing practice may result in intensive localized fishing activity. Observers on scallop trips have noted on occasion, that what appears to be the same fish may be caught more than once. Counting a fish more than once if it is captured multiple times may result in over-estimation of discards. A program for marking discarded fish using fin

clipping was instituted in 2007 to prevent multiple counting of the same discards. A recapture rate was calculated as the ratio of the number of fin clipped fish that were recaptured to the total number of fin clipped fish that were released. The 2007 prorated trip discards were adjusted downwards using the recapture rate:  $adjusted\ discards = discards / (1 + recapture\ rate)$ . The magnitude of this adjustment was inconsequential (Gavaris et al 2008); therefore the practice was not continued for 2008.

### **Effort Standardization**

Prior to 2004, virtually none of the scallops landed were caught by freezer trawlers. The prevalence of freezer trawlers has increased rapidly in recent years with freezer trawler landings accounting for 34%, 57%, 63%, 67% and 69% in 2004 to 2008 respectively. Freezer trawlers operate differently and use somewhat larger dredges. The effective fishing intensity exerted by an hour of fishing by a freezer trawler may therefore not be equivalent to that of a wet fish trawler. The conversion factor of 1.2 for standardizing wet fish hours to freezer trawler hours derived by Gavaris et al. (2007) was applied to 2008 data. Inadvertently, the inverse of the conversion factor was applied to 2005 – 2007 data in Gavaris et al (2007) and Gavaris et al (2008). That error was corrected and updated results are reported here.

## **RESULTS AND DISCUSSION**

Estimates of Atlantic cod, haddock and yellowtail flounder discards from the 2008 Canadian scallop fishery on Georges Bank were based on observed discards from 23 observed trips (Table 1). The effort for observed trips in 2008 comprised about 10% of total effort. The spatial coverage of observed trips in relation to the fishery is illustrated by quarter in Figure 1. Fishing locations for observed trips appear to be generally representative of the spatial distribution of fishing locations by the fleet. However, observed trips were somewhat north of fleet activity in quarter 1 and the limited fleet activity in 5Zm in quarters 3 and 4 was not observed.

Both temporal and spatial patterns in discard rates might be expected, but there were not enough observed trips in 2008 to calculate discard rates by area, as unit area 5Zm had limited fishing and observer coverage. Seasonal patterns in discard rates were taken into account by applying calculations using a 3-month moving window. Similar to previous years, the 2008 discard rates (kg/hr) for yellowtail flounder were higher during the spring and early summer and lower during winter, while for cod and haddock they were higher during the early part of the year (Figure 2). To estimate discards, the 3-month moving window discard rates were applied to total monthly effort of the scallop fleet. The corrections for the proper application of the wet fish/freezer trawler conversion generally resulted in nominal reduction of annual discards (Table 2). These adjustments indicate that observer sampling was representative of the wet fish/freezer trawler mix for the fishery, and also that the discard rates for freezer trawlers were lower than the discard rates for wet fish trawlers. Monthly and annual cumulative estimated discards for 2008 are given in Table 3.

## **SUMMARY**

Total annual estimated discards in 2008 were highest for yellowtail flounder, at 117 mt, while those for Atlantic cod and haddock were 36 mt and 33 mt respectively. Declines in annual discards may reflect voluntary gear modifications and avoidance fishing practices as well as area/time closures for yellowtail flounder and Atlantic cod. In the absence of reliable survival estimates, all discarded Atlantic cod, haddock and yellowtail flounder are assumed dead for the purpose of stock assessment computations.

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**Table 1.** Observed trips from the Canadian Georges Bank scallop fishery in 2008.

Trip ID	Board Date	Land Date	Proration			Yellowtail Flounder		Discards (kg)		Haddock		Effort (hrs)
			Dredges Obs.	Total	Prop.	Observed	Prorated	Cod Observed	Prorated	Observed	Prorated	
T2008-1	02/01/2008	24/01/2008	612	1226	0.50	14	28	400	801	259	519	239
T2008-2	18/01/2008	29/01/2008	225	420	0.54	0	0	63	118	31	58	75
T2008-3	24/02/2008	04/03/2008	190	358	0.53	6	11	98	185	102	192	77
T2008-4	23/02/2008	10/03/2008	648	1320	0.49	5	10	27	55	12	24	194
T2008-5	10/03/2008	15/03/2008	58	116	0.50	27	54	96	192	53	106	25
T2008-6	23/03/2008	02/04/2008	230	432	0.53	50	94	87	163	70	131	95
T2008-7	09/04/2008	21/04/2008	410	810	0.51	2031	4012	199	393	292	577	163
T2008-8	09/04/2008	24/04/2008	374	844	0.44	45	102	62	140	12	27	194
T2008-9	14/05/2008	23/05/2008	138	252	0.55	250	457	61	111	2	4	40
T2008-10	31/05/2008	19/06/2008	546	1078	0.51	464	916	10	20	7	14	217
T2008-11	25/06/2008	09/07/2008	432	827	0.52	232	444	72	138	46	88	138
T2008-12	09/07/2008	17/07/2008	112	182	0.62	246	400	19	31	23	37	27
T2008-13	15/07/2008	29/07/2008	361	721	0.50	62	124	14	28	13	26	133
T2008-14	02/08/2008	25/08/2008	398	806	0.49	601	1217	208	421	312	632	337
T2008-15	23/08/2008	06/09/2008	510	940	0.54	6	11	0	0	1	2	190
T2008-16	15/09/2008	24/09/2008	196	366	0.54	226	421	76	141	41	77	90
T2008-17	21/09/2008	26/09/2008	168	266	0.63	79	125	11	17	5	8	58
T2008-18	30/09/2008	09/10/2008	290	468	0.62	27	44	18	29	16	26	101
T2008-19	07/10/2008	28/10/2008	589	1145	0.51	216	420	127	247	164	319	217
T2008-20	07/11/2008	22/11/2008	637	1265	0.50	48	95	49	97	40	79	225
T2008-21	13/11/2008	28/11/2008	549	1040	0.53	154	292	218	413	165	313	211
T2008-22	06/12/2008	22/12/2008	538	1089	0.49	24	49	125	253	148	300	225
T2008-23	14/12/2008	20/12/2008	202	364	0.55	14	25	10	18	9	16	56

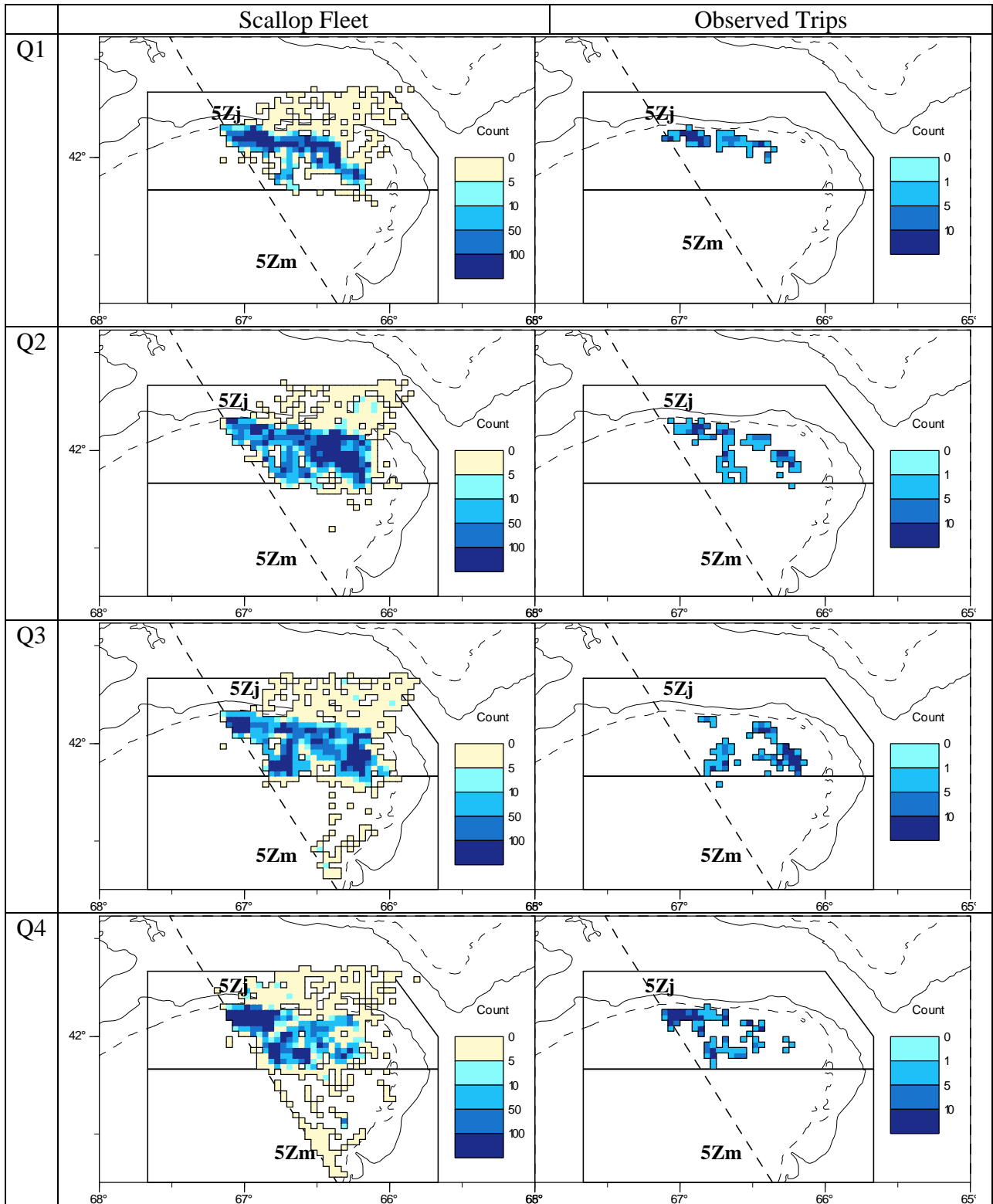


**Table 2.** Adjusted discards, correcting the application of the wet fish/freezer trawler conversion factor, from the Canadian scallop fishery on Georges Bank for 2005-2007 calculated using a 3 month moving window discard rate. For 2007, discard rates were also adjusted for fish that were re-caught based on results of the fin clipping experiment.

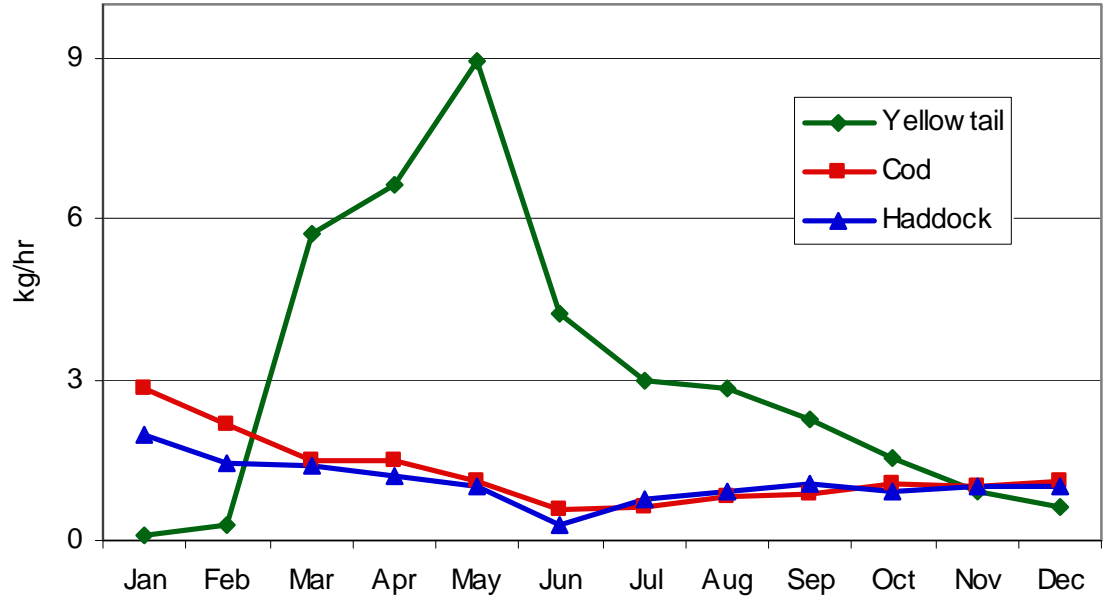
	Discard Rate (kg/hour)			Effort	Discard (mt)			Cum Annual Discard (mt)		
	Yellowtail	Cod	Haddock		Yellowtail	Cod	Haddock	Yellowtail	Cod	Haddock
<b>2005</b>										
Jan	5.353	5.252	2.447	108	1	1	0	1	1	0
Feb	5.638	3.629	2.524	529	3	2	1	4	2	2
Mar	5.018	2.722	1.829	3139	16	9	6	19	11	7
Apr	10.735	3.356	1.873	3023	32	10	6	52	21	13
May	16.836	5.792	0.898	1866	31	11	2	83	32	15
Jun	26.437	3.463	2.569	1362	36	5	3	119	37	18
Jul	20.072	2.739	2.335	1868	37	5	4	157	42	23
Aug	17.577	2.358	2.115	3674	65	9	8	221	50	30
Sep	2.898	2.613	1.553	2921	8	8	5	230	58	35
Oct	2.300	2.424	1.636	2980	7	7	5	237	65	40
Nov	1.833	3.878	1.754	3350	6	13	6	243	78	46
Dec	1.747	3.295	1.190	1849	3	6	2	<b>246</b>	<b>84</b>	<b>48</b>
<b>2006</b>										
Jan	3.158	10.547	5.053	461	1	5	2	1	5	2
Feb	8.481	4.478	2.586	548	5	2	1	6	7	4
Mar	12.560	14.397	2.714	238	3	3	1	9	11	4
Apr	19.046	12.177	2.095	1633	31	20	3	40	31	8
May	56.857	8.537	2.457	2596	148	22	6	188	53	14
Jun	43.952	2.015	2.105	2836	125	6	6	312	59	20
Jul	34.556	2.097	2.313	3130	108	7	7	421	65	27
Aug	8.760	1.783	2.099	3673	32	7	8	453	72	35
Sep	3.384	2.537	1.896	3786	13	10	7	466	81	42
Oct	3.757	1.389	0.943	3789	14	5	4	480	86	46
Nov	2.933	2.947	1.877	4299	13	13	8	492	99	54
Dec	2.796	3.045	2.022	4142	12	13	8	<b>504</b>	<b>112</b>	<b>62</b>
<b>2007</b>										
Jan	0.079	13.317	2.836	966	0	13	3	0	13	3
Feb	0.754	12.637	2.986	991	1	13	3	1	25	6
Mar	8.755	16.965	5.928	693	6	12	4	7	37	10
Apr	12.828	15.383	6.228	1800	23	28	11	30	65	21
May	12.572	12.848	5.542	2681	34	34	15	64	99	36
Jun	7.029	3.487	5.514	1035	7	4	6	71	103	42
Jul	3.936	1.833	2.971	2006	8	4	6	79	107	48
Aug	4.552	1.946	2.867	2247	10	4	6	89	111	54
Sep	2.411	1.130	0.821	1522	4	2	1	93	113	55
Oct	3.701	1.918	1.416	454	2	1	1	<b>94</b>	<b>114</b>	<b>56</b>
Nov										
Dec										

**Table 3.** Discards from the Canadian scallop fishery on Georges Bank for 2008 calculated using a 3 month moving window discard rate.

<b>2008</b>	Discard Rate (kg/hour)			Effort	Discard (mt)			Cum Annual Discard (mt)		
	Yellowtail	Cod	Haddock		Yellowtail	Cod	Haddock	Yellowtail	Cod	Haddock
Jan	0.101	2.825	1.968	1274	0	4	3	0	4	3
Feb	0.280	2.148	1.463	1287	0	3	2	0	6	4
Mar	5.733	1.510	1.416	2939	17	4	4	17	11	9
Apr	6.655	1.485	1.224	3793	25	6	5	43	16	13
May	8.943	1.083	1.013	3564	32	4	4	74	20	17
Jun	4.219	0.591	0.304	2231	9	1	1	84	22	17
Jul	2.987	0.612	0.767	3283	10	2	3	94	24	20
Aug	2.821	0.799	0.894	3395	10	3	3	103	26	23
Sep	2.255	0.862	1.071	2507	6	2	3	109	28	26
Oct	1.550	1.048	0.911	2644	4	3	2	113	31	28
Nov	0.893	1.022	1.017	2879	3	3	3	116	34	31
Dec	0.643	1.090	0.987	2088	1	2	2	<b>117</b>	<b>36</b>	<b>33</b>



**Figure 1.** Fleet fishing locations based on count of VMS polls (left panels) compared to locations of observed fishing based on count of dredges (right panels) for the 2008 Canadian scallop fishery on Georges Bank.



**Figure 2.** Seasonal patterns in discard rates of yellowtail flounder, Atlantic cod and haddock from the Canadian scallop fishery on Georges Bank in 2008 calculated using a 3-month moving window.