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### **Discards of Atlantic Cod, Haddock and Yellowtail Flounder from the 2009 Canadian Scallop Fishery on Georges Bank**

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### **ABSTRACT**

Discards of Atlantic cod, haddock and yellowtail flounder from the 2009 Canadian scallop fishery on Georges Bank were estimated from 22 trips that were monitored by at-sea observers. Data were insufficient to determine spatial differences in discard rates per hour. Temporal discard trends were estimated by applying the monthly discard rate per hour obtained by a 3-month moving window calculation to the total monthly effort in hours of the scallop fleet. Total annual estimated discards in 2009 were highest for yellowtail flounder, at 84 mt, while those for Atlantic cod and haddock were 69 mt and 54 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 2009 ont été estimés d'après les résultats de 22 sorties de pêche au cours desquelles un observateur était présent. Les données étaient insuffisantes pour cerner les différences spatiales dans les taux de rejets par heure. On a estimé les tendances temporelles des rejets en appliquant le 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, exprimé en heures, de la flottille de pétoncliers. Parmi les rejets annuels totaux estimés pour 2009, ce sont les rejets de limande à queue jaune qui étaient les plus importants (84 tm), les rejets de morue et d'aiglefin s'élevant respectivement à 69 tm et 54 tm.

## INTRODUCTION

Incidental catch not landed (i.e., 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 2009 were therefore discarded. Discards of Atlantic cod, haddock and yellowtail flounder from the Canadian scallop fishery for 1960-2004 were first estimated by Van Eeckhaute et al. (2005) and updated for 2005 - 2008 by Gavaris et al. (2007, 2008, 2009). The Canadian scallop fishery discard estimates for 2009 and corrections of discard estimates for 2007 and 2008 are described in this report.

## 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 a 3-month moving window to discard rates in kg/hour. Discard rates obtained from observed trips (trips monitored by DFO accredited at-sea observers) were applied to total monthly effort of the scallop fleet in hours as follows:

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

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. The results can, therefore, be sensitive to inadequate sampling of the spatial/temporal variation in the population density of the incidentally caught species.

For this calculation effort refers to hours towed, with usually 2 dredges being towed at the same time. As there is no information on the number of dredges or size of dredges for unobserved vessels, it is assumed that the gear used on observed trips is representative of the gear typically used by the fleet. 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, this 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 (two dredges are usually towed but here, a dredge haul is equivalent to one dredge per tow) that are observed and the total number of dredge hauls 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 dredge hauls to observed number of dredge hauls 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 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.

### **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%, 69% and 67% in 2004 to 2009, respectively. Freezer trawlers operate differently than the conventional scallop fleet and use somewhat larger dredges. The effective fishing intensity exerted by an hour of fishing by a freezer trawler is therefore not 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 2009 data. Inadvertently, the inverse of the conversion factor was applied to 2005 – 2007 data in Gavaris et al (2007 and 2008). This error was corrected and the updated results reported in Gavaris et al. (2009).

## **RESULTS AND DISCUSSION**

Estimates of Atlantic cod, haddock and yellowtail flounder discards from the 2009 Canadian scallop fishery on Georges Bank were based on observed discards from 22 observed trips (Table 1). The effort for observed trips in 2009 comprised 10.5% of total effort. The spatial coverage, derived from a vessel monitoring system (VMS), 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, the fleet activity in 5Zm had limited observer coverage and differences in discard rates by area were not taken into account.

Seasonal differences in discard rates were taken into account by calculating discards on a monthly basis with 3-month moving window discard rates (Figure 2) which were applied to total monthly effort of the scallop fleet. Similar to previous years, the 2009 discard rates (kg/hr) for yellowtail flounder were higher during the spring and early summer and decreased in mid-summer. Unlike previous years, however, rates increased during fall. Discard rates for cod decreased in mid-summer and increased in the fall. For haddock they were highest during the early part of the year, decreased in the summer and increased again in the fall. Monthly and annual cumulative estimated discards for 2009 are given in Table 2.

To check that the time averaging (moving window) is not creating radically different estimates than those based on the mean annual catch rate, the estimates for 2005 to 2009 were compared with the discards obtained when the catch and effort from all trips in a year were summed. These estimates were quite similar to the approach that has been used and were not biased in one direction or another.

Discards for 2007 and 2008 were adjusted for minor changes in input data from two 2007 trips and two 2008 trips. The 2007 discard rates reported in the 2009 report, which did not correspond to the values on record, were also corrected (Table 3). Changes to total discards occurred for yellowtail flounder in 2007, increasing from 94 mt to 95 mt, and for cod in 2008, increasing from 36 mt to 37 mt.

## **Summary**

Total annual estimated discards in 2009 were highest for yellowtail flounder, at 84 mt, while those for Atlantic cod and haddock were 69 mt and 54 mt respectively. Yellowtail flounder discards decreased from 2008 while cod and haddock increased. Discard amounts may reflect voluntary gear modifications (DFO 2009) and avoidance fishing practices as well as area/time closures for yellowtail flounder (DFO 2007) and Atlantic cod (DFO 2006). 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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**Discards from the 2009 Canadian  
Scallop Fishery on George Bank**

**Table 1.** Observed trips from the Canadian Georges Bank scallop fishery in 2009. Effort hours are standardized to freezer trawler hour equivalents.

Trip ID	Board Date	Land Date	Proration			Yellowtail Flounder		Discards (kg)		Haddock		Effort (hrs)
			Dredges		Prop.	Observed	Prorated	Observed	Prorated	Observed	Prorated	
T2009-01	2009-01-02	2009-01-23	384	804	0.48	57	119	268	561	430	900	290
T2009-02	2009-01-16	2009-01-29	463	855	0.54	13	24	171	316	206	380	170
T2009-03	2009-02-18	2009-03-06	614	1252	0.49	246	502	244	498	162	330	212
T2009-04	2009-02-19	2009-03-03	320	624	0.51	25	49	170	332	29	57	112
T2009-05	2009-03-10	2009-03-20	366	686	0.53	117	219	45	84	64	120	118
T2009-06	2009-03-27	2009-04-14	810	1320	0.61	632	1030	208	339	666	1085	279
T2009-07	2009-04-14	2009-04-24	92	178	0.52	31	60	11	21	8	15	19
T2009-08	2009-04-16	2009-05-01	306	594	0.52	145	281	323	627	174	338	129
T2009-09	2009-05-06	2009-05-15	390	590	0.66	116	175	21	32	27	41	68
T2009-10	2009-05-16	2009-05-31	495	990	0.50	769	1538	235	470	84	168	183
T2009-11	2009-06-15	2009-06-24	114	204	0.56	4	7	6	11	0	0	10
T2009-12	2009-06-16	2009-07-01	292	518	0.56	73	130	46	82	12	21	79
T2009-13	2009-07-09	2009-07-24	431	745	0.58	12	21	170	294	67	116	129
T2009-14	2009-07-14	2009-07-23	125	272	0.46	23	50	108	235	27	59	56
T2009-15	2009-07-31	2009-08-15	467	937	0.50	119	239	49	98	125	251	193
T2009-16	2009-08-17	2009-08-22	232	392	0.59	101	171	7	12	8	14	62
T2009-17	2009-09-08	2009-09-18	360	594	0.61	143	236	81	134	46	76	117
T2009-18	2009-09-16	2009-10-01	504	950	0.53	370	697	298	562	90	170	212
T2009-19	2009-09-30	2009-10-20	682	1386	0.49	1208	2455	776	1577	644	1309	276
T2009-20	2009-10-17	2009-11-01	510	1097	0.46	33	71	92	198	49	105	192
T2009-21	2009-11-14	2009-12-01	640	1100	0.58	72	124	349	600	132	227	277
T2009-22	2009-11-15	2009-12-02	469	954	0.49	64	130	146	297	53	108	249



**Discards from the 2009 Canadian  
Scallop Fishery on George Bank**

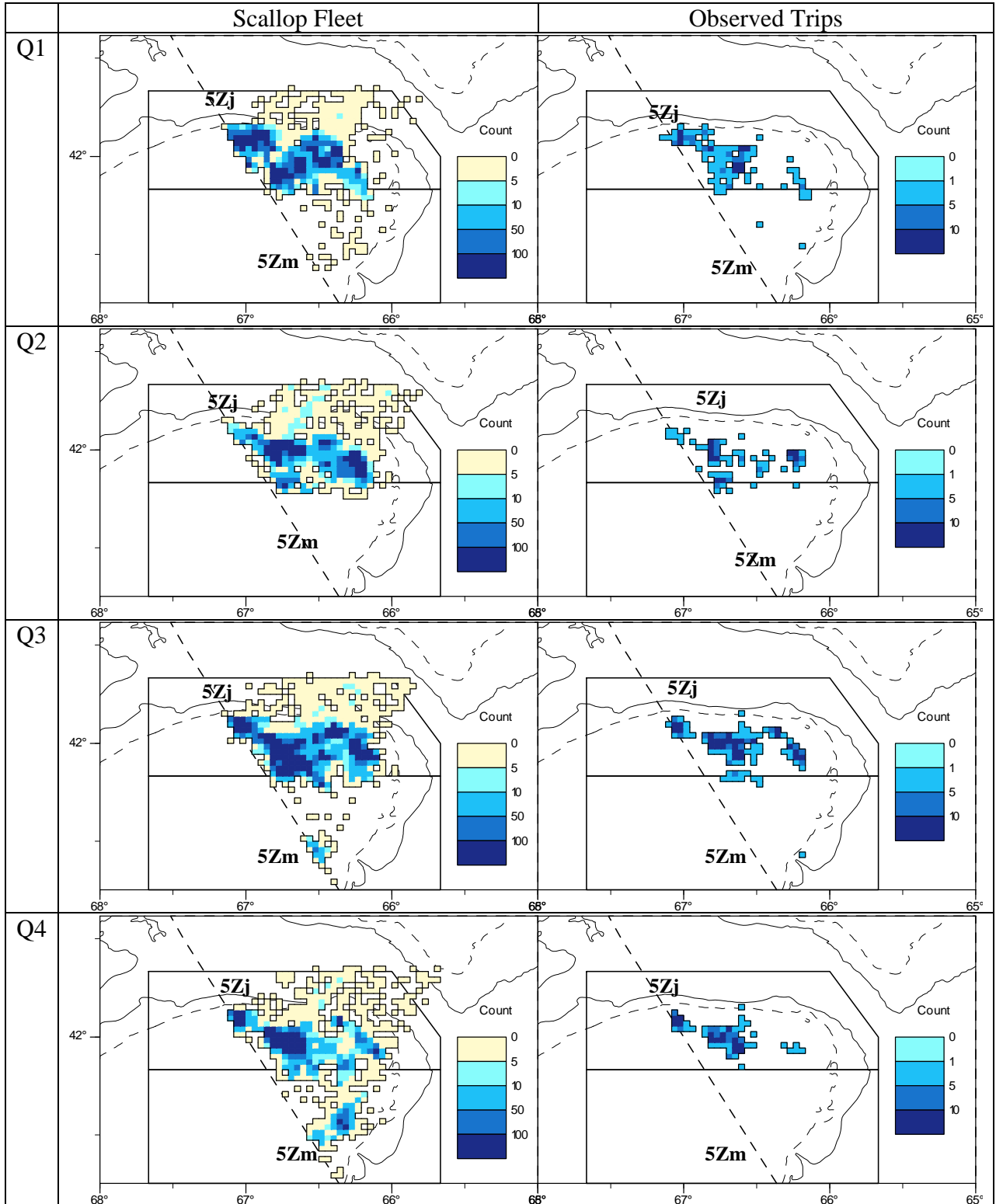
**Table 2.** Discards from the Canadian scallop fishery on Georges Bank for 2009 calculated using a 3 month moving window discard rate. Effort hours are standardized to freezer trawler hour equivalents.

<b>2009</b>	Discard Rate (kg/hour)			Effort	Discard (mt)			Cum Annual Discard (mt)		
	Yellowtail	Cod	Haddock		Yellowtail	Cod	Haddock	Yellowtail	Cod	Haddock
Jan	0.885	2.176	2.127	2687	2	6	6	2	6	6
Feb	1.012	1.984	1.981	2502	3	5	5	5	11	11
Mar	2.462	2.186	2.237	3075	8	7	7	12	18	18
Apr	4.151	1.977	2.220	2385	10	5	5	22	22	23
May	4.202	2.063	2.177	2840	12	6	6	34	28	29
Jun	3.664	2.142	0.772	2250	8	5	2	43	33	31
Jul	1.167	1.384	0.871	3129	4	4	3	46	37	33
Aug	1.840	1.737	0.891	3434	6	6	3	53	43	37
Sep	3.680	2.454	1.830	3164	12	8	6	64	51	42
Oct	2.807	2.546	1.508	3733	10	10	6	75	60	48
Nov	2.797	2.688	1.759	3322	9	9	6	84	69	54
Dec	0.483	1.705	0.636	37	0	0	0	<b>84</b>	<b>69</b>	<b>54</b>

**Table 3.** Discards from the Canadian scallop fishery on Georges Bank for 2007 and 2008 were adjusted for minor changes in input data from two 2007 trips and two 2008 trips. The 2007 discard rates reported in the 2009 document, which do not correspond to the values on record, have been corrected. For 2007, discard rates were also adjusted for fish that were re-caught based on results of the fin clipping experiment. Effort hours are standardized to freezer trawler hour equivalents.

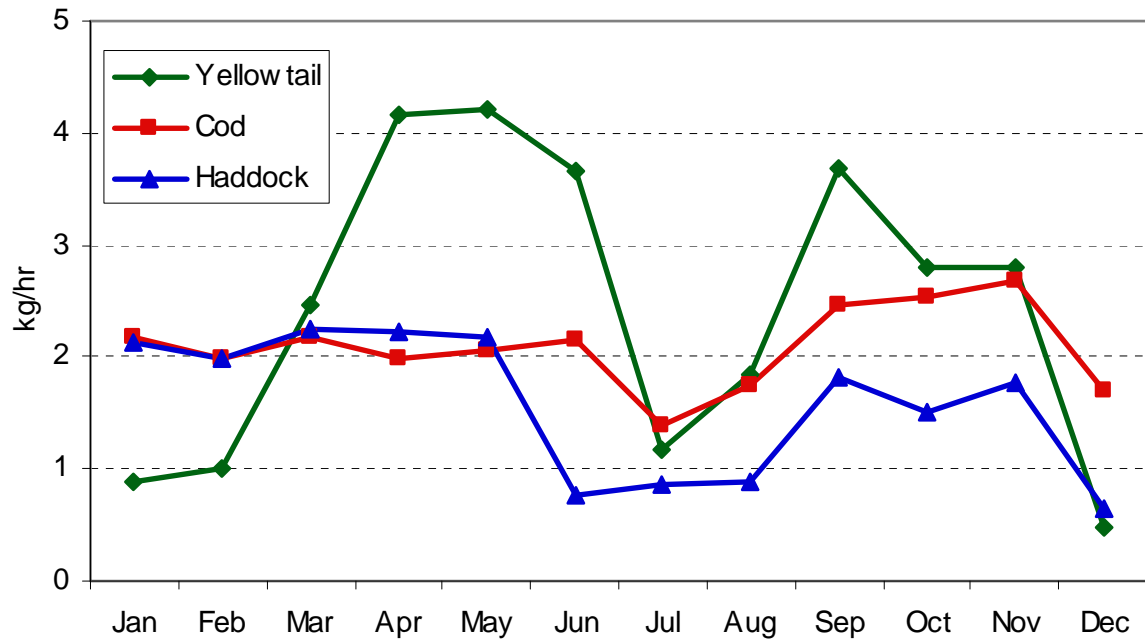
	Discard Rate (kg/hour)			Effort	Discard (mt)			Cum Annual Discard (mt)		
	Yellowtail	Cod	Haddock		Yellowtail	Cod	Haddock	Yellowtail	Cod	Haddock
<b>2007</b>										
Jan	0.080	13.548	2.854	966	0	13	3	0	13	3
Feb	0.768	12.813	3.006	991	1	13	3	1	26	6
Mar	8.913	17.124	5.966	693	6	12	4	7	38	10
Apr	13.041	15.413	6.268	1800	23	28	11	30	65	21
May	12.770	12.872	5.575	2681	34	35	15	65	100	36
Jun	7.029	3.488	5.515	1035	7	4	6	72	104	42
Jul	3.936	1.833	2.971	2006	8	4	6	80	107	48
Aug	4.552	1.946	2.867	2247	10	4	6	90	112	54
Sep	2.411	1.130	0.821	1522	4	2	1	94	113	55
Oct	3.701	1.918	1.416	454	2	1	1	<b>95</b>	<b>114</b>	<b>56</b>
Nov										
Dec										
<b>2008</b>										
Jan	0.102	2.851	1.985	1274	0	4	3	0	4	3
Feb	0.281	2.163	1.472	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	18
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	29	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>37</b>	<b>33</b>

**Discards from the 2009 Canadian Scallop Fishery on George Bank**



**Figure 1.** Fleet fishing locations based on count of Vessel Monitoring System polls (left panels) compared to locations of observed fishing based on count of dredges (right panels) for the 2009 Canadian scallop fishery on Georges Bank.

Discards from the 2009 Canadian Scallop Fishery on George Bank



**Figure 2.** Seasonal patterns in discard rates (kg/hour) of yellowtail flounder, Atlantic cod and haddock from the Canadian scallop fishery on Georges Bank in 2009 calculated using a 3-month moving window.