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Groundfish by-catch within the northern shrimp fishery off the eastern coasts of Newfoundland and Labrador over the years 2007 – 2009

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Introduction

Prior to 1997, the shrimp fishery off the northeastern coasts of Newfoundland and Labrador was entirely a large vessel (>500 t) fishery. There were 17 shrimp fishing licences and in any one year approximately 13 vessels. Since 1996, approximately 360 small vessels (<=100 ' length overall (LOA); <=500 t) have been granted temporary shrimp fishing licences. In 2000, the NAFO Div. 3LNO shrimp fishery began with a total allowable catch (TAC) of 5000 t, 83% of which was to be fished by Canadian vessels in the Canadian EEZ while 17% could be fished by non-Canadian vessels in the NRA. Then in 2007, the temporary licences were converted to permanent licences. The TAC for the entire study area (northern Labrador to the southern border of 3L) has increased from 6650 t in 1980 to 150,345 t by 2009. There is a great deal of potential for capturing non target species, some of the finfish bycatch are listed as being endangered under the Species at Risk Act (SARA) Legislation while others are under moratoria; therefore it is important to minimize bycatch. The following lists some of the forms of mitigation used in Canada.

Since 1996, usage of Nordmore Grates has been mandatory, within the Canadian northern shrimp fishery, as a means of reducing finfish by-catch. North of Shrimp Fishing Area (SFA) 6 (Fig. 1), bar spacing within large vessel (>500 t) codends must not exceed 28 mm. South of SFA 5 (Fig. 1), the bar spacing within large vessel codends must not exceed 22 mm. The bar spacing within all small vessel (<= 500 t; LOA <100') codends must not exceed 22 mm regardless of area fished.

In order to protect groundfish within Div 3LNO (SFA 7), Canadian fishing vessel licence conditions include the following stipulation:

"If total by-catches of all regulated groundfish species in any haul exceeds 2.5 percent by weight of the catch of shrimp, the master of the vessel must immediately change fishing area by a minimum of 10 nautical miles from any position of the previous tow in order to seek to avoid further by-catches of all regulated groundfish. If after moving, the next haul exceeds these by-catch limits the vessel must leave the Division and not return for at least 60 hours."

Small vessel licences have the additional groundfish protection stipulation:

"The trawl shall be configured with toggle and chain lengths set to a minimum of 71.12cm (28 inches), length measured from the centre of the toggle hole to the fishing line (bolch line)."
During September 2002, a 400 square Nmi area within Hawke Channel was closed to all but snow crab fishing. The next year, the closed area was expanded to 2500 square Nmi. Then during 2005, the Funk Island Deep box was closed to bottom trawling. These closures were to protect both Atlantic cod and juvenile snow crab.

In 2007, the offshore shrimp and groundfish sectors introduced a 12,500 square kilometre Coral Protection Zone in the northern Labrador Sea to protect coral concentrations in that area (Fig. 1). This is part of an industry-led initiative, sponsored by the Canadian Association of Prawn Producers (CAPP), the Groundfish Enterprise Allocation Council (GEAC), and the Northern Coalition (NC), which also includes other conservation measures designed to promote marine stewardship and the preservation of sensitive marine ecological features. For example, fishing captains are to collect data on all cold-water coral they encounter and communicate this information to the fleets so

that gear can be removed and/or fishing activity halted in those regions. Information gathered will also be used by industry in their research surveys so that research survey sets avoid critical coral habitat (IFMP 2010).

The Hawke Channel closure is a mandatory closure for all fisheries other than the snow crab pot fishery. The Funk Island Deep fishery is a mandatory closure for the small vessel shrimp fishing fleet but a voluntary closure for the large vessel fleet. The coral protection zone is a voluntary closure for the large vessel fleet.

This report provides a preliminary account of the by-catch taken by Canadian vessels fishing for shrimp off the east coast of Labrador and northeastern Newfoundland. The detailed results are presented by SFA, year and fleet for the following groundfish species: Atlantic cod (*Gadus morhua*), Greenland halibut (*Reinhardtius hippoglossoides*), redfish (*Sebastes* spp.), spotted wolffish (*Anarhichas minor*), striped wolffish (*Anarhichas lupus*), northern wolfish (*Anarhichas denticulatus*) and American Plaice (*Hippoglossoides* platessoides). A summary by SFA and fleet for the year 2008-09 also presents the importance in terms of percent occurrence and weight for each species captured by the shrimp fishing fleets. Data are also presented from the non-Canadian fleet fishing for shrimp in the NAFO Division 3L, NAFO Regulatory Area (NRA).

Beginning in 2003, industry was granted a change in management year from a calendar (Jan 1 – Dec. 31) year to a fiscal (Apr. 1 – Mar. 31) year for all domestic shrimp fishing areas (SFAs). Therefore, large vessel data is presented by fiscal year for SFAs 4-6. While the small vessel quota is managed by fiscal year, the catch is taken before the end of December; therefore the data are presented by calendar year. The NAFO Division 3L management unit (SFA 7) is managed by calendar year and all by-catch is presented accordingly.

Methods and Materials

Groundfish by-catch within the Canadian northern shrimp fishery

There is mandatory 100% observer deployment on all large Canadian vessels (>500 t) fishing shrimp off the eastern coast of Labrador and northeastern Newfoundland.

However, there is a target of 10% observer coverage among the Canadian small vessel (<= 500 t; LOA<100') shrimp fishing fleet. Since 2000, attempts have been made to ensure that the small vessel observer coverage is representative of the fishery. This is accomplished by dividing the coastal areas of Newfoundland and Labrador into 26 port areas. A month X area matrix was created with the cells containing the percent catch landed in each area by month (Table 1). The number of observers assigned to port areas by month was prorated according to the matrix of catch and the funds available for the observer program. Much of the small vessel fishery takes place between April and October; therefore, the deployment scheme was restricted to that seven month period.

This stratified deployment pattern was chosen because the licenses do not restrict fishers to particular NAFO Statistical Units. There is no reason to believe that a fisher from St. Anthony will always fish in St. Anthony Basin. By sampling various locations throughout the year, there is high probability of obtaining representative data. Additionally, the proposed pattern of deployment allows flexibility because each year the matrix is updated from past fishery performance. The continual updates are necessary because it is assumed that the fishery will change over time, as the environment/ distributions of shrimp change.

Upon deployment to a port, the observer is asked to make use of a random number table when choosing a vessel according to vessel side number. If a vessel is chosen during a deployment, it is removed from the next selection process. Deployment by lottery ensures that all vessels have an equal opportunity of being chosen. The only caveat is that the observer is not to choose a vessel that he/ she feels is not safe.

The observer database provides information used to determine the potential impacts that shrimp fishing may have upon groundfish species. Groundfish by-catch is recorded to 1 kg. precision for all observed fishing sets. Length frequencies are recorded to 1 cm. precision from randomly selected samples of commercial groundfish species. A species specific length weight relationship was applied to the bycatch length frequencies. The resultant weights were added together on a species by species and set by set basis. A ratio of observed weight to modeled weight was used to correct for the 1 kg precision. Using a ratio of corrected species catch weight versus weight of fish measured, the length frequencies were adjusted on a set by set basis. Adjusted length frequencies were added

together on a species by species basis. An average length frequency distribution per kg. of by-catch was produced and then merged with the catch records. The average frequency per kg was multiplied by the total by-catch weight in an effort to produce total length frequency data on a set by set, species by species basis.

The total catch weight of shrimp by Shrimp Fishing Area (SFA), year and fleet from the Canadian Atlantic Quota Report (CAQR) provided the logbook estimate of shrimp catch that was used as a multiplier (correction factor = logbook catch/ observed catch) to correct by-catch estimates when the observer records indicated that total shrimp catch was less than the logbook catch. In the case, of large vessels, a high proportion of the catch was observed and therefore the correction factor was always close to 1. If the total observed catch was greater than the total CAQR catch, the correction factor was set at 1.

Distributional maps of juvenile Atlantic cod (*Gadus morhua*), American plaice (*Hippoglossoides platessoides*), Greenland halibut (*Rheinhardtius hippoglossoides*) and redfish (*Sebastes mentella*) were overlain with plots of survey shrimp catches to determine the degree of overlap and therefore potential for impact by the shrimp fishery. The term juvenile refers to the modal length of a species (LC_{50}) passing through a 22 mm Nordmore Grate. The respective LC_{50} values for Atlantic cod, Greenland halibut, redfish and American plaice were: 19 cm (Hickey *et al* 1993), 24 cm (Nicolajsen, 1997), 14-18 cm (Hickey *et al.*1993, Kulka and Power, 1996, Kulka, 1998, Nicolajsen, 1997 and Skűladóttir, 1997) and 23 cm (Orr *et al.* 2000). L_{50} values for Broadhead (*Anarhichas denticulatus*), striped (*A. lupus*) and spotted (*A. minor*) were not found in the published literature and therefore the default values of 20 cm were used in the overlay plots for all wolfish. The overlay plots are for SFA's 5-7 and do not include SFA 4 because groundfish length frequencies are taken on an opportunistic basis only within that Shrimp Fishing Area.

All statistical analyses were completed using SAS version 9.01 while all plots were created using Surfer 9.11 (Golden Software, 2010).

Results and Discussion

Tables 2-13 provide the details of the year, fleet and species by-catch. The correction factor (logbook catch/ observed catch), percent of by-catch sets with measurements, number of fish measured all provide an indication of whether the length frequency data is representative of the by-catch. For instance, table 2 indicates that redfish measurements were taken from several large vessel fishing sets and thousands of redfish were measured; therefore it is probable that the estimates of number of redfish taken by length class are representative of the by-catch. On the other hand, the estimates of American plaice at length may be more suspect for the 2007 – 08 season because measurements were taken from less than 1% of the sets with by-catch and only 142 animals were measured.

The correction factor provides a measure of observer coverage. As noted above, every large Canadian shrimp fishing vessel has an observer before it leaves port, therefore the observed and logbook total shrimp catch weights are close to each other; subsequently, the correction factors are always close to 1. Alternatively, the Canadian small vessel fleet has a target of only 10% observer coverage. The Canadian small vessel correction factors range from 10.5 – 25.4 meaning that this fleet had an observer coverage that ranged between 9.5% and 3.9% respectively (Tables 8 and 12). Therefore there is less confidence that the small vessel by-catch estimates are representative of the fishery. The small vessel observer coverage is low and does not often meet the 10% target for the following reasons:

1. there are several fisheries, many of which require observer coverage, however, there are only a limited number of observers;
2. there is a high level of turn over among observers;
3. for conservation reasons, priority may be shifted from one fishery to another. For instance, during the spring there may be a disproportionate number of observers assigned to the snow crab fishery due to soft shell concerns;
4. it may be difficult to find observers willing to work in remote locations such as along the coast of Labrador.

Even though the observer coverage is low, a comparison between the logbook and observed positions (Fig. 2) indicates that the observed sets were spatially and temporally similar to the logbook sets. This is evidence that the small vessel observed sets may be representative of the small vessel shrimp fishery.

Due to the number of tasks undertaken by observers, and because conditions on vessels are not always conducive for detailed sampling of several species, there may be species for which few length measurements were taken. Where

there is a high estimated number of fish in the by-catch (>20,000) but only a low number sets sampled (<6) and a low number of measurements taken (<100), the number at length may not be representative of the by-catch.

Tables 2-12 indicate that relatively low numbers of (<400,000 animals) and weights (<20 t) of Atlantic cod (*Gadus morhua*), American plaice (*Hippoglossoides platessoides*), spotted wolffish (*Anarhichas minor*), striped wolffish (*Anarhichas lupus*), broadhead wolfish (*Anarhichas denticulatus*) had been taken by either large or small shrimp fishing fleets within each year of the 2006-07 to 2008-09 study period.

However, Greenland halibut (*Reinhardtius hippoglossoides*) by-catch taken by the large vessel fleet ranged between 2.8 t (77,000 animals) taken in SFA 4 during 2008-09 and 28 t (550,000 animals) taken in SFA 5 during 2008-09. Over the study period the small vessel Greenland halibut by-catch ranged between 0.9 t (38,000 animals) taken in SFA 7 during 2007 and 117 t (1,125,000 animals) taken in SFA 6 during 2008. It should be noted that even though by-catch, in SFA 6, is higher among the small vessel fleet, total shrimp catch for small vessels is higher than it is for large vessels. In terms of weight of Greenland halibut by-catch (kg) per ton of shrimp taken, the metric ranged between 0.27 kg/t and 1.16 kg/t for the large vessel fleet while it was 0.07 kg/t and 2.03 kg/t for the small vessel fleet.

Over the three year study period, redfish (*Sebastes* spp.) by-catch taken by the large vessel fleet ranged between 2.5 t (25,000 animals) taken from SFA 4 during 2007-08 and 14 t (174,000 animals) taken from SFA 5 during 2008-09. Over the same period, the small vessel redfish by-catch ranged between 28 t taken from SFA 7 during 2008 (1,040,000 animals) and 212 t (5,011,000 animals) taken in SFA 6 during 2008. In terms of weight of redfish by-catch (kg) per ton of shrimp taken, the metric ranged between 0.15 kg/t and 0.75 kg/t for the large vessel fleet while it was 1.53 kg/t and 3.68 kg/t for the small vessel fleet.

One should not construe relatively low levels of by-catch as necessarily implying that there may not be a problem. It is possible to have a situation in which there are dangerously low abundances of a groundfish species. In this case, it would not be surprising to have relatively low levels of by-catch. Alternatively relatively high levels of by-catch, in relation to other species, does not necessarily mean that irreparable harm is being done. The by-catch should be described in the context of the groundfish resource.

Distribution of shrimp in relation to various commercially important groundfish species

Greenland halibut

Figures 3-5 indicate that large concentrations of juvenile Greenland halibut (<=24 cm total length) are sympatric with large concentrations of shrimp. High spatial overlap with shrimp, fusiform shape, relatively high abundances of Greenland halibut and the fact that they swim upright allowing relatively large animals to pass through the Nordmore Grate, result in relatively high Greenland halibut by-catchs within the shrimp fishery.

Redfish

Both shrimp and juvenile redfish (<=16 cm total length) are commonly found in the channels and along the 2J3KL shelf edge in water between 200 and 500 m (Figs. 6-8). Given the high degree of overlap between these species and the fact that redfish are slow growing and hence susceptible to passage through a Nordmore Grate, it is not surprising that redfish bycatch is high relative to many other groundfish species.

Atlantic cod

Relatively few juvenile cod (<=19 cm total length) have been caught during recent years, although, young cod were often found within inshore areas (Figs. 9-11). Shrimp and juvenile cod distributions may overlap within certain inshore areas; however, the large and small vessel fisheries occur chiefly in the channels and along the 2GHJ3KL shelf edge (Figs. 1 and 2). This may explain the relatively low cod bycatch within the shrimp fishery (Tables 2-12).

American plaice

Figures 12-14 indicates that juvenile American plaice (<=23 cm total length) are dispersed throughout SFA 5-7 and that there is overlap between American plaice and large shrimp catches. However, most American plaice were found in water shallower than 200 m with concentrations in Notre Dame and White Bay areas. Thus there was not a complete overlap between American plaice and shrimp and an even lower overlap between American plaice and the shrimp fishery (Figs. 1 and 2). The relatively low bycatch of American plaice (Tables 2-12) may also be due to the fact that it swims on its side.

Wolfish

There are no figures for the overlap between broadhead wolfish and shrimp because broadhead wolfish (<=20 cm total length) were very rare in the catches. Figures 15 and 16 indicate that while spotted wolfish were rare, enough animals were caught to detect whether there was overlap with shrimp. They were found in the channels and along the shelf break where the shrimp were found. Similarly, figures 17 and 18 clearly illustrate the overlap between striped wolfish and shrimp. The most important feature of the spotted and striped wolfish plots is the fact that abundances of these animals are much lower than they are for the groundfish species described above. Broadhead and spotted wolfish (COSEWIC, 2001 a and b) are presently listed as threatened while striped wolfish are of special concern (COSEWIC, 2000).

Information provided by these plots is in agreement with by-catch levels provided in tables 2-12. Levels of by-catch are generally in relation to abundances of juvenile groundfish and degrees of overlap between the species.

In General

Low numbers of wolfish were found in the survey and low numbers were taken as bycatch. Similarly, there were relatively few Atlantic cod and these were for the most part are distributed away from the shrimp fishery; consequently by-catch of Atlantic cod has generally been in the order of a few tons. Juvenile American plaice are more abundant, but concentrations were in shallower water and in the southwest away from the shrimp fishery, therefore the total American plaice bycatch was normally less than 20 t per year. There is more overlap between juvenile redfish, Greenland halibut and the shrimp fishery. By-catch is greatest among these groundfish.

Summary tables for bycatch are presented in tables 3, 5, 7, 9, 11 and 13. These tables provided a detailed analysis of percent occurrence in the fishing sets and percent weight in the total catch. It should be noted that correction factors have not been applied to the numbers in these tables therefore, the weights in these tables may not be the same as the bycatch weights in the detailed groundfish tables that present length frequencies. Additionally, not all observers have the same level of skill in identifying finfish or invertebrates therefore these tables are not meant to give a complete accounting of all bycatch species. Some species such as skates which are very hard to identify when small, and therefore have been grouped. Having said that the values of easily identified species (e.g. Capelin, Greenland halibut and redfish) can be used to provide an indicator of relative importance in the bycatch. Capelin, skates, lanternfish, eelpouts, redfish and Greenland halibut appeared most frequently in the catches and were most important in terms of finfish weight.

Bycatch taken by non-Canadian vessels in the NRA

Bycatch data were received from Estonian, Greenland, Norway and Spain and is presented in Tables 14 – 17. Unfortunately by-catch was not always identified to the species level. Regardless redfish appeared commonly in the list from all nations. Capelin, Greenland halibut, lanternfish, redfish, American plaice were the most common by-catch species found in the Estonian and Spanish shrimp catches.

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Table 1. The stratified deployment scheme used to assign observers on the Canadian small vessel shrimp fishing fleet during 2009. The numbers represent the requested days per area and month.

	Number of observer days per area and month assuming approximately 640 sea days.							
Port Area	Month							
	April	May	June	July	August	September	October	Total
Cook's Harbour – Goose Cove (near St. Anthony)	2	9	35	43	39	18	4	150
Ireland's Bight – Roddickton (includes Englee)	0	0	0	0	0	0	0	1
Great Harbour Deep	0	0	0	0	0	0	0	0
Jackson's Arm – Middle Arm	0	0	5	7	6	2	1	21
Rattling Brook – Triton	0	0	0	0	0	0	0	0
Glover's Harbour – Newstead	0	0	0	0	0	0	0	0
Summerford – Carmanville	0	5	25	29	24	12	2	97
Aspen Cove – Gambo	0	0	1	1	1	0	0	4
Glovertown – Bonavista	0	0	0	0	0	0	0	1
Lance Cove – Clarenville	1	15	23	31	34	14	4	122
Snook's Harbour – Old Perlican	1	6	9	12	15	6	2	50
Grate's Cove – Port de Grave	2	11	14	25	31	15	4	102
Hussey's Cove – Quidi vidi	0	0	1	2	3	1	0	7
St. John's	3	5	4	3	1	1	0	17
Blackhead (Freshwater Bay) – Cape Broyle	0	0	0	0	0	0	0	0
Calvert – St. Shotts	0	0	0	0	0	0	0	0
St. Stephen's – St. Leonard's	0	0	0	0	0	0	0	0
Isle au Valen – English Harbour, Fortune Bay	0	0	0	0	0	0	0	0
Femme – St. Alban's	0	0	0	0	0	0	0	0
Great Jarvis – Lapoile	0	0	0	0	0	0	0	0
West Point – Lewis Brook	0	0	0	0	0	0	0	0
Shag Island – River of Ponds	0	0	0	0	0	0	0	0
Spirity Cove – L'anse Aux Loop	0	2	2	7	7	2	0	19
Red Bay – Murray's Harbour	0	0	0	0	0	0	0	0
Port Hope Simpson - Cartwright	0	0	6	15	15	10	1	46
Grand Total								639

Table 2. NAFO Division 2G (Shrimp Fishing Area 4) Canadian large vessel (>500 t) bycatch over the period 2006 – 07 to 2008-09. Since 2003, the fishery management year changed from Jan. 1 – Dec. 31 to Apr. 1 – Mar. 31 of the next year. During the March 2008 Zonal Assessment Process meeting it was agreed that all catches would be presented according to the management year. All trips on large shrimp fishing vessels must have an observer therefore the correction factor (logbook catch/observer catch) is always close to 1. Please note that if the observer catch is greater than the logbook catch, the correction factor is 1.

		Atlantic Cod			American Plaice		
	Year	2006-07	2007-08	2008-09	2006-07	2007-08	2008-09
Observed shrimp catch (t)		9,890	10,642	6,632	9,890	10,642	6,632
Logbook shrimp catch (t)		10,009	9,682	10,654	10,009	9,682	10,654
correction factor		1.0120	1.0000	1.6065	1.0120	1.0000	1.6065
estimated bycatch (kg)		62	122	4,966	2,318	1,086	2,741
Bycatch (kg)/ (t) shrimp		0.01	0.01	0.47	0.23	0.10	0.26
total number of sets observed		1668	1622	866	1,668	1,622	866
number of sets with bycatch		60	110	142	673	800	274
freq. sets with 1Kg recorded		31	70	12	328	431	49
percent bycatch sets with 1Kg recorded		51.67%	63.64%	8.45%	48.74%	53.88%	17.88%
number sets with measurements		15	1	0	22	5	0
percent bycatch sets with measurements		25.00%	0.91%	0.00%	3.27%	0.63%	0.00%
number of fish measured		26	1	0	991	142	0
total length							
	cm	estimated number at length			estimated number at length		
	1	0	0	0	0	0	0
	2	0	0	0	0	0	0
	3	0	0	0	0	0	0
	4	0	0	0	0	0	0
	5	0	0	0	0	0	0
	6	0	0	0	0	0	0
	7	0	0	0	0	0	0
	8	0	0	0	0	0	0
	9	0	0	0	22	0	0
	10	0	0	0	90	0	0
	11	0	0	0	15	115	0
	12	0	0	0	0	121	0
	13	0	0	0	142	0	0
	14	0	0	0	246	724	0
	15	0	0	0	699	1,074	0
	16	0	0	0	660	1,304	0
	17	0	0	0	533	1,201	0
	18	0	0	0	721	2,040	0
	19	0	0	0	1,176	1,931	0
	20	0	0	0	1,880	2,988	0
	21	0	0	0	2,377	1,649	0
	22	0	0	0	1,441	833	0
	23	11	0	0	1,266	724	0
	24	16	0	0	886	712	0
	25	0	0	0	1,061	350	0
	26	16	0	0	1,037	471	0
	27	0	0	0	1,289	362	0
	28	0	0	0	703	115	0
	29	0	0	0	753	115	0
	30	0	0	0	327	0	0
	31	5	0	0	242	0	0
	32	0	0	0	190	0	0
	33	0	0	0	305	0	0
	34	11	0	0	102	0	0
	35	0	0	0	305	0	0
	36	0	0	0	22	0	0
	37	16	283	0	22	0	0
	38	16	0	0	37	0	0
	39	0	0	0	65	0	0
	40	5	0	0	22	121	0
	41	0	0	0	0	0	0
	42	0	0	0	0	0	0
	43	11	0	0	0	0	0
	44	11	0	0	0	0	0
	45	5	0	0	0	0	0
	46	5	0	0	0	0	0
	47	0	0	0	0	0	0
	48	0	0	0	0	0	0
	49	11	0	0	0	0	0
	50	0	0	0	0	0	0
	51	0	0	0	0	0	0
	52	0	0	0	0	0	0
	53	0	0	0	0	0	0
	54	0	0	0	0	0	0
	55	0	0	0	0	0	0
	56	0	0	0	0	0	0
	57	0	0	0	0	0	0
	58	0	0	0	0	0	0
	59	0	0	0	0	0	0
	60	0	0	0	0	0	0
	61	0	0	0	0	0	0
	62	0	0	0	0	0	0
	63	0	0	0	0	0	0
Total		137	283	0	18,633	16,950	0

Table 2. (Continued)

		Redfish			Greenland Halibut		
Year		2006-07	2007-08	2008-09	2006-07	2007-08	2008-09
Observed shrimp catch (t)		9,890	10,642	6,632	9,890	10,642	6,632
Logbook shrimp catch (t)		10,009	9,682	10,654	10,009	9,682	10,654
correction factor		1.0120	1.0000	1.6065	1.0120	1.0000	1.6065
estimated bycatch (kg)		3,422	2,506	5,063	6,916	5,664	2,832
Bycatch (kg)/ (t) shrimp		0.35	0.24	0.48	0.70	0.53	0.27
total number of sets observed		1,668	1,622	866	1,668	1,622	866
number of sets with bycatch		1,116	1,196	854	1,610	1,555	778
freq. sets with 1Kg recorded		44	18	2	195	287	197
percent bycatch sets with 1Kg recorded		3.94%	1.51%	0.23%	12.11%	18.46%	25.32%
number sets with measurements		36	42	31	13	23	10
percent bycatch sets with measurements		3.23%	3.51%	3.63%	0.81%	1.48%	1.29%
number of fish measured		8,331	7,650	7,181	1,857	3,540	909
total length							
	cm	estimated number at length			estimated number at length		
	1	0	0	0	0	0	0
	2	0	0	0	0	0	0
	3	0	0	0	0	0	0
	4	0	0	0	0	0	0
	5	90	0	0	0	0	0
	6	1,822	127	32	0	108	0
	7	4,901	135	1,364	0	1,502	319
	8	3,670	2,151	9,727	336	4,627	130
	9	3,844	8,131	7,531	1,678	1,719	913
	10	4,011	8,999	2,004	1,548	664	3,099
	11	3,257	3,356	7,593	596	461	9,727
	12	3,888	1,476	11,222	1,643	2,923	16,449
	13	3,301	367	4,093	5,854	8,988	18,930
	14	1,614	298	696	13,365	13,126	7,534
	15	1,141	210	25	10,535	13,612	796
	16	1,633	103	38	10,243	8,031	607
	17	692	89	2	12,188	4,207	810
	18	174	44	1	9,333	1,183	3,647
	19	57	3	0	4,160	975	4,936
	20	14	2	0	1,902	2,643	3,431
	21	7	0	1	3,131	4,680	1,839
	22	7	0	0	2,451	6,285	1,462
	23	5	0	0	2,298	6,045	261
	24	1	0	1	1,718	4,333	1,013
	25	0	0	0	1,763	3,048	246
	26	1	0	0	718	1,298	304
	27	0	0	0	619	1,003	319
	28	0	0	0	588	758	391
	29	0	0	0	504	814	130
	30	0	0	0	237	733	58
	31	0	0	0	191	491	0
	32	0	0	0	420	244	0
	33	0	0	0	267	55	0
	34	0	0	0	267	110	0
	35	0	0	0	153	0	0
	36	0	0	0	38	81	0
	37	0	0	0	76	26	0
	38	0	0	0	0	55	0
	39	0	0	0	38	0	0
	40	0	0	0	0	0	0
	41	0	0	0	0	0	0
	42	0	0	0	0	0	0
	43	0	0	0	0	0	0
	44	0	0	0	0	0	0
	45	0	0	0	0	0	0
	46	0	0	0	0	0	0
	47	0	0	0	0	0	0
	48	0	0	0	0	0	0
	49	0	0	0	0	0	0
	50	0	0	0	0	0	0
	51	0	0	0	0	0	0
	52	0	0	0	0	0	0
	53	0	0	0	0	0	0
	54	0	0	0	0	0	0
	55	0	0	0	0	0	0
	56	0	0	0	0	0	0
	57	0	0	0	0	0	0
	58	0	0	0	0	0	0
	59	0	0	0	0	0	0
	60	0	0	0	0	0	0
	61	0	0	0	0	0	0
	62	0	0	0	0	0	0
	63	0	0	0	0	0	0
Total		34,128	25,491	44,330	88,860	94,829	77,352

Table 2. Continued

	Striped Wolfish			Spotted Wolfish			Broadhead Wolfish		
Year	2006-07	2007-08	2008-09	2006-07	2007-08	2008-09	2006-07	2007-08	2008-09
Observed shrimp catch (t)	9,890	10,642	6,632	9,890	10,642	6,632	9,890	10,642	6,632
Logbook shrimp catch (t)	10,009	9,682	10,654	10,009	9,682	10,654	10,009	9,682	10,654
correction factor	1.0120	1.0000	1.6065	1.0120	1.0000	1.6065	1.0120	1.0000	1.6065
estimated bycatch (kg)	580	425	90	45	76	27	25	44	13
Bycatch (kg)/ (t) shrimp	0.06	0.04	0.01	0.00	0.01	0.00	0.00	0.00	0.00
total number of sets observed	1,668	1,622	866	1,668	1,622	866	1,668	1,622	866
number of sets with bycatch	374	293	55	36	64	17	9	43	8
freq. sets with 1Kg recorded	287	222	55	33	63	17	6	42	8
percent bycatch sets with 1Kg recorded	76.74%	75.77%	100.00%	91.67%	98.44%	100.00%	66.67%	97.67%	100.00%
number sets with measurements	48	0	2	5	0	0	0	0	0
percent bycatch sets with measurements	12.83%	0.00%	3.64%	13.89%	0.00%	0.00%	0.00%	0.00%	0.00%
number of fish measured	820	0	0	14	0	0	0	0	0
total length									
cm	estimated number at length			estimated number at length			estimated number at length		
1	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0
9	19	0	0	9	0	0	0	0	0
10	50	0	0	0	0	0	0	0	0
11	37	0	0	0	0	0	0	0	0
12	10	0	0	0	0	0	0	0	0
13	69	0	0	9	0	0	0	0	0
14	152	0	0	9	0	0	0	0	0
15	127	0	0	0	0	0	0	0	0
16	162	0	0	9	0	0	0	0	0
17	227	0	0	0	0	0	0	0	0
18	294	0	0	0	0	0	0	0	0
19	313	0	0	0	0	0	0	0	0
20	260	0	0	0	0	0	0	0	0
21	240	0	0	0	0	0	0	0	0
22	230	0	0	9	0	0	0	0	0
23	252	0	0	18	0	0	0	0	0
24	253	0	0	0	0	0	0	0	0
25	241	0	0	0	0	0	0	0	0
26	216	0	0	0	0	0	0	0	0
27	177	0	0	0	0	0	0	0	0
28	80	0	0	0	0	0	0	0	0
29	79	0	0	0	0	0	0	0	0
30	177	0	0	0	0	0	0	0	0
31	67	0	0	0	0	0	0	0	0
32	44	0	0	0	0	0	0	0	0
33	0	0	0	0	0	0	0	0	0
34	8	0	0	0	0	0	0	0	0
35	10	0	0	0	0	0	0	0	0
36	0	0	0	0	0	0	0	0	0
37	8	0	0	0	0	0	0	0	0
38	8	0	0	0	0	0	0	0	0
39	8	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0
41	0	0	0	0	0	0	0	0	0
42	8	0	0	0	0	0	0	0	0
43	0	0	0	0	0	0	0	0	0
44	16	0	0	0	0	0	0	0	0
45	0	0	0	0	0	0	0	0	0
46	0	0	0	0	0	0	0	0	0
47	0	0	0	0	0	0	0	0	0
48	0	0	0	0	0	0	0	0	0
49	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0
51	0	0	0	0	0	0	0	0	0
52	8	0	0	0	0	0	0	0	0
53	0	0	0	0	0	0	0	0	0
54	0	0	0	0	0	0	0	0	0
55	0	0	0	0	0	0	0	0	0
56	0	0	0	0	0	0	0	0	0
57	0	0	0	0	0	0	0	0	0
58	0	0	0	0	0	0	0	0	0
59	0	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0	0
61	0	0	0	0	0	0	0	0	0
62	0	0	0	0	0	0	0	0	0
63	0	0	0	0	0	0	0	0	0
Total	3,851	0	0	62	0	0	0	0	0

Table 3. A summary of the bycatch species taken by the large vessel fleet fishing for shrimp in NAFO Division 2G (SFA 4), over the management year 2008 – 09.

number of fishing sets = 1052
number of species in bycatch = 95

OCCUR	OCCUR (%)	WEIGHT kg	WEIGHT (%)	Common name
525	49.90	788	0.01	SKATES (NS)
169	16.06	356	0.00	HERRING,ATLANTIC
917	87.17	134017	1.85	CAPELIN
4	0.38	7	0.00	BLACKSMELT,GOITRE
1	0.10	1	0.00	ANGLEMOUTH,LONGTOOTH
49	4.66	70	0.00	VIPERFISH
26	2.47	31	0.00	DRAGONFISH,BOA
376	35.74	2063	0.03	LANTERNFISHES (NS)
256	24.33	507	0.01	BARRACUDINAS (NS)
9	0.86	39	0.00	EELS, FRESHWATER (NS)
37	3.52	45	0.00	EELS,SNIPE (NS)
19	1.81	19	0.00	SNIPE EEL,ATLANTIC
8	0.76	9	0.00	SNIPE EEL,SHORTNOSE
145	13.78	169	0.00	COD,ATLANTIC
6	0.57	8	0.00	HAKE,LONGFIN
9	0.86	12	0.00	HAKE,RED (SQUIRREL)
19	1.81	20	0.00	HAKE,WHITE (COMMON)
75	7.13	92	0.00	COD,ARCTIC
28	2.66	28	0.00	THREEBEARD ROCKLING
19	1.81	19	0.00	THREEBEARD RKLG,SILVER
1	0.10	1	0.00	CUSK
24	2.28	24	0.00	FOURBEARD ROCKLING
11	1.05	11	0.00	GRENADIERS (NS)
6	0.57	6	0.00	GRENADIER,ROUGHHEAD
4	0.38	4	0.00	MARLIN SPIKE (COMMON)
1	0.10	1	0.00	GRENADIER,ROUNDNOSE
10	0.95	109	0.00	SAND LANCES (NS)
74	7.03	141	0.00	SAND LANCES (NS)
1	0.10	1	0.00	WOLFFISH,BROADHEAD
149	14.16	192	0.00	WOLFFISH,STRIPED
14	1.33	14	0.00	WOLFFISH,SPOTTED
3	0.29	4	0.00	SHANNY,ARCTIC
223	21.20	362	0.00	FOURLINE SNAKEBLENNY
1	0.10	1	0.00	SHANNY,RADIATED
354	33.65	569	0.01	BLENNIES (NS)
609	57.89	2474	0.03	EELPOUTS (NS)
133	12.64	541	0.01	EELPOUT (NS)
1	0.10	1	0.00	POUT,OCEAN (COMMON)
1	0.10	1	0.00	OCEAN POUT,GREEN
753	71.58	6937	0.10	REDFISH (NS) SEB.SP.
60	5.70	77	0.00	SCULPINS (NS)
1	0.10	1	0.00	SEA RAVEN
140	13.31	142	0.00	HOOKEAR SCULPIN (NS)
335	31.84	714	0.01	MAILED SCULPINS (NS)
4	0.38	4	0.00	SCULPIN, RIBBED (HORNE
7	0.67	9	0.00	SCULPIN,ARCTIC STAGHOR
1	0.10	3	0.00	MUDDLER (NS)
1	0.10	1	0.00	SCULPIN,DEEP SEA

Table 3 (Continued)

OCCUR	OCCUR (%)	WEIGHT kg	WEIGHT (%)	Common name
1	0.10	3	0.00	TWOHORN SCULPIN (NS)
92	8.75	107	0.00	ALLIGATORFISH (NS)
106	10.08	144	0.00	ALLIGATORFISH,NORTHERN
288	27.38	294	0.00	ALLIGATORFISH,COMMON
28	2.66	28	0.00	LUMPFISH (NS) EUM.SP.
5	0.48	5	0.00	LUMPFISH,COMMON
27	2.57	28	0.00	SEASNAILS (NS)
769	73.10	4945	0.07	AMERICAN PLAICE
8	0.76	16	0.00	WITCH FLOUNDER
2	0.19	26	0.00	YELLOWTAIL FLOUNDER
1014	96.39	10000	0.14	GREENLAND HALIBUT
1	0.10	3	0.00	FLOUNDER,WINTER
145	13.78	2385	0.03	REDFISH, LARGE
28	2.66	366	0.01	UNIDENTIFIED FISH
29	2.76	29	0.00	SPONGE
25	2.38	30	0.00	CNIDARIAN
1	0.10	1	0.00	SCYPHOZOAN
23	2.19	23	0.00	ANTHOZOAN
13	1.24	13	0.00	SEA ANEMONE
1	0.10	1	0.00	WHELK BUCC.
75	7.13	84	0.00	CEPHALOPOD (NS)
8	0.76	8	0.00	OCTOPUS OCTOPODA
1	0.10	5	0.00	MYSID
1	0.10	3	0.00	EUPHAUSIID EUPH.SP.
3	0.29	3	0.00	DECAPOD, CRUSTACEAN
90	8.56	97	0.00	SHRIMP NATA.
50	4.75	1033	0.01	SHRIMP SERG.ARC.
2	0.19	575	0.01	SHRIMP PASIP.MUL.
6	0.57	6	0.00	SHRIMP EUAL.GAI.GAI.
2	0.19	2	0.00	SHRIMP LEB.POL.
1047	99.52	7089598	97.63	SHRIMP PAND.BOR.
117	11.12	1006	0.01	SHRIMP PAND.MON.
16	1.52	83	0.00	SHRIMP SCLE.FER.
27	2.57	27	0.00	SHRIMP SAB.SAR.
58	5.51	104	0.00	SHRIMP ARG.DEN.
2	0.19	2	0.00	CRAB SPIDER
62	5.89	66	0.00	CRAB, SNOW OR QUEEN
25	2.38	25	0.00	CRAB, TOAD HYAS.SP.
6	0.57	6	0.00	CRAB, TOAD HYAS ARA.
2	0.19	2	0.00	CRAB, TOAD HYAS COAR
7	0.67	7	0.00	SEA CUCUMBER HOL.
2	0.19	2	0.00	SEA URCHIN ECH.
4	0.38	4	0.00	SAND DOLLAR CYLP.
14	1.33	14	0.00	SEA STAR
1	0.10	1	0.00	CORAL GORGONIA
2	0.19	2	0.00	CORAL ALCY0NACEAN
13	1.24	13	0.00	CORAL ALYCONACEAN
		7261870	99.97	

Table 4. Hopedale + Cartwright Channels (Shrimp Fishing Area 5) Canadian large vessel (>500 t) bycatch over the period 2006 – 07 to 2008-09. Since 2003, the fishery management year changed from Jan. 1 – Dec. 31 to Apr. 1 – Mar. 31 of the next year. During the March 2008 Zonal Assessment Process meeting it was agreed that all catches would be presented according to the management year. All trips on large shrimp fishing vessels must have an observer therefore the correction factor (logbook catch/observer catch) is always close to 1. Please note that if the observer catch is greater than the logbook catch, the correction factor is 1. There is a small vessel (<= 500 t; LOA <= 100') shrimp quota however, very little shrimp is taken from this quota and it is difficult to receive small vessel observer coverage from this area; therefore, the small vessel bycatch was not analysed for this area.

		Atlantic Cod			American Plaice		
Year		2006-07	2007-08	2008-09	2006-07	2007-08	2008-09
Observed shrimp catch (t)		23,988	20,350	7,373	23,988	20,350	7,373
Logbook shrimp catch (t)		23,747	20,409	24,869	23,747	20,409	24,869
correction factor		1.0000	1.0029	3.3729	1.0000	1.0029	3.3729
estimated bycatch (kg)		282	496	179	5,315	1,573	2,747
Bycatch (kg)/ (t) shrimp		0.01	0.02	0.01	0.22	0.08	0.11
total number of sets observed		3,464	3,148	1,145	3,464	3,148	1,145
number of sets with bycatch		291	296	125	1,598	1,500	578
freq. sets with 1Kg recorded		247	197	98	797	956	287
percent bycatch sets with 1Kg recorded		84.88%	66.55%	78.40%	49.87%	63.73%	49.65%
number sets with measurements		177	67	30	15	13	11
percent bycatch sets with measurements		60.82%	22.64%	24.00%	0.94%	0.87%	1.90%
number of fish measured		667	264	75	1,248	727	217
total length							
	cm	estimated number at length			estimated number at length		
	1	0	0	0	0	0	0
	2	0	0	0	0	0	0
	3	0	0	0	0	0	0
	4	0	0	0	0	0	0
	5	0	0	0	54	0	0
	6	0	0	0	62	0	0
	7	0	0	0	0	0	0
	8	0	0	0	185	0	0
	9	0	0	0	547	65	0
	10	0	0	0	793	317	0
	11	0	0	0	902	386	0
	12	3	0	0	2,237	905	423
	13	15	0	0	4,496	2,372	2,769
	14	29	0	0	5,195	2,135	2,943
	15	15	0	0	7,158	2,053	5,000
	16	18	0	16	9,117	3,013	5,049
	17	21	0	16	5,868	2,987	2,557
	18	24	0	64	5,661	2,601	2,030
	19	38	9	32	3,992	2,668	1,433
	20	50	9	64	3,171	1,003	1,846
	21	35	26	64	3,267	1,095	3,230
	22	69	49	145	3,742	903	1,732
	23	88	59	81	3,112	660	1,732
	24	134	92	81	2,905	253	1,645
	25	126	86	145	1,878	159	798
	26	139	39	113	1,994	227	375
	27	140	17	48	1,422	159	847
	28	136	3	48	1,415	90	885
	29	98	5	16	1,074	129	0
	30	69	0	64	633	43	423
	31	42	17	32	286	65	423
	32	31	19	81	394	90	0
	33	26	46	16	286	22	0
	34	14	19	16	387	0	423
	35	15	45	32	239	0	0
	36	16	85	0	177	0	0
	37	5	91	32	123	0	0
	38	11	51	0	177	0	0
	39	11	43	0	123	0	0
	40	9	43	0	62	0	0
	41	10	38	0	177	0	0
	42	5	31	0	0	0	0
	43	7	21	0	0	0	0
	44	5	25	0	0	0	0
	45	4	30	0	0	0	0
	46	0	32	0	0	0	0
	47	0	8	0	0	0	0
	48	2	21	0	0	0	0
	49	0	16	0	0	0	0
	50	1	3	0	0	0	0
	51	0	5	0	0	0	0
	52	1	5	0	0	0	0
	53	2	5	0	0	0	0
	54	0	0	0	0	0	0
	55	0	5	0	0	0	0
	56	0	5	0	0	0	0
	57	0	5	0	0	0	0
	58	0	0	0	0	0	0
	59	0	0	0	0	0	0
	60	0	0	0	0	0	0
	61	0	0	0	0	0	0
	62	0	0	0	0	0	0
	63	0	0	0	0	0	0
Total		1,465	1,106	1,209	73,311	24,399	36,565

Table 4. (Continued)

				Redfish			Greenland Halibut
	Year	2006-07	2007-08	2008-09	2006-07	2007-08	2008-09
Observed shrimp catch (t)		23,988	20,350	7,373	23,988	20,350	7,373
Logbook shrimp catch (t)		23,747	20,409	24,869	23,747	20,409	24,869
correction factor		1.0000	1.0029	3.3729	1.0000	1.0029	3.3729
estimated bycatch (kg)		9,736	6,498	14,239	16,145	6,709	28,394
Bycatch (kg)/ (t) shrimp		0.41	0.32	0.57	0.67	0.33	1.14
total number of sets observed		3,464	3,148	1,145	3,464	3,148	1,145
number of sets with bycatch		2,392	2333	1,089	3,315	2975	1116
freq. sets with 1Kg recorded		371	162	17	345	331	137
percent bycatch sets with 1Kg recorded		15.51%	6.94%	1.56%	10.41%	11.13%	12.28%
number sets with measurements		68	47	44	54	31	20
percent bycatch sets with measurements		2.84%	2.01%	4.04%	1.63%	1.04%	1.79%
number of fish measured		15,882	9,897	9,812	9,795	4,144	2,876
total length							
	cm	estimated number at length			estimated number at length		
	1	0	0	0	0	0	0
	2	0	0	0	0	0	0
	3	0	0	0	0	0	0
	4	0	0	0	0	0	0
	5	47	1	275	0	0	0
	6	1,117	31	2,123	12	0	0
	7	4,858	175	8,889	0	0	0
	8	6,045	1,052	12,468	110	6	1,490
	9	5,365	7,292	13,315	922	41	7,668
	10	7,708	3,890	14,584	5,087	199	46,941
	11	8,609	1,903	34,670	16,333	922	87,422
	12	8,234	2,858	41,949	29,846	4,235	99,120
	13	8,630	1,356	31,651	26,878	7,155	66,542
	14	10,077	307	10,927	10,792	6,910	24,691
	15	11,168	188	2,136	4,074	2,774	10,494
	16	6,443	126	624	4,212	1,799	13,130
	17	3,134	57	228	7,881	2,614	17,902
	18	1,470	40	76	11,781	4,060	30,092
	19	1,019	29	126	13,079	4,661	32,184
	20	556	18	13	9,912	3,288	25,457
	21	367	11	58	6,731	2,054	23,453
	22	178	5	174	4,297	2,316	10,664
	23	122	5	150	3,692	2,119	9,960
	24	107	2	8	3,579	1,472	12,046
	25	55	3	0	3,136	1,474	7,991
	26	13	0	0	2,565	743	7,955
	27	34	0	0	1,786	467	6,930
	28	44	0	0	1,481	484	3,400
	29	5	0	0	1,363	485	1,192
	30	3	0	0	1,444	245	966
	31	3	0	0	1,327	217	966
	32	0	0	0	945	44	298
	33	3	0	0	1,116	93	0
	34	0	0	0	617	47	0
	35	0	0	0	511	52	167
	36	0	0	0	341	22	167
	37	0	0	0	487	22	0
	38	0	0	0	243	11	0
	39	3	0	0	166	17	0
	40	0	0	0	126	0	0
	41	0	0	0	69	0	0
	42	0	0	0	12	0	0
	43	0	0	0	0	0	0
	44	0	0	0	0	6	0
	45	0	0	0	24	0	0
	46	0	0	0	0	0	0
	47	0	0	0	12	0	0
	48	0	0	0	12	0	0
	49	0	0	0	0	0	0
	50	0	0	0	0	0	0
	51	0	0	0	0	0	0
	52	0	0	0	0	0	0
	53	0	0	0	0	0	0
	54	0	0	0	0	0	0
	55	0	0	0	0	0	0
	56	0	0	0	0	0	0
	57	0	0	0	0	0	0
	58	0	0	0	0	0	0
	59	0	0	0	0	0	0
	60	0	0	0	0	0	0
	61	0	0	0	0	0	0
	62	0	0	0	0	0	0
	63	0	0	0	0	0	0
Total		85,414	19,347	174,441	177,002	51,051	549,290

Table 4. (Continued)

	Striped Wolfish			Spotted Wolfish			Broadhead Wolfish		
Year	2006-07	2007-08	2008-09	2006-07	2007-08	2008-09	2006-07	2007-08	2008-09
Observed shrimp catch (t)	23,988	20,350	7,373	23,988	20,350	7,373	23,988	20,350	7,373
Logbook shrimp catch (t)	23,747	20,409	24,869	23,747	20,409	24,869	23,747	20,409	24,869
correction factor	1.0000	1.0029	3.3729	1.0000	1.0029	3.3729	1.0000	1.0029	3.3729
estimated bycatch (kg)	2,316	1,562	691	304	114	223	193	103	229
Bycatch (kg)/ (t) shrimp	0.10	0.08	0.03	0.01	0.01	0.01	0.01	0.01	0.01
total number of sets observed	3,464	3,148	1,145	3,464	3,148	1,145	3,464	3,148	1,145
number of sets with bycatch	811	651	265	149	79	52	67	10	118
freq. sets with 1Kg recorded	441	393	235	119	70	46	58	9	105
percent bycatch sets with 1Kg recorded	54.38%	60.37%	88.68%	79.87%	88.61%	88.46%	86.57%	90.00%	88.98%
number sets with measurements	145	0	2	23	0	0	0	0	0
percent bycatch sets with measurements	17.88%	0.00%	0.75%	15.44%	0.00%	0.00%	0.00%	0.00%	0.00%
number of fish measured	7,116	0	0	80	0	0	0	0	0
total length									
cm	estimated number at length			estimated number at length			estimated number at length		
1	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0
6	6	0	0	0	0	0	0	0	0
7	73	0	0	0	0	0	0	0	0
8	390	0	0	0	0	0	0	0	0
9	517	0	0	0	0	0	0	0	0
10	567	0	0	29	0	0	0	0	0
11	613	0	0	29	0	0	0	0	0
12	586	0	0	0	0	0	0	0	0
13	790	0	0	14	0	0	0	0	0
14	954	0	0	29	0	0	0	0	0
15	1,402	0	0	14	0	0	0	0	0
16	1,550	0	0	14	0	0	0	0	0
17	1,715	0	0	87	0	0	0	0	0
18	1,462	0	0	0	0	0	0	0	0
19	1,457	0	0	0	0	0	0	0	0
20	1,327	0	0	43	0	0	0	0	0
21	1,266	0	0	14	0	0	0	0	0
22	1,017	0	0	43	0	0	0	0	0
23	801	0	0	29	0	0	0	0	0
24	857	0	0	0	0	0	0	0	0
25	820	0	0	0	0	0	0	0	0
26	631	0	0	29	0	0	0	0	0
27	589	0	0	0	0	0	0	0	0
28	369	0	0	0	0	0	0	0	0
29	375	0	0	0	0	0	0	0	0
30	261	0	0	0	0	0	0	0	0
31	249	0	0	0	0	0	0	0	0
32	148	0	0	0	0	0	0	0	0
33	159	0	0	0	0	0	0	0	0
34	113	0	0	0	0	0	0	0	0
35	93	0	0	0	0	0	0	0	0
36	137	0	0	0	0	0	0	0	0
37	102	0	0	0	0	0	0	0	0
38	110	0	0	0	0	0	0	0	0
39	56	0	0	0	0	0	0	0	0
40	56	0	0	14	0	0	0	0	0
41	17	0	0	0	0	0	0	0	0
42	40	0	0	0	0	0	0	0	0
43	64	0	0	0	0	0	0	0	0
44	62	0	0	0	0	0	0	0	0
45	23	0	0	0	0	0	0	0	0
46	23	0	0	0	0	0	0	0	0
47	17	0	0	0	0	0	0	0	0
48	23	0	0	0	0	0	0	0	0
49	0	0	0	0	0	0	0	0	0
50	11	0	0	0	0	0	0	0	0
51	0	0	0	0	0	0	0	0	0
52	0	0	0	0	0	0	0	0	0
53	0	0	0	0	0	0	0	0	0
54	0	0	0	0	0	0	0	0	0
55	0	0	0	0	0	0	0	0	0
56	0	0	0	0	0	0	0	0	0
57	0	0	0	0	0	0	0	0	0
58	0	0	0	0	0	0	0	0	0
59	0	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0	0
61	0	0	0	0	0	0	0	0	0
62	0	0	0	0	0	0	0	0	0
63	0	0	0	0	0	0	0	0	0
Total	21,901	0	0	391	0	0	0	0	0

Table 5. A summary of the bycatch species taken by the large vessel fleet fishing for shrimp in Hopedale + Cartwright Channels (SFA 5), over the management year 2008 – 09.

number of fishing sets = 2262
number of species in bycatch = 136

OCCUR	OCCUR (%)	WEIGHT kg	WEIGHT (%)	Common name
4	0.18	4	0.00	HAGFISH, ATLANTIC
9	0.40	2570	0.02	SHARK,GREENLAND
1	0.04	800	0.00	SHARK,BASKING
843	37.27	2735	0.02	SKATES (NS)
162	7.16	242	0.00	HERRING,ATLANTIC
1	0.04	1	0.00	HERRING,BLUEBACK
1	0.04	1	0.00	SMOOTHHEADS (NS)
6	0.27	6	0.00	SMOOTHHEAD,AGASSIZ'S
23	1.02	23	0.00	HERRING,BLACK
6	0.27	6	0.00	ATLANTIC GYMNAST
256	11.32	2401	0.01	CAPELIN
1	0.04	1	0.00	SMELT
2	0.09	2	0.00	ARGENTINE,ATLANTIC
3	0.13	3	0.00	HATCHETFISHES (NS)
1	0.04	1	0.00	HATCHETFISH,SILVER (NC
91	4.02	98	0.00	VIPERFISH
71	3.14	75	0.00	DRAGONFISH,BOA
3	0.13	3	0.00	DAGGERTOOTHFISHES (NS)
1282	56.68	54873	0.34	LANTERNFISHES (NS)
18	0.80	24	0.00	LOOSEJAWS (NS)
749	33.11	1439	0.01	BARRACUDINAS (NS)
19	0.84	187	0.00	CONGER,AMERICAN
33	1.46	37	0.00	EELS,SNIPE (NS)
17	0.75	17	0.00	SNIPE EEL,ATLANTIC
18	0.80	20	0.00	SNIPE EEL,SHORTNOSE
29	1.28	48	0.00	LONGNOSE EEL
2	0.09	2	0.00	HAKE,BLUE
121	5.35	164	0.00	COD,ATLANTIC
1	0.04	1	0.00	COD,GREENLAND (ROCK)
24	1.06	24	0.00	WHITING,BLUE
2	0.09	2	0.00	HADDOCK
2	0.09	2	0.00	HAKE,LONGFIN
1	0.04	1	0.00	HAKE,RED (SQUIRREL)
22	0.97	22	0.00	HAKE,WHITE (COMMON)
27	1.19	27	0.00	HAKE,SILVER
7	0.31	7	0.00	HAKE (NS) MER.SP.
612	27.06	5010	0.03	COD,ARCTIC
22	0.97	28	0.00	THREEBEARD ROCKLING (N
139	6.15	146	0.00	THREEBEARD ROCKLING
124	5.48	205	0.00	THREEBEARD RKLG,SILVER
3	0.13	3	0.00	FOURBEARD ROCKLING
12	0.53	14	0.00	GRENADIERS (NS)
67	2.96	137	0.00	GRENADIER,ROUGHHEAD
17	0.75	18	0.00	MARLIN SPIKE (COMMON)
17	0.75	18	0.00	GRENADIER,ROUNDNOSE
15	0.66	24	0.00	GRENADIER,ROUGHNOSE
1	0.04	90	0.00	WRECKFISH
1	0.04	1	0.00	BLACK SWALLOWER
3	0.13	17	0.00	SAND LANCES (NS)
24	1.06	28	0.00	SAND LANCES (NS)
4	0.18	4	0.00	WOLFFISH,BROADHEAD
211	9.33	272	0.00	WOLFFISH,STRIPED
22	0.97	23	0.00	WOLFFISH,SPOTTED
3	0.13	3	0.00	GUNNEL,ROCK
1	0.04	1	0.00	FOURLINE SNAKEBLENNY
4	0.18	4	0.00	SHANNY,RADIATED
295	13.04	408	0.00	BLENNIES (NS)
1020	45.09	3807	0.02	EELPOUTS (NS)
494	21.84	1438	0.01	EELPOUT (NS)
54	2.39	792	0.00	POUT,OCEAN (COMMON)
13	0.57	13	0.00	WOLF EEL (NS)
1	0.04	1	0.00	BUTTERFISH
1420	62.78	100310	0.62	REDFISH (NS) SEB.SP.

Table 5 (Continued)

OCCUR	OCCUR (%)	WEIGHT kg	WEIGHT (%)	Common name
315	13.93	776	0.00	SCULPINS (NS)
562	24.85	729	0.00	HOOKEAR SCULPIN (NS)
442	19.54	653	0.00	MAILED SCULPINS (NS)
115	5.08	265	0.00	SCULPIN, RIBBED (HORNE
1	0.04	1	0.00	SCULPIN,ARCTIC STAGHOR
19	0.84	67	0.00	SCULPIN,DEEP SEA
1	0.04	1	0.00	TWOHORN SCULPIN (NS)
532	23.52	754	0.00	ALLIGATORFISH (NS)
357	15.78	562	0.00	ALLIGATORFISH,NORTHERN
762	33.69	1016	0.01	ALLIGATORFISH,COMMON
5	0.22	5	0.00	LUMPFISHES (NS)
13	0.57	13	0.00	LUMPFISH (NS) EUM.SP.
7	0.31	12	0.00	LUMPFISH,COMMON
121	5.35	202	0.00	SEASNAILS (NS)
11	0.49	11	0.00	SEA TADPOLE
991	43.81	2457	0.02	AMERICAN PLAICE
10	0.44	11	0.00	WITCH FLOUNDER
2175	96.15	37690	0.23	GREENLAND HALIBUT
1	0.04	40	0.00	HALIBUT (ATLANTIC)
1	0.04	1	0.00	DEEPSEA ANGLER,BIG
1	0.04	1	0.00	SEA DEVIL, WARTED
807	35.68	117360	0.73	REDFISH, LARGE
30	1.33	401	0.00	UNIDENTIFIED FISH
24	1.06	34	0.00	INVERTEBRATE (NS)
121	5.35	183	0.00	SPONGE
93	4.11	140	0.00	CNIDARIAN
1	0.04	1	0.00	
24	1.06	44	0.00	SCYPHOZOAN
47	2.08	48	0.00	ANTHOZOAN
2	0.09	2	0.00	GASTROPOD GAST.
7	0.31	7	0.00	WHELK BUCC.
1	0.04	1	0.00	BIVALVE
1	0.04	1	0.00	SCALLOP, ICELANDIC
273	12.07	311	0.00	CEPHALOPOD (NS)
44	1.95	44	0.00	OCTOPUS OCTOPODA
2	0.09	2	0.00	POLYCHAETE
15	0.66	661	0.00	CRUSTACEAN
14	0.62	14	0.00	MYSID
7	0.31	7	0.00	DECAPOD, CRUSTACEAN
36	1.59	51	0.00	SHRIMP NATA.
30	1.33	236	0.00	SHRIMP PENA.
139	6.15	4721	0.03	SHRIMP SERG.ARC.
1	0.04	1	0.00	SHRIMP SERG.ROB.
2	0.09	2	0.00	SHRIMP PASIP.TAR.
9	0.40	11	0.00	SHRIMP PASIP.MUL.
18	0.80	94	0.00	SHRIMP EUAL.MAC.
2	0.09	2	0.00	SHRIMP SPIRO.LIL.
1	0.04	1	0.00	SHRIMP LEB.POL.
1	0.04	18	0.00	SHRIMP PANDALUS SP.
2250	99.47	15686884	97.63	SHRIMP PAND.BOR.
147	6.50	32406	0.20	SHRIMP PAND.MON.
10	0.44	10	0.00	SHRIMP SCLE.BOR.
6	0.27	7	0.00	SHRIMP SAB.SP.
1	0.04	1	0.00	SHRIMP SAB.SEP.
45	1.99	45	0.00	SHRIMP SAB.SAR.
12	0.53	12	0.00	SHRIMP ARG.DEN.
1	0.04	1	0.00	MALACOSTRACAN STE.SCU.
1	0.04	1	0.00	HERMIT CRAB PAG.
3	0.13	3	0.00	SPINY CRAB LITH.MAJ.
32	1.41	32	0.00	CRAB, SNOW OR QUEEN
1	0.04	1	0.00	CRAB, TOAD HYAS.SP.
8	0.35	8	0.00	SEA CUCUMBER HOL.
15	0.66	15	0.00	SEA URCHIN ECH.
47	2.08	55	0.00	SEA STAR

Table 5 (Continued)

OCCUR	OCCUR (%)	WEIGHT kg	WEIGHT (%)	
1	0.04	1	0.00	BASKET STAR GORGO. SP.
5	0.22	5	0.00	CORAL PENNATULID
2	0.09	2	0.00	CORAL GORGONIAN
1	0.04	1	0.00	CORAL GORGONIA
4	0.18	4	0.00	CORAL ALCY0NACEAN
13	0.57	13	0.00	CORAL ALYCONACEAN
1	0.04	1	0.00	CORAL GORGONIA
2	0.09	2	0.00	CORAL GORGONIA
43	1.90	185	0.00	
		16068044	99.93	

Table 6. Hawke Channel + 3K (Shrimp Fishing Area 6) Canadian large vessel (>500 t) bycatch over the period 2006 – 07 to 2008-09. Since 2003, the fishery management year changed from Jan. 1 – Dec. 31 to Apr. 1 – Mar. 31 of the next year. During the March 2008 Zonal Assessment Process meeting it was agreed that all catches would be presented according to the management year. All trips on large shrimp fishing vessels must have an observer therefore the correction factor (logbook catch/observer catch) is always close to 1. Please note that if the observer catch is greater than the logbook catch, the correction factor is 1.

		Atlantic Cod			American Plaice		
	Year	2006-07	2007-08	2008-09	2006-07	2007-08	2008-09
Observed shrimp catch (t)		29,592	20,316	12,985	29,592	20,316	12,985
Logbook shrimp catch (t)		27,507	16,741	18,199	27,507	16,741	18,199
correction factor		1.0000	1.0000	1.4015	1.0000	1.0000	1.4015
estimated bycatch (kg)		1,350	732	246	4,894	944	1,342
Bycatch (kg)/ (t) shrimp		0.05	0.04	0.01	0.17	0.05	0.07
total number of sets observed		4,234	3,159	1,923	4,234	3,159	1,923
number of sets with bycatch		1066	631	264	1,983	1,334	608
freq. sets with 1Kg recorded		780	486	202	1,083	834	332
percent bycatch sets with 1Kg recorded		73.17%	77.02%	76.52%	54.61%	62.52%	54.61%
number sets with measurements		332	271	95	27	18	17
percent bycatch sets with measurements		31.14%	42.95%	35.98%	1.36%	1.35%	2.80%
number of fish measured		2,336	2,416	596	1,549	239	558
total length							
	cm	estimated number at length			estimated number at length		
	1	0	0	0	0	0	0
	2	0	0	0	0	0	0
	3	0	0	0	0	0	0
	4	0	0	0	0	0	0
	5	0	0	0	0	0	0
	6	0	0	0	0	0	0
	7	4	0	0	0	0	31
	8	8	0	0	29	0	0
	9	17	0	0	0	0	62
	10	13	0	0	113	133	93
	11	4	5	0	429	267	124
	12	18	64	0	574	67	57
	13	83	119	0	683	200	176
	14	153	218	4	769	427	197
	15	244	263	18	966	1,001	668
	16	326	224	18	1,508	1,317	1,118
	17	458	114	33	1,985	1,709	2,579
	18	601	68	146	1,902	887	2,800
	19	564	132	172	2,602	471	1,510
	20	536	301	357	2,998	295	1,045
	21	535	511	426	4,490	362	641
	22	500	541	487	3,648	214	926
	23	547	586	239	3,822	187	579
	24	383	501	250	3,249	508	502
	25	366	326	69	2,584	320	574
	26	386	217	46	2,328	227	642
	27	462	120	15	2,319	148	347
	28	425	51	22	1,557	335	347
	29	531	67	4	995	121	310
	30	426	48	4	1,018	121	275
	31	224	40	4	876	0	114
	32	111	45	22	933	0	31
	33	68	20	0	507	0	52
	34	102	62	9	226	0	26
	35	56	53	0	312	67	0
	36	54	51	13	56	0	31
	37	65	30	9	197	0	26
	38	31	55	4	56	0	93
	39	36	35	4	28	0	26
	40	31	23	0	0	0	0
	41	23	19	4	28	0	0
	42	19	25	4	0	0	0
	43	11	5	0	84	0	0
	44	14	9	0	0	0	26
	45	9	5	0	0	0	0
	46	3	8	0	0	0	0
	47	15	5	0	0	0	0
	48	5	2	0	0	0	0
	49	9	2	0	0	0	0
	50	9	2	0	0	0	0
	51	3	0	0	0	0	0
	52	3	0	0	0	0	0
	53	3	0	4	0	0	0
	54	0	0	0	0	0	0
	55	0	2	0	0	0	0
	56	0	0	0	0	0	0
	57	4	2	0	0	0	0
	58	0	0	0	0	0	0
	59	0	2	0	0	0	0
	60	0	0	0	0	0	0
	61	0	0	0	0	0	0
	62	0	0	0	0	0	0
	63	0	0	0	0	0	0
Total		8,498	4,977	2,393	43,873	9,381	16,025

Table 6. (Continued)

		Redfish			Greenland Halibut		
Year		2006-07	2007-08	2008-09	2006-07	2007-08	2008-09
Observed shrimp catch (t)		29,592	20,316	12,985	29,592	20,316	12,985
Logbook shrimp catch (t)		27,507	16,741	18,199	27,507	16,741	18,199
correction factor		1.0000	1.0000	1.4015	1.0000	1.0000	1.4015
estimated bycatch (kg)		22,140	2,976	4,828	24,991	11,244	9,199
Bycatch (kg)/ (t) shrimp		0.75	0.15	0.27	0.84	0.55	0.51
total number of sets observed		4,234	3,159	1,923	4,234	3,159	1,923
number of sets with bycatch		3,359	2059	999	3,978	2423	1,020
freq. sets with 1Kg recorded		555	162	47	501	155	143
percent bycatch sets with 1Kg recorded		16.52%	7.87%	4.70%	12.59%	6.40%	14.02%
number sets with measurements		71	56	31	77	38	23
percent bycatch sets with measurements		2.11%	2.72%	3.10%	1.94%	1.57%	2.25%
number of fish measured		12,162	9,723	6,916	10,373	5,925	2,529
total length							
cm		estimated number at length			estimated number at length		
1		0	0	0	0	0	0
2		0	0	0	0	0	0
3		0	0	0	0	0	0
4		16	0	3	0	0	0
5		574	70	64	0	0	0
6		6,044	37	214	198	0	0
7		9,532	403	953	213	223	1,087
8		14,538	1,931	2,077	611	599	2,876
9		22,981	3,754	4,074	1,021	2,016	5,905
10		23,256	4,546	5,543	3,782	7,023	12,208
11		25,399	6,347	11,463	7,102	12,048	19,429
12		21,597	4,750	13,606	11,607	10,677	20,938
13		19,662	1,894	12,118	15,236	5,803	8,995
14		20,785	683	6,636	12,096	2,258	2,900
15		16,935	481	1,940	6,271	1,128	1,897
16		12,828	387	719	5,391	1,417	6,419
17		11,809	218	297	8,174	3,662	10,239
18		10,675	283	120	10,663	7,754	16,283
19		10,254	80	100	16,395	11,928	16,546
20		9,189	17	64	19,626	12,553	11,124
21		7,179	14	30	25,625	10,986	6,977
22		4,610	5	61	20,118	8,046	6,893
23		3,066	1	6	13,918	5,366	7,202
24		1,864	4	3	9,462	3,395	5,029
25		1,803	2	0	6,537	2,458	4,148
26		881	0	0	5,520	1,659	3,408
27		761	0	0	5,080	928	2,019
28		465	0	0	3,568	683	1,659
29		294	0	0	2,872	462	707
30		208	0	0	2,459	378	367
31		147	0	0	1,829	140	84
32		32	0	0	1,718	233	84
33		54	0	0	1,186	51	0
34		70	0	0	745	28	58
35		16	0	0	1,051	14	84
36		77	0	0	861	14	84
37		0	0	0	421	0	0
38		38	0	0	680	0	0
39		0	0	0	333	0	0
40		0	0	0	208	0	0
41		0	0	0	107	0	0
42		0	0	0	310	0	0
43		0	0	0	88	0	0
44		0	0	0	69	0	0
45		0	0	0	115	0	0
46		0	0	0	93	0	0
47		0	0	0	51	0	0
48		0	0	0	19	0	0
49		0	0	0	37	0	0
50		0	0	0	0	0	0
51		0	0	0	19	0	0
52		0	0	0	0	0	0
53		0	0	0	0	0	0
54		0	0	0	0	0	0
55		0	0	0	0	0	0
56		0	0	0	0	0	0
57		0	0	0	0	0	0
58		0	0	0	0	0	0
59		0	0	0	0	0	0
60		0	0	0	0	0	0
61		0	0	0	0	0	0
62		0	0	0	0	0	0
63		0	0	0	0	0	0
Total		257,641	25,909	60,093	223,484	113,930	175,647

Table 6. (Continued)

	Striped Wolfish			Spotted Wolfish			Broadhead Wolfish		
Year	2006-07	2007-08	2008-09	2006-07	2007-08	2008-09	2006-07	2007-08	2008-09
Observed shrimp catch (t)	29,592	20,316	12,985	29,592	20,316	12,985	29,592	20,316	12,985
Logbook shrimp catch (t)	27,507	16,741	18,199	27,507	16,741	18,199	27,507	16,741	18,199
correction factor	1.0000	1.0000	1.4015	1.0000	1.0000	1.4015	1.0000	1.0000	1.4015
estimated bycatch (kg)	2,128	410	506	899	254	97	839	7	80
Bycatch (kg)/ (t) shrimp	0.07	0.02	0.03	0.03	0.01	0.01	0.03	0.00	0.00
total number of sets observed	4234	3,159	1,923	4234	3,159	1,923	4234	3,159	1,923
number of sets with bycatch	941	332	274	281	234	55	215	7	50
freq. sets with 1Kg recorded	650	300	227	210	225	53	138	7	48
percent bycatch sets with 1Kg recorded	69.08%	90.36%	82.85%	74.73%	96.15%	96.36%	64.19%	100.00%	96.00%
number sets with measurements	164	6	2	31	0	0	0	0	0
percent bycatch sets with measurements	17.43%	1.81%	0.73%	11.03%	0.00%	0.00%	0.00%	0.00%	0.00%
number of fish measured	4,733	63	4	120	0	0	0	0	0
total length									
cm	estimated number at length			estimated number at length			estimated number at length		
1	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0
7	105	0	0	0	0	0	0	0	0
8	600	52	0	0	0	0	0	0	0
9	1,519	0	0	0	0	0	0	0	0
10	1,117	52	0	58	0	0	0	0	0
11	816	105	0	116	0	0	0	0	0
12	1,140	262	0	145	0	0	0	0	0
13	1,259	105	0	377	0	0	0	0	0
14	1,273	52	0	203	0	0	0	0	0
15	1,119	629	69	174	0	0	0	0	0
16	1,732	472	0	87	0	0	0	0	0
17	1,862	629	69	87	0	0	0	0	0
18	1,702	629	0	87	0	0	0	0	0
19	1,610	105	0	87	0	0	0	0	0
20	1,352	0	69	87	0	0	0	0	0
21	1,171	105	0	29	0	0	0	0	0
22	903	210	0	29	0	0	0	0	0
23	804	105	0	0	0	0	0	0	0
24	612	0	0	29	0	0	0	0	0
25	642	0	69	0	0	0	0	0	0
26	448	0	0	0	0	0	0	0	0
27	393	0	0	0	0	0	0	0	0
28	170	0	0	0	0	0	0	0	0
29	110	0	0	0	0	0	0	0	0
30	110	0	0	0	0	0	0	0	0
31	143	0	0	0	0	0	0	0	0
32	143	0	0	0	0	0	0	0	0
33	64	0	0	0	0	0	0	0	0
34	70	0	0	0	0	0	0	0	0
35	46	0	0	0	0	0	0	0	0
36	46	0	0	0	0	0	0	0	0
37	55	0	0	0	0	0	0	0	0
38	9	0	0	0	0	0	0	0	0
39	0	0	0	0	0	0	0	0	0
40	37	0	0	0	0	0	0	0	0
41	9	0	0	0	0	0	0	0	0
42	18	0	0	0	0	0	0	0	0
43	9	0	0	0	0	0	0	0	0
44	18	0	0	0	0	0	0	0	0
45	37	0	0	0	0	0	0	0	0
46	0	0	0	0	0	0	0	0	0
47	9	0	0	0	0	0	0	0	0
48	0	0	0	0	0	0	0	0	0
49	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0
51	0	0	0	0	0	0	0	0	0
52	0	0	0	0	0	0	0	0	0
53	0	0	0	0	0	0	0	0	0
54	13	0	0	0	0	0	0	0	0
55	13	0	0	0	0	0	0	0	0
56	0	0	0	0	0	0	0	0	0
57	0	0	0	0	0	0	0	0	0
58	0	0	0	0	0	0	0	0	0
59	0	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0	0
61	0	0	0	0	0	0	0	0	0
62	0	0	0	0	0	0	0	0	0
63	0	0	0	0	0	0	0	0	0
Total	23,305	3,513	275	1,595	0	0	0	0	0

Table 7. A summary of the bycatch species taken by the large vessel fleet fishing for shrimp in Hawke Channel + 3K (SFA 6), over the management year 2008 – 09.

number of fishing sets = 1645
number of species in bycatch = 115

OCCUR	OCCUR (%)	WEIGHT kg	WEIGHT (%)	Common name
3	0.18	1000	0.01	SHARK,GREENLAND
350	21.28	591	0.01	SKATES (NS)
71	4.32	101	0.00	HERRING,ATLANTIC
15	0.91	15	0.00	SMOOTHHEAD,BAIRD'S
21	1.28	21	0.00	HERRING,BLACK
399	24.26	19931	0.21	CAPELIN
3	0.18	3	0.00	ARGENTINES (NS)
1	0.06	1	0.00	ANGLEMOUTH,LONGTOOTH
1	0.06	1	0.00	HATCHETFISHES (NS)
1	0.06	1	0.00	HATCHETFISH,ATL. SILVE
1	0.06	1	0.00	HATCHETFISH,SILVER (NC
2	0.12	2	0.00	HATCHETFISH,TRANSPAREN
84	5.11	84	0.00	VIPERFISH
41	2.49	41	0.00	DRAGONFISH,BOA
8	0.49	8	0.00	DRAGONFISHES,SMOOTH
1	0.06	1	0.00	DAGGERTOOTHFISHES (NS)
606	36.84	9435	0.10	LANTERNFISHES (NS)
16	0.97	16	0.00	LOOSEJAWS (NS)
547	33.25	1311	0.01	BARRACUDINAS (NS)
37	2.25	38	0.00	EELS,SNIPE (NS)
14	0.85	14	0.00	SNIPE EEL,ATLANTIC
32	1.95	32	0.00	SNIPE EEL,SHORTNOSE
13	0.79	15	0.00	LONGNOSE EEL
1	0.06	1	0.00	GULPER,PELICAN
322	19.57	492	0.01	COD,ATLANTIC
13	0.79	13	0.00	WHITING,BLUE
18	1.09	18	0.00	HAKE,LONGFIN
4	0.24	4	0.00	HAKE,WHITE (COMMON)
3	0.18	3	0.00	HAKE,SILVER
167	10.15	208	0.00	COD,ARCTIC
15	0.91	15	0.00	THREEBEARD ROCKLING (N
132	8.02	134	0.00	THREEBEARD ROCKLING
49	2.98	49	0.00	THREEBEARD RKLG,SILVER
2	0.12	2	0.00	CUSK
18	1.09	22	0.00	FOURBEARD ROCKLING
18	1.09	18	0.00	GRENADIERS (NS)
1	0.06	1	0.00	GRENADIERS (NS) MAC.SP
84	5.11	106	0.00	GRENADIER,ROUGHHEAD
30	1.82	48	0.00	MARLIN SPIKE (COMMON)
23	1.40	28	0.00	GRENADIER,ROUGHNOSE
1	0.06	1	0.00	MACKEREL,ATLANTIC
1	0.06	3	0.00	SAND LANCES (NS)
38	2.31	48	0.00	SAND LANCES (NS)
30	1.82	30	0.00	BLENNIES (NS)
5	0.30	5	0.00	WOLFFISH,BROADHEAD
205	12.46	266	0.00	WOLFFISH,STRIPED
8	0.49	8	0.00	WOLFFISH,SPOTTED
7	0.43	7	0.00	FOURLINE SNAKEBLENNY
2	0.12	2	0.00	SHANNY,RADIATED
344	20.91	719	0.01	BLENNIES (NS)
2	0.12	2	0.00	WRYMOUTH
705	42.86	1994	0.02	EELPOUTS (NS)
279	16.96	634	0.01	EELPOUT (NS)
23	1.40	225	0.00	POUT,OCEAN (COMMON)
3	0.18	3	0.00	EELPOUT,SOFT
2	0.12	2	0.00	WOLF EEL (NS)
7	0.43	7	0.00	BUTTERFISH
1004	61.03	29606	0.31	REDFISH (NS) SEB.SP.

Table 7 (Continued)

OCCUR	OCCUR (%)	WEIGHT kg	WEIGHT (%)	Common name
232	14.10	318	0.00	SCULPINS (NS)
239	14.53	282	0.00	HOOKEAR SCULPIN (NS)
157	9.54	210	0.00	MAILED SCULPINS (NS)
58	3.53	126	0.00	SCULPIN, RIBBED (HORNE
1	0.06	1	0.00	SCULPIN,ARCTIC STAGHOR
8	0.49	8	0.00	SCULPIN,DEEP SEA
183	11.12	249	0.00	ALLIGATORFISH (NS)
391	23.77	536	0.01	ALLIGATORFISH,NORTHERN
486	29.54	607	0.01	ALLIGATORFISH,COMMON
1	0.06	1	0.00	LUMPFISH (NS) EUM.SP.
105	6.38	113	0.00	SEASNAILS (NS)
729	44.32	1501	0.02	AMERICAN PLAICE
34	2.07	45	0.00	WITCH FLOUNDER
1563	95.02	17509	0.18	GREENLAND HALIBUT
1	0.06	1	0.00	FILEFISH,ORANGE
1	0.06	3	0.00	TRIGGERFISH,GREY
1	0.06	1	0.00	SEA DEVILS (NS)
4	0.24	4	0.00	DEEPSEA ANGLER,BIG
552	33.56	20015	0.21	REDFISH, LARGE
20	1.22	79	0.00	UNIDENTIFIED FISH
18	1.09	24	0.00	INVERTEBRATE (NS)
34	2.07	43	0.00	SPONGE
36	2.19	69	0.00	CNIDARIAN
18	1.09	68	0.00	SCYPHOZOAN
12	0.73	12	0.00	ANTHOZOAN
125	7.60	142	0.00	CEPHALOPOD (NS)
14	0.85	14	0.00	OCTOPUS OCTOPODA
59	3.59	441	0.00	CRUSTACEAN
14	0.85	1097	0.01	EUPHAUSIID EUPH.SP.
35	2.13	168	0.00	SHRIMP NATA.
60	3.65	1293	0.01	SHRIMP PENA.
112	6.81	1889	0.02	SHRIMP SERG.ARC.
11	0.67	11	0.00	SHRIMP SERG.ROB.
4	0.24	4	0.00	SHRIMP ACANT.PEL.
2	0.12	2	0.00	SHRIMP NOTO.STOM.
1	0.06	100	0.00	SHRIMP PASIP.
8	0.49	8	0.00	SHRIMP PASIP.MUL.
3	0.18	3	0.00	SHRIMP EUAL.MAC.
2	0.12	2	0.00	SHRIMP LEB.POL.
1	0.06	1	0.00	SHRIMP PANDALUS SP.
1623	98.66	9471355	98.78	SHRIMP PAND.BOR.
60	3.65	2677	0.03	SHRIMP PAND.MON.
13	0.79	15	0.00	SHRIMP SAB.SP.
6	0.36	6	0.00	SHRIMP SAB.SEP.
38	2.31	38	0.00	SHRIMP SAB.SAR.
6	0.36	6	0.00	SHRIMP ARG.DEN.
2	0.12	2	0.00	MALACOSTRACAN STE.SCU.
2	0.12	2	0.00	SPINY CRAB LITH.MAJ.
137	8.33	141	0.00	CRAB, SNOW OR QUEEN
15	0.91	15	0.00	CRAB, TOAD HYAS.SP.
1	0.06	1	0.00	SEA CUCUMBER HOL.
19	1.16	19	0.00	SEA STAR
1	0.06	1	0.00	CORAL GORGONIA
9	0.55	9	0.00	CORAL ALCY0NACEAN
18	1.09	18	0.00	CORAL ALYCONACEAN
2	0.12	2	0.00	CORAL GORGONIA
18	1.09	43	0.00	
		=======	======	
		9588737	99.98	

Table 8. Hawke Channel + 3K (Shrimp Fishing Area 6) Canadian small vessel (<=500 t; LOA<100') bycatch over the period 2007 - 2009. Since 2003, the fishery management year changed from Jan. 1 – Dec. 31 to Apr. 1 – Mar. 31 of the next year. However, the dates on these tables indicate calendar years because the fishery takes place between April and December of each year. There is a target of 10% observer coverage on these vessels; however, as indicated by the correction factors, this target is not usually met (correction factor = logbook catch/observer catch).

		Atlantic Cod			American Plaice		
	Year	2007	2008	2009	2007	2008	2009
Observed shrimp catch (t)		2,427	2,493	1,061	2,427	2,493	1,061
Logbook shrimp catch (t)		53,218	57,764	26,912	53,218	57,764	26,912
correction factor		21.9313	23.1678	25.3577	21.9313	23.1678	25.3577
estimated bycatch (kg)		1,142	506	14,115	16,961	23,677	9,059
Bycatch (kg)/ (t) shrimp		0.02	0.01	0.52	0.32	0.41	0.34
total number of sets observed		1301	1262	713	1301	1262	713
number of sets with bycatch		197	264	106	638	509	268
freq. sets with 1Kg recorded		181	199	70	503	331	145
percent bycatch sets with 1Kg recorded		91.88%	75.38%	66.04%	78.84%	65.03%	54.10%
number sets with measurements		50	1	1	9	1	1
percent bycatch sets with measurements		25.38%	0.38%	0.94%	1.41%	0.20%	0.37%
number of fish measured		170	2	28	89	14	4
total length							
	cm	estimated number at length			estimated number at length		
	1	0	0	0	0	0	0
	2	0	0	0	0	0	0
	3	0	0	0	0	0	0
	4	0	0	0	0	0	0
	5	0	0	0	0	0	0
	6	0	0	0	0	0	0
	7	0	0	0	0	0	0
	8	0	0	0	0	0	0
	9	0	0	0	0	0	0
	10	0	0	0	0	0	0
	11	621	0	0	0	0	0
	12	207	0	0	1,503	23,677	0
	13	414	0	0	6,013	0	0
	14	1,034	9,638	0	1,503	0	0
	15	414	0	0	9,019	23,677	0
	16	931	9,638	0	1,503	0	0
	17	1,552	0	0	1,503	47,355	0
	18	2,793	0	0	3,006	71,032	0
	19	2,690	0	141,145	4,509	0	0
	20	3,103	0	0	5,814	47,355	0
	21	2,172	0	112,916	10,522	23,677	0
	22	1,241	0	56,458	4,311	0	0
	23	103	0	84,687	7,516	23,677	0
	24	207	0	0	8,820	0	0
	25	0	0	0	10,522	23,677	0
	26	0	0	0	9,927	23,677	29,618
	27	0	0	0	15,741	0	29,618
	28	0	0	0	6,920	0	0
	29	0	0	0	4,509	0	0
	30	0	0	0	5,814	0	0
	31	0	0	0	3,006	0	0
	32	0	0	0	3,006	23,677	0
	33	0	0	0	1,305	0	0
	34	0	0	0	3,006	0	0
	35	0	0	0	0	0	0
	36	0	0	0	1,305	0	0
	37	0	0	0	0	0	0
	38	0	0	0	0	0	0
	39	0	0	0	0	0	0
	40	0	0	0	0	0	0
	41	0	0	0	0	0	0
	42	0	0	0	0	0	0
	43	0	0	0	0	0	0
	44	0	0	0	0	0	0
	45	0	0	0	0	0	0
	46	0	0	0	0	0	0
	47	0	0	0	0	0	0
	48	0	0	0	0	0	0
	49	0	0	0	0	0	0
	50	0	0	0	0	0	0
	51	0	0	0	0	0	0
	52	0	0	0	0	0	0
	53	0	0	0	0	0	0
	54	0	0	0	0	0	0
	55	0	0	0	0	0	0
	56	0	0	0	0	0	0
	57	0	0	0	0	0	0
	58	0	0	0	0	0	0
	59	0	0	0	0	0	0
	60	0	0	0	0	0	0
	61	0	0	0	0	0	0
	62	0	0	0	0	0	0
	63	103	0	0	0	0	0
Total		17,586	19,276	395,207	130,604	331,485	59,236

Table 8. (Continued)

		Redfish			Greenland Halibut		
	Year	2007	2008	2009	2007	2008	2009
Observed shrimp catch (t)		2,427	2,493	1,061	2,427	2,493	1,061
Logbook shrimp catch (t)		53,218	57,764	26,912	53,218	57,764	26,912
correction factor		21.9313	23.1678	25.3577	21.9313	23.1678	25.3577
estimated bycatch (kg)		122,268	212,296	41,133	82,453	116,985	62,827
Bycatch (kg)/ (t) shrimp		2.30	3.68	1.53	1.55	2.03	2.33
total number of sets observed		1301	1262	713	1301	1262	713
number of sets with bycatch		1166	1,153	607	1,182	1,135	230
freq. sets with 1Kg recorded		435	426	278	524	329	108
percent bycatch sets with 1Kg recorded		37.31%	36.95%	45.80%	44.33%	28.99%	46.96%
number sets with measurements		28	5	6	29	14	15
percent bycatch sets with measurements		2.40%	0.43%	0.99%	2.45%	1.23%	6.52%
number of fish measured		2,611	428	1,369	1,613	1,966	3,256
total length							
	cm	estimated number at length			estimated number at length		
	1	0	0	0	0	0	0
	2	0	0	0	0	0	0
	3	0	0	0	0	0	0
	4	0	0	0	0	0	0
	5	1,885	0	0	0	0	0
	6	3,706	23,589	0	0	0	0
	7	36,500	58,971	0	0	0	0
	8	122,131	70,765	72,587	0	0	0
	9	117,042	185,055	233,891	1,085	0	1,143
	10	75,830	255,821	90,843	1,085	576	32,780
	11	102,783	271,267	37,191	16,204	8,068	112,736
	12	137,210	420,940	90,364	69,833	11,519	197,151
	13	167,368	543,372	140,328	191,900	41,233	215,150
	14	167,434	271,267	172,126	384,548	70,414	101,533
	15	282,904	334,728	150,313	391,943	91,546	107,444
	16	382,922	326,586	89,463	269,975	53,290	131,421
	17	384,491	432,734	57,351	117,668	20,075	96,601
	18	191,112	530,740	27,273	39,833	10,360	40,260
	19	107,679	566,122	12,995	19,120	9,759	36,440
	20	54,531	353,826	935	29,999	17,770	35,821
	21	15,392	200,502	0	29,253	34,355	39,544
	22	880	58,971	1,613	39,017	65,759	45,971
	23	0	47,177	0	50,543	102,363	38,726
	24	2,827	0	0	67,086	120,639	25,808
	25	2,764	23,589	0	51,897	117,827	22,673
	26	0	23,589	0	50,205	105,384	11,661
	27	0	11,794	0	29,900	78,995	9,050
	28	0	0	0	19,628	57,286	5,652
	29	0	0	0	6,848	33,760	3,922
	30	0	0	0	3,424	24,597	5,390
	31	0	0	0	1,085	14,331	1,143
	32	0	0	1,613	2,170	10,310	1,699
	33	0	0	0	0	5,155	0
	34	0	0	0	0	2,869	1,992
	35	0	0	0	1,254	2,875	0
	36	0	0	0	0	1,729	0
	37	0	0	0	0	1,723	0
	38	0	0	0	0	1,146	587
	39	0	0	0	0	1,153	0
	40	0	0	0	0	2,299	0
	41	0	0	0	0	0	0
	42	0	0	0	0	0	0
	43	0	0	0	0	576	0
	44	0	0	0	0	1,723	0
	45	0	0	0	0	570	0
	46	0	0	0	0	0	0
	47	0	0	0	0	1,140	0
	48	0	0	0	0	576	0
	49	0	0	0	0	0	0
	50	0	0	0	0	1,146	0
	51	0	0	0	0	0	0
	52	0	0	0	0	0	0
	53	0	0	0	0	0	0
	54	0	0	0	0	576	0
	55	0	0	0	0	0	0
	56	0	0	0	0	0	0
	57	0	0	0	0	0	0
	58	0	0	0	0	0	0
	59	0	0	0	0	0	0
	60	0	0	0	0	0	0
	61	0	0	0	0	0	0
	62	0	0	0	0	0	0
	63	0	0	0	0	0	0
Total		2,357,392	5,011,404	1,178,887	1,885,502	1,125,471	1,322,301

Table 8. (continued)

	Striped Wolffish			Spotted Wolffish			Broadhead Wolffish		
Year	2007	2008	2009	2007	2008	2009	2007	2008	2009
Observed shrimp catch (t)	2,427	2,493	1,061	2,427	2,493	1,061	2,427	2,493	1,061
Logbook shrimp catch (t)	53,218	57,764	26,912	53,218	57,764	26,912	53,218	57,764	26,912
correction factor	21.9313	23.1678	25.3577	21.9313	23.1678	25.3577	21.9313	23.1678	25.3577
estimated bycatch (kg)	6,272	8,572	2,409	1,579	1,112	558	1,075	70	101
Bycatch (kg)/ (t) shrimp	0.12	0.15	0.09	0.03	0.02	0.02	0.02	0.00	0.00
total number of sets observed	1301	1262	713	1301	1262	713	1301	1262	713
number of sets with bycatch	221	207	56	59	41	13	26	3	3
freq. sets with 1Kg recorded	187	141	35	50	35	9	14	3	2
percent bycatch sets with 1Kg recorded	84.62%	68.12%	62.50%	84.75%	85.37%	69.23%	53.85%	100.00%	66.67%
number sets with measurements	21	0	0	16	0	0	0	0	0
percent bycatch sets with measurements	9.50%	0.00%	0.00%	27.12%	0.00%	0.00%	0.00%	0.00%	0.00%
number of fish measured	272	0	0	36	0	0	0	0	0
total length									
cm	estimated number at length			estimated number at length			estimated number at length		
1	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0
5	1,792	0	0	0	0	0	0	0	0
6	2,389	0	0	0	0	0	0	0	0
7	2,688	0	0	0	0	0	0	0	0
8	4,480	0	0	99	0	0	0	0	0
9	2,987	0	0	0	0	0	0	0	0
10	12,246	0	0	0	0	0	0	0	0
11	5,974	0	0	99	0	0	0	0	0
12	1,792	0	0	0	0	0	0	0	0
13	1,195	0	0	0	0	0	0	0	0
14	299	0	0	592	0	0	0	0	0
15	597	0	0	395	0	0	0	0	0
16	896	0	0	99	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0
18	597	0	0	296	0	0	0	0	0
19	299	0	0	0	0	0	0	0	0
20	597	0	0	0	0	0	0	0	0
21	299	0	0	99	0	0	0	0	0
22	299	0	0	0	0	0	0	0	0
23	299	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0
25	299	0	0	0	0	0	0	0	0
26	597	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0	0	0
32	0	0	0	0	0	0	0	0	0
33	0	0	0	0	0	0	0	0	0
34	0	0	0	0	0	0	0	0	0
35	0	0	0	0	0	0	0	0	0
36	0	0	0	0	0	0	0	0	0
37	0	0	0	0	0	0	0	0	0
38	0	0	0	0	0	0	0	0	0
39	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0
41	0	0	0	0	0	0	0	0	0
42	0	0	0	0	0	0	0	0	0
43	0	0	0	0	0	0	0	0	0
44	0	0	0	0	0	0	0	0	0
45	0	0	0	0	0	0	0	0	0
46	0	0	0	0	0	0	0	0	0
47	0	0	0	0	0	0	0	0	0
48	0	0	0	0	0	0	0	0	0
49	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0
51	0	0	0	0	0	0	0	0	0
52	0	0	0	0	0	0	0	0	0
53	0	0	0	0	0	0	0	0	0
54	0	0	0	0	0	0	0	0	0
55	0	0	0	0	0	0	0	0	0
56	0	0	0	0	0	0	0	0	0
57	0	0	0	0	0	0	0	0	0
58	0	0	0	0	0	0	0	0	0
59	0	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0	0
61	0	0	0	0	0	0	0	0	0
62	0	0	0	0	0	0	0	0	0
63	0	0	0	0	0	0	0	0	0
Total	40,621	0	0	1,678	0	0	0	0	0

Table 9. A summary of the bycatch species taken by the small vessel fleet fishing for shrimp in Hawke Channel + 3K (SFA 6), during 2009.

number of fishing sets = 713
number of species in bycatch = 51

OCCUR	OCCUR (%)	WEIGHT kg	WEIGHT (%)	Common name
193	27.07	262	0.02	SKATES (NS)
88	12.34	153	0.01	HERRING,ATLANTIC
391	54.84	3553	0.33	CAPELIN
1	0.14	1	0.00	VIPERFISHES (NS)
77	10.80	201	0.02	LANTERNFISHES (NS)
52	7.29	74	0.01	BARRACUDINAS (NS)
29	4.07	29	0.00	BILLFISH
106	14.87	270	0.03	COD,ATLANTIC
2	0.28	2	0.00	TOMCOD
1	0.14	1	0.00	POLLOCK
318	44.60	1307	0.12	COD,ARCTIC
1	0.14	1	0.00	THREEBEARD ROCKLING
2	0.28	2	0.00	CUSK
6	0.84	15	0.00	FOURBEARD ROCKLING
7	0.98	7	0.00	GRENADIERS (NS)
10	1.40	17	0.00	MACKEREL,ATLANTIC
13	1.82	49	0.00	SAND LANCES (NS)
95	13.32	126	0.01	SAND LANCES (NS)
3	0.42	4	0.00	WOLFFISH,BROADHEAD
65	9.12	113	0.01	WOLFFISH,STRIPED
4	0.56	4	0.00	WOLFFISH,SPOTTED
71	9.96	80	0.01	BLENNIES (NS)
1	0.14	1	0.00	WRYMOUTH
364	51.05	773	0.07	EELPOUTS (NS)
42	5.89	65	0.01	EELPOUT (NS)
607	85.13	1880	0.17	REDFISH (NS) SEB.SP.
170	23.84	198	0.02	SCULPINS (NS)
3	0.42	3	0.00	MAILED SCULPINS (NS)
110	15.43	129	0.01	ALLIGATORFISH (NS)
50	7.01	59	0.01	ALLIGATORFISH,NORTHERN
306	42.92	336	0.03	ALLIGATORFISH,COMMON
2	0.28	2	0.00	SEASNAILS (NS)
283	39.69	616	0.06	AMERICAN PLAICE
77	10.80	104	0.01	WITCH FLOUNDER
682	95.65	4691	0.44	GREENLAND HALIBUT
1	0.14	1	0.00	FLOUNDERS (NS) PAR.SP.
44	6.17	281	0.03	UNIDENTIFIED FISH
5	0.70	5	0.00	SPONGE
1	0.14	1	0.00	SCYPHOZOAN
3	0.42	3	0.00	SEA ANEMONE
2	0.28	2	0.00	WHELK BUCC.
110	15.43	122	0.01	CEPHALOPOD (NS)
3	0.42	3	0.00	OCTOPUS OCTOPODA
1	0.14	1	0.00	SHRIMP SERG.ARC.
8	1.12	8	0.00	SHRIMP PASIP.TAR.
5	0.70	5	0.00	SHRIMP PASIP.MUL.
705	98.88	1061294	98.55	SHRIMP PAND.BOR.
34	4.77	38	0.00	CRAB, SNOW OR QUEEN
4	0.56	4	0.00	CRAB, TOAD HYAS.SP.
9	1.26	14	0.00	SEA CUCUMBER HOL.
7	0.98	9	0.00	SEA STAR
		1076919	99.99	

Table 10. NAFO Division 3L (Shrimp Fishing Area 7) Canadian large vessel (>500 t) bycatch over the period 2007 - 2009. As with all NAFO straddling shrimp stocks, this unit is managed on a calendar year basis (Jan 1 – Dec. 31). All trips on large shrimp fishing vessels must have an observer therefore the correction factor (logbook catch/observer catch) is always close to 1. Please note that if the observer catch is greater than the logbook catch, the correction factor is 1.

		Atlantic cod			American plaice			redfish			Greenland halibut		
	Year	2007	2008	2009	2007	2008	2009	2007	2008	2009	2007	2008	2009
Observed shrimp catch (t)		6,168	7,284	3,964	6,168	7,284	3,964	6,168	7,284	3,964	6,168	7,284	3,964
Logbook shrimp catch (t)		5,743	6,314	6,550	5,743	6,314	6,550	5,743	6,314	6,550	5,743	6,314	6,550
correction factor		1.0000	1.0000	1.6524	1.0000	1.0000	1.6524	1.0000	1.0000	1.6524	1.0000	1.0000	1.6524
estimated bycatch (kg)		20	35	151	1,968	1,056	3,334	2,546	2,183	3,539	7,153	4,869	3,104
Bycatch (kg)/ (t) shrimp		0.00	0.00	0.02	0.32	0.15	0.51	0.41	0.30	0.54	1.16	0.67	0.47
total number of sets observed		1076	1,179	612	1076	1,179	612	1076	1,179	612	1076	1,179	612
number of sets with bycatch		74	155	140	673	800	425	812	709	491	1,047	1,093	594
freq. sets with 1Kg recorded		70	99	114	328	431	155	312	175	105	152	185	52
percent bycatch sets with 1Kg recorded		94.59%	63.87%	81.43%	48.74%	53.88%	36.47%	38.42%	24.68%	21.38%	14.52%	16.93%	8.75%
number sets with measurements		40	42	17	20	6	5	20	9	6	30	12	13
percent bycatch sets with measurements		54.05%	27.10%	12.14%	2.97%	0.75%	1.18%	2.46%	1.27%	1.22%	2.87%	1.10%	2.19%
number of fish measured		62	106	108	546	464	142	1,908	651	610	2,739	682	1,670
	cm	estimated number at length			estimated number at length			estimated number at length			estimated number at length		
	1	0	0	0	0	0	0	0	0	0	0	0	0
	2	0	0	0	0	0	0	0	0	0	0	0	0
	3	0	0	0	0	0	0	0	0	0	0	0	0
	4	0	0	0	0	0	0	0	0	0	0	0	0
	5	0	0	0	0	0	0	54	136	0	0	0	0
	6	0	0	0	0	0	0	319	91	56	0	0	0
	7	0	0	0	0	0	0	551	388	112	0	0	0
	8	0	0	0	0	0	0	1,557	321	56	0	0	101
	9	0	0	0	27	0	0	4,075	2,684	463	129	191	323
	10	0	0	0	139	0	0	6,115	2,891	2,183	178	95	393
	11	0	0	0	23	0	353	3,585	3,340	3,834	114	382	121
	12	0	0	0	0	0	370	1,023	1,991	5,645	358	95	323
	13	0	10	0	185	27	0	2,515	3,592	7,569	1,260	0	958
	14	0	20	0	255	95	2,223	4,198	2,607	5,912	1,658	0	1,876
	15	0	25	0	387	491	3,299	5,944	3,482	3,827	2,818	382	3,279
	16	4	30	0	615	286	4,004	4,346	2,213	730	5,564	798	6,051
	17	0	46	69	452	259	3,687	3,865	4,338	955	10,026	3,704	8,812
	18	2	56	181	366	523	6,262	3,706	2,028	1,067	12,900	4,857	7,256
	19	4	91	191	381	987	5,927	2,999	1,091	843	12,699	9,501	2,716
	20	10	51	276	1,164	1,114	9,172	1,522	546	281	8,566	12,159	1,362
	21	17	61	216	1,324	1,570	5,062	1,742	273	112	5,302	12,502	344
	22	25	56	157	720	1,090	2,558	702	546	225	3,597	5,736	414
	23	4	20	139	829	778	2,223	269	91	281	2,257	2,933	172
	24	8	25	78	640	441	2,187	54	0	393	967	989	253
	25	13	15	95	798	532	1,076	79	136	393	901	286	202
	26	4	20	9	916	410	1,446	54	91	225	339	286	666
	27	6	5	34	1,244	436	1,111	0	45	344	832	768	787
	28	4	0	17	836	136	353	0	45	225	810	1,592	888
	29	2	5	34	703	244	353	0	0	0	1,176	1,466	565
	30	0	0	17	293	122	0	0	0	0	1,543	1,627	545
	31	0	0	0	312	28	0	0	0	0	1,392	577	677
	32	2	0	0	284	0	0	0	0	56	718	286	595
	33	0	0	0	375	14	0	0	0	56	379	95	242
	34	0	0	0	133	0	0	0	0	0	339	286	81
	35	0	0	0	398	0	0	0	0	0	267	0	272
	36	2	0	0	55	0	0	0	0	0	372	0	60
	37	2	0	0	55	0	0	0	0	0	307	0	51
	38	0	0	0	51	0	0	0	0	0	444	0	60
	39	0	0	0	82	0	0	0	0	0	235	0	30
	40	0	0	0	27	0	370	0	0	0	322	0	71
	41	2	0	0	0	0	0	0	0	0	226	0	40
	42	2	0	0	0	0	0	0	0	0	275	0	10
	43	2	0	0	0	0	0	0	0	0	290	0	0
	44	0	0	0	0	0	0	0	0	0	226	0	0
	45	0	0	0	0	0	0	0	0	0	154	0	0
	46	0	0	0	0	0	0	0	0	0	97	0	0
	47	1	0	0	0	0	0	0	0	0	32	0	0
	48	0	0	0	27	0	0	0	0	0	32	0	0
	49	0	0	0	0	0	0	0	0	0	0	0	0
	50	0	0	0	0	0	0	0	0	0	0	0	0
	51	0	0	0	0	0	0	0	0	0	0	0	0
	52	0	0	0	0	0	0	0	0	0	0	0	0
	53	0	0	0	0	0	0	0	0	0	0	0	0
	54	0	0	0	0	0	0	0	0	0	0	0	0
	55	1	0	0	0	0	0	0	0	0	0	0	0
	56	0	0	0	0	0	0	0	0	0	0	0	0
	57	0	0	0	0	0	0	0	0	0	0	0	0
	58	0	0	0	0	0	0	0	0	0	0	0	0
	59	0	0	0	0	0	0	0	0	0	0	0	0
	60	0	0	0	0	0	0	0	0	0	0	0	0
	61	0	0	0	0	0	0	0	0	0	0	0	0
	62	0	0	0	0	0	0	0	0	0	0	0	0
	63	0	0	0	0	0	0	0	0	0	0	0	0
Total		115	538	1,516	14,094	9,584	52,036	49,274	32,967	35,843	80,100	61,596	40,597

Table 10. (Continued)

	Striped Wolfish			Spotted Wolfish			Broadhead Wolfish		
Year	2007	2008	2009	2007	2008	2009	2007	2008	2009
Observed shrimp catch (t)	6,168	7,284	3,964	6,168	7,284	3,964	6,168	7,284	3,964
Logbook shrimp catch (t)	5,743	6,314	6,550	5,743	6,314	6,550	5,743	6,314	6,550
correction factor	1.0000	1.0000	1.6524	1.0000	1.0000	1.6524	1.0000	1.0000	1.6524
estimated bycatch (kg)	560	367	266	61	23	25	5	12	8
Bycatch (kg)/ (t) shrimp	0.09	0.05	0.04	0.01	0.00	0.00	0.00	0.00	0.00
total number of sets observed	1076	1,179	612	1076	1,179	254	1076	1,179	254
number of sets with bycatch	372	281	114	33	22	15	5	11	5
freq. sets with 1Kg recorded	272	211	80	28	22	15	5	10	5
percent bycatch sets with 1Kg recorded	73.12%	75.09%	70.18%	84.85%	100.00%	100.00%	100.00%	90.91%	100.00%
number sets with measurements	29	0	0	4	0	0	0	0	0
percent bycatch sets with measurements	7.80%	0.00%	0.00%	12.12%	0.00%	0.00%	0.00%	undefined	undefined
number of fish measured	496	0	0	8	0	0	0	0	0
cm	estimated number at length			estimated number at length			estimated number at length		
1	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0
11	53	0	0	0	0	0	0	0	0
12	93	0	0	0	0	0	0	0	0
13	200	0	0	15	0	0	0	0	0
14	280	0	0	0	0	0	0	0	0
15	280	0	0	0	0	0	0	0	0
16	320	0	0	15	0	0	0	0	0
17	440	0	0	15	0	0	0	0	0
18	400	0	0	0	0	0	0	0	0
19	267	0	0	15	0	0	0	0	0
20	80	0	0	0	0	0	0	0	0
21	27	0	0	0	0	0	0	0	0
22	40	0	0	0	0	0	0	0	0
23	67	0	0	0	0	0	0	0	0
24	53	0	0	0	0	0	0	0	0
25	80	0	0	0	0	0	0	0	0
26	93	0	0	0	0	0	0	0	0
27	93	0	0	0	0	0	0	0	0
28	27	0	0	0	0	0	0	0	0
29	13	0	0	0	0	0	0	0	0
30	40	0	0	0	0	0	0	0	0
31	27	0	0	0	0	0	0	0	0
32	27	0	0	0	0	0	0	0	0
33	27	0	0	0	0	0	0	0	0
34	40	0	0	0	0	0	0	0	0
35	13	0	0	0	0	0	0	0	0
36	27	0	0	0	0	0	0	0	0
37	13	0	0	0	0	0	0	0	0
38	67	0	0	0	0	0	0	0	0
39	27	0	0	0	0	0	0	0	0
40	53	0	0	0	0	0	0	0	0
41	0	0	0	0	0	0	0	0	0
42	0	0	0	0	0	0	0	0	0
43	13	0	0	0	0	0	0	0	0
44	0	0	0	0	0	0	0	0	0
45	0	0	0	0	0	0	0	0	0
46	0	0	0	0	0	0	0	0	0
47	0	0	0	0	0	0	0	0	0
48	0	0	0	0	0	0	0	0	0
49	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0
51	0	0	0	0	0	0	0	0	0
52	0	0	0	0	0	0	0	0	0
53	0	0	0	0	0	0	0	0	0
54	13	0	0	0	0	0	0	0	0
55	13	0	0	0	0	0	0	0	0
56	0	0	0	0	0	0	0	0	0
57	0	0	0	0	0	0	0	0	0
58	0	0	0	0	0	0	0	0	0
59	0	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0	0
61	0	0	0	0	0	0	0	0	0
62	0	0	0	0	0	0	0	0	0
63	0	0	0	0	0	0	0	0	0
Total	3,307	0	0	61	0	0	0	0	0

Table 11. A summary of the bycatch species taken by the Canadian large vessel fleet fishing for shrimp in NAFO Division 3L (SFA 7), during 2009.

number of fishing sets = 1052
number of species in bycatch = 95

OCCUR	OCCUR (%)	WEIGHT kg	WEIGHT (%)	Common name
525	49.90	788	0.01	SKATES (NS)
169	16.06	356	0.00	HERRING,ATLANTIC
917	87.17	134017	1.85	CAPELIN
4	0.38	7	0.00	BLACKSMELT,GOITRE
1	0.10	1	0.00	ANGLEMOUTH,LONGTOOTH
49	4.66	70	0.00	VIPERFISH
26	2.47	31	0.00	DRAGONFISH,BOA
376	35.74	2063	0.03	LANTERNFISHES (NS)
256	24.33	507	0.01	BARRACUDINAS (NS)
9	0.86	39	0.00	EELS, FRESHWATER (NS)
37	3.52	45	0.00	EELS,SNIPE (NS)
19	1.81	19	0.00	SNIPE EEL,ATLANTIC
8	0.76	9	0.00	SNIPE EEL,SHORTNOSE
145	13.78	169	0.00	COD,ATLANTIC
6	0.57	8	0.00	HAKE,LONGFIN
9	0.86	12	0.00	HAKE,RED (SQUIRREL)
19	1.81	20	0.00	HAKE,WHITE (COMMON)
75	7.13	92	0.00	COD,ARCTIC
28	2.66	28	0.00	THREEBEARD ROCKLING
19	1.81	19	0.00	THREEBEARD RKLG,SILVER
1	0.10	1	0.00	CUSK
24	2.28	24	0.00	FOURBEARD ROCKLING
11	1.05	11	0.00	GRENADIERS (NS)
6	0.57	6	0.00	GRENADIER,ROUGHHEAD
4	0.38	4	0.00	MARLIN SPIKE (COMMON)
1	0.10	1	0.00	GRENADIER,ROUNDNOSE
10	0.95	109	0.00	SAND LANCES (NS)
74	7.03	141	0.00	SAND LANCES (NS)
1	0.10	1	0.00	WOLFFISH,BROADHEAD
149	14.16	192	0.00	WOLFFISH,STRIPED
14	1.33	14	0.00	WOLFFISH,SPOTTED
3	0.29	4	0.00	SHANNY,ARCTIC
223	21.20	362	0.00	FOURLINE SNAKEBLENNY
1	0.10	1	0.00	SHANNY,RADIATED
354	33.65	569	0.01	BLENNIES (NS)
609	57.89	2474	0.03	EELPOUTS (NS)
133	12.64	541	0.01	EELPOUT (NS)
1	0.10	1	0.00	POUT,OCEAN (COMMON)
1	0.10	1	0.00	OCEAN POUT,GREEN
753	71.58	6937	0.10	REDFISH (NS) SEB.SP.
60	5.70	77	0.00	SCULPINS (NS)
1	0.10	1	0.00	SEA RAVEN
140	13.31	142	0.00	HOOKEAR SCULPIN (NS)
335	31.84	714	0.01	MAILED SCULPINS (NS)
4	0.38	4	0.00	SCULPIN, RIBBED (HORNE
7	0.67	9	0.00	SCULPIN,ARCTIC STAGHOR
1	0.10	3	0.00	MUDDLER (NS)
1	0.10	1	0.00	SCULPIN,DEEP SEA
1	0.10	3	0.00	TWOHORN SCULPIN (NS)
92	8.75	107	0.00	ALLIGATORFISH (NS)

Table 11 (Continued)

OCCUR	OCCUR (%)	WEIGHT kg	WEIGHT (%)	Common name
106	10.08	144	0.00	ALLIGATORFISH,NORTHERN
288	27.38	294	0.00	ALLIGATORFISH,COMMON
28	2.66	28	0.00	LUMPFISH (NS) EUM.SP.
5	0.48	5	0.00	LUMPFISH,COMMON
27	2.57	28	0.00	SEASNAILS (NS)
769	73.10	4945	0.07	AMERICAN PLAICE
8	0.76	16	0.00	WITCH FLOUNDER
2	0.19	26	0.00	YELLOWTAIL FLOUNDER
1014	96.39	10000	0.14	GREENLAND HALIBUT
1	0.10	3	0.00	FLOUNDER,WINTER
145	13.78	2385	0.03	REDFISH, LARGE
28	2.66	366	0.01	UNIDENTIFIED FISH
29	2.76	29	0.00	SPONGE
25	2.38	30	0.00	CNIDARIAN
1	0.10	1	0.00	SCYPHOZOAN
23	2.19	23	0.00	ANTHOZOAN
13	1.24	13	0.00	SEA ANEMONE
1	0.10	1	0.00	WHELK BUCC.
75	7.13	84	0.00	CEPHALOPOD (NS)
8	0.76	8	0.00	OCTOPUS OCTOPODA
1	0.10	5	0.00	MYSID
1	0.10	3	0.00	EUPHAUSIID EUPH.SP.
3	0.29	3	0.00	DECAPOD, CRUSTACEAN
90	8.56	97	0.00	SHRIMP NATA.
50	4.75	1033	0.01	SHRIMP SERG.ARC.
2	0.19	575	0.01	SHRIMP PASIP.MUL.
6	0.57	6	0.00	SHRIMP EUAL.GAI.GAI.
2	0.19	2	0.00	SHRIMP LEB.POL.
1047	99.52	7089598	97.63	SHRIMP PAND.BOR.
117	11.12	1006	0.01	SHRIMP PAND.MON.
16	1.52	83	0.00	SHRIMP SCLE.FER.
27	2.57	27	0.00	SHRIMP SAB.SAR.
58	5.51	104	0.00	SHRIMP ARG.DEN.
2	0.19	2	0.00	CRAB SPIDER
62	5.89	66	0.00	CRAB, SNOW OR QUEEN
25	2.38	25	0.00	CRAB, TOAD HYAS.SP.
6	0.57	6	0.00	CRAB, TOAD HYAS ARA.
2	0.19	2	0.00	CRAB, TOAD HYAS COAR
7	0.67	7	0.00	SEA CUCUMBER HOL.
2	0.19	2	0.00	SEA URCHIN ECH.
4	0.38	4	0.00	SAND DOLLAR CYLP.
14	1.33	14	0.00	SEA STAR
1	0.10	1	0.00	CORAL GORGONIA
2	0.19	2	0.00	CORAL ALCY0NACEAN
13	1.24	13	0.00	CORAL ALYCONACEAN
		7261870	99.97	

Table 12. NAFO Division 3L (Shrimp Fishing Area 7) Canadian small vessel (<=500 t; LOA<100') bycatch over the period 2007 - 2009. As with all NAFO straddling shrimp stocks, this unit is managed on a calendar year basis (Jan 1 – Dec. 31). There is a target of 10% observer coverage on these vessels; however, as indicated by the correction factors, this target is not usually met (correction factor = logbook catch/observer catch).

		Atlantic cod			American plaice			redfish			Greenland halibut		
	Year	2007	2008	2009	2007	2008	2009	2007	2008	2009	2007	2008	2009
Observed shrimp catch (t)		808	1,417	1,082	808	1,417	1,082	808	1,417	1,082	808	1,417	1,082
Logbook shrimp catch (t)		12,573	14,873	13,944	12,573	14,873	13,944	12,573	14,873	13,944	12,573	14,873	13,944
correction factor		15.5616	10.4962	12.8912	15.5616	10.4962	12.8912	15.5616	10.4962	12.8912	15.5616	10.4962	12.8912
estimated bycatch (kg)		16	147	1,571	3,828	6,382	10,915	28,609	27,671	27,948	865	24,302	18,243
Bycatch (kg)/ (t) shrimp		0.00	0.01	0.11	0.30	0.43	0.78	2.28	1.86	2.00	0.07	1.63	1.31
total number of sets observed		503	734	721	503	734	721	503	734	721	503	734	721
number of sets with bycatch		30	95	115	111	391	352	377	666	594	329	630	612
freq. sets with 1Kg recorded		24	86	96	62	263	155	223	251	260	205	283	268
percent bycatch sets with 1Kg recorded		80.00%	90.53%	83.48%	55.86%	67.26%	44.03%	59.15%	37.69%	43.77%	62.31%	44.92%	43.79%
number sets with measurements		1	4	2	0	0	4	1	4	18	1	7	14
percent bycatch sets with measurements		3.33%	4.21%	1.74%	0.00%	0.00%	1.14%	0.27%	0.60%	3.03%	0.30%	1.11%	2.29%
number of fish measured		1	7	66	0	0	303	25	375	1,634	9	225	2,074
total length													
	cm	estimated number at length			estimated number at length			estimated number at length			estimated number at length		
	1	0	0	0	0	0	0	0	0	0	0	0	0
	2	0	0	0	0	0	0	0	0	0	0	0	0
	3	0	0	0	0	0	0	0	0	0	0	0	0
	4	0	0	0	0	0	0	0	0	0	0	0	0
	5	0	0	0	0	0	0	0	0	0	0	0	0
	6	0	0	0	0	0	0	0	0	1,629	0	0	0
	7	0	0	0	0	0	0	0	5,534	15,947	0	0	0
	8	0	0	0	0	0	5,953	0	31,498	28,538	0	2,648	325
	9	0	0	17,655	0	0	15,876	0	97,202	61,735	0	2,648	257
	10	0	0	36,914	0	0	18,852	0	213,773	98,130	8,414	2,843	2,205
	11	0	0	24,074	0	0	6,946	0	282,597	139,718	0	8,918	15,567
	12	0	286	1,605	0	0	9,922	85,827	194,403	124,692	4,207	18,226	66,136
	13	0	286	3,210	0	0	28,775	28,609	96,848	129,927	0	11,956	134,987
	14	0	0	0	0	0	41,674	57,218	24,904	92,458	4,207	11,761	146,437
	15	638	286	4,815	0	0	40,696	114,436	16,603	76,108	0	15,189	73,988
	16	0	286	9,630	0	0	29,767	85,827	41,506	50,140	12,620	14,994	42,478
	17	0	0	1,605	0	0	19,845	143,045	13,835	30,418	4,207	6,075	15,552
	18	0	0	0	0	0	18,867	114,436	8,301	15,506	4,207	13,670	6,045
	19	0	0	1,605	0	0	18,852	57,218	11,068	10,848	0	16,707	1,866
	20	0	0	3,210	0	0	9,922	0	2,767	4,408	0	15,189	4,057
	21	0	0	1,605	0	0	9,922	28,609	0	556	0	33,220	6,816
	22	0	0	0	0	0	6,946	0	0	0	0	16,707	7,790
	23	0	286	0	0	0	6,946	0	0	0	0	24,302	8,182
	24	0	0	0	0	0	1,999	0	0	0	0	41,009	6,816
	25	0	286	0	0	0	1,984	0	0	0	0	25,821	3,597
	26	0	0	0	0	0	0	0	0	0	0	19,745	4,436
	27	0	0	0	0	0	2,977	0	0	0	0	18,226	4,950
	28	0	0	0	0	0	992	0	0	0	0	3,038	1,609
	29	0	286	0	0	0	0	0	0	0	0	3,038	771
	30	0	0	0	0	0	992	0	0	0	0	3,038	649
	31	0	0	0	0	0	0	0	0	0	0	4,557	325
	32	0	0	0	0	0	0	0	0	0	0	1,519	649
	33	0	0	0	0	0	992	0	0	0	0	0	0
	34	0	0	0	0	0	0	0	0	0	0	3,038	325
	35	0	0	0	0	0	992	0	0	0	0	0	325
	36	0	0	0	0	0	0	0	0	0	0	0	0
	37	0	0	0	0	0	0	0	0	0	0	0	0
	38	0	0	0	0	0	0	0	0	0	0	0	0
	39	0	0	0	0	0	0	0	0	0	0	0	0
	40	0	0	0	0	0	0	0	0	0	0	0	0
	41	0	0	0	0	0	0	0	0	0	0	0	0
	42	0	0	0	0	0	0	0	0	0	0	0	0
	43	0	0	0	0	0	0	0	0	0	0	0	0
	44	0	0	0	0	0	0	0	0	0	0	0	0
	45	0	0	0	0	0	0	0	0	0	0	0	0
	46	0	0	0	0	0	0	0	0	0	0	1,519	0
	47	0	0	0	0	0	0	0	0	0	0	0	0
	48	0	0	0	0	0	0	0	0	0	0	0	0
	49	0	0	0	0	0	0	0	0	0	0	0	0
	50	0	0	0	0	0	0	0	0	0	0	0	0
	51	0	0	0	0	0	0	0	0	0	0	0	0
	52	0	0	0	0	0	0	0	0	0	0	0	0
	53	0	0	0	0	0	0	0	0	0	0	0	0
	54	0	0	0	0	0	0	0	0	0	0	0	0
	55	0	0	0	0	0	0	0	0	0	0	0	0
	56	0	0	0	0	0	0	0	0	0	0	0	0
	57	0	0	0	0	0	0	0	0	0	0	0	0
	58	0	0	0	0	0	0	0	0	0	0	0	0
	59	0	0	0	0	0	0	0	0	0	0	0	0
	60	0	0	0	0	0	0	0	0	0	0	0	0
	61	0	0	0	0	0	0	0	0	0	0	0	0
	62	0	0	0	0	0	0	0	0	0	0	0	0
	63	0	0	0	0	0	0	0	0	0	0	0	0
Total		638	2,002	105,927	0	0	300,688	715,224	1,040,840	880,759	37,861	339,600	557,140

Table 12. (Continued)

	Striped Wolffish			Spotted Wolffish			Broadhead Wolffish		
Year	2007	2008	2009	2007	2008	2009	2007	2008	2009
Observed shrimp catch (t)	808	1,417	1,082	808	1,417	1,082	808	1,417	1,082
Logbook shrimp catch (t)	12,573	14,873	13,944	12,573	14,873	13,944	12,573	14,873	13,944
correction factor	15.5616	10.4962	12.8912	15.5616	10.4962	12.8912	15.5616	10.4962	12.8912
estimated bycatch (kg)	1,727	3,002	657	296	31	39	327	147	13
Bycatch (kg)/ (t) shrimp	0.14	0.20	0.05	0.02	0.00	0.00	0.03	0.01	0.00
total number of sets observed	503	734	291	503	734	291	503	734	291
number of sets with bycatch	76	198	41	11	3	3	8	12	1
freq. sets with 1Kg recorded	57	162	36	6	3	3	2	10	1
percent bycatch sets with 1Kg recorded	75.00%	81.82%	87.80%	54.55%	100.00%	100.00%	25.00%	83.33%	100.00%
number sets with measurements	1	8	1	0	0	0	0	0	0
percent bycatch sets with measurements	1.32%	4.04%	2.44%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
number of fish measured	2	64	19	0	0	0	0	0	0
total length									
cm	estimated number at length			estimated number at length			estimated number at length		
1	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0
9	0	375	0	0	0	0	0	0	0
10	0	1,126	0	0	0	0	0	0	0
11	0	1,501	0	0	0	0	0	0	0
12	0	2,251	0	0	0	0	0	0	0
13	0	3,002	1,315	0	0	0	0	0	0
14	0	3,752	657	0	0	0	0	0	0
15	0	1,876	657	0	0	0	0	0	0
16	0	2,251	657	0	0	0	0	0	0
17	0	1,501	0	0	0	0	0	0	0
18	0	750	0	0	0	0	0	0	0
19	0	2,251	1,972	0	0	0	0	0	0
20	0	1,501	1,972	0	0	0	0	0	0
21	0	1,126	657	0	0	0	0	0	0
22	1,727	375	1,972	0	0	0	0	0	0
23	0	375	0	0	0	0	0	0	0
24	0	0	1,972	0	0	0	0	0	0
25	0	0	657	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0
27	1,727	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0	0	0
32	0	0	0	0	0	0	0	0	0
33	0	0	0	0	0	0	0	0	0
34	0	0	0	0	0	0	0	0	0
35	0	0	0	0	0	0	0	0	0
36	0	0	0	0	0	0	0	0	0
37	0	0	0	0	0	0	0	0	0
38	0	0	0	0	0	0	0	0	0
39	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0
41	0	0	0	0	0	0	0	0	0
42	0	0	0	0	0	0	0	0	0
43	0	0	0	0	0	0	0	0	0
44	0	0	0	0	0	0	0	0	0
45	0	0	0	0	0	0	0	0	0
46	0	0	0	0	0	0	0	0	0
47	0	0	0	0	0	0	0	0	0
48	0	0	0	0	0	0	0	0	0
49	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0
51	0	0	0	0	0	0	0	0	0
52	0	0	0	0	0	0	0	0	0
53	0	0	0	0	0	0	0	0	0
54	0	0	0	0	0	0	0	0	0
55	0	0	0	0	0	0	0	0	0
56	0	0	0	0	0	0	0	0	0
57	0	0	0	0	0	0	0	0	0
58	0	0	0	0	0	0	0	0	0
59	0	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0	0
61	0	0	0	0	0	0	0	0	0
62	0	0	0	0	0	0	0	0	0
63	0	0	0	0	0	0	0	0	0
Total	3,455	24,015	12,492	0	0	0	0	0	0

Table 13. A summary of the bycatch species taken by the Canadian small vessel fleet fishing for shrimp in NAFO Division 3L (SFA 7), during 2009.

number of fishing sets = 721
number of species in bycatch = 51

OCCUR	OCCUR (%)	WEIGHT kg	WEIGHT (%)	Common name
107	14.84	160	0.01	SKATES (NS)
1	0.14	1	0.00	HERRINGS (NS)
34	4.72	35	0.00	HERRING,ATLANTIC
483	66.99	8554	0.78	CAPELIN
12	1.66	12	0.00	DAGGERTOOTHFISHES (NS)
64	8.88	65	0.01	LANTERNFISHES (NS)
7	0.97	7	0.00	BARRACUDINAS (NS)
2	0.28	2	0.00	COD(NS) GADUS SP.
115	15.95	249	0.02	COD,ATLANTIC
86	11.93	94	0.01	COD,ARCTIC
1	0.14	1	0.00	THREEBEARD ROCKLING
6	0.83	7	0.00	CUSK
4	0.55	4	0.00	FOURBEARD ROCKLING
1	0.14	1	0.00	GRENADIERS (NS)
11	1.53	13	0.00	GRENADIERS (NS)
1	0.14	1	0.00	GRENADIER,ROUGHHEAD
15	2.08	19	0.00	SAND LANCES (NS)
1	0.14	1	0.00	SAND LANCES (NS)
4	0.55	5	0.00	WOLFFISHES (NS)
2	0.28	2	0.00	WOLFFISH,BROADHEAD
113	15.67	127	0.01	WOLFFISH,STRIPED
6	0.83	23	0.00	WOLFFISH,SPOTTED
42	5.83	42	0.00	FOURLINE SNAKEBLENNY
79	10.96	81	0.01	BLENNIES (NS)
368	51.04	822	0.07	EELPOUTS (NS)
22	3.05	27	0.00	EELPOUT (NS)
594	82.39	2328	0.21	REDFISH (NS) SEB.SP.
52	7.21	78	0.01	SCULPINS (NS)
10	1.39	10	0.00	HOOKEAR SCULPIN (NS)
84	11.65	84	0.01	MAILED SCULPINS (NS)
1	0.14	1	0.00	TWOHORN SCULPIN (NS)
35	4.85	35	0.00	ALLIGATORFISH (NS)
3	0.42	3	0.00	ALLIGATORFISH,NORTHERN
218	30.24	227	0.02	ALLIGATORFISH,COMMON
6	0.83	6	0.00	LUMPFISH (NS) EUM.SP.
352	48.82	859	0.08	AMERICAN PLAICE
62	8.60	69	0.01	WITCH FLOUNDER
612	84.88	1788	0.16	GREENLAND HALIBUT
2	0.28	4	0.00	HALIBUT (ATLANTIC)
19	2.64	35	0.00	FLOUNDERS (NS) PAR.SP.
28	3.88	165	0.02	UNIDENTIFIED FISH
1	0.14	1	0.00	WHELK BUCC.
151	20.94	255	0.02	CEPHALOPOD (NS)
1	0.14	1	0.00	SHRIMP PASIP.TAR.
714	99.03	1081665	98.51	SHRIMP PAND.BOR.
1	0.14	1	0.00	SHRIMP PAND.MON.
3	0.42	3	0.00	SHRIMP ARG.DEN.
40	5.55	84	0.01	CRAB, SNOW OR QUEEN
9	1.25	15	0.00	SEA CUCUMBER HOL.
2	0.28	2	0.00	CORAL ALCY0NACEAN
5	0.69	5	0.00	CORAL ALYCONACEAN
		1098079	99.98	

Table 14. Bycatch of various groundfish species taken by Estonian vessels fishing for shrimp in the NAFO Division 3L NRA over the period 2007 – 2009.

Bycatch (kg) in Estonian shrimp fishery in 3L		Year		
Latin name	English name	2007	2008	2009
Anarhichas lupus	Atlantic wolffish	27	16	30
Mallotus villosus	Capelin	5,106	5,245	7,417
Anarhichas minor	Spotted wolffish	0	24	157
Anarhichas sp.	Wolffishes (NS)			
Lycodes sp.	Eelpouts (NS)	75	9	
Reinhardtius hippoglossoides	Greenland halibut	84	247	246
Urophycis chesteri	Longfin hake		7	99
Merluccius bilinearis	Silver hake	3		
Notoscopelus sp.	Lanternfish			138
	marine fish not specified	9,307	5,866	4,296
Hippoglossoides platessoides	American plaice	7	30	93
Sebastes sp.	Atlantic redfishes	629	1,321	3,274
Macrourus berglax	Roughhead grenadier		10	102
Amblyraja radiata	Thorny skate		5	
Coryphaenoides rupestris	Roundnose grenadier	0		
Raja sp.	Skates (NS)		33	
Glyptocephalus cynoglossus	Witch flounder			
Pandalus borealis catch	shrimp catch	1,453,018	1,458,097	1,659,034

Table 15. Bycatch of various groundfish species taken by Spanish vessels fishing for shrimp in the NAFO Division 3L NRA during the first three months of 2008..

discarded catch (kgs.)	**January - March**
Lanternfish	766
Arctic eelpot	335
American plaice	228
Redfish	73
Greenland halibut	27
Witch flounder	25
Capelan	14
Longfin hake	13
Other pisces	40
Crustacea	3
Other invertebrata	8

Table 16. Bycatch of unidentified finfish and redfish taken by Greenlandic vessels fishing for shrimp in the NAFO Division 3L NRA over the period 2005 – 2008.

	2007	2008	2009	2010
Shrimp catch (t)	455	648	488	741
Bycatch (kg)				
Redfish	65	127	410	355
Other	2,261	1,316	990	7,560
Total	2326	1443	1400	7915
Percent bycatch	.51%	.22%	.29%	1.07%

Table 17. Bycatch of unidentified finfish and redfish taken by Norwegian vessels fishing for shrimp in the NAFO Division 3L NRA during 2007.

Common Name	kg
Redfish	259
Unidentified finfish	430

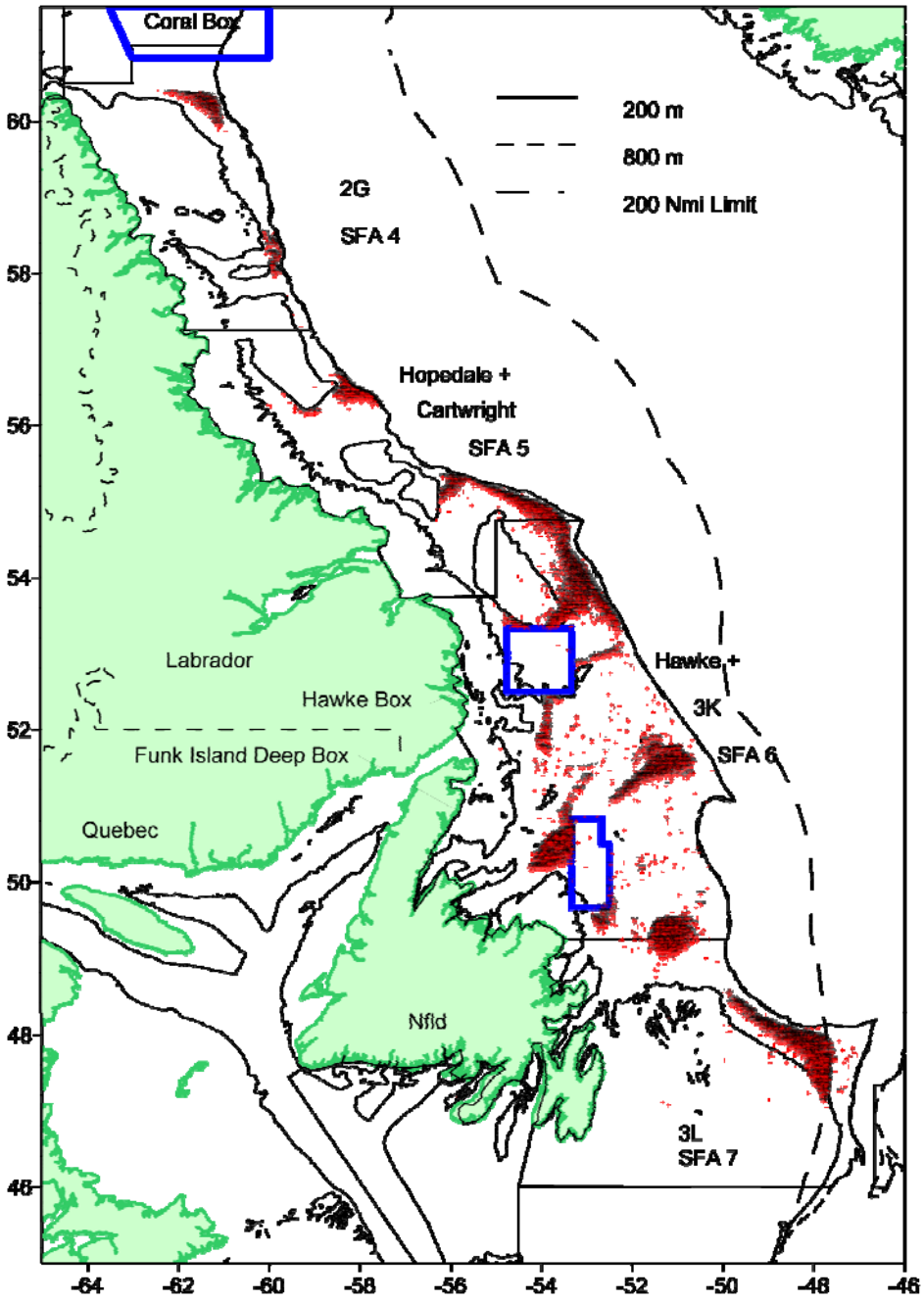
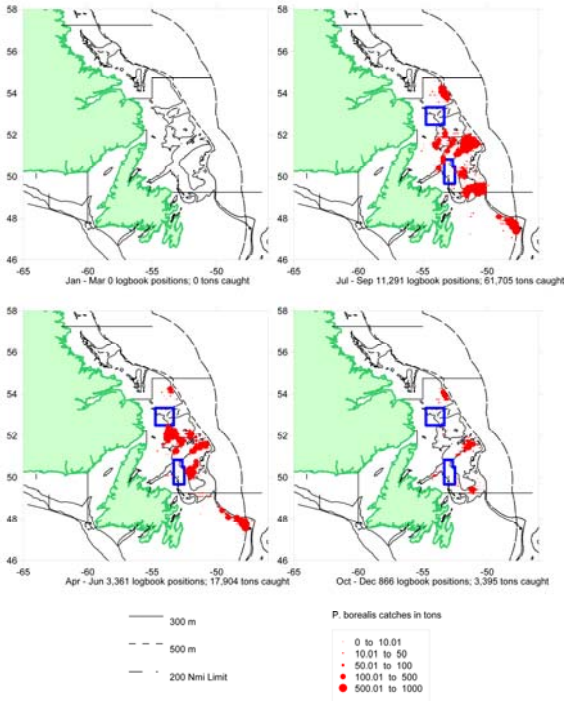
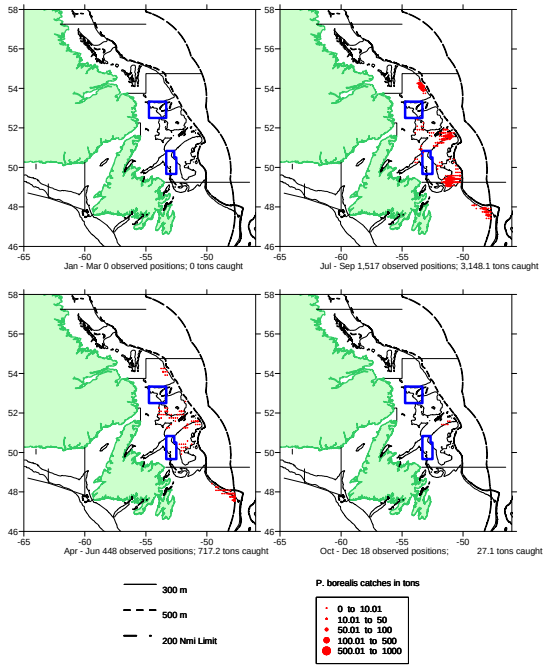


Figure 1. Distribution of observed Canadian large (>500 t) and small (<=500 t; LOA<100') shrimp fishing positions in Shrimp Fishing Areas (SFA's) 4-7 during 2009. The blue boxes indicate the location of areas that are closed to bottom trawling. The northern box was voluntarily closed by the large vessel fleet to protect coral. The middle box is referred to the Hawke Channel box and was closed to all but snow crab pot fishing. The more southern box is referred to as the Funk Island Deep box and is closed to small vessel bottom trawling and voluntarily closed to large vessel bottom trawling.



A) Distribution of logbook Canadian small vessel shrimp catches during 2008.



b) Distribution of observed Canadian small vessel shrimp catches during 2008.

Figure 2. Comparison of logbook (a) and observed (b) small vessel shrimp catches during 2008.

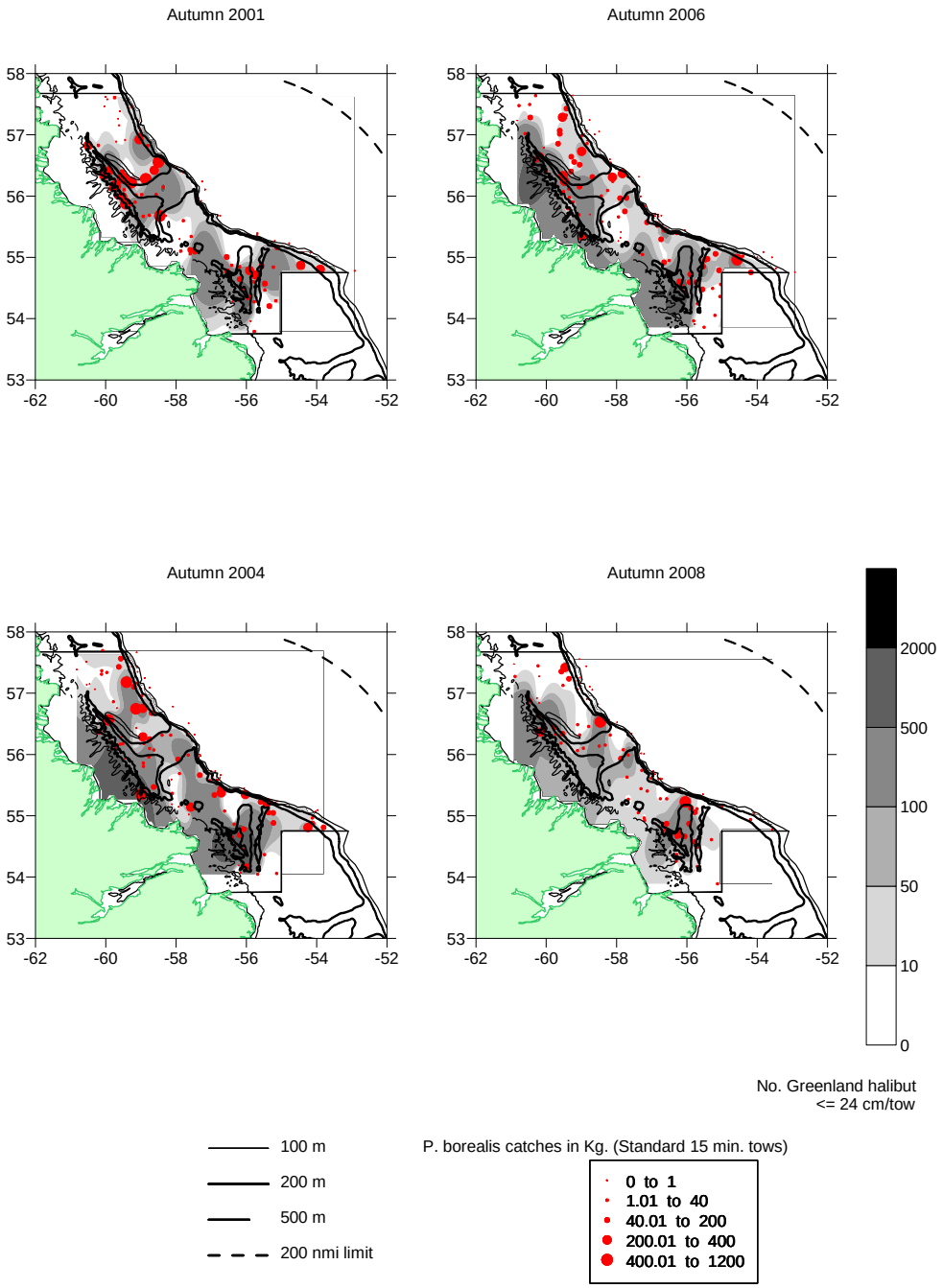


Figure 3. Distribution of northern shrimp in relation to Greenland halibut (TL<=24 cm) collected during Canadian autumn 2001 – autumn 2008 multi-species bottom trawl surveys in SFA 5 (Hopedale and Cartwright Channels). Catches were made using a Campelen 1800 shrimp trawl; standard 15 min. tows). Please note that these were the only years over the period 2001 – 2009 for which the entire of SFA 5 was surveyed.

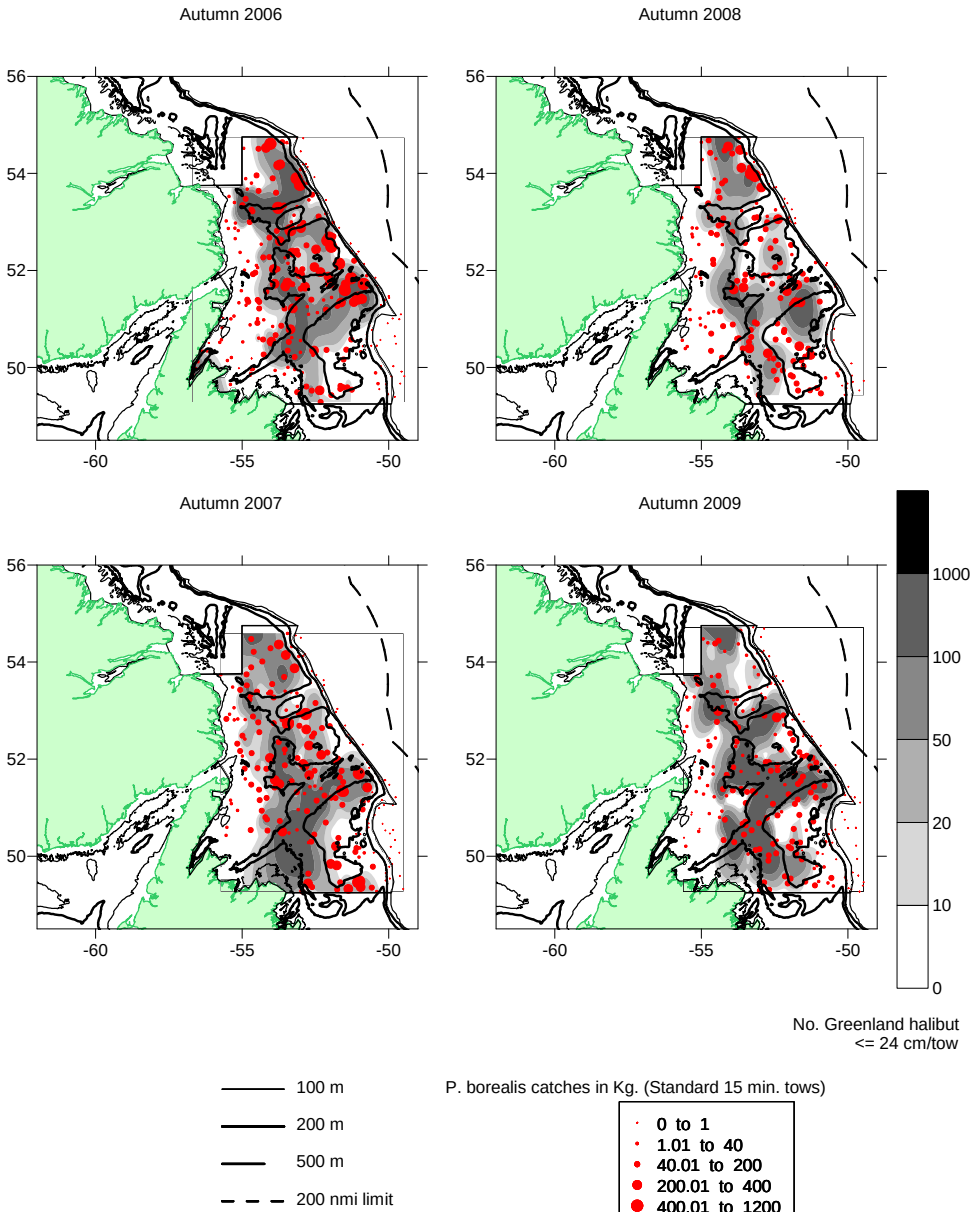


Figure 4. Distribution of northern shrimp in relation to Greenland halibut (TL<=24 cm) collected during Canadian autumn 2006 – autumn 2009 multi-species bottom trawl surveys in SFA 6 (Hawke Channel + NAFO Div. 3K). Catches were made using a Campelen 1800 shrimp trawl; standard 15 min. tows).

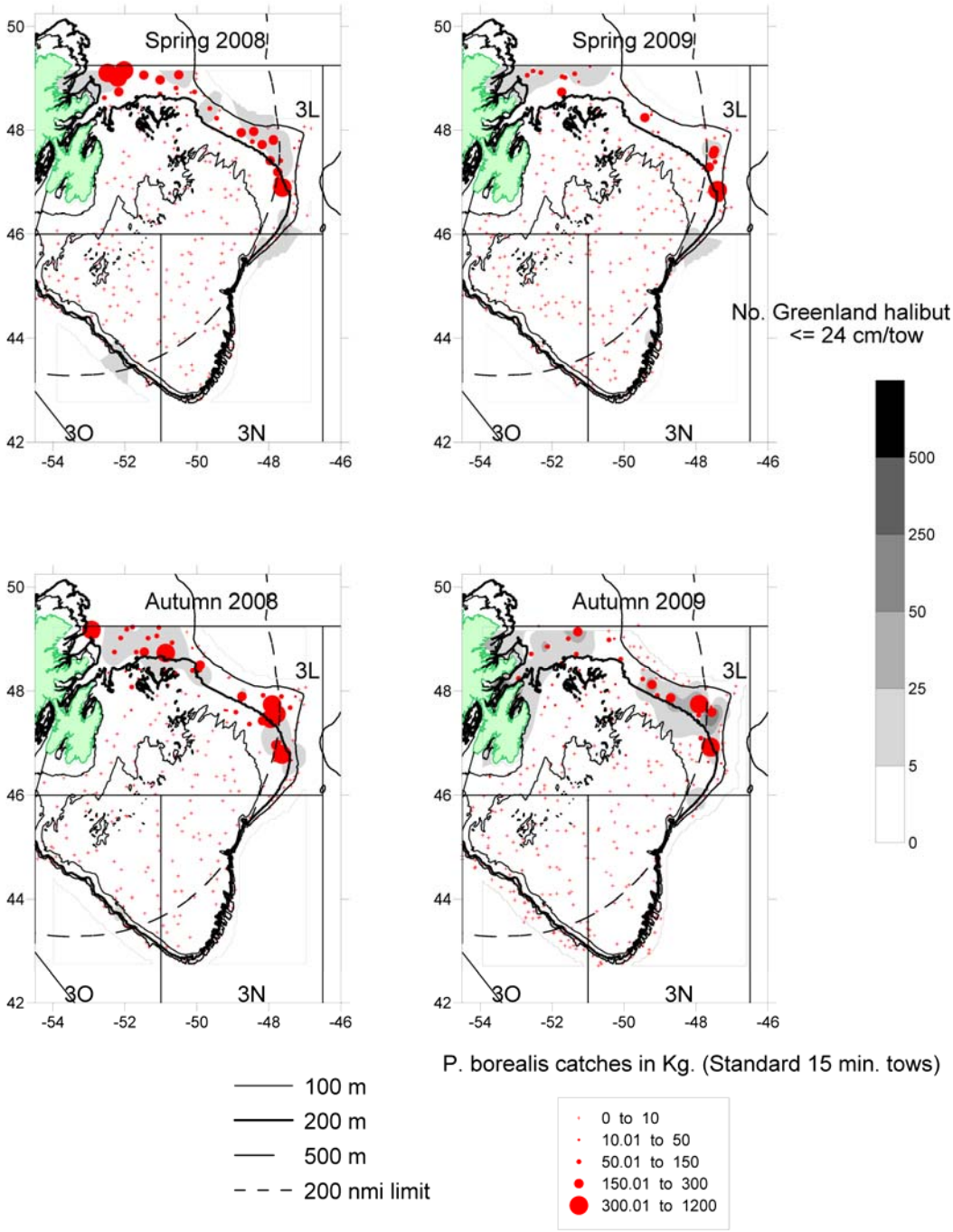


Figure 5. Distribution of northern shrimp in relation to Greenland halibut (TL<=24 cm) collected during Canadian spring 2008 – autumn 2009 multi-species bottom trawl surveys in SFA 7 (NAFO Divs. 3LNO). Catches were made using a Campelen 1800 shrimp trawl; standard 15 min. tows).

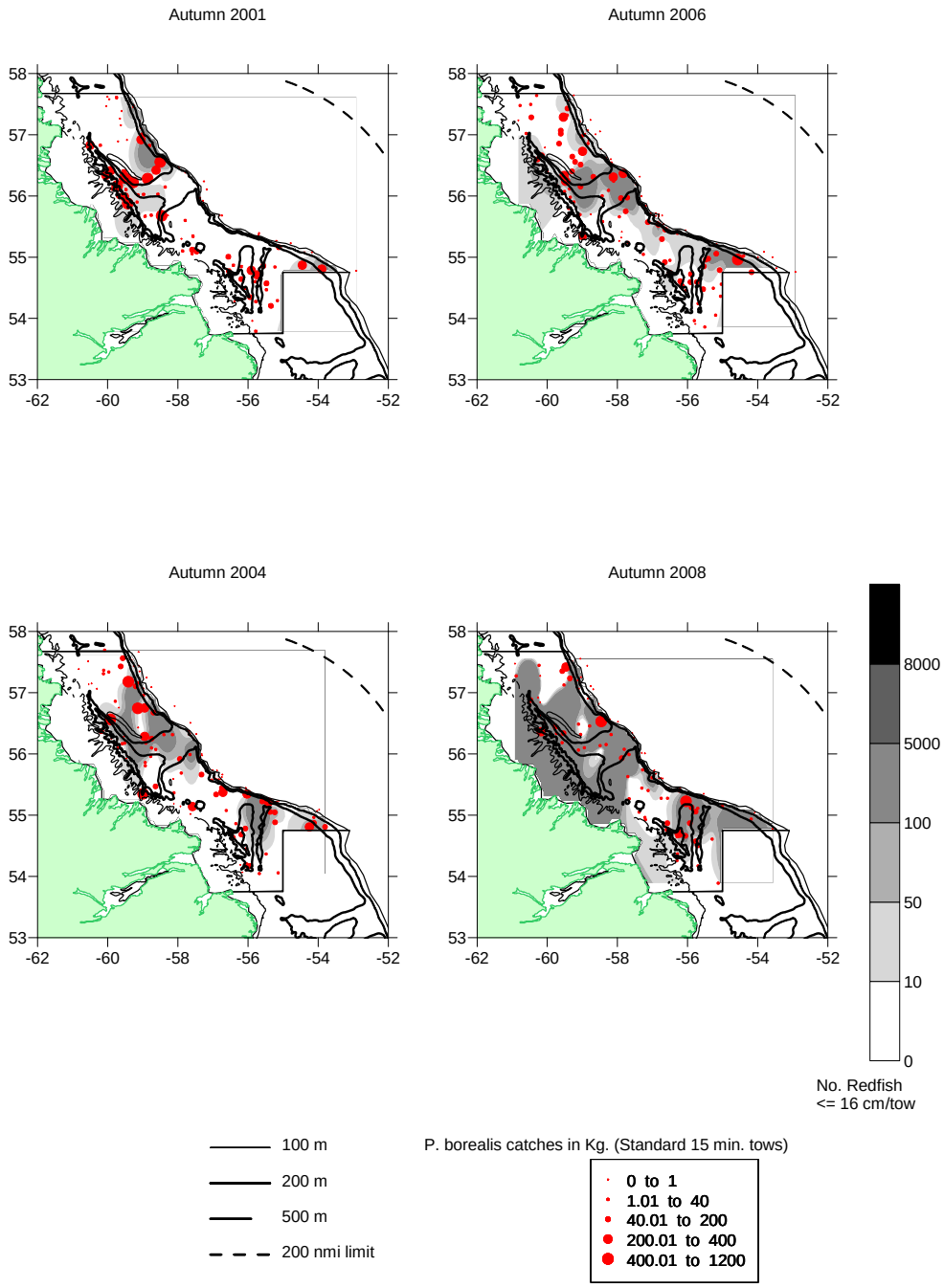


Figure 6. Distribution of northern shrimp in relation to redfish (TL<=16 cm) collected during Canadian autumn 2001 – autumn 2008 multi-species bottom trawl surveys in SFA 5 (Hopedale and Cartwright Channels). Catches were made using a Campelen 1800 shrimp trawl; standard 15 min. tows). Please note that these were the only years over the period 2001 – 2009 for which the entire of SFA 5 was surveyed.

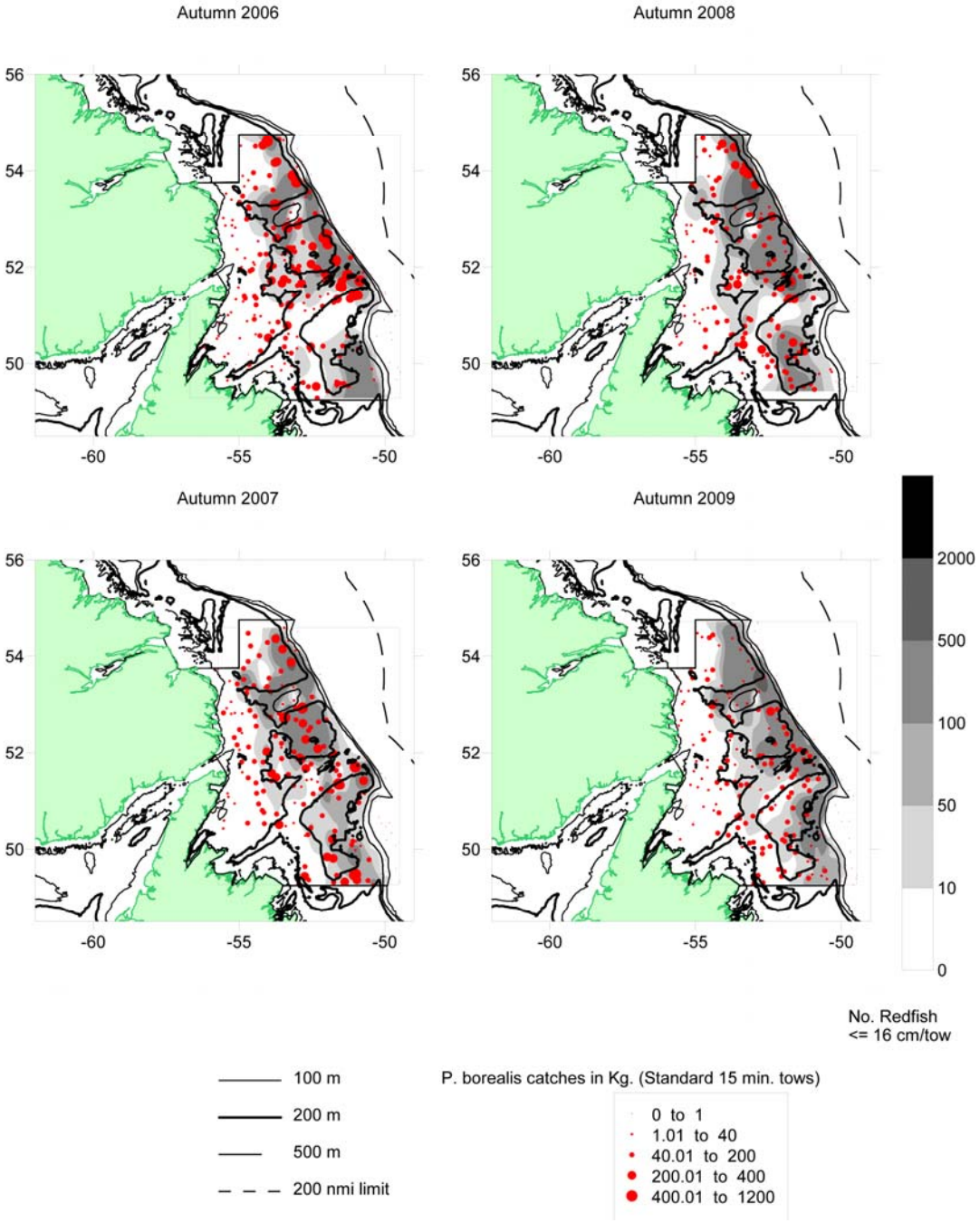


Figure 7. Distribution of northern shrimp in relation to redfish (TL<=16 cm) collected during Canadian autumn 2006 – autumn 2009 multi-species bottom trawl surveys in SFA 6 (Hawke Channel + NAFO Div. 3K). Catches were made using a Campelen 1800 shrimp trawl; standard 15 min. tows).

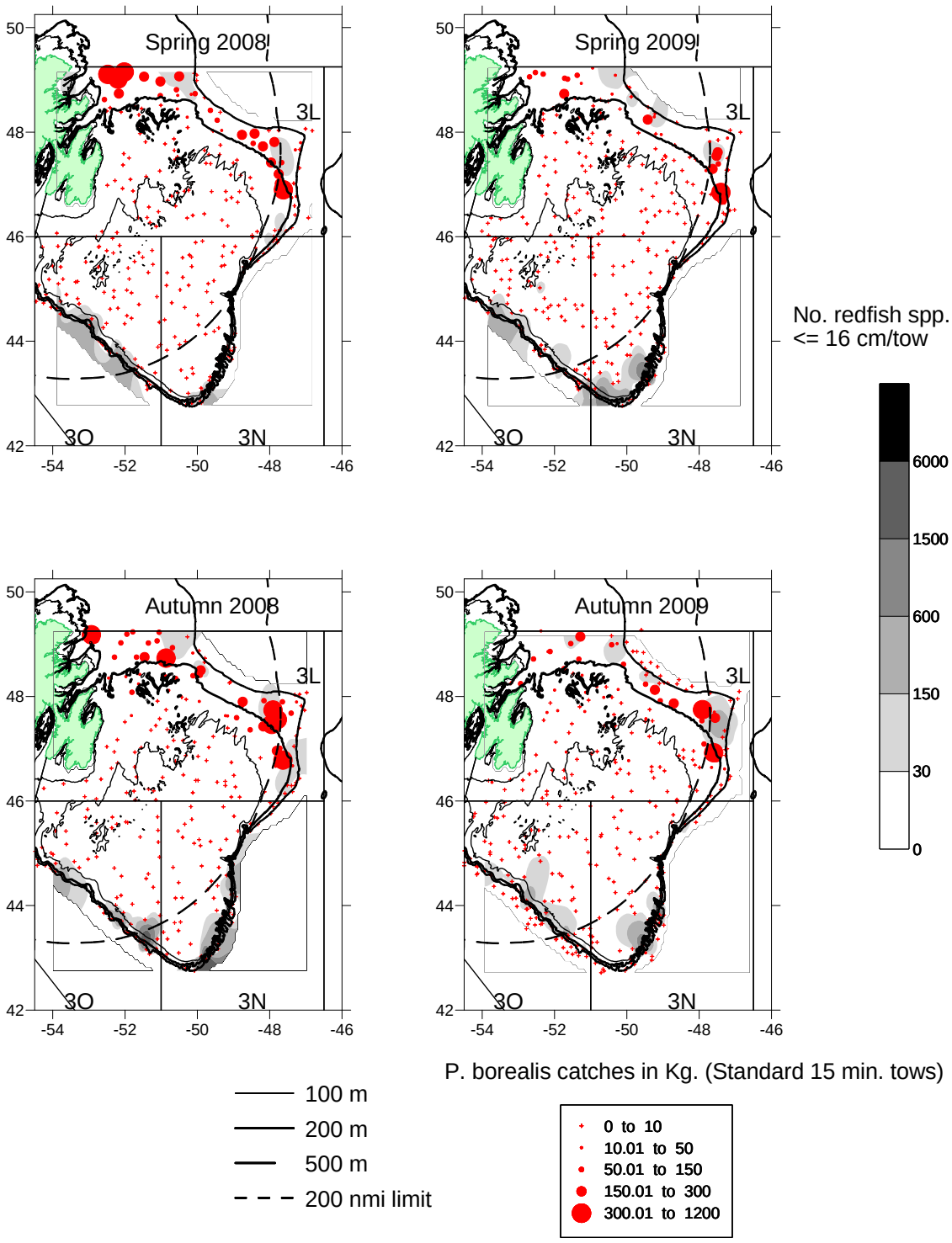


Figure 8. Distribution of northern shrimp in relation to redfish (TL<=16 cm) collected during Canadian spring 2008 – autumn 2009 multi-species bottom trawl surveys in SFA 7 (NAFO Divs. 3LNO). Catches were made using a Campelen 1800 shrimp trawl; standard 15 min. tows).

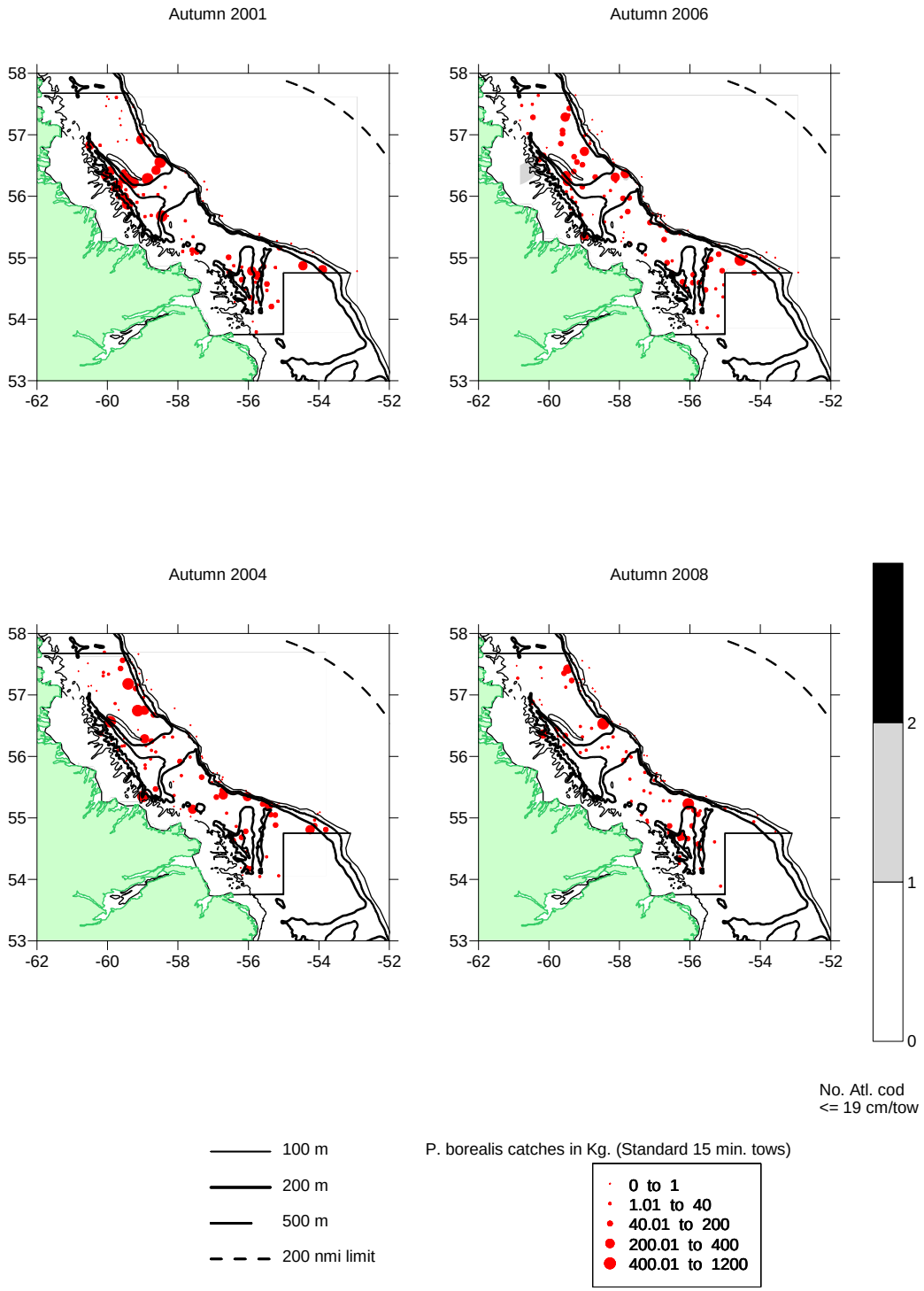


Figure 9. Distribution of northern shrimp in relation to Atlantic cod (TL<=19 cm) collected during Canadian autumn 2001 – autumn 2008 multi-species bottom trawl surveys in SFA 5 (Hopedale and Cartwright Channels). Catches were made using a Campelen 1800 shrimp trawl; standard 15 min. tows). Please note that these were the only years over the period 2001 – 2009 for which the entire of SFA 5 was surveyed.

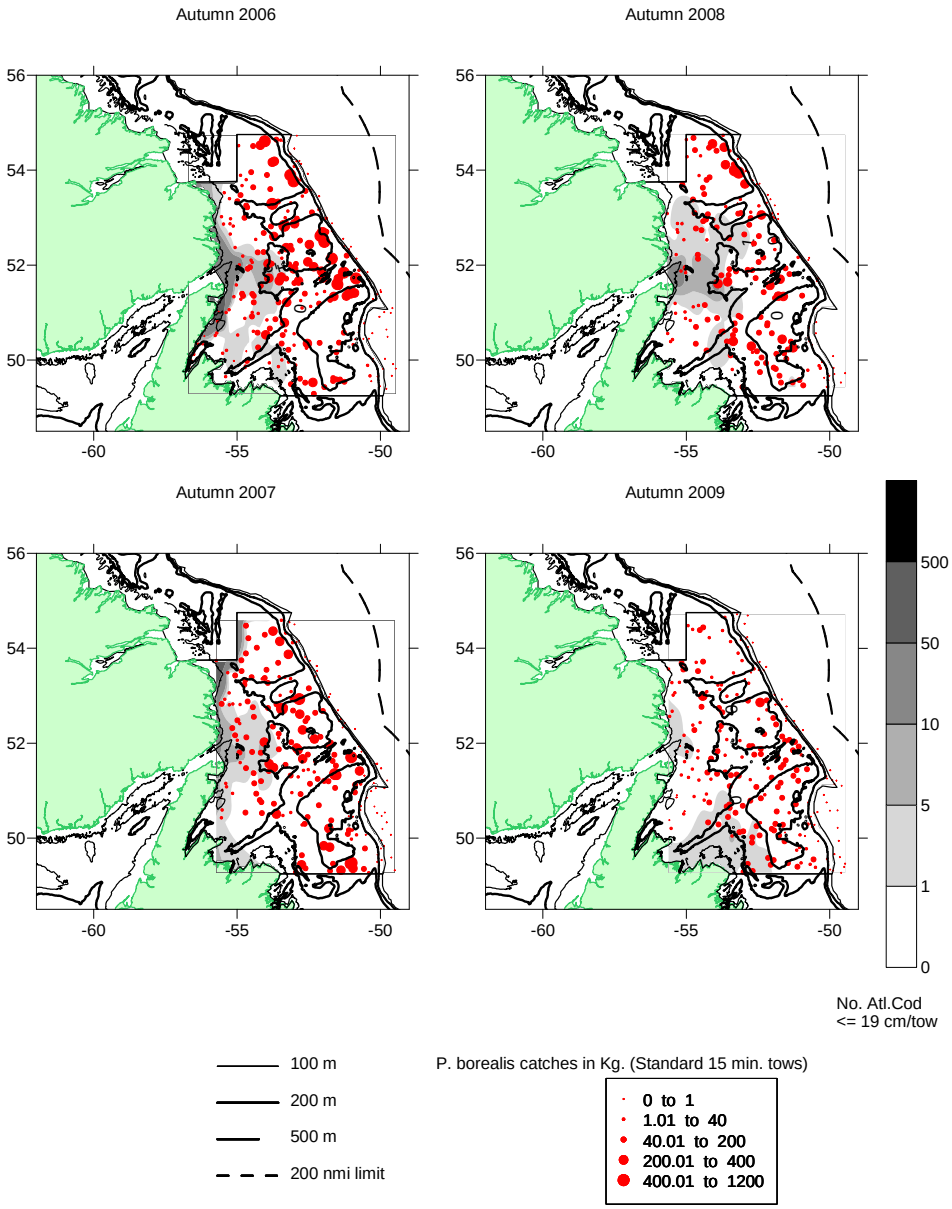


Figure 10. Distribution of northern shrimp in relation to Atlantic cod (TL<=19 cm) collected during Canadian autumn 2006 – autumn 2009 multi-species bottom trawl surveys in SFA 6 (Hawke Channel + NAFO Div. 3K). Catches were made using a Campelen 1800 shrimp trawl; standard 15 min. tows).

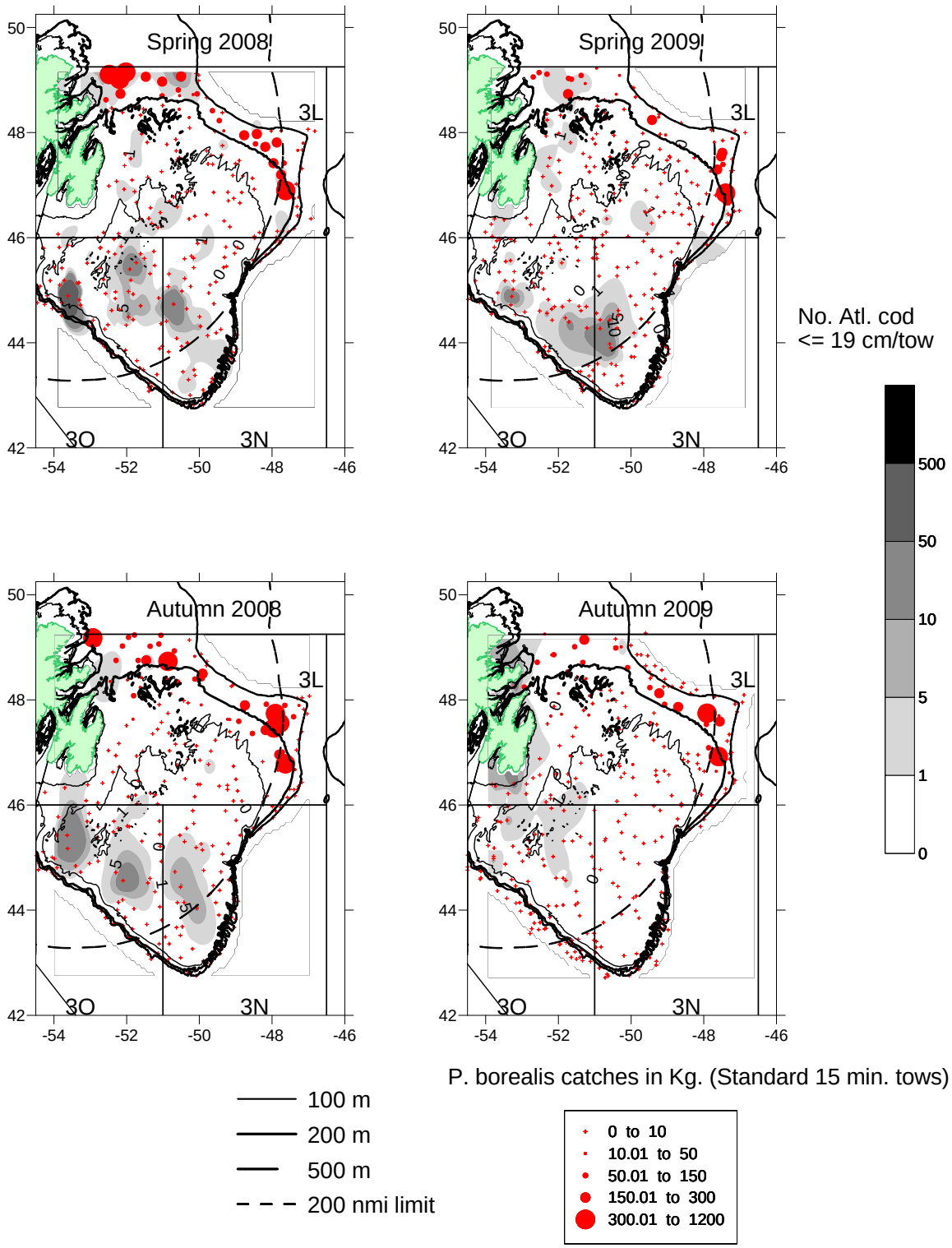


Figure 11. Distribution of northern shrimp in relation to Atlantic cod (TL<=19 cm) collected during Canadian spring 2008 – autumn 2009 multi-species bottom trawl surveys in SFA 7 (NAFO Divs. 3LNO). Catches were made using a Campelen 1800 shrimp trawl; standard 15 min. tows).

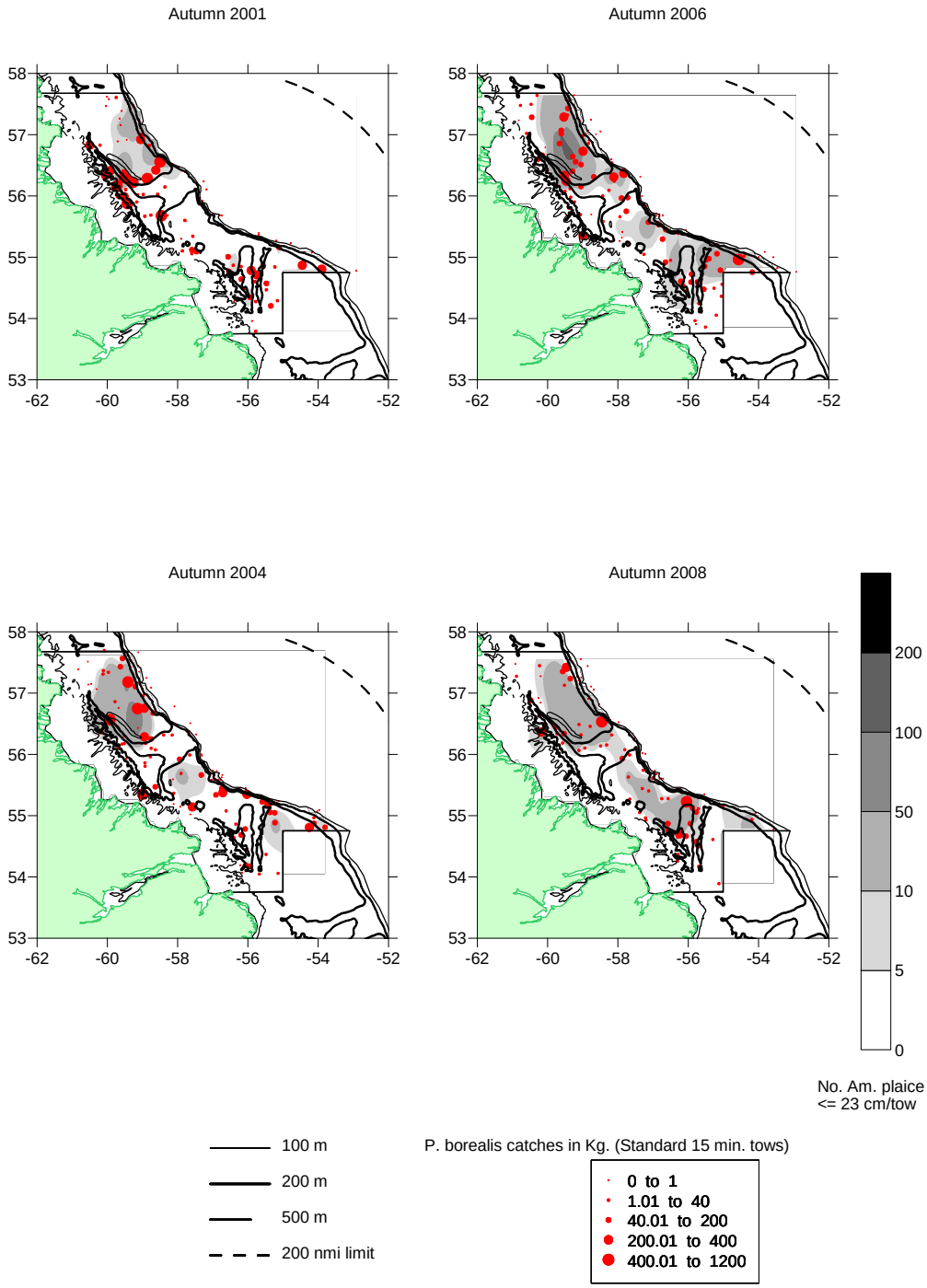


Figure 12. Distribution of northern shrimp in relation to American plaice (TL<=23 cm) collected during Canadian autumn 2001 – autumn 2008 multi-species bottom trawl surveys in SFA 5 (Hopedale and Cartwright Channels). Catches were made using a Campelen 1800 shrimp trawl; standard 15 min. tows). Please note that these were the only years over the period 2001 – 2009 for which the entire of SFA 5 was surveyed.

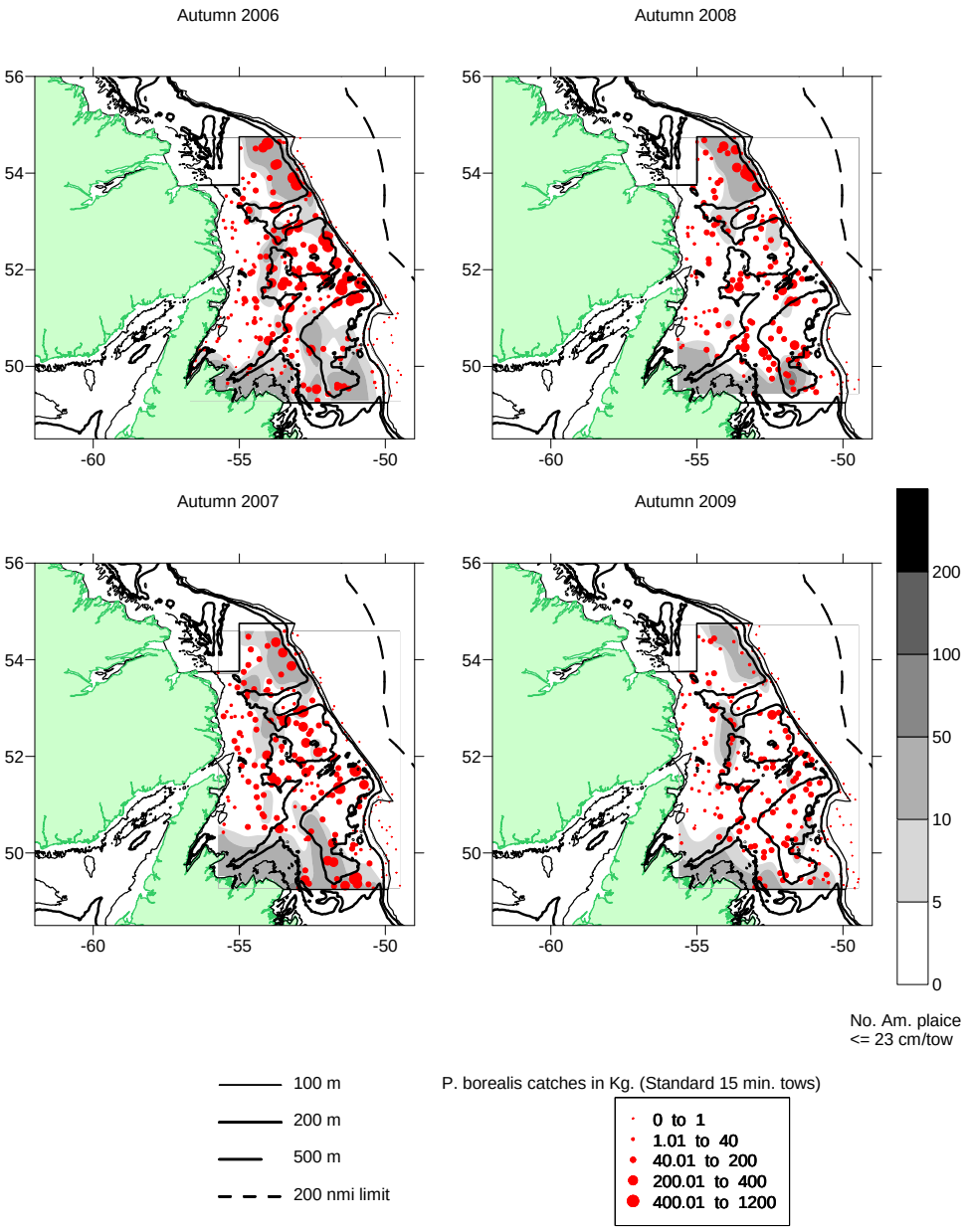


Figure 13. Distribution of northern shrimp in relation to American plaice (TL<=23 cm) collected during Canadian autumn 2006 – autumn 2009 multi-species bottom trawl surveys in SFA 6 (Hawke Channel + NAFO Div. 3K). Catches were made using a Campelen 1800 shrimp trawl; standard 15 min. tows).

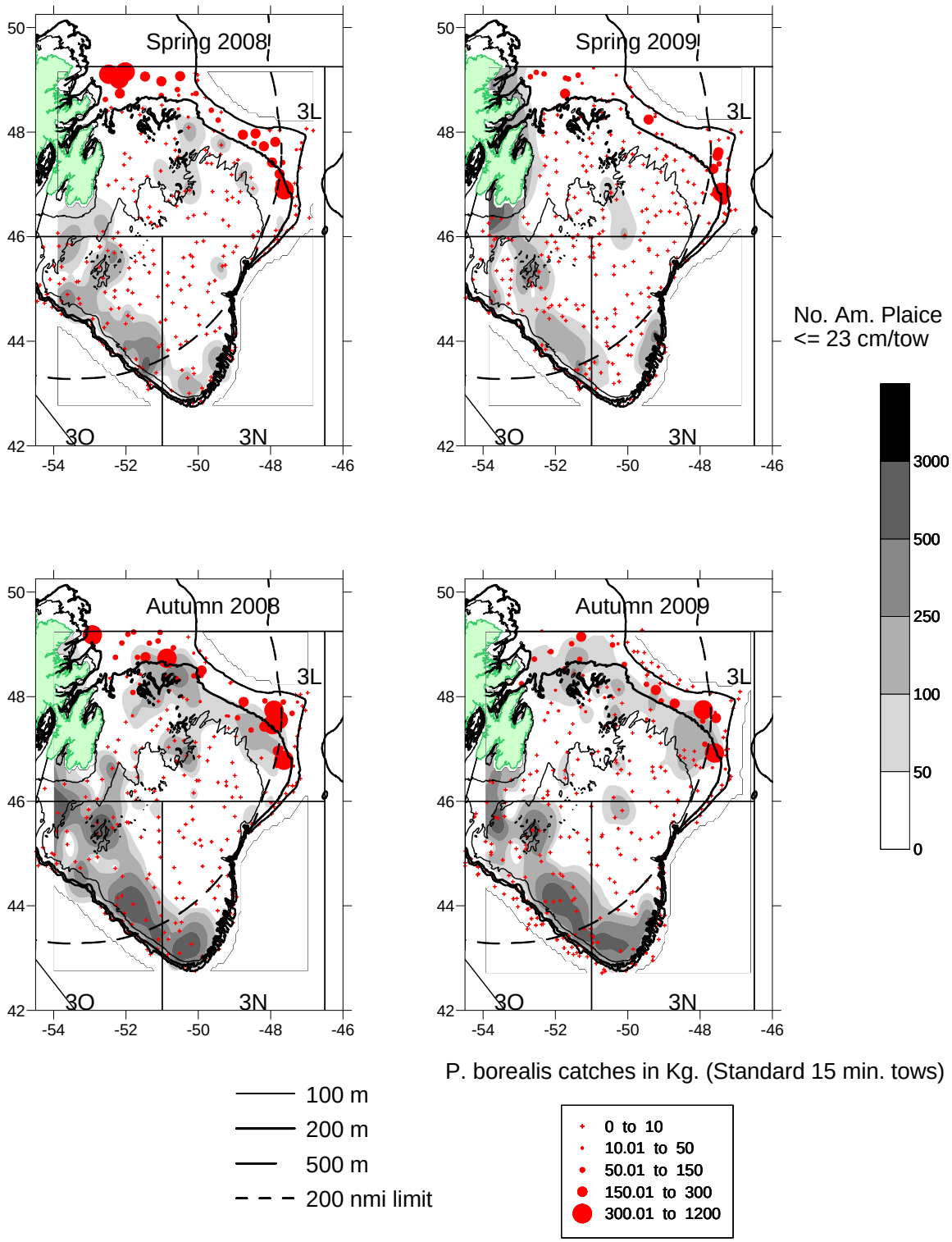


Figure 14. Distribution of northern shrimp in relation to American plaice (TL<=23 cm) collected during Canadian spring 2008 – autumn 2009 multi-species bottom trawl surveys in SFA 7 (NAFO Divs. 3LNO). Catches were made using a Campelen 1800 shrimp trawl; standard 15 min. tows).

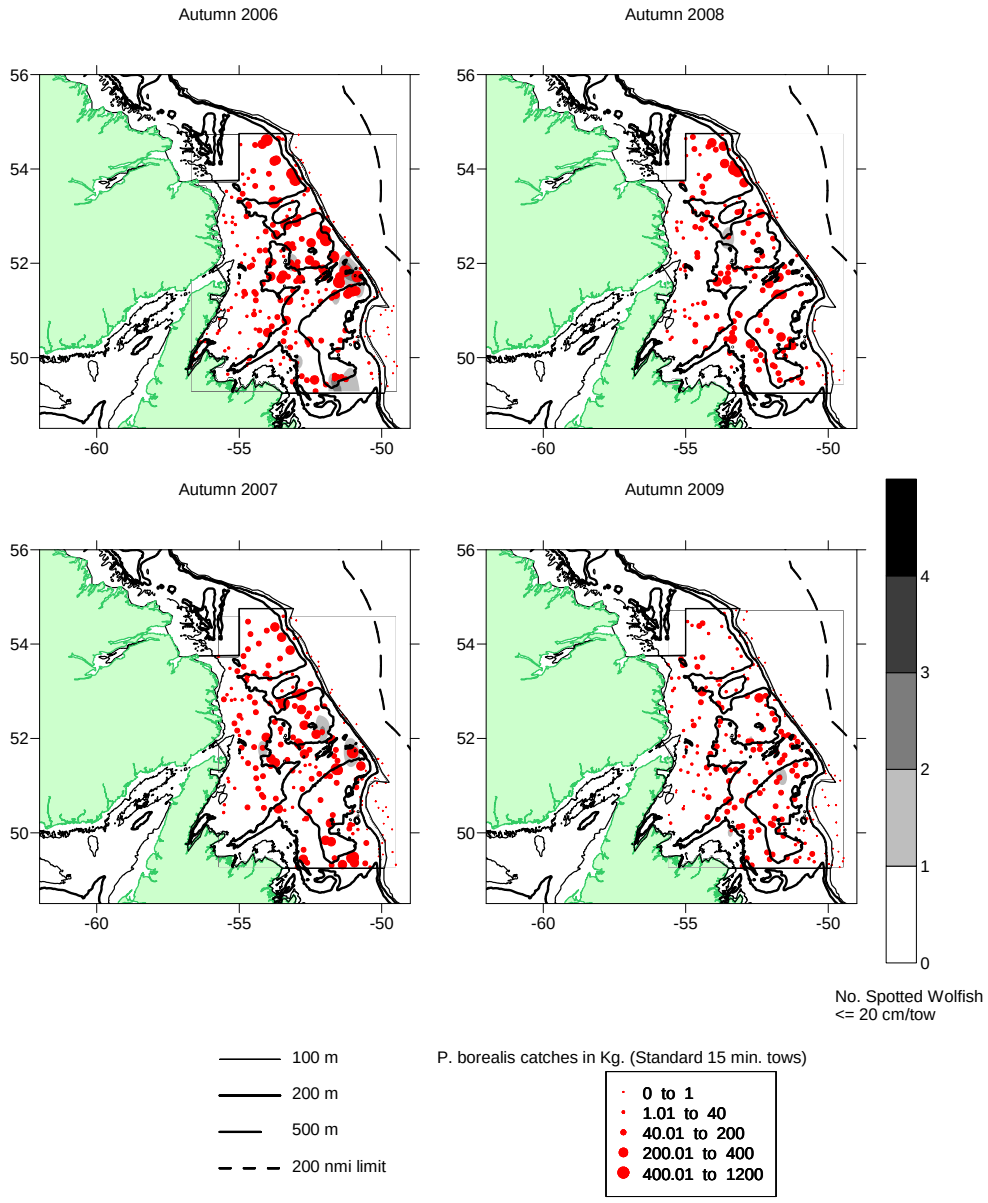


Figure 15. Distribution of northern shrimp in relation to spotted wolfish (TL<=20 cm) collected during Canadian autumn 2006 – autumn 2009 multi-species bottom trawl surveys in SFA 6 (Hawke Channel + NAFO Div. 3K). Catches were made using a Campelen 1800 shrimp trawl; standard 15 min. tows).

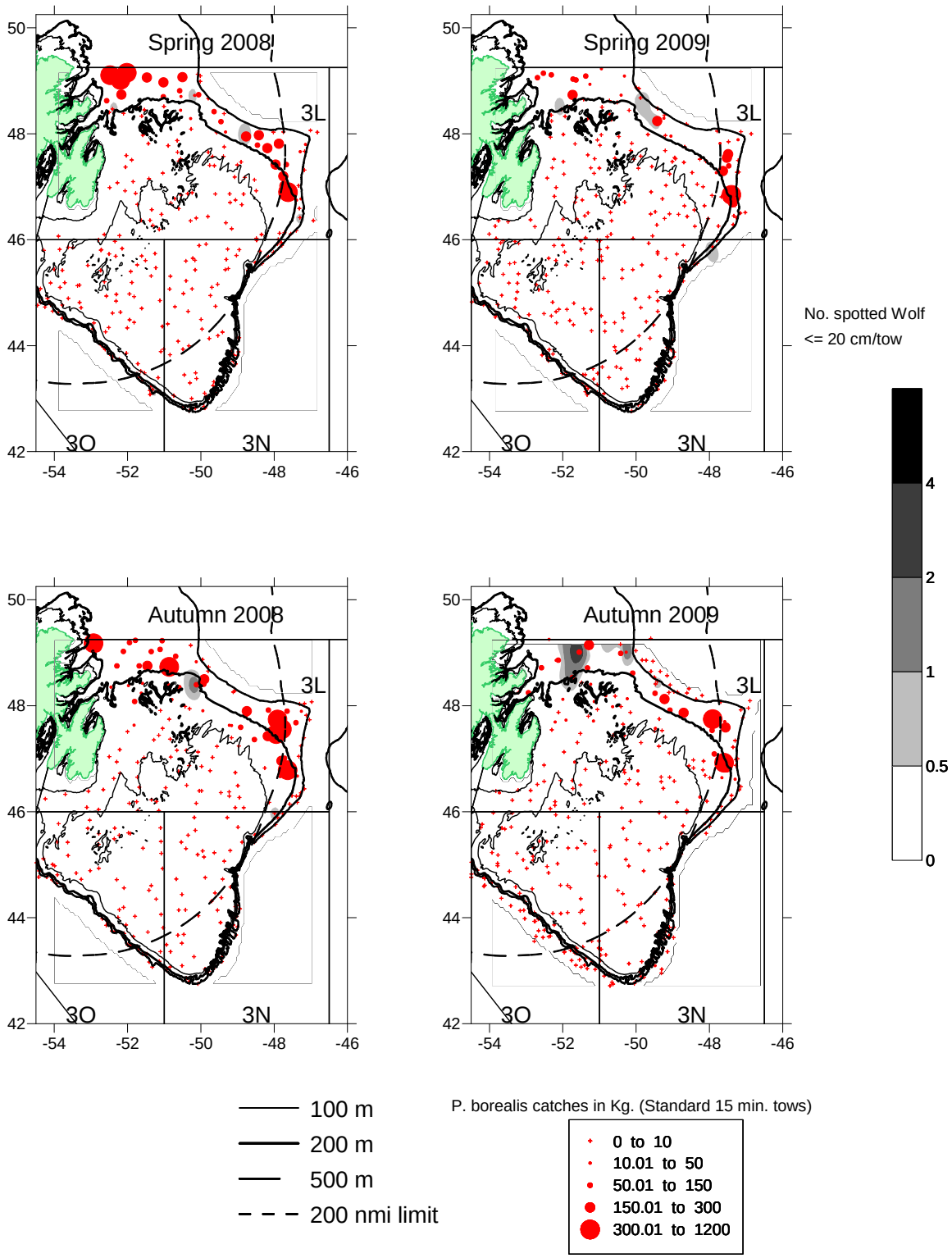


Figure 16. Distribution of northern shrimp in relation to spotted wolfish (TL<=20 cm) collected during Canadian spring 2008 – autumn 2009 multi-species bottom trawl surveys in SFA 7 (NAFO Divs. 3LNO). Catches were made using a Campelen 1800 shrimp trawl; standard 15 min. tows).

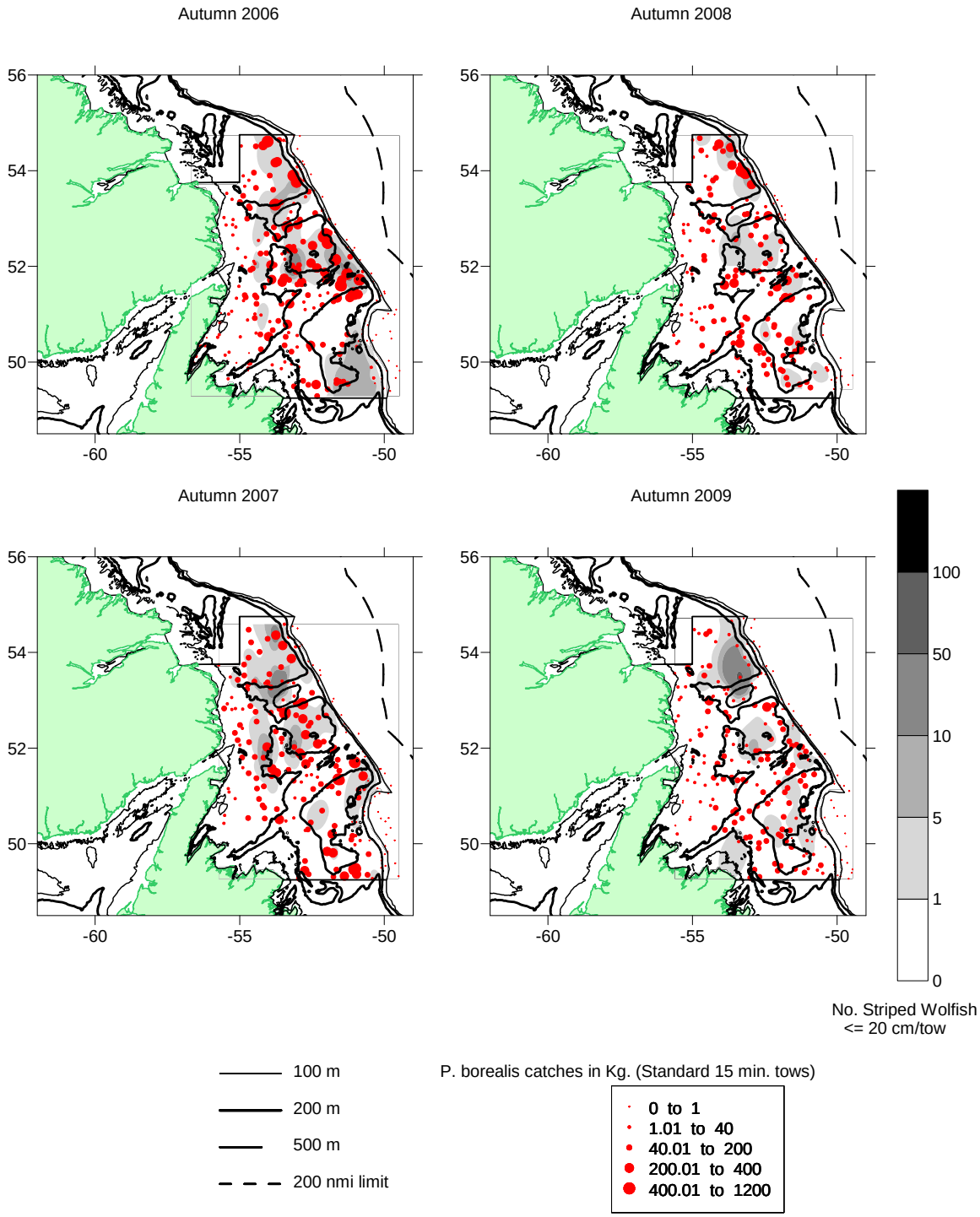


Figure 17. Distribution of northern shrimp in relation to striped wolfish (TL<=20 cm) collected during Canadian autumn 2006 – autumn 2009 multi-species bottom trawl surveys in SFA 6 (Hawke Channel + NAFO Div. 3K). Catches were made using a Campelen 1800 shrimp trawl; standard 15 min. tows).

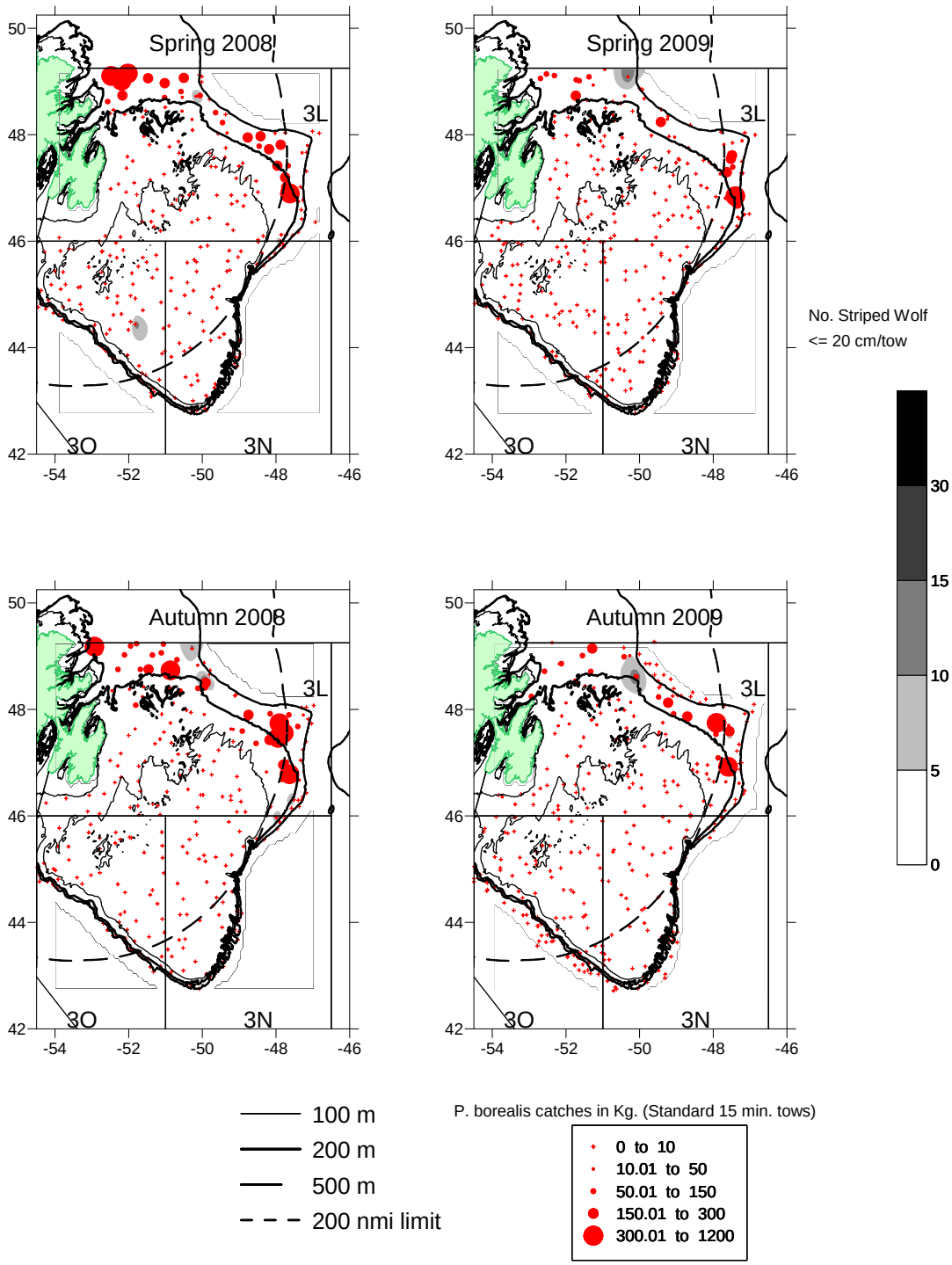


Figure 18. Distribution of northern shrimp in relation to striped wolfish (TL<=20 cm) collected during Canadian spring 2008 – autumn 2009 multi-species bottom trawl surveys in SFA 7 (NAFO Divs. 3LNO). Catches were made using a Campelen 1800 shrimp trawl; standard 15 min. tows).