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Summary of the 2012 multispecies snow crab trawl survey activities in the southern Gulf of St. Lawrence and preliminary results

J.-F. Landry, E. Wade, M. Moriyasu and M. Hébert

Science Branch, Gulf Region
Fisheries and Oceans Canada
P.O. Box 5030
Moncton, New Brunswick
E1C 9B6

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Foreword

This series documents the scientific basis for the evaluation of aquatic resources and ecosystems in Canada. As such, it addresses the issues of the day in the time frames required and the documents it contains are not intended as definitive statements on the subjects addressed but rather as progress reports on ongoing investigations.

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ABSTRACT

This document summarizes the details of the 2012 snow crab/multispecies bottom trawl survey of the southern Gulf of St. Lawrence. The primary objective of the survey is to provide the data on abundance and geographic distribution of snow crab and other by-catch species. The survey was conducted from July 10 to September 23 using a chartered commercial fishing vessel, the “Marco-Michel”. A total of 321 stations from a target of 325 stations were successfully trawled. Details on the survey protocols, timing of the survey, characteristics of the individual trawl tows, and summaries of snow crab catches are provided.

Sommaire des activités et des résultats préliminaires du relevé au chalut multi-espèces et de crabe des neiges du sud du golfe du Saint-Laurent de 2012

RÉSUMÉ

Ce document fournit un résumé des détails sur le relevé au chalut de fond du crabe des neiges et multi-espèces entrepris dans le sud du golfe Saint-Laurent en 2012. L’objectif principal de ce relevé est de fournir les données d’abondance et la distribution du crabe des neiges et d’autres espèces de capture accessoires. Le relevé a été entrepris du 10 juillet au 23 septembre à bord d’un navire de pêche commerciale nolisé “Marco-Michel’’. Au total, 325 stations ont été visitées parmi lesquelles 321 stations ont été chalutées avec succès. Les détails sur le protocole, le déroulement du relevé, les caractéristiques de chaque trait ainsi que le sommaire des captures du crabe des neiges et des espèces accessoires sont décrits.

INTRODUCTION

This document summarizes the details of the 2012 snow crab/multispecies bottom trawl survey of the southern Gulf of St. Lawrence. The primary objective of the survey is to provide the fishery-independent data to assess the status of the snow crab (*Chionoecetes opilio*) resource of the southern Gulf of St. Lawrence. The specific objectives of the survey were: 1) estimate abundances for different biological categories of snow crab, their spatial distribution, and monitor their biological characteristics, and 2) obtain relative abundance and spatial distribution information of other species of invertebrates and fish captured during the survey.

In the present document, only detailed information on the catches of snow crab are provided, in support of the assessment of the snow crab stock (Hébert et al. 2014).

SURVEY DESIGN AND PROTOCOL FOR 2012

The survey protocol (target number of stations, their positions and sampling grid setting) was modified for 2012 from previous years (DFO 2012; Wade et al. 2014). The survey spatial sampling design is based on a survey area partitioned into square grids of 13.36 km x 13.36 km (Fig. 1). In each grid identified for sampling, a primary location was randomly chosen prior to the survey. If the trawl net was damaged while fishing at the primary station and the station was considered untrawlable by the onboard biologist, a tow at the first alternate sampling station within the same grid was done. If the trawl net was damaged at the first alternative station, a tow was conducted at the second alternate station. If the primary and the two alternative stations within the grid were considered untrawlable, the station within that grid was abandoned. An exception to this protocol was made during the first two sampling trips in 2012. During those two trips, when the primary tow was not successful, another two attempts were made at the same primary station.

Only good tows are considered in the analysis. Bad tows are defined as torn or damaged nets resulting in loss of specimens and/or uncompleted tows due to the weather, sea conditions. In the event that the net has physically performed well but a malfunction of the electronic net censors occurred, then the tow was considered good and the swept area for that tow was estimated as the mean swept area of the nearest 10 neighbouring tows which were fully successful.

Standard tows were made using a Nephrops trawl at a speed of 2 knots with a target duration of five minutes, based on the time the trawl touched the sea floor as determined by a hydroacoustic system (Moriyasu et al. 2008). Information about the geometry of the trawl (horizontal spread of the doors and wings, vertical opening of the trawl and depth) was recorded for each tow using hydroacoustic sensors (Netmind©). Descriptions of the net mensuration protocols are provided by Moriyasu et al. (2008).

Trawling was always done between morning- and evening- civil twilight time (civil twilight begins at sunset and ends when the geometric center of the sun reaches 6° below the horizon). There is enough light from the sun during this period that artificial sources of light may not be needed to carry on outdoor activities; this usually occurs 30 minutes earlier than sunrise and later than sunset.

The sampling protocol calls for the survey to be postponed in the event of adverse weather conditions; i.e., winds above 20 to 25 knots or sea conditions that may hinder the manoeuvrability of the boat.

For most of the fishing stations conducted, a vertical profile of the water column was made using a SeaBird 19 plusTM CTD equipped with a dissolved oxygen sensor (SBE 43) and a WetStarTM fluorometer. The sensors sampled the following variables: temperature, conductivity (salinity), pH, and fluorescence.

For each trawl sample, the catch was sorted by species and the number of individuals, fish and invertebrates, was recorded. Species identifications were determined based on taxanomic information in Scott and Scott (1988), Brunel et al. (1998), Pohle (1990), and Squires (1990). For snow crab, detailed measurements included the carapace width, chela height, shell hardness, gonad color, egg color, missing legs, and disease identification.

In addition, whole specimens from different fish and invertebrate taxa were collected, either for taxonomic identification purposes or for more in-depth laboratory analysis. Although species identification other than snow crab were recorded since the first year of the survey, the protocol and effort put on species other than snow crab have not been consistent over years. It is only since 2006 that more complete collection of information on number per species began and since 2010 that size measurements of sub-samples (maximum of 100 individuals per station) of fish species at pre-selected stations (100 in total) were initiated. All other catches were sorted by species or species group, counted, and discarded.

SURVEY ACTIVITIES IN 2012

The survey vessel used in 2012 was the '*Marco-Michel*', the same vessel used since 2003. The '*Marco-Michel*' is 65 ft in length, has a 660 hp engine and a fiberglass hull.

PERSONNEL AND ONBOARD TASKS

There were always at least five crew members during the survey (Table 2). André LeBlanc was the captain (working since 2003) except for the third trip when Ghislain Bourgeois acted as captain. Nicholas Chiasson, Ghislain Bourgeois and Michel Dugas oversaw general trawling operations (winch operation). The net repair was supervised by Michel Dugas who has been working since the beginning of the survey in 1988.

Three (3) employees (Marcel Hébert, Jean-François Landry and Pierre DeGrâce) from DFO Science participated in the 2012 survey such that there was always two DFO Science employees on board at any given time throughout the survey period. One DFO Science member was responsible for the operation of the Netmind and CTD data recording as well as determining the tow quality. CTD operation was ensured by Wayne Aucoin, Ghislain Bourgeois and Nicholas Chiasson. The second DFO Science member was responsible for the measurement data on crab and other species, assisted by Stephane Albert, a crew member, who has been working on the snow crab survey since 1993.

DURATION AND TIMING OF THE SURVEY

The survey began on July 10 and ended on September 23, 2012, a total duration of 76 days (Table 3; Figs. 2 to 4). The vessel was at sea for 40 days and trawling occurred during 38 of those days; 36 full days and 2 days of shortened work due to high wind (July 12 and 20), inactivity due to engine problem for 2 days (September 14 and 15), and 2 days for stand-by at sea due to a strong wind (August 26 and September 6). It took eight (8) trips to complete the survey with a trip duration varying from 3 to 7 days (Table 4).

The intention was to conduct trawling between morning and evening during civil twilight time (civil twilight begins at sunset and ends when the geometric center of the sun reaches 6° below the horizon). In 2012, there were two exceptions (3 tows) during the last two days of

the survey (September 22 and 23). The last tow on September 22 and last two tows on September 23 were conducted after evening twilight time (Table 3).

SURVEY ITINERARY

There were eight (8) trips for the 2012 survey, departing from different locations (Tables 3, 4; Fig. 4).

1. The first trip departed from the port of Cheticamp and trawled in the eastern part of Area 12F, around the Magdalen Islands counter-clock wise and returned to Cheticamp (itinerary marked in dark blue in Fig. 4).
2. The second trip departed from Cheticamp and conducted sampling off eastern PEI, Bradelle Valley, and Bradelle Bank (in yellow) and berthed at the wharf in Caraquet NB.
3. The third trip departed from Caraquet, sampling northern Bradelle Bank and Area 12E towards the northern most part of the survey area, and returned to Caraquet (in vivid green).
4. The fourth trip started from Caraquet and sampled mainly the Shediac Valley area and returned to Caraquet (in vivid blue).
5. The fifth trip departed Caraquet and trawled in the Baie des Chaleurs and Bradelle Bank areas and returned to Cheticamp (in grey).
6. The sixth trip departed Cheticamp and trawled Area 19 and adjacent areas and returned to Cheticamp (in pink).
7. The seventh trip departed Cheticamp and trawled in the portion south of the Magdalen Islands and returned to Cheticamp (in clear blue).
8. The last trip departed Cheticamp and trawled off northern shore of PEI and returned to Cheticamp (in clear green).

QUALITY OF TOWS

A total of 401 tows were conducted in 2012. The number of bad tows (80) accounted for 20% of total number of tows tried in 2012 and was the highest in the time series since 1988 (average at 9.6%). There was no apparent tendency of geographic distribution of bad tows (Fig. 5), whereas there was no bad tow in the Cape Breton trough.

The total number of grids trawled in 2012 was 325 and the total number of grids successfully sampled was 321 (Table 5). Of the 325 grids trawled, 274 grids were sampled at the primary station and 47 grids were sampled using an alternate station. Of the grids with primary station samples, 269 of them were successfully sampled on the first tow, and nine required two to four repeat tows (Table 5). Of the 47 grids sampled using alternate stations, 35 of them were successfully sampled on the first attempt and twelve required a second (11 grids) or a third attempt (Table 5).

Four survey grids were deemed to be untrawlable after multiple attempts. These grids are located in the southern part of Bradelle Bank- Eastern Bradelle valley off Prince Edward Island (station numbers gp46a2, gp120a2, gp197a2 and gp134a2 in Fig. 5).

Details of the successful tow characteristics by station are provided in Appendix 1.

RESULTS

The following section summarizes the results of the catches, the size frequency distributions, and the catch rate distributions for snow crab (*Chionoecetes opilio*). Catches of other species are summarized in Table 6 and details of the catches for these species are presented in a data report of the survey (in preparation). A total of 29 species of invertebrates (groups) and 49 species of fish were processed in 2012 (Table 6).

SNOW CRAB

The total number of commercial-sized (>= 95 mm carapace width) male snow crabs sampled and the mean number per tow sampled during the surveys are shown in Table 7.The total number of male snow crab, all sizes and maturities have fluctuated throughout the time series with notable peak values in 1990 and 1999 and the lowest in 2009 (the 1996 value should be disregarded as the survey was conducted only in Area 19). The total number of male snow crab per tow in 2012 is comparable to that in 1993 and 1995 (Fig. 6).

The total number of female per tow has also fluctuated throughout the time series (Fig. 7) but showed a decreasing trend since 1988. Notable peak was observed during the 1991 and 1999 surveys and the lowest value in 2006 (1996 value should be disregarded as the survey was conducted only in Area 19).

Commercial-sized adult male snow crab observed during the survey peaked in 1993 with over 16 crabs per tow (Fig. 8) and peaked again in 2004 at approximately 10 crabs per tow. In 2012, there was a mean of 6.5 crabs per tow during the survey with a mean unadjusted density of 2,359 crabs per km^2 (Table 7). Crabs with shell conditions of 3 or older were more prevalent during the 1990's compared to recent years (Fig. 8).

The mean individual weight of commercial-sized adult male in 2012 was 566 grams (Table 7). The size frequency of all (immature/adolescent and adult) males (Fig. 9) and (immature and adult) females (Fig. 10) show the timing, strength and growth of new recruitment to the population.

In 2012, a total of 27,656 snow crab of all life stages and sexes were captured and processed. The most common invertebrate species captured (and counted), in number, was brittle stars (78,088) followed by snow crab (27,656) and the shrimp group (18,182), whereas the most common species of fish captured was American plaice (36,753) followed by yellowtail flounder (4,040) (Table 6).

In terms of frequency of observation (number of grids with presence) for invertebrates, snow crab was most frequently observed (294 /321 grids) followed by starfish group (254/321) and shrimp group (254/321), and for fish, American plaice (300/321) followed by cod (232/321) (Table 6).

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TABLES

Table 1: Number of grids sampled in total and by quality of tow (QT) for surveys in 1997 to 2012. Quality of tow labels are as follows: QT1 = successful trawl sample and acceptable area swept data; QT2 = successful trawl sample, and the area swept data was estimated by the average area swept of 10 neighbouring stations; QT3 = original trawl set unsuccessful, repeated successful tow near original station and acceptable area swept data; QT4 = original trawl set unsuccessful, repeated successful tow near original station and the area swept data was estimated by the average area swept of 10 neighbouring stations, QT5 = unsuccessful tows and grid abandoned.*

Year of survey	Total	QT1	QT2	QT3	QT4	QT5
1997	259	193	52	12	2	
1998	261	152	97	10	2	
1999	277	132	123	10	12	
2000	280	236	28	12	4	
2001	292	249	23	19	1	
2002	319	285	12	16	6	
2003	317	283	11	22	1	
2004	333	284	49	11	3	
2005	344	304	11	37	3	
2006	354	298	34	21	1	1
2007	355	295	31	25	4	0
2008	355	285	37	32	1	0
2009	355	294	40	20	1	0
2010	354	287	33	28	6	1
2011	353	263	60	25	5	2
2012	321	214	55	41	11	4

Table 2: List of DFO scientific members and 'Marco-Michel' crew and duties[1] by trip number for the 2012 survey.

Trip number	DFO M. Hébert	DFO J.F. Landry	DFOP. DeGrâce	Captain A. LeBlanc	CTD/MSP G. Bourgeois	CTD/MSP W. Aucoin	CTD/MSP N. Chiasson	Meas S. Albert	Mend/oper/MSP M. Dugas
1		X	X	X	X	X	X	X	X
2	X	X		X	X	X	X	X	X
3	X	X		G. Bourgeois	J. Deveaux	X	X	X	X
4	X	X		X	W. Gaudet	X	X	X	X
5	X	X		X	X	X	X	X	X
6		X	X	X	X	X	X	X	X
7	X	X		X	X	X	X	X	X
8	X	X		X	X	X	X	X	B. Tommons

[1] Duties are summarized as: Meas = crab measurements; Mend/oper = net mending and trawl operation; CTD = CTD operation; MSP = multispecies measurements

Table 3: Start and end time of daily fishing operations and corresponding morning (mCtwt) and evening (eCtwt) civil twilight times during the 2012 trawl survey.

Trip number	Date	mCtwt	First tow	Last tow	eCtwt
1	10-Jul-12	4h53	5h19	19h56	21h42
1	11-Jul-12	4h54	5h19	20h40	21h42
1	12-Jul-12	4h55	5h02	13h25	21h41
1	13-Jul-12	4h56	5h41	20h34	21h4
1	14-Jul-12	4h57	5h24	18h44	21h39
2	19-Jul-12	5h03	7h30	21h10	21h35
2	20-Jul-12	5h04	14h35	19h36	21h34
2	21-Jul-12	5h05	5h11	19h56	21h32
2	22-Jul-12	5h07	5h11	20h06	21h31
2	23-Jul-12	5h08	5h14	20h11	21h3
3	30-Jul-12	5h17	5h29	20h34	21h21
3	31-Jul-12	5h18	5h19	20h21	21h2
3	1-Aug-12	5h19	5h16	20h07	21h18
3	2-Aug-12	5h21	5h29	20h50	21h17
3	3-Aug-12	5h22	5h33	20h04	21h15
3	4-Aug-12	5h24	5h20	20h08	21h14
4	11-Aug-12	5h33	5h54	20h24	21h02
4	12-Aug-12	5h35	5h55	18h40	21h02
4	13-Aug-12	5h36	6h00	20h21	20h59
4	14-Aug-12	5h37	5h46	20h29	20h57
4	15-Aug-12	5h39	6h00	16h50	20h55
5	21-Aug-12	5h47	6h08	20h25	20h44
5	22-Aug-12	5h48	6h02	19h13	20h42
5	23-Aug-12	5h5	6h03	20h09	20h41
5	24-Aug-12	5h51	6h03	20h12	20h39
5	25-Aug-12	5h52	6h06	19h47	20h37
6	2-Sep-12	6h03	12h00	20h06	20h21
6	3-Sep-12	6h05	6h12	19h48	20h19
6	4-Sep-12	6h06	6h12	19h15	20h17
6	5-Sep-12	6h07	6h27	16h23	20h15
6	7-Sep-12	6h1	6h32	19h44	20h11
6	8-Sep-12	6h11	6h16	19h41	20h09
7	12-Sep-12	6h16	10h45	19h42	20h01
7	13-Sep-12	6h18	6h25	18h26	29h59
7	16-Sep-12	6h22	6h34	16h45	19h53
8	21-Sep-12	6h28	6h34	19h57	19h43
8	22-Sep-12	6h29	6h49	20h13	19h41
8	23-Sep-12	5h56	6h29	22h44	19h39

Table 4: Survey performance statistics (duration of each trip, number of days at sea, number of tows attempted, number of failed tows, number of successful tows, number of abandoned grids) by trip number and overall for the 2012 trawl survey.

Statistics by trip number	1	2	3	4	5	6	7	8	Total
Duration (days)	5	5	6	5	6	7	5	3	42
Number of days at sea	5	5	6	5	5	6	5	3	40
Number of tows	54	52	66	56	53	61	23	36	401
Failed tows	11	12	10	18	9	1	10	9	80
Successful tows	43	40	56	38	44	60	13	27	321
Incomplete grids	0	0	0	1	1	0	1	1	4

Table 5: Survey performance (number of stations trawled by tow attempt at primary or alternate stations) by trip number for the 2012 trawl survey. The asterisk indicates grids which could not be sampled and were abandoned.

Details of tow sequences by trip number	1	2	3	4	5	6	7	8	Total
First tow (always at primary station)	36	32	47	27	38	59	8	22	269
Second tow (at the primary station)	5	1	0	0	1	0	0	0	7
Third tow (at the primary station)	0	1	0	0	0	0	0	0	1
Fourth tow (at the primary station)	1	0	0	0	0	0	0	0	1
Second tow (at alternate station)	1	6	8	8	5	1	4	2	35
Third tow (at alternate station)	0	0	0	4*	1*	0	2*	4*	11
Fourth tow (at alternate station)	0	0	1	0	0	0	0	0	1

Table 6. Summary of total catches (by number) by species of invertebrates and fish, and number of grids out of 352 sampled where the species were present in the catches of the survey in 2012. Catches identified to larger group rather than species are marked with an asterisk.

Scientific name	Common name	Total number captured	Number of grids where species present
Aspidophoroides monopterygius	Alligatorfish	218	77
Hippoglossoides platessoides	American plaice	36,753	300
Actinauge sp.	Anemones*	3,907	126
Gymnocanthus tricuspis	Arctic staghorn sculpin	1,237	127
Artediellus atlanticus	Atlantic hookear sculpin	43	15
Leptagonus decagonus	Atlantic poacher	362	66
Gorgonocephalus sp.	Basket Star	2,134	127
Ophiacantha sp.	Brittle star*	78,088	20
Mallotus villosus	Capelin	944	44
Gadus morhua	Cod	3,513	232
Lycenchelys paxillus	Common wolf eelpout	1	1
Leptoclinus maculatus	Daubed shanny	18	15
Centroscyllium fabricii	Dogfish	16	2
Liparis gibbus	Dusky seasnail	67	18
Gymnelus viridis	Fish doctor	1	1
Enchelyopus cimbrius	Fourbeard rockling	48	23
Eumesogrammus praecisus	Fourline snakeblenny	81	34
Melanogrammus aeglefinus	Haddock	8	4
Myxine glutinosa	Hag fish	1	1
Hippoglossus hippoglossus	Halibut	9	8
Pagurus sp.	Hermit crab	1,145	174
Clupea harengus	Herring	686	16
Hyas araneus and *Hyas coarctatus*	Hyas*	1,245	180
Clinocardium islandicum	Iceland clam	1,331	28
Atolla sp.	Jellyfish	219	94
Lycodes lavalaei	Laval eelpout	142	84
Phycis chesteri	Longfin hake	21	8
Myoxocephalus octodecemspinosus	Longhorn sculpin	107	35
Cyclopterus lumpus	Lumpfish	6	6
Lophius americanus	Monkfish	2	1
N/A	Moonsnail egg	26	19
Triglops murrayi	Moustache sculpin	129	58
Mytilus edulis	Mussels	4	3
Lithodes maja	Northern stone crab	113	21
Zoarces americanus	Ocean pout	10	7
Rossia megaptera	Bob-tailed squid	9	7
Arctica islandica	Quahog	988	31
Sebastes sp.	Redfish	825	41
Gadus ogac	Rock cod	12	9
Cancer irroratus	Rock crab	303	7
Nezumia bairdii	Roundnose grenadier	438	21
Echinarachnius parma	Sand dollar	17,465	105
Ammodytes sp.	Sand lance	3	1
Placopecten magellanicus	Scallop	88	33
Holothuroidea	Sea cucumber*	756	51

Scientific name	Common name	Total number captured	Number of grids where species present
Aphrodita hastata	Sea mouse	57	11
Pennatula sp.	Sea pen	1,151	3
Boltenia ovifera	Sea potato	1,551	66
Hemitripterus americanus	Sea raven	13	12
Careproctus reinhardti	Sea tadpole	3	3
Strongylocentrotus sp.	Sea urchin	17,823	188
Polychaeta	Sea worm	4	4
Myoxocephalus scorpius	Shorthorn sculpin	110	52
Decapoda	Shrimp*	18,182	237
Merluccius bilinearis	Silver hake	23	13
N/A	Skate egg	494	11
Malacoraja senta	Smooth skate	119	29
Lumpenus lampretaeformis	Snakeblenny	301	46
Chionoecetes opilio	Snow crab	27,656	294
Icelus spatula	Spatulate sculpin	66	30
Eumicrotremus spinosus	Spiny lumpsucker	10	7
Porifera	Sponge	274	46
Illex illecebrosus	Squid	15	9
Asteroidea	Starfish*	13,177	254
Anisarchus medius	Stout eelblenny	1	1
Amblyraja radiata	Thorny skate	323	62
Reinhardtius hippoglossoides	Turbot	74	26
Icelus bicornis	Twohorn sculpin	70	30
Lycodes vahlii	Vahl's eelpout	20	12
Buccinidae	Whelk*	2,209	199
N/A	Whelk egg	166	70
Urophycis tenuis	White hake	201	25
Pseudopleuronectes americanus	Winter flounder	438	18
Leucoraja ocellata	Winter skate	3	3
Glyptocephalus cynoglossus	Witch flounder	689	74
Anarhichas lupus	Wolf fish	2	1
Cryptacanthodes maculatus	Wrymouth	3	3
Limanda ferruginea	Yellowtail flounder	4,040	121

Anemones, brittle stars, sea cucumber, decapods (shrimp), star fish, whelks and *Hyas* sp. are marked with an asterisk and catches were not identified to species

Table 7: Number of commercial-sized (>= 95 mm carapace width) adult male crabs captured during the survey, mean number of crabs per tow (unadjusted), estimated mean weight of commercial-sized adult crabs, and mean density (number per km²) of commercial crab, number of grids sampled and mean swept area of successful tows, for the surveys from 1988 to 2012.

Year	Number of crabs sampled	Crabs per tow	Mean weight (g)	Crab density (number per km²)	Number of grids sampled	Mean swept area (m²)
1997	1,335	5	600	2,383	213	2,245
1998	1,419	5	596	2,258	215	2,352
1999	1,472	5	563	2,166	225	2,542
2000	1,346	5	587	1,798	224	2,717
2001	1,724	6	540	2,168	225	2,658
2002	1,913	6	546	2,530	229	2,504
2003	2,682	9	560	3,150	226	2,921
2004	3,321	10	577	3,221	229	3,200
2005	2,327	7	585	2,656	233	2,778
2006	2,302	7	616	2,558	259	2,850
2007	1,911	5	610	2,252	259	2,768
2008	1,431	4	611	1,787	259	2,658
2009	900	3	610	1,029	259	2,847
2010	1,057	3	607	1,280	258	2,734
2011	1,970	6	584	2,036	257	2,708
2012	2,093	7	566	2,359	321	2,677

FIGURES

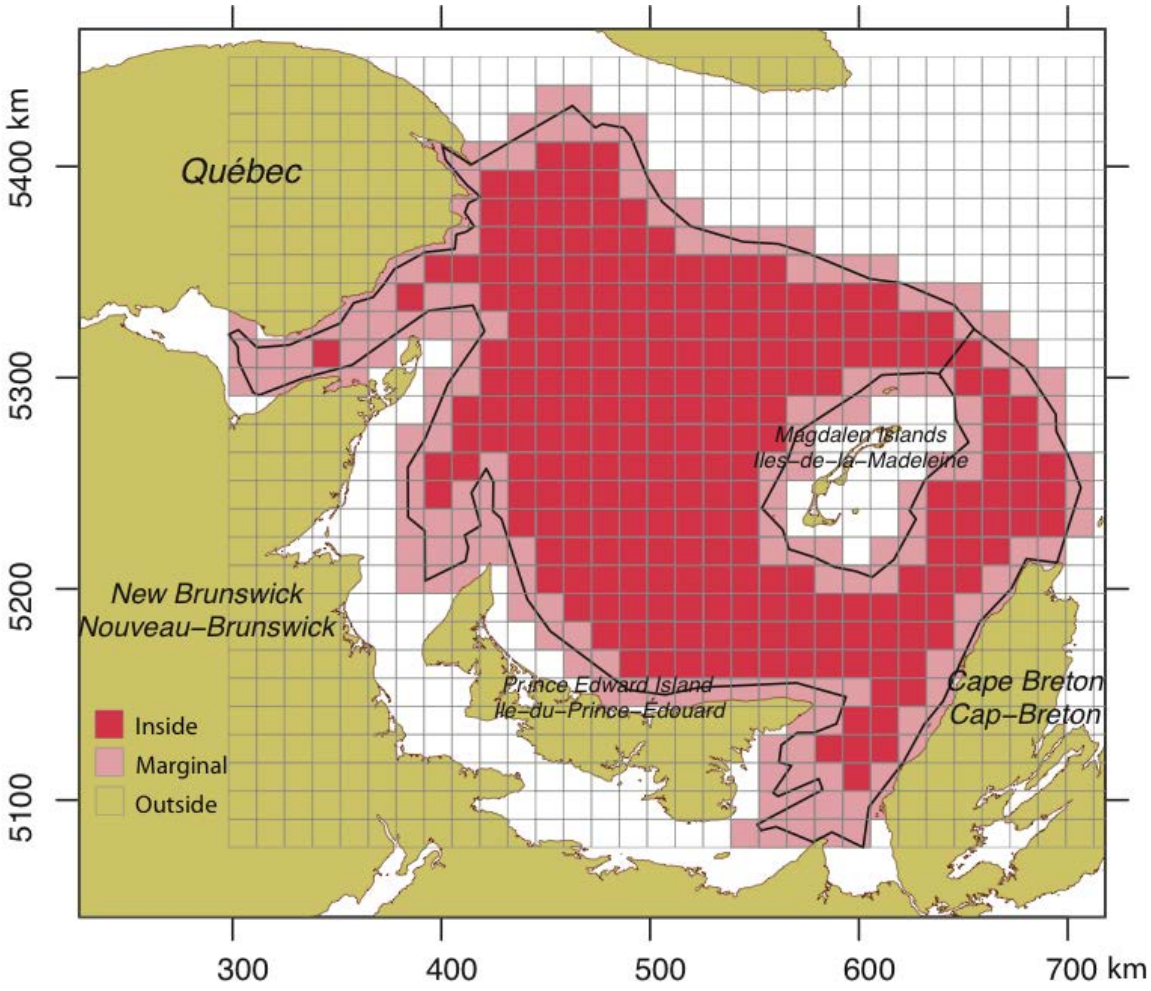

Figure 1: Snow crab/multi-species survey grid sampling design for the southern Gulf of St. Lawrence in 2012. There are a total of 325 sampling grids defined by squares measuring 13.36 by 13.36 kilometres.

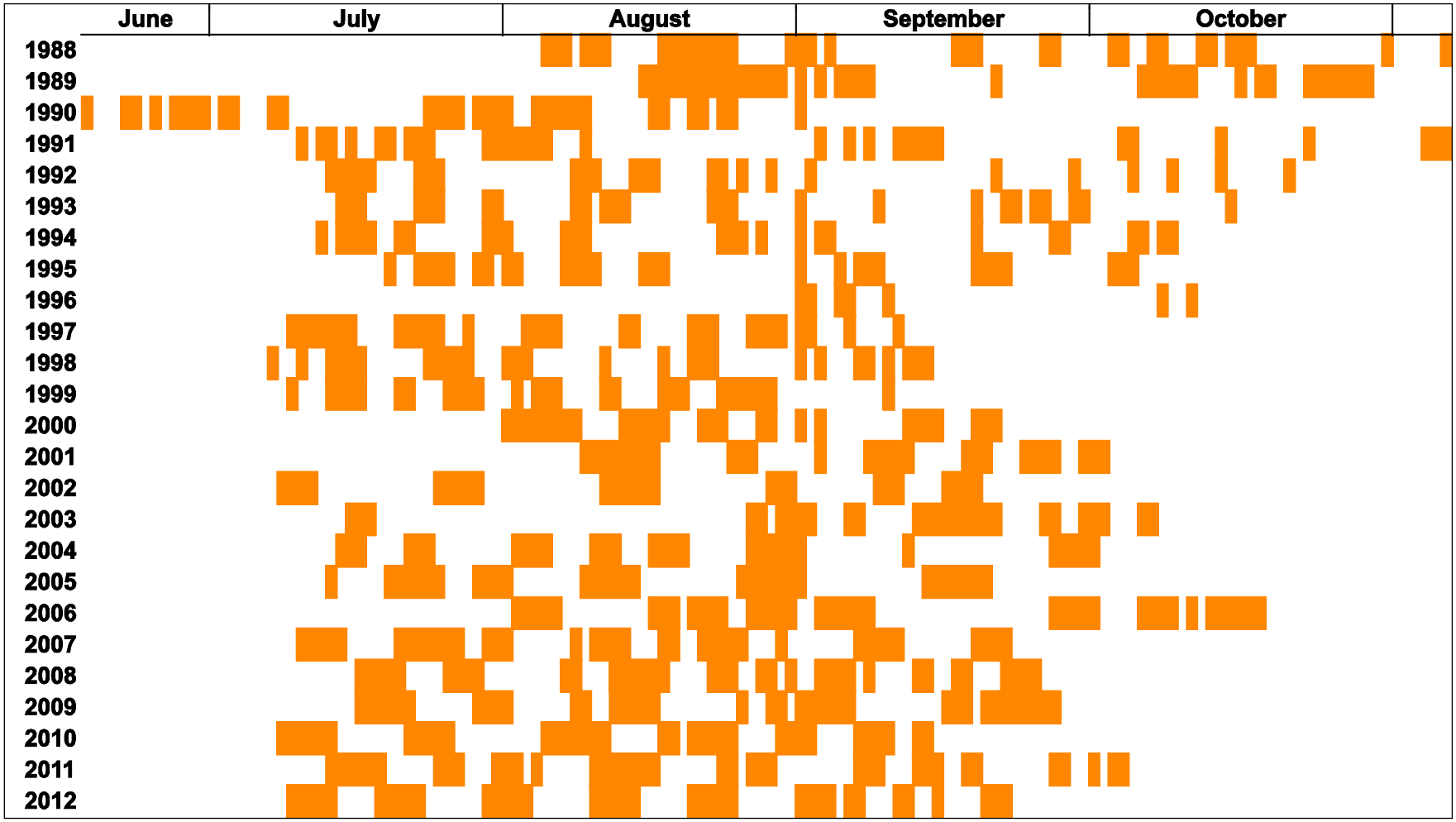

Figure 2: Summary information on the timing (start and end dates) and duration of individual trips for the snow crab/multi-species survey, 1988 to 2012.

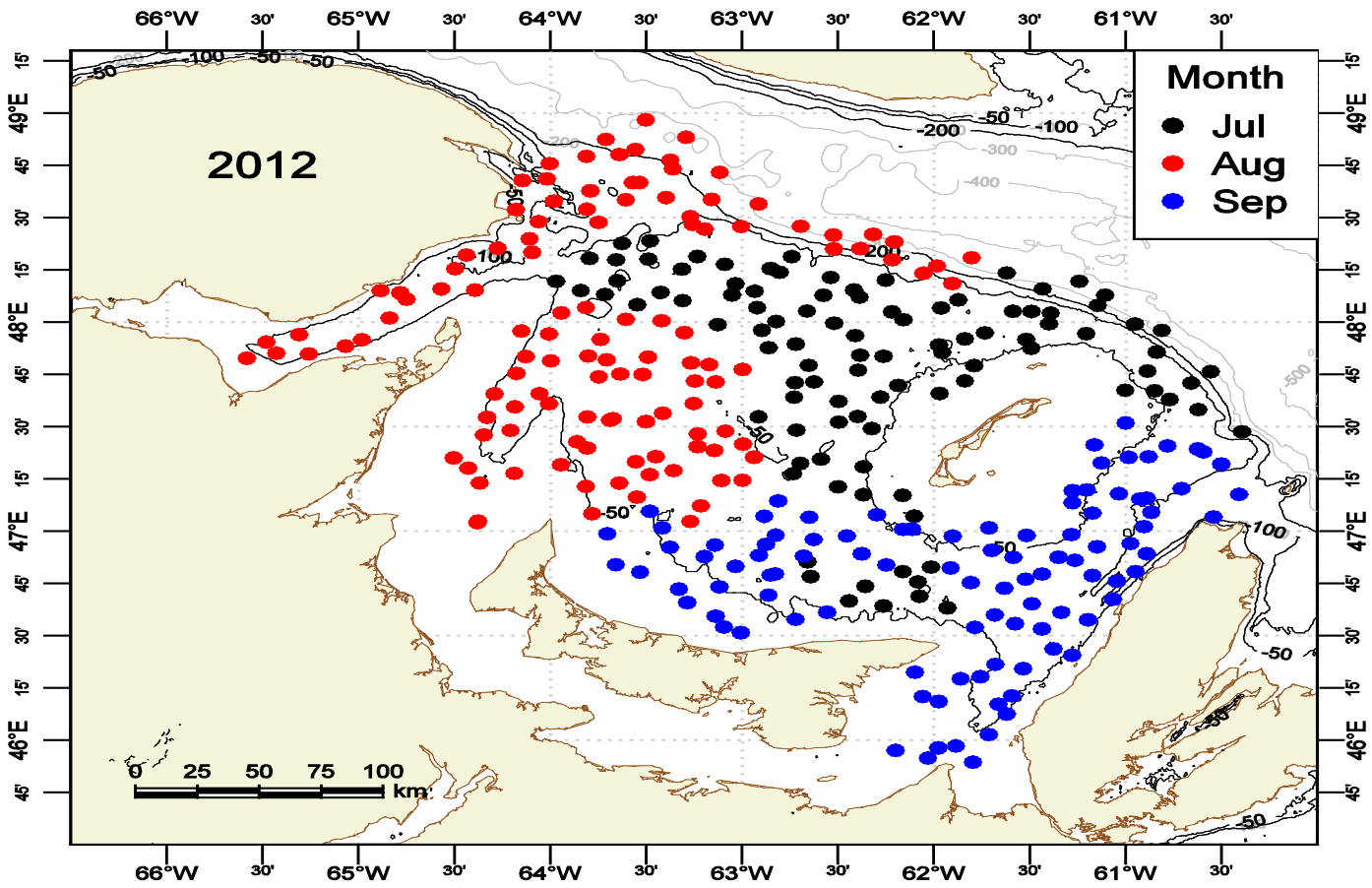

Figure 3: Monthly geographic distribution of stations trawled during the 2012 snow crab/multi-species survey.

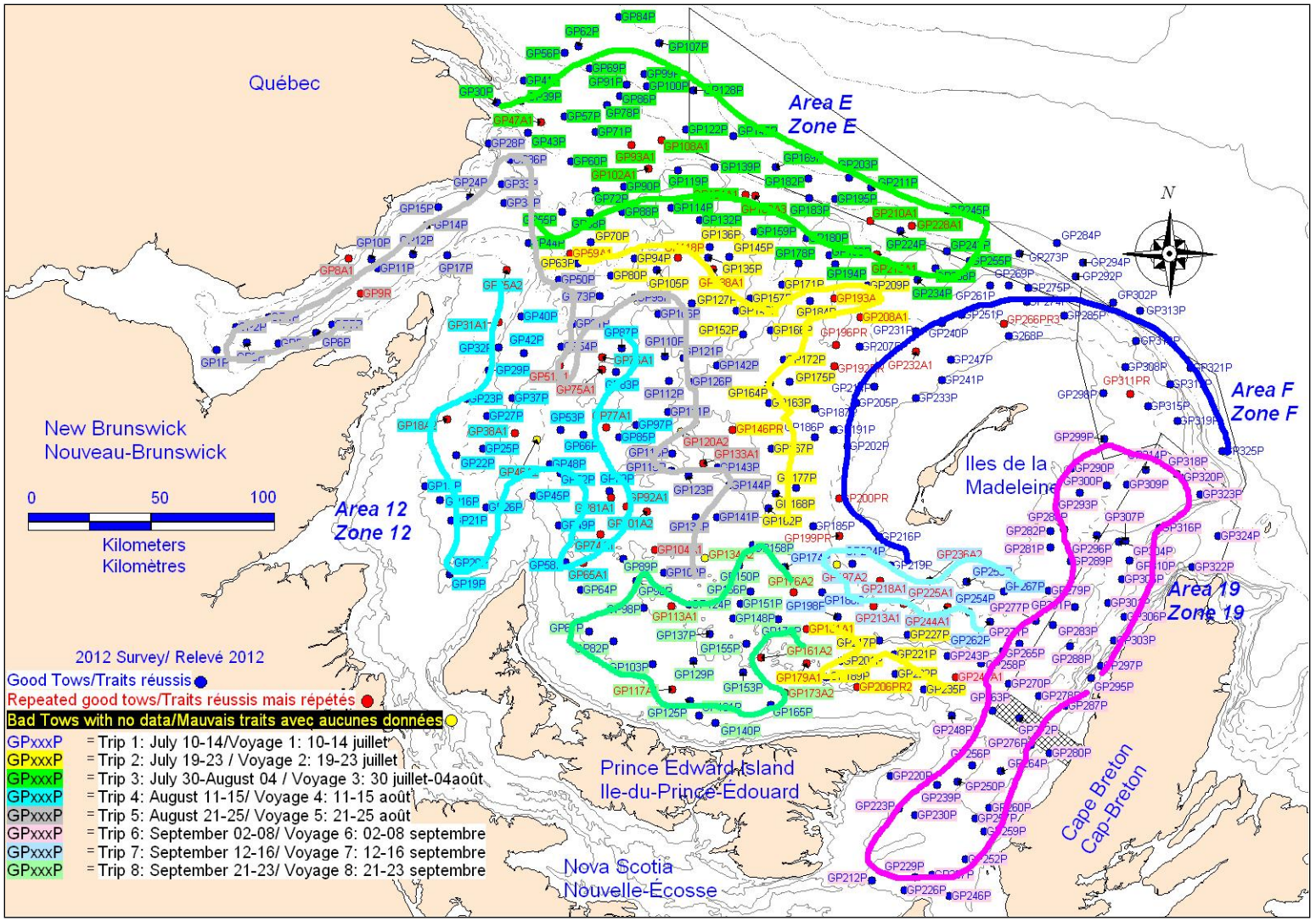

Figure 4: Itinerary and sequence of stations sampled by trip during the 2012 snow crab/multi-species survey.

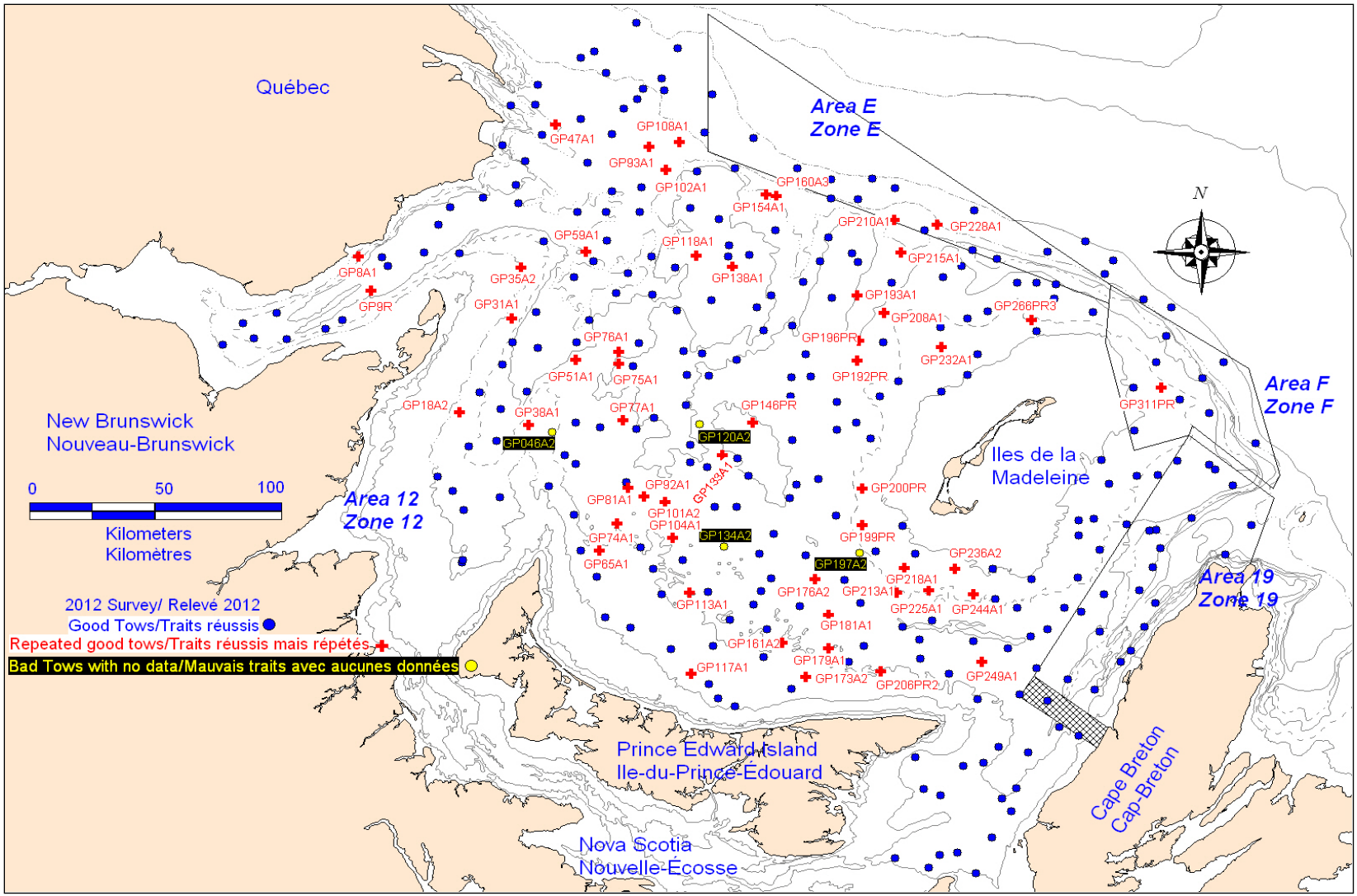

Figure 5: Distribution of survey stations relative to the tow quality during the 2012 snow crab/multi-species survey.

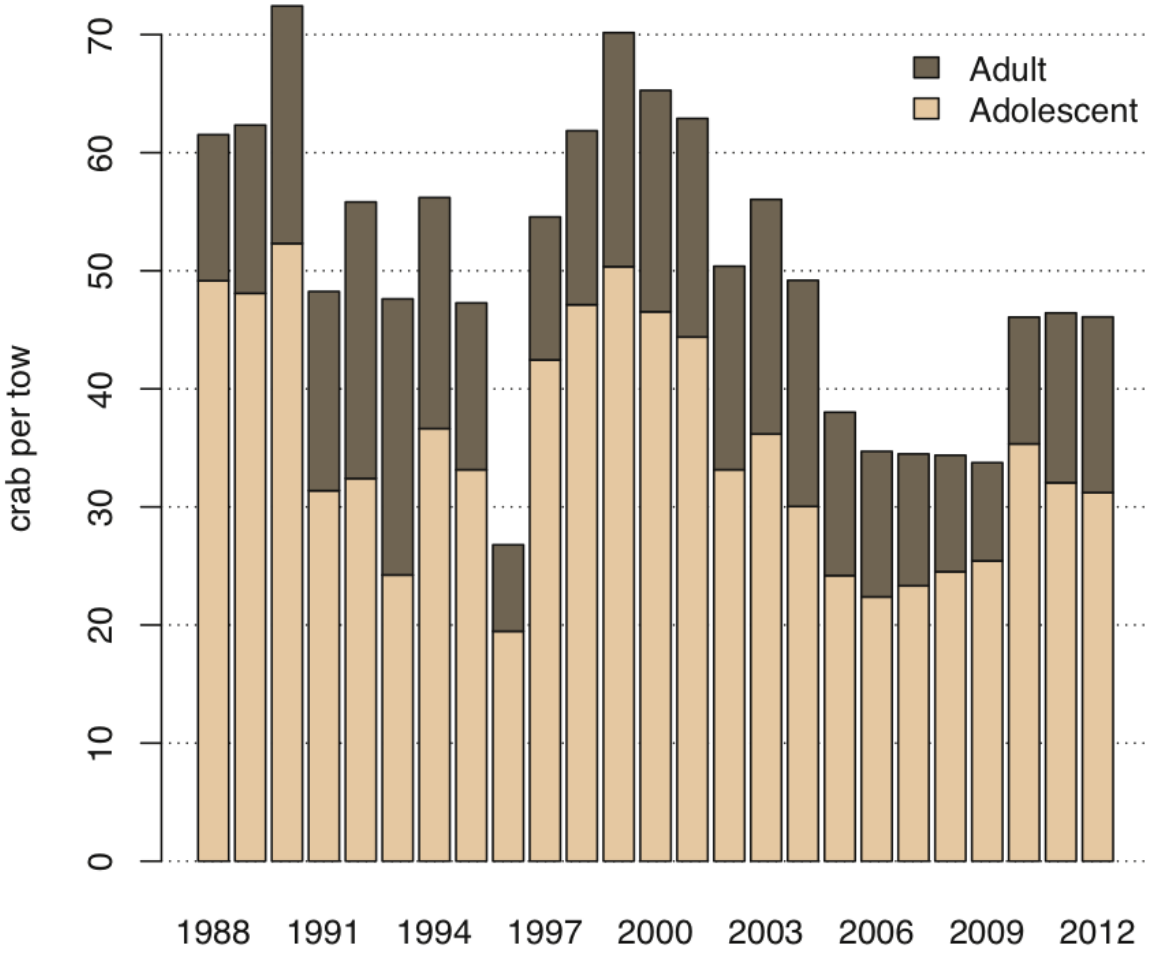

Figure 6: Mean number of male snow crabs per tow by maturity stage (adult vs adolescent) sampled during the snow crab/multi-species surveys of 1988 to 2012.

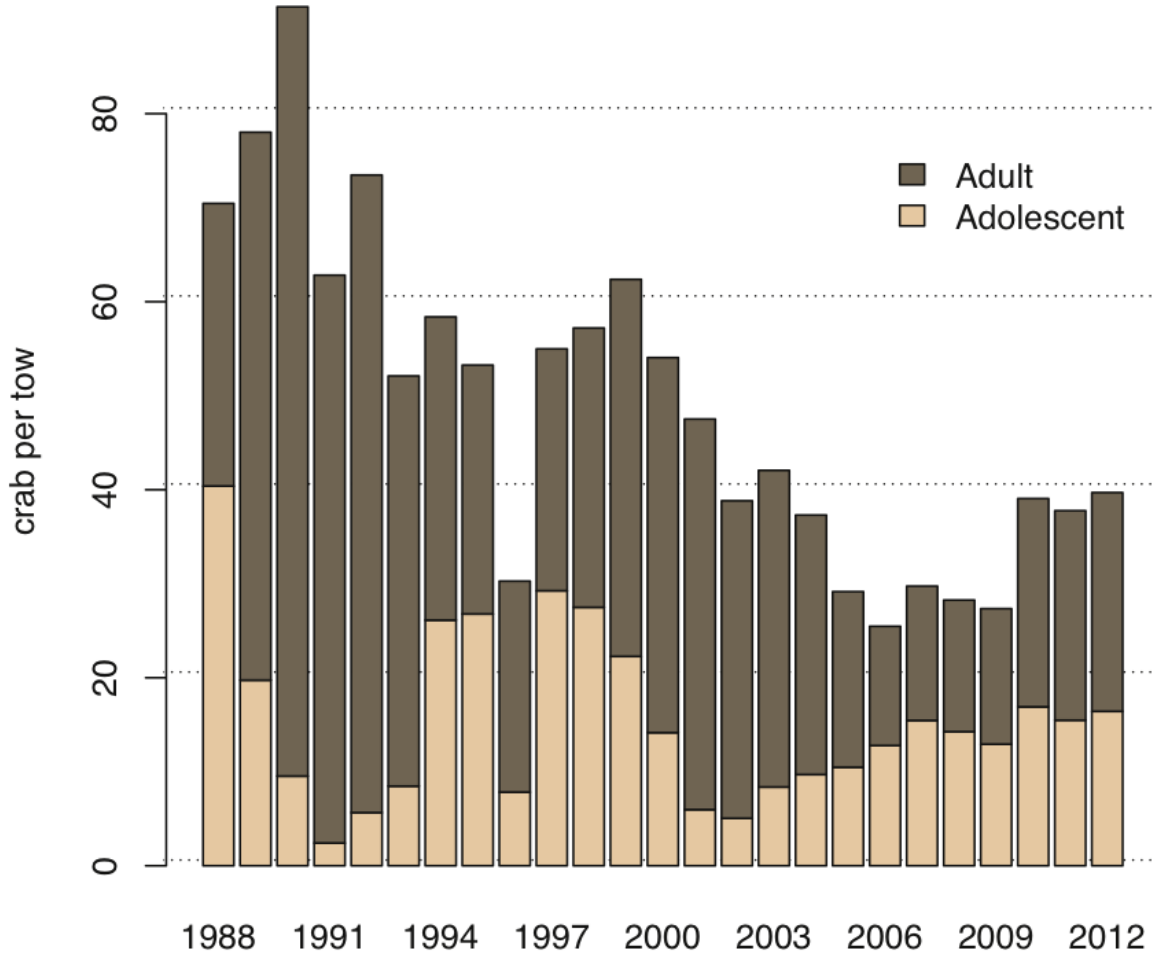

Figure 7: Mean number of female snow crabs per tow by maturity stage (adult vs adolescent) sampled during the snow crab/multi-species surveys of 1988 to 2012.

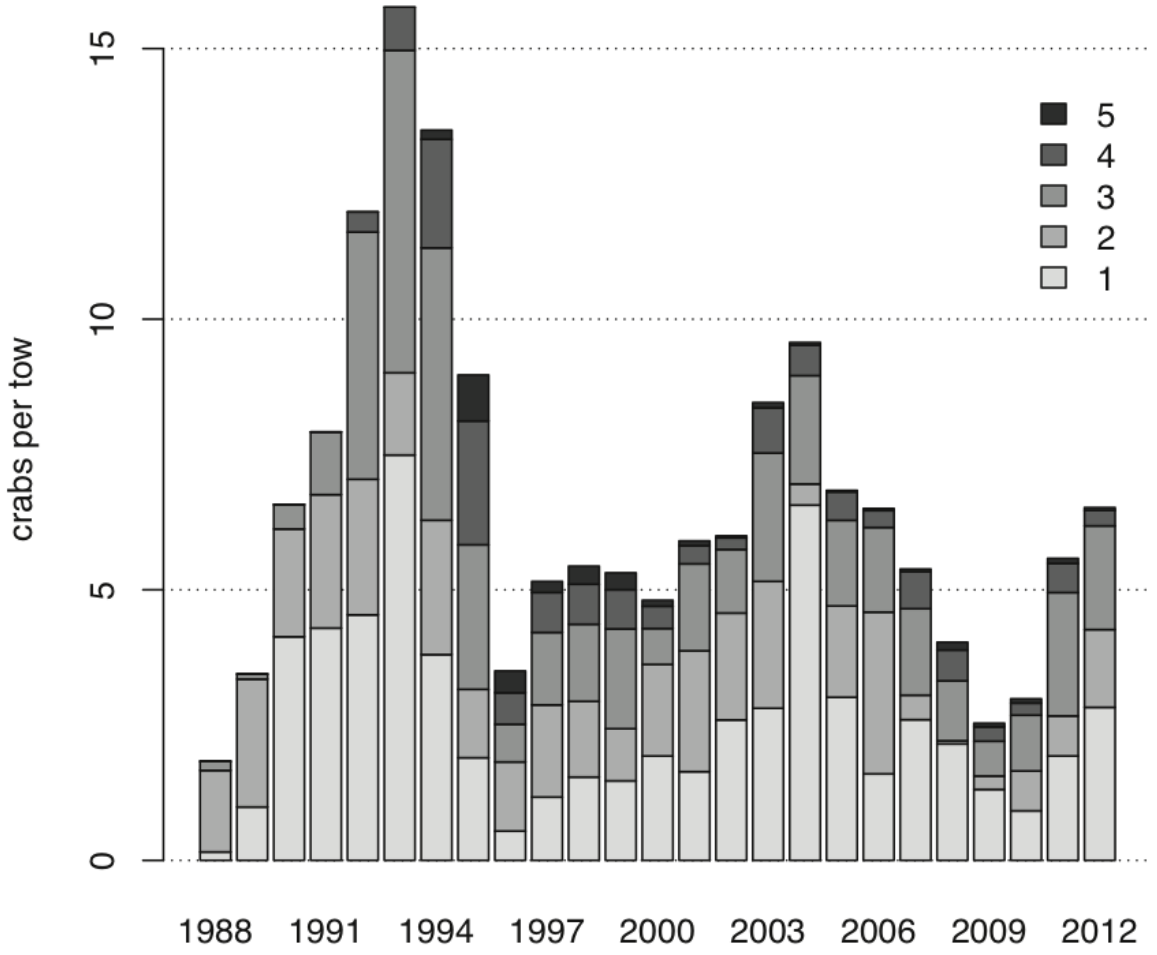

Figure 8: Mean number of commercial-sized adult male snow crabs per tow and by shell condition sampled during the snow crab/multi-species surveys of 1988 to 2012.

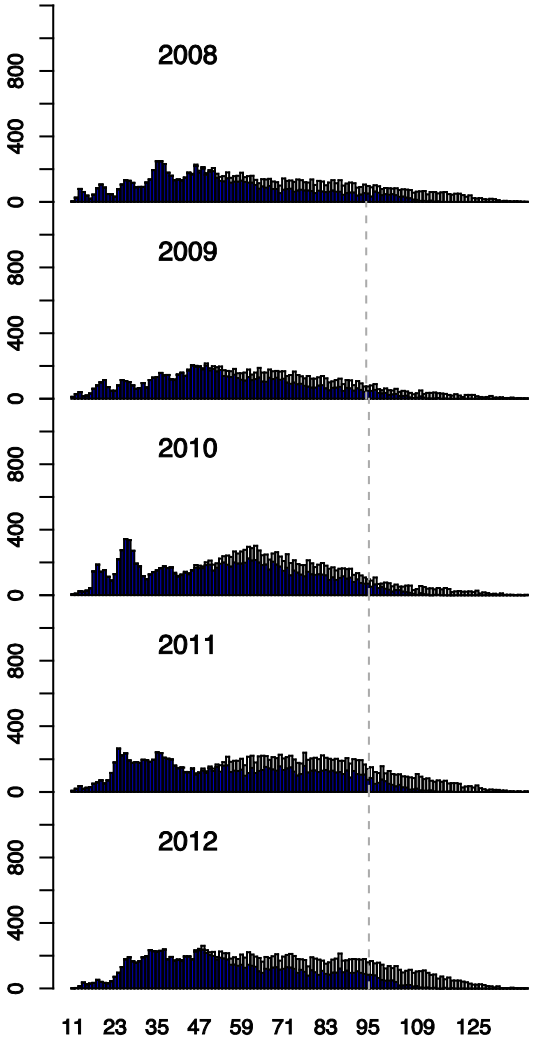

Figure 9: Size frequency distributions for male snow crabs based on samples from the post-fishery trawl surveys in the southern Gulf of St. Lawrence, 2008 to 2012. White bars represent adults and coloured bars immatures/adolescents.

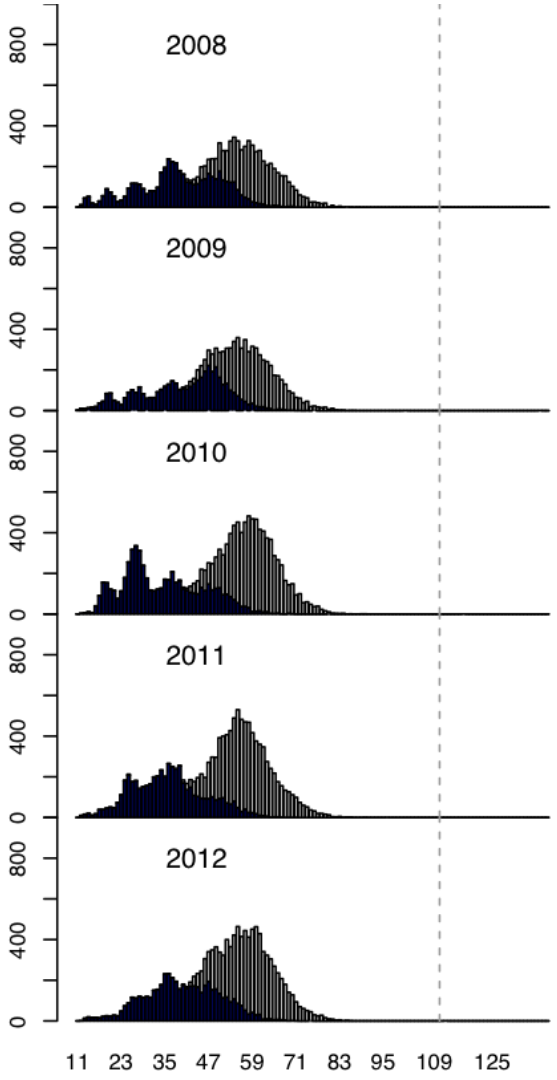

Figure 10: Size frequency distributions for female snow crabs based on samples from the post-fishery trawl surveys in the southern Gulf of St. Lawrence, 2008 to 2012. Light bars represent adults and dark bars immatures/adolescents.

APPENDIX

Appendix 1: Individual trawl sample details for 2012: date, sequential daily tow number, position (Latitude, Longitude), swept area estimate (AS, m²), depth (m) of station, bottom temperature (T, ºC) at station, catches in number and weight of commercial-sized adult male snow crab of carapace condition 1 and 2 (rC/tow and rW/tow, respectively), catches in number and weight of commercial-sized adult male snow crab of carapace conditions 3, 4 and 5 (RC/tow and RW/tow, respectively), and tow quality indicator (TQ). Tow quality indices represent: 1 = successful trawl sample and acceptable area swept data; 2 = successful trawl sample, and the area swept data was estimated by the average area swept of 10 neighbouring stations; 3 = original trawl set unsuccessful, repeated successful tow near original station and acceptable area swept data; 4 = original trawl set unsuccessful, repeated successful tow near original station and the area swept data was estimated by the average area swept of 10 neighbouring stations.*

Date (dd/mm/yyyy)	Tow number	Latitude	Longitude	AS (m²)	Depth (m)	T (ºC)	rC/tow (number)	rW/tow (kg)	RC/tow (number)	RW/tow (kg)	TQ*
10/07/2012	3	47.6301	-60.7695	2702	54.9	1.7	0	0	0	0	1
10/07/2012	7	47.7657	-60.8853	2933	62.2	1.3	3	2.216	0	0	1
10/07/2012	8	47.7085	-60.6575	2096	80.5	1.5	3	1.914	0	0	1
10/07/2012	9	47.7629	-60.5558	2003	285.3	5.6	0	0	0	0	1
10/07/2012	10	47.8569	-60.837	2206	82.3	1.6	0	0	0	0	1
10/07/2012	11	47.9605	-60.8105	2561	343.8	5.5	0	0	0	0	1
11/07/2012	1	47.9447	-61.2052	2428	62.2	1.3	0	0	0	0	1
11/07/2012	2	47.9908	-60.9509	2537	278.0	5.8	0	0	0	0	1
11/07/2012	4	48.129	-61.1063	2229	356.6	5.5	0	0	0	0	1
11/07/2012	5	48.1955	-61.2407	2062	387.7	5.3	0	0	0	0	1
11/07/2012	6	48.1592	-61.4323	2661	237.7	5.8	0	0	0	0	1
11/07/2012	7	48.0521	-61.5871	3547	65.8	1	3	1.706	0	0	1
11/07/2012	8	48.051	-61.4904	2937	69.5	1.2	0	0	0	0	1
11/07/2012	9	48.0434	-61.3901	2982	75.0	1.3	0	0	0	0	1
11/07/2012	10	47.9921	-61.3989	3203	64.0	1	11	6.236	0	0	1
12/07/2012	1	47.8752	-61.4921	2907	49.4	0.6	0	0	0	0	1
12/07/2012	5	47.9485	-61.7332	3499	64.0	1.2	14	7.232	2	0.865	1
13/07/2012	3	47.7918	-61.7894	2587	47.5	0.6	16	9.403	1	0.478	1
13/07/2012	4	47.719	-61.8375	2625	36.6	1.3	0	0	0	0	1
13/07/2012	6	47.6974	-62.1851	2929	53.0	0.3	7	3.621	1	0.402	1
13/07/2012	7	47.8368	-62.2619	2881	60.4	0.9	4	1.927	2	1.003	1
13/07/2012	12	47.6414	-62.2784	2958	54.9	0.6	7	3.464	0	0	1
13/07/2012	13	47.6209	-62.4965	3420	78.6	0.9	20	9.34	15	7.054	1
14/07/2012	1	47.5215	-62.4948	3178	76.8	0.9	21	9.849	5	2.279	1
14/07/2012	2	47.5486	-62.3963	2880	65.8	0.6	12	5.184	10	4.217	1
14/07/2012	3	47.4908	-62.3231	2953	60.4	0.2	3	1.223	2	0.77	1
14/07/2012	6	47.2122	-62.4993	3374	60.4	0.3	1	0.36	0	0	1
14/07/2012	9	47.1714	-62.1626	1710	38.4	2.9	0	0	0	0	1
14/07/2012	10	47.0718	-62.1016	2620	45.7	0.7	0	0	0	0	1

Date (dd/mm/yyyy)	Tow number	Latitude	Longitude	AS (m²)	Depth (m)	T (ºC)	rC/tow (number)	rW/tow (kg)	RC/tow (number)	RW/tow (kg)	TQ*
19/07/2012	1	46.6332	-61.9284	3613	56.7	0.9	0	0	0	0	1
19/07/2012	2	46.6886	-62.0744	2874	58.5	0.6	5	2.538	1	0.38	1
19/07/2012	3	46.7574	-62.0825	2843	67.7	0.4	41	25.384	10	6.231	1
19/07/2012	4	46.8281	-62.0143	3219	69.5	0.3	15	8.367	10	5.528	1
19/07/2012	5	46.8066	-62.162	2565	71.3	0.2	14	7.338	11	5.723	1
19/07/2012	6	46.7361	-62.357	2873	64.0	0.6	43	27.385	0	0	1
19/07/2012	10	46.6663	-62.4418	2943	60.4	0.9	10	6.378	0	0	1
21/07/2012	1	47.2748	-62.7336	1765	65.8	0.7	7	3.759	3	1.42	1
21/07/2012	2	47.3239	-62.6961	2761	65.8	0.4	1	1.096	0	0	1
21/07/2012	3	47.3446	-62.5887	3696	75.0	0.7	42	20.789	16	8.455	1
21/07/2012	4	47.4831	-62.7162	2791	54.9	0.7	0	0	0	0	1
21/07/2012	7	47.6411	-62.7284	2960	75.0	0.7	6	2.715	1	0.453	1
21/07/2012	8	47.7103	-62.724	2468	62.2	0.6	0	0	0	0	1
21/07/2012	10	47.7932	-62.6522	2899	65.8	0.9	7	3.302	1	0.466	1
21/07/2012	12	47.895	-62.7192	3111	73.2	1.5	10	5.314	2	1.183	1
22/07/2012	3	48.0491	-62.2178	3659	82.3	1.7	3	1.35	3	1.35	1
22/07/2012	8	48.003	-62.8219	2695	76.8	1.2	5	3.056	3	1.736	1
22/07/2012	9	47.9613	-62.8966	3084	71.3	1	8	4.761	1	0.366	1
22/07/2012	10	47.9879	-63.1269	3362	56.7	1	3	1.374	0	0	1
23/07/2012	2	48.1831	-63.034	2908	76.8	1	11	5.232	1	0.483	1
23/07/2012	3	48.1303	-63.0516	3207	67.7	1	2	1.052	0	0	1
23/07/2012	6	48.1025	-63.3089	3215	73.2	1	2	0.8	0	0	1
23/07/2012	7	48.1422	-63.4241	3864	91.4	1.7	9	4.955	4	2.195	1
23/07/2012	8	48.0835	-63.5462	1914	98.8	1.6	13	6.809	5	2.621	1
23/07/2012	9	48.1328	-63.7141	3758	93.3	1.5	9	4.826	6	3.021	1
30/07/2012	2	48.3053	-63.795	2993	86.0	1.6	6	3.898	3	2.123	1
30/07/2012	3	48.298	-63.656	2666	89.6	1.6	1	0.357	1	0.357	1
30/07/2012	4	48.3768	-63.6255	4869	102.4	2	13	6.964	3	1.492	1
30/07/2012	6	48.3016	-63.4883	3962	102.4	2.9	6	2.761	2	0.913	1
30/07/2012	8	48.2763	-63.0902	2966	58.5	1.2	3	1.583	0	0	1
31/07/2012	3	48.2384	-62.8037	3667	80.5	1.6	5	2.387	1	0.415	1
31/07/2012	4	48.2135	-62.5377	3370	69.5	1.2	1	0.423	0	0	1
31/07/2012	5	48.1285	-62.5757	3075	75.0	1.2	11	4.772	5	2.378	1
31/07/2012	6	48.1532	-62.4159	3024	64.0	1.2	0	1.67	0	0	1
31/07/2012	7	48.1196	-62.3868	2751	62.2	1.3	2	0.765	2	0.765	1
31/07/2012	10	48.0675	-61.9621	2445	69.5	1.3	10	5.242	2	1.174	1
31/07/2012	11	48.1065	-61.8714	3050	75.0	1.7	2	1.131	2	1.131	1
31/07/2012	12	48.235	-61.6196	2316	332.8	5.6	0	0	0	0	1
01/08/2012	2	48.1847	-61.9031	2232	84.1	2.3	1	0.538	1	0.538	1
01/08/2012	8	48.3838	-62.205	3204	301.8	5.8	0	0	0	0	1
01/08/2012	9	48.4197	-62.3163	3117	365.8	5.6	0	0	0	0	1
01/08/2012	10	48.3516	-62.3829	3452	257.9	5.6	1	0.39	0	0	1
01/08/2012	11	48.3502	-62.5211	2407	168.2	5.1	0	0	0	0	1

Date (dd/mm/yyyy)	Tow number	Latitude	Longitude	AS (m²)	Depth (m)	T (ºC)	rC/tow (number)	rW/tow (kg)	RC/tow (number)	RW/tow (kg)	TQ*
02/08/2012	1	48.4166	-62.5236	2831	332.8	5.6	0	0	0	0	1
02/08/2012	4	48.4577	-63.0054	2747	96.9	2.3	3	1.407	1	0.503	1
02/08/2012	5	48.4451	-63.1948	2206	69.5	1.2	0	0	0	0	1
02/08/2012	12	48.5869	-63.1586	2772	219.5	5.3	7	4.035	7	4.035	1
03/08/2012	2	48.7333	-63.3605	1813	210.3	4.9	0	0	0	0	1
03/08/2012	4	48.8845	-63.2924	2409	349.3	5.6	0	0	0	0	1
03/08/2012	5	48.9678	-63.5025	1604	347.5	5.6	0	0	0	0	1
03/08/2012	7	48.7931	-63.8117	1665	175.6	4.5	2	1.568	1	0.901	1
03/08/2012	8	48.8019	-63.6398	1923	212.1	4.9	0	0	0	0	1
04/08/2012	2	48.6675	-63.5351	2663	162.8	4.3	8	3.593	8	3.593	1
04/08/2012	3	48.6677	-63.5699	1589	157.3	4.2	1	0.439	1	0.439	1
04/08/2012	4	48.5852	-63.6059	2955	120.7	2.8	0	0	0	0	1
04/08/2012	5	48.4775	-63.7482	2811	146.3	3.5	6	4.227	0	0	1
04/08/2012	7	48.6282	-63.7905	1903	139.0	4	0	0	0	0	1
04/08/2012	10	48.678	-64.1444	4219	91.4	2.3	11	6.447	2	0.971	1
11/08/2012	4	47.9433	-64.0063	3703	87.8	1.6	5	2.841	2	0.869	1
11/08/2012	7	47.8353	-64.1275	2233	73.2	1.5	6	3.277	2	1.115	1
11/08/2012	9	47.7548	-64.1765	2992	71.3	1.5	6	3.171	1	0.359	1
11/08/2012	11	47.5948	-64.1844	2099	65.8	1.3	11	6.665	0	0	1
12/08/2012	5	47.4818	-64.2068	3098	60.4	1.3	14	8.391	3	2.075	1
12/08/2012	6	47.4603	-64.3463	3900	51.2	1.6	7	4.946	0	0	1
12/08/2012	7	47.3504	-64.5035	2420	40.2	4	0	0	0	0	1
12/08/2012	8	47.3013	-64.4277	2580	42.1	1.6	1	0.413	1	0.413	1
12/08/2012	9	47.2302	-64.3686	3504	45.7	1.7	7	5.215	0	0	1
12/08/2012	10	47.0483	-64.3762	3084	38.4	4	0	0	0	0	1
12/08/2012	11	47.0399	-64.3801	3055	38.4	4	0	0	0	0	1
13/08/2012	2	47.3174	-63.9444	3447	40.2	1.3	0	0	0	0	1
13/08/2012	3	47.2141	-63.8144	2501	49.4	1.2	0	0	0	0	1
13/08/2012	4	47.0835	-63.782	2953	49.4	1.2	0	0	0	0	1
14/08/2012	4	47.3321	-63.5543	3283	65.8	0.9	7	3.526	1	0.401	1
14/08/2012	6	47.4277	-63.8604	3085	60.4	1.3	15	7.8	1	0.465	1
14/08/2012	12	47.5463	-63.8059	2405	67.7	1.2	11	6.3	0	0	1
15/08/2012	5	47.7496	-63.5181	3490	82.3	1	19	9.518	0	0	1
15/08/2012	6	47.8324	-63.4903	3100	67.7	0.9	3	1.297	1	0.483	1
21/08/2012	1	47.8272	-65.5818	1784	40.2	1.6	3	2.387	0	0	1
21/08/2012	2	47.9044	-65.4804	3362	54.9	1.3	3	2.278	0	0	1
21/08/2012	3	47.8517	-65.4283	1759	60.4	1.7	1	0.515	0	0	1
21/08/2012	4	47.9401	-65.3096	1767	62.2	1.6	6	4.869	1	0.649	1
21/08/2012	5	47.8479	-65.259	2377	65.8	1.7	4	2.608	3	1.649	1
21/08/2012	7	47.9159	-64.982	2371	71.3	1.7	1	0.417	0	0	1
22/08/2012	1	48.1399	-64.7823	2330	93.3	1.7	0	0	0	0	1
22/08/2012	2	48.1096	-64.7495	1996	86.0	1.7	2	1.161	1	0.559	1
22/08/2012	3	48.1587	-64.5679	2740	91.4	1.9	6	3.283	0	0	1

Date (dd/mm/yyyy)	Tow number	Latitude	Longitude	AS (m²)	Depth (m)	T (ºC)	rC/tow (number)	rW/tow (kg)	RC/tow (number)	RW/tow (kg)	TQ*
22/08/2012	6	48.3208	-64.437	2643	115.2	1.7	7	4.258	1	0.386	1
22/08/2012	7	48.3532	-64.2741	2784	115.2	2.3	12	7.124	1	0.584	1
22/08/2012	8	48.3339	-64.0943	3545	89.6	2.2	0	0	0	0	1
22/08/2012	9	48.3983	-64.108	3204	69.5	2.2	0	0	0	0	1
22/08/2012	10	48.4808	-64.0615	2080	117.0	1.9	6	3.293	5	2.892	1
22/08/2012	11	48.5385	-64.1792	2797	82.3	1.7	13	8.138	3	1.523	1
23/08/2012	4	47.8379	-63.8022	1746	84.1	1.7	7	3.519	2	0.777	1
23/08/2012	5	47.9171	-63.738	2333	86.0	1.9	4	2.038	2	1.07	1
23/08/2012	6	48.0698	-63.814	1865	100.6	2.2	2	1.154	0	0	1
23/08/2012	7	48.0136	-63.6054	3354	84.1	2	9	4.691	4	2.228	1
23/08/2012	8	48.0068	-63.4196	3617	80.5	1.7	5	2.389	2	0.936	1
23/08/2012	10	47.8052	-63.2662	3162	82.3	1.6	12	5.552	1	0.384	1
24/08/2012	2	47.7738	-62.9969	3185	71.3	2	7	3.3	1	0.48	1
24/08/2012	4	47.7183	-63.2457	3365	82.3	1.6	9	5.266	2	1.089	1
24/08/2012	5	47.6105	-63.2518	3352	84.1	1.3	24	12.849	8	4.065	1
25/08/2012	1	47.4655	-63.2309	2284	86.0	1.3	25	12.238	18	8.748	1
25/08/2012	2	47.4048	-63.2316	3454	71.3	1	21	12.068	9	4.31	1
25/08/2012	3	47.3865	-63.1445	3384	75.0	1.2	15	7.849	3	1.913	1
25/08/2012	6	47.4167	-62.9949	2662	56.7	0.9	3	1.878	0	0	1
25/08/2012	7	47.3535	-62.9371	2392	54.9	0.9	4	2.626	0	0	1
25/08/2012	8	47.2437	-62.9976	3112	62.2	1	9	4.725	1	0.381	1
25/08/2012	9	47.2425	-63.1078	3376	69.5	1	8	4.131	1	0.482	1
25/08/2012	12	47.0467	-63.2699	2622	60.4	0.7	24	13.251	1	0.459	1
02/09/2012	1	46.8922	-60.8897	2020	115.2	2.8	9	6.826	9	6.826	1
02/09/2012	2	46.9406	-60.9747	2834	107.9	2.6	6	4.52	2	1.89	1
02/09/2012	3	47.0219	-60.904	3126	111.6	3.9	5	3.406	3	2.007	1
02/09/2012	4	47.0905	-60.8658	3171	135.3	4.5	25	14.514	16	9.298	1
02/09/2012	7	47.2035	-60.7078	2332	104.2	2.6	1	0.556	0	0	1
02/09/2012	8	47.0678	-60.5408	3543	131.7	3.5	9	6.667	4	3.13	1
03/09/2012	1	47.1759	-60.4077	2119	182.9	6.1	0	0	0	0	1
03/09/2012	2	47.3206	-60.5008	2487	65.8	2.3	2	1.013	0	0	1
03/09/2012	3	47.3788	-60.5941	3078	67.7	2.2	3	1.49	2	1.107	1
03/09/2012	5	47.4079	-60.7818	2541	62.2	2.3	10	4.834	4	1.84	1
03/09/2012	6	47.3562	-60.8797	2671	65.8	2.3	13	8.481	11	7.252	1
03/09/2012	9	47.4129	-61.162	2433	38.4	2.3	1	0.767	0	0	1
03/09/2012	10	47.3262	-61.1255	2378	51.2	2.2	3	1.619	0	0	1
04/09/2012	2	46.6114	-61.3353	1963	78.6	2.2	15	9.214	12	7.64	1
04/09/2012	3	46.5324	-61.4357	2979	64.0	1.6	10	6.6	9	5.746	1
04/09/2012	4	46.5572	-61.5764	3085	60.4	1.3	34	23.816	28	20.125	1
04/09/2012	5	46.6525	-61.4882	3093	65.8	1.1	20	13.766	17	12.106	1
04/09/2012	6	46.7701	-61.5214	3053	69.5	0.8	14	9.373	13	8.714	1
04/09/2012	7	46.7948	-61.4356	1639	65.8	0.7	13	9.118	13	9.118	1
04/09/2012	8	46.8753	-61.3493	2769	60.4	1.7	7	3.764	7	3.764	1

Date (dd/mm/yyyy)	Tow number	Latitude	Longitude	AS (m²)	Depth (m)	T (ºC)	rC/tow (number)	rW/tow (kg)	RC/tow (number)	RW/tow (kg)	TQ*
04/09/2012	9	46.8607	-61.2639	2968	60.4	1.3	19	13.882	18	12.966	1
04/09/2012	10	46.9253	-61.1486	3080	62.2	2.2	7	3.856	3	1.942	1
05/09/2012	1	47.1971	-61.2031	2835	51.2	2.2	14	8.634	10	6.529	1
05/09/2012	2	47.1932	-61.2755	2698	45.7	2.3	10	5.955	6	3.671	1
05/09/2012	3	47.1363	-61.2769	2723	47.5	2.3	22	11.535	10	4.94	1
05/09/2012	4	47.0861	-61.1718	2905	56.7	2.2	14	7.177	7	3.63	1
05/09/2012	5	46.9835	-61.2824	2882	51.2	1.6	32	17.982	10	6.181	1
05/09/2012	7	46.7608	-61.0448	2237	100.6	2.2	4	2.399	1	0.597	1
05/09/2012	8	46.6746	-61.0652	2321	58.5	2.2	9	4.974	7	3.961	1
07/09/2012	1	46.4064	-61.2783	2811	53.0	2.9	14	9.24	12	7.944	1
07/09/2012	2	46.4367	-61.3758	2625	64.0	2.6	14	8.789	7	4.217	1
07/09/2012	3	46.3419	-61.534	2648	64.0	2.3	5	3.328	5	3.328	1
07/09/2012	4	46.2123	-61.5931	2573	56.7	2.5	6	3.611	3	1.677	1
07/09/2012	5	46.1722	-61.6628	2872	56.7	1.7	7	5.375	2	1.29	1
07/09/2012	6	46.1253	-61.6195	2103	51.2	2.6	3	2.516	2	1.632	1
07/09/2012	7	46.0269	-61.7128	2305	45.7	3.7	9	6.593	0	0	1
07/09/2012	8	45.8948	-61.7958	2450	38.4	9	0	0	0	0	1
07/09/2012	9	45.9724	-61.8844	2008	45.7	3.8	6	4.804	2	1.466	1
07/09/2012	10	45.9631	-61.9766	1909	45.7	4.9	0	0	0	0	1
07/09/2012	11	45.9145	-62.0304	2012	40.2	7	0	0	0	0	1
07/09/2012	12	45.9512	-62.1994	2639	40.2	5.3	0	0	0	0	1
08/09/2012	1	46.185	-61.9746	2204	42.1	2.9	0	0	0	0	1
08/09/2012	2	46.2087	-62.0575	3219	38.4	4.3	0	0	0	0	1
08/09/2012	3	46.3253	-62.0982	2807	38.4	3.8	0	0	0	0	1
08/09/2012	4	46.2938	-61.8596	2222	47.5	2.6	5	3.789	0	0	1
08/09/2012	5	46.3038	-61.7569	2148	51.2	2.2	4	3.163	3	2.314	1
08/09/2012	6	46.363	-61.6791	2909	49.4	2.5	11	7.809	8	5.658	1
08/09/2012	7	46.5396	-61.7854	2548	51.2	1	0	0	0	0	1
08/09/2012	10	46.7539	-61.8069	3339	73.2	0.4	8	5.04	6	3.67	1
08/09/2012	11	46.727	-61.6317	2516	69.5	1.4	6	2.781	5	2.3	1
12/09/2012	1	46.9795	-61.5156	2393	43.9	2.3	1	0.613	0	0	1
12/09/2012	2	46.8745	-61.5849	2639	56.7	0.8	17	9.872	6	4.35	1
12/09/2012	3	46.9084	-61.6973	2305	51.2	0.7	4	2.625	0	0	1
12/09/2012	6	47.0159	-61.7118	1736	36.6	6.1	0	0	0	0	1
13/09/2012	4	47.0785	-62.2966	3193	53.0	0.8	1	0.52	0	0	1
13/09/2012	8	47.0663	-62.6495	2731	62.2	1	12	5.778	2	1.156	1
16/09/2012	5	46.8917	-62.3755	2472	67.7	0.5	2	1.177	0	0	1
16/09/2012	6	46.9771	-62.453	3317	67.7	0.4	6	3.298	1	0.797	1
21/09/2012	5	46.9808	-62.8248	2799	64.0	0.7	9	5.233	4	1.88	1
21/09/2012	6	47.0711	-62.8842	2737	58.5	1	14	7.873	2	1.26	1
21/09/2012	7	47.1448	-62.8112	2545	64.0	1	26	16.273	3	1.858	1
21/09/2012	11	46.9334	-63.1411	2753	60.4	1.6	53	27.354	3	1.305	1
22/09/2012	4	47.0161	-63.4154	2179	49.4	2	0	0	0	0	1

Date (dd/mm/yyyy)	Tow number	Latitude	Longitude	AS (m²)	Depth (m)	T (ºC)	rC/tow (number)	rW/tow (kg)	RC/tow (number)	RW/tow (kg)	TQ*
22/09/2012	5	47.095	-63.4805	3209	58.5	1.4	5	2.637	0	0	1
22/09/2012	6	46.9874	-63.7024	2369	43.9	2.9	1	0.395	0	0	1
22/09/2012	7	46.8395	-63.6579	2448	38.4	3.8	0	0	0	0	1
22/09/2012	8	46.8039	-63.5317	2775	40.2	2	0	0	0	0	1
22/09/2012	9	46.7228	-63.3294	2624	45.7	3.7	0	0	0	0	1
23/09/2012	1	46.6941	-62.8616	2962	53.0	1.4	1	0.715	0	0	1
23/09/2012	5	46.7899	-62.8511	1726	58.5	0.7	0	0	0	0	1
23/09/2012	6	46.8316	-63.0339	2965	58.5	1.1	5	2.536	1	0.448	1
23/09/2012	7	46.7333	-63.1178	2763	51.2	1.3	0	0	0	0	1
23/09/2012	9	46.5935	-63.1376	2256	42.1	2.5	0	0	0	0	1
23/09/2012	11	46.5144	-63.0065	2297	40.2	4.1	0	0	0	0	1
23/09/2012	12	46.578	-62.7212	2496	45.7	2.6	0	0	0	0	1
10/07/2012	2	47.5817	-60.6202	2439	60.4	1.9	0	0	0	0	2
10/07/2012	6	47.674	-61.0019	2444	42.1	2	0	0	0	0	2
11/07/2012	3	48.0797	-61.1455	2715	279.8	5.6	0	0	0	0	2
12/07/2012	6	47.92	-61.838	2935	60.4	0.7	5	2.75	0	0	2
12/07/2012	7	47.89	-61.9729	2300	54.9	0.7	3	1.9	0	0	2
13/07/2012	5	47.6585	-61.9696	2832	38.4	1.6	1	0.406	0	0	2
21/07/2012	9	47.7141	-62.6238	2828	65.8	0.9	4	1.983	3	1.367	2
21/07/2012	11	47.8774	-62.8608	2980	73.2	1	2	0.897	1	0.377	2
22/07/2012	6	47.9947	-62.5192	2992	73.2	1.2	8	3.88	6	2.975	2
22/07/2012	7	48.0529	-62.6614	3043	91.4	1.6	15	6.239	7	2.823	2
23/07/2012	1	48.148	-62.934	2965	71.3	1.2	3	1.346	2	0.886	2
23/07/2012	10	48.1981	-63.6509	2981	102.4	1.9	6	3.111	3	1.571	2
30/07/2012	1	48.1955	-63.9688	2869	60.4	1.6	0	0	0	0	2
30/07/2012	5	48.3889	-63.4792	2795	111.6	3	5	2.784	1	0.536	2
30/07/2012	7	48.314	-63.2332	3001	53.0	1.3	1	0.405	0	0	2
01/08/2012	1	48.308	-61.8021	2620	358.4	5.6	0	0	0	0	2
01/08/2012	5	48.2339	-62.0539	2766	113.4	2.5	0	0	0	0	2
02/08/2012	2	48.4586	-62.6943	2944	349.3	5.8	1	0.618	1	0.618	2
02/08/2012	3	48.5655	-62.9136	2544	362.1	5.6	0	0	0	0	2
03/08/2012	1	48.7165	-63.1167	2323	334.7	5.5	1	0.592	0	0	2
03/08/2012	3	48.7745	-63.374	2273	237.7	5.1	1	0.414	1	0.414	2
03/08/2012	6	48.874	-63.7103	2274	270.7	5.3	4	1.959	1	0.596	2
04/08/2012	1	48.8258	-63.5555	2074	239.6	5.3	3	1.427	3	1.427	2
04/08/2012	6	48.5401	-63.8092	2466	170.1	3.9	17	10.433	0	0	2
04/08/2012	8	48.7581	-64.0033	2460	118.9	3	0	0	0	0	2
04/08/2012	9	48.6857	-64.0179	2515	109.7	2.5	4	1.933	3	1.498	2
04/08/2012	11	48.579	-63.9806	2677	76.8	2.2	2	0.919	1	0.409	2
11/08/2012	8	47.8147	-63.9971	2362	82.3	1.6	1	0.412	1	0.412	2
11/08/2012	10	47.658	-64.056	2437	82.3	1.5	17	10.106	2	1.241	2
12/08/2012	1	47.6568	-64.2904	2585	53.0	1.5	1	0.49	0	0	2
13/08/2012	1	47.2765	-64.1872	3067	45.7	2.2	1	0.565	0	0	2

Date (dd/mm/yyyy)	Tow number	Latitude	Longitude	AS (m²)	Depth (m)	T (ºC)	rC/tow (number)	rW/tow (kg)	RC/tow (number)	RW/tow (kg)	TQ*
14/08/2012	5	47.3978	-63.8075	2779	64.0	1.2	18	10.342	0	0	2
14/08/2012	13	47.5309	-63.6886	2951	67.7	1.2	7	3.439	1	0.457	2
15/08/2012	3	47.524	-63.5009	2710	76.8	0	32	17.333	4	2.391	2
15/08/2012	4	47.564	-63.4132	3109	75.0	0.9	17	9.243	9	4.301	2
21/08/2012	6	47.885	-65.0676	2178	56.7	1.7	4	2.923	0	0	2
22/08/2012	4	48.1532	-64.3927	2462	56.7	1.9	3	0	0	0	2
22/08/2012	5	48.2554	-64.4965	2607	102.4	2	2	1.222	1	0.369	2
23/08/2012	9	47.9498	-63.3006	3216	86.0	1.9	7	3.847	3	1.541	2
24/08/2012	1	47.797	-63.1714	3176	76.8	1.9	16	8.216	5	2.461	2
24/08/2012	3	47.714	-63.1373	2937	73.2	1.9	45	22.745	7	3.432	2
02/09/2012	5	47.1542	-60.9239	2767	95.1	2.6	16	8.861	10	5.91	2
02/09/2012	6	47.1581	-60.8897	2834	98.8	2.6	10	5.501	4	2.435	2
03/09/2012	4	47.3934	-60.6232	2524	67.7	2.5	7	4.114	2	1.148	2
03/09/2012	7	47.3534	-60.9836	2686	56.7	2.2	15	8.078	9	4.739	2
03/09/2012	8	47.5174	-60.9991	2587	42.1	2	1	0.769	0	0	2
03/09/2012	11	47.1794	-61.0346	2767	73.2	2.5	8	4.507	7	3.945	2
04/09/2012	1	46.5759	-61.1956	2572	71.3	2.9	12	7.324	10	6.146	2
04/09/2012	11	46.7876	-61.172	2471	76.8	1.6	3	1.78	3	1.78	2
05/09/2012	6	46.8064	-60.948	2741	115.2	2.9	12	6.987	12	6.987	2
21/09/2012	2	46.8813	-62.6788	2523	58.5	0.8	1	0.504	0	0	2
21/09/2012	3	46.8843	-62.9116	2499	60.4	1	17	9.216	0	0	2
21/09/2012	4	46.9367	-62.8752	2474	62.2	0.7	51	30.116	7	3.954	2
22/09/2012	3	46.9227	-63.3755	2517	53.0	2.3	3	2.286	0	0	2
23/09/2012	10	46.5411	-63.0945	2371	42.1	2.9	0	0	0	0	2
13/07/2012	2	47.8553	-61.9559	2881	53.0	0.4	10	5.582	0	0	3
13/07/2012	9	47.8417	-62.3836	2452	71.3	1.2	10	4.635	8	3.843	3
13/07/2012	11	47.7701	-62.3944	2124	64.0	1	9	4.625	8	4.208	3
14/07/2012	5	47.308	-62.3664	2152	54.9	0.3	4	2.145	0	0	3
14/07/2012	8	47.1745	-62.3672	1978	54.9	0.2	2	0.796	0	0	3
20/07/2012	2	46.7827	-62.6419	2304	60.4	0.6	3	1.356	0	0	3
20/07/2012	5	46.8537	-62.6582	2466	64.0	0.4	4	2.096	0	0	3
21/07/2012	6	47.5469	-62.9137	2044	53.0	0.9	2	0.891	0	0	3
22/07/2012	2	48.0117	-62.158	2871	71.3	1.2	5	2.518	2	1.159	3
22/07/2012	12	48.0692	-62.9213	2879	67.7	1	0	0	0	0	3
23/07/2012	5	48.2532	-63.313	3323	75.0	1.3	8	4.261	2	1.51	3
23/07/2012	12	48.1512	-63.8414	2115	76.8	1.6	1	0.418	1	0.418	3
30/07/2012	10	48.256	-62.8506	2774	80.5	1.3	6	2.494	1	0.382	3
31/07/2012	2	48.3135	-62.7402	2106	93.3	2.5	1	0.469	1	0.469	3
31/07/2012	9	48.2012	-62.2509	2646	89.6	2.6	5	2.127	2	0.77	3
01/08/2012	4	48.2682	-61.9836	2137	182.9	4.9	0	0	0	0	3
01/08/2012	7	48.298	-62.2166	1965	120.7	3.8	0	0	0	0	3
02/08/2012	7	48.4669	-63.2565	2033	100.6	3.3	2	0.822	0	0	3
02/08/2012	9	48.5958	-63.3958	2212	146.3	4.8	0	0	0	0	3

Date (dd/mm/yyyy)	Tow number	Latitude	Longitude	AS (m²)	Depth (m)	T (ºC)	rC/tow (number)	rW/tow (kg)	RC/tow (number)	RW/tow (kg)	TQ*
02/08/2012	11	48.5041	-63.2697	2790	118.9	4.3	0	0	0	0	3
11/08/2012	3	48.044	-63.9428	2058	80.5	1.7	13	6.362	3	1.33	3
11/08/2012	6	47.9575	-64.1512	1376	34.7	2.9	0	0	0	0	3
12/08/2012	4	47.5446	-64.3295	2835	51.2	1.5	3	2.02	0	0	3
13/08/2012	6	47.1628	-63.5482	2154	62.2	0.9	5	2.595	1	0.42	3
13/08/2012	8	47.23	-63.64	3335	65.8	1	4	2.148	1	0.482	3
13/08/2012	11	47.2899	-63.3571	2828	65.8	0.7	1	0.457	0	0	3
14/08/2012	1	47.2705	-63.481	3291	62.2	0.9	4	1.987	1	0.444	3
14/08/2012	11	47.6093	-64.0059	1190	45.7	2.2	0	0	0	0	3
21/08/2012	9	48.02	-64.8385	1948	82.3	1.9	4	2.797	0	0	3
21/08/2012	12	48.1505	-64.8853	2083	49.4	2	0	0	0	0	3
23/08/2012	1	47.7516	-63.6343	3294	73.2	1.2	10	5.52	1	0.49	3
23/08/2012	3	47.7382	-63.747	2691	67.7	1.3	0	0	0	0	3
25/08/2012	5	47.4783	-63.0865	2026	53.0	1	2	1.349	0	0	3
25/08/2012	11	47.1212	-63.2146	2086	62.2	1	8	4.475	0	0	3
08/09/2012	9	46.5992	-61.6814	2426	60.4	1.6	8	4.529	4	2.61	3
13/09/2012	3	47.0087	-62.1603	1643	53.0	0.5	0	0	0	0	3
16/09/2012	4	46.8384	-62.2474	2151	71.3	0.7	1	0.816	0	0	3
21/09/2012	1	46.9602	-62.6263	1716	60.4	1.1	0	0	0	0	3
22/09/2012	2	46.8785	-63.1956	2106	56.7	1.4	0	0	0	0	3
23/09/2012	8	46.6585	-63.2856	1515	42.1	4.4	0	0	0	0	3
23/09/2012	15	46.6118	-62.5563	1745	49.4	3.1	0	0	0	0	3
10/07/2012	5	47.6717	-60.8485	2468	54.9	1.2	0	0	0	0	4
12/07/2012	4	47.9169	-61.5178	2938	58.5	0.7	0	0	0	0	4
19/07/2012	9	46.6422	-62.2622	2704	54.9	1	1	0.463	0	0	4
22/07/2012	5	47.9354	-62.4099	2885	78.6	1.3	3	1.698	2	1.163	4
14/08/2012	3	47.3568	-63.4495	3060	73.2	0.9	6	2.991	0	0	4
15/08/2012	2	47.538	-63.6735	2953	80.5	1	30	17.793	5	3.17	4
15/08/2012	8	47.8198	-63.7059	2919	69.5	1.5	1	0.65	0	0	4
12/09/2012	5	46.8239	-61.9118	2806	76.8	0.7	13	7.038	11	5.889	4
13/09/2012	2	46.976	-61.9013	2530	47.5	1.3	0	0	0	0	4
16/09/2012	2	47.0092	-62.112	2487	53.0	1.1	1	0.377	0	0	4
23/09/2012	4	46.7956	-62.8272	2495	58.5	0.8	49	28.828	1	0.631	4