



Preliminary Report on the July 2010 Mobile Sentinel Survey in the Northern Gulf of St. Lawrence

December 2010

Sentinel Fisheries Program

Each year, biologists from Fisheries and Oceans assess the status of commercially exploited fish and invertebrate stocks. In order to perform these evaluations, scientists use data provided, in part, by mobile gear sentinel fishers (trawlers). The surveys performed by the mobile sentinel fishers cover almost the entire northern Gulf of St. Lawrence. Once analysed, the collected data are used to calculate abundance indices that are used to estimate the status of various stocks.

The mobile gear Sentinel Fisheries Program follows a depth-stratified random survey plan. The northern Gulf is divided into depth strata because depth is known to have an influence on the distribution of fish and invertebrate species. The following strata have been defined: 10-20, 20-50, 50-100, 100-150, 150-200 and over 200 fathoms (1 fathom = 1.83 meters = 6 feet). The mobile survey generally consists of 300 stations randomly selected within those strata. All strata are sampled because results from this survey are used for many species that have different depth preferences. It is also important to find the limits of distribution of a specie and to monitor any potential shifts in time. Nine trawlers, five from Newfoundland and four from Quebec perform the entire survey. At each predetermined station, the vessel performs a standard 30 minutes tow at 2,5 knots. The nine boats participating in the survey use the same trawl, a 300 Star Balloon mounted on a Rock Hopper footgear. The trawl mesh size is 145 mm with a liner of 40 mm in the codend. The use of a liner allows the sampling of fish as young as age 2 for cod but also requires the presence of an observer or a trained technician aboard each vessel. The observers are from Biorex in Quebec and Seawatch in Newfoundland. In spite of the fact that all nine boats use the same trawl, a study showed a 25% variability in wing spread opening during trawling activities. The use of a restrictor cable allows to reduce this variability from 25% to 6 % without bias due to depth and thus to compare the catches from all vessels.

The sentinel surveys require a great deal of thoroughness in collecting a variety of data. With the help of crewmembers, observers or technicians are responsible for the collection of numerous data according to a scientific protocol. At each set, the total catch is sorted by species and weighed. Then the length, weight, sex, and maturity of a number of fish of each species are recorded. For specific demands, some samples (otoliths, liver, gonads, stomach etc.) may also be taken on some fish. Moreover, fish samples are collected and frozen for diverse studies. Finally, water temperature and fishing depth data are collected using a Vemco sensor installed on the trawl. These biological and oceanographic data yield valuable information on the size, growth, condition and diet of various species, as well as stock abundance and water temperature.

The Department of Fisheries and Oceans (DFO) has primary responsibility for the administration of the sentinel program. The implementation of the program is the responsibility of the Capitaines-Propriétaires de la Gaspésie inc. (ACPG) for mobile gear fisheries in Divisions 4S and 4T, and of the Fish, Food and Allied Workers (FFAW) of Newfoundland in Subdivision 3Pn and Division 4R.

July 2010 Survey

The 16th annual July sentinel survey was conducted in the northern Gulf of St. Lawrence between June 30 and July 19, 2010. A total of 280 fishing stations were successfully carried out (Figure 1), including 21 stations in 3Pn, 129 in 4R (including 10 tows in the 10 to 20 fathoms strata), 100 in 4S and 30 in 4T. Those 280 stations represent 93% of the sampling target.

- From July 1st to July 19th, four Quebec trawlers sampling 4ST completed 130 out of a planned 152 stations (Figure 1). On the west coast of Newfoundland (3Pn, 4R), five trawlers carried out all 150 planned stations from June 30th to July 5th (Figure 1).
- The 30 tows done in 4T are conducted to complement the assessment of Unit 1 redfish, Greenland halibut (turbot) and Atlantic halibut stocks of the management units 4RST. **The cod catches in 4T are not included in the estimation of abundance of the northern Gulf of St-Lawrence cod stock (3Pn, 4RS).**
- Since 2003, 10 tows have been carried out each year in three coastal strata in 4R (10 - 20 fathoms). The relevance for adding these strata to the calculation of the index of minimum trawlable biomass for cod was discussed and approved during the cod assessment in February and March 2009. Therefore, catches from these coastal tows are now included in a new index of abundance for cod.
- Cod, redfish, turbot and Atlantic halibut catches for the 280 successful tows of the 2010 July survey are presented in table 1. This table also shows the total catches including the unsuccessful and the discretionary tows. It is important to note that following the Larocque case, no discretionary tows have been allowed since 2006. In 2010, the fish composing the main proportion of the other fish species category are American plaice, thorny skate and shorthorn sculpin.

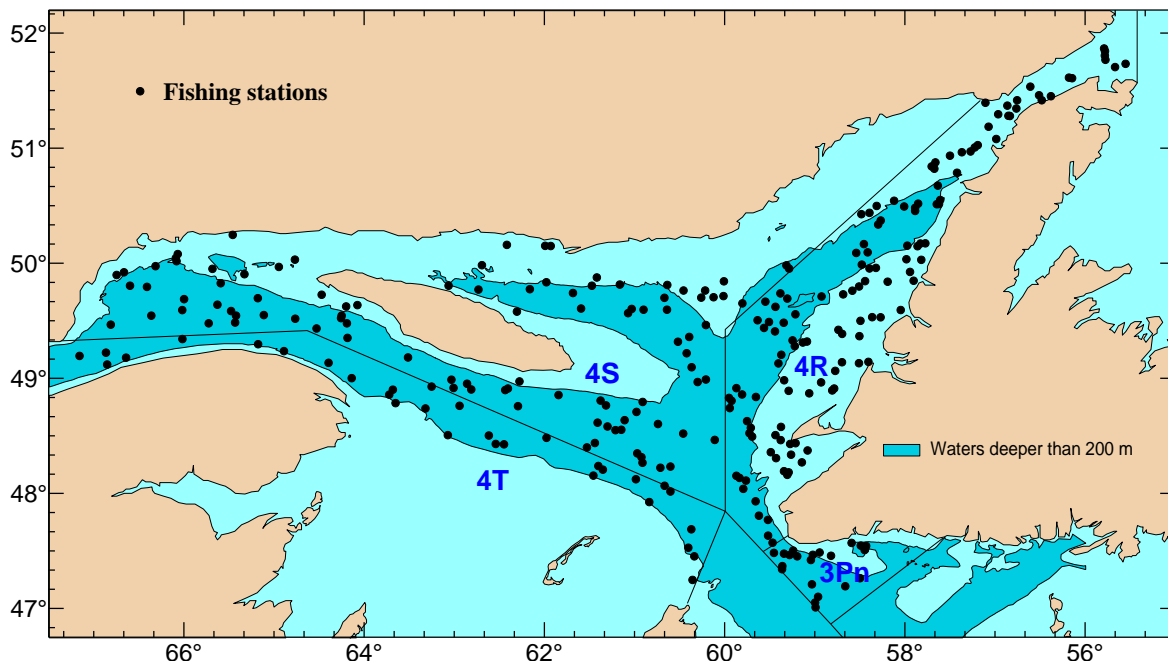


Figure 1: Distribution of stratified random tows performed during the July 2010 survey.

Table 1: Cod, redfish, turbot and Atlantic halibut catches for the successful tows and total catches including unsuccessful and discretionary tows for the July 1995-2010 surveys (3Pn, 4RST).

Year	Sets	Survey Catches (kg)				Sets	Total Catches (kg)				
	Survey	Cod	Redfish	Turbot	Halibut		Total	Cod	Redfish	Turbot	Halibut
1995	311	6 477	11 457	649	84	326	6 598	11 662	675	84	4 716
1996	272	7 254	16 921	1 300	114	332	12 108	27 169	1 502	150	8 593
1997	285	8 642	12 358	1 206	27	313	11 271	13 582	1 397	80	5 848
1998	289	7 719	16 154	1 472	17	320	12 196	36 231	1 668	113	7 198
1999	294	5 487	12 623	1 703	42	335	19 396	17 177	2 079	129	4 031
2000	291	7 893	7 574	1 583	97	324	16 963	10 486	1 932	126	5 454
2001	275	10 238	7 603	1 342	120	317	16 476	14 421	1 814	208	4 194
2002	261	7 729	8 101	1 486	113	293	18 551	8 849	3 090	160	4 155
2003	296	13 741	6 400	1 693	44	326	14 040	6 616	3 512	72	3 590
2004	280	14 072	8 245	2 015	216	317	15 655	13 295	2 567	271	6 670
2005	285	9 662	6 785	2 977	226	303	10 023	7 802	3 649	402	8 652
2006	295	13 174	5 106	2 748	335	325	15 332	5 963	3 624	577	6 647
2007*	291	6 431	6 797	2 976	382	297	6 435	6 836	2 977	399	3 905
2008*	289	9 931	4 310	2 594	456	293	9 931	4 341	2 604	456	2 743
2009*	282	8 939	3 605	1 701	521	285	8 940	3 605	1 716	521	3 921
2010*	280	7 137	4 059	1 935	395	284	7 137	4 059	1 965	395	2 689

* No discretionary tows

1. Biomass and Distribution of Groundfish

Cod

The July sentinel survey series for water deeper than 20 fathoms (1995-2009) suggests an increase in the minimum trawlable biomass for cod between 1995 and 2001 with a rather stable period up to 2006. After an important decrease in 2007 and 2008, the biomass index showed a marked increase in 2009. In 2010, with an estimate of 36 478 tons, the minimum trawlable biomass index decreased again bringing the index level very close to the lowest values observed in the series (33 000 tons in 1995 and 2008) (Figure 2a).

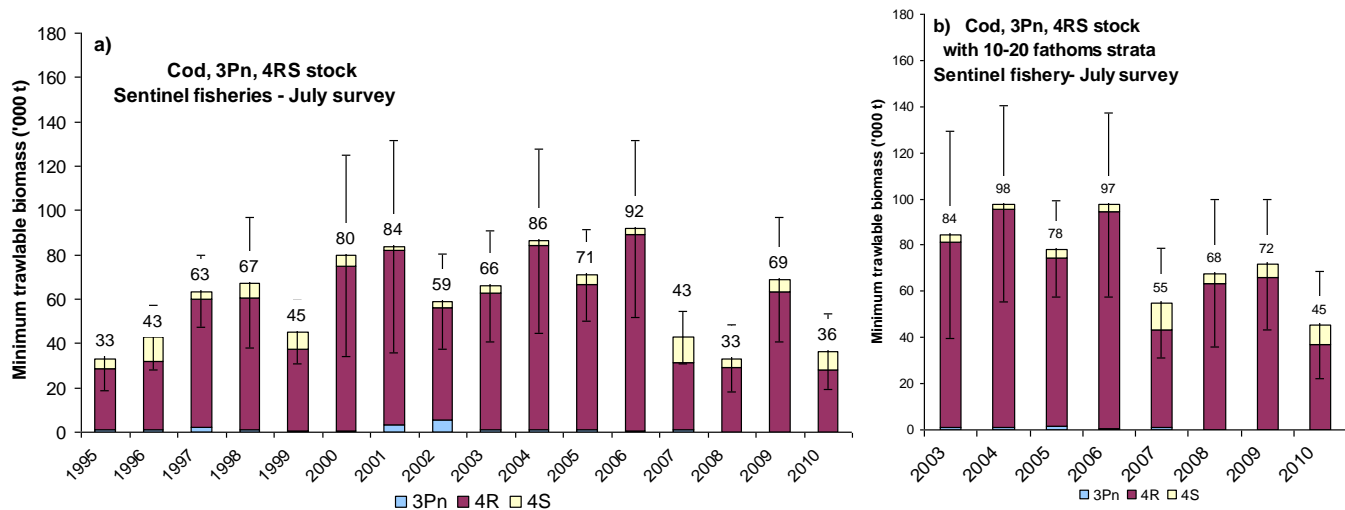


Figure 2: Minimum trawlable biomass index for cod based on the stratified random tows of the July sentinel mobile survey in Subdivision 3Pn and Divisions 4RS (1995 – 2010). a) For strata of depth greater or equal to 20 fathoms (1995 - 2010) b) Including the three strata in 10-20 fathoms (2003 - 2010).

In 2010, for waters deeper than 20 fathoms, the minimum trawlable biomass for 4S shows an increase of 34% compared to 2009, going from 5 540 tons to 8 434 tons, which is the third highest value of the series for this division. For 4R, the biomass estimate for 2010 is 28 010 tons, representing a decrease of 56% from 2009 (63 207 tons), and is the second lowest value of the series. The 3Pn estimate in 2010 is the lowest of the 1995 – 2010 series with 34 tons.

Since 2003, three inshore strata with depth range of 10 to 20 fathoms are sampled in 4R. The purpose of adding those strata was, in part, to look for the presence of cod outside the zone previously sampled by trawlers in the July mobile gear sentinel survey. The location of the strata are as follows: one on both side of the strait of Belle Isle; one north of the 49th parallel; and a third one south of the 49th parallel. Ten tows were done in these strata by four trawlers during the July 2010 survey. The cod catches varied between 0 and 1051 kg for a 30 minutes standard tow. Six of the ten tows reached the 30 minutes duration while the other four lasted less than 30 minutes because of bad bottom (trawl hooked at the bottom). The global biomass index (including the 10-20 fathoms strata) is 45 323 tons for 2010 (Figure 2b). This value is the lowest of the 2003 – 2010 series.

As in the past, the catch distribution shows that cod is located primarily in 4R along the west coast of Newfoundland (Figure 3). In 2010, the cod concentration remains low in 4S and 3Pn. Of the 280 tows performed in this survey, 5 had catches of cod of more than 400 kg and they were all located in 4R. Only one of the large catches was done in the 10 to 20 fathoms strata. The largest catches for 4S and 3Pn are 61 and 3 kg respectively.

A temperature and depth recorder is installed on the trawl of each boat participating in the mobile survey. However, this year, one of the sensors was lost at sea and another malfunctioned. Therefore, temperature data are not available for tows done in the south part of 4R and in 3Pn.

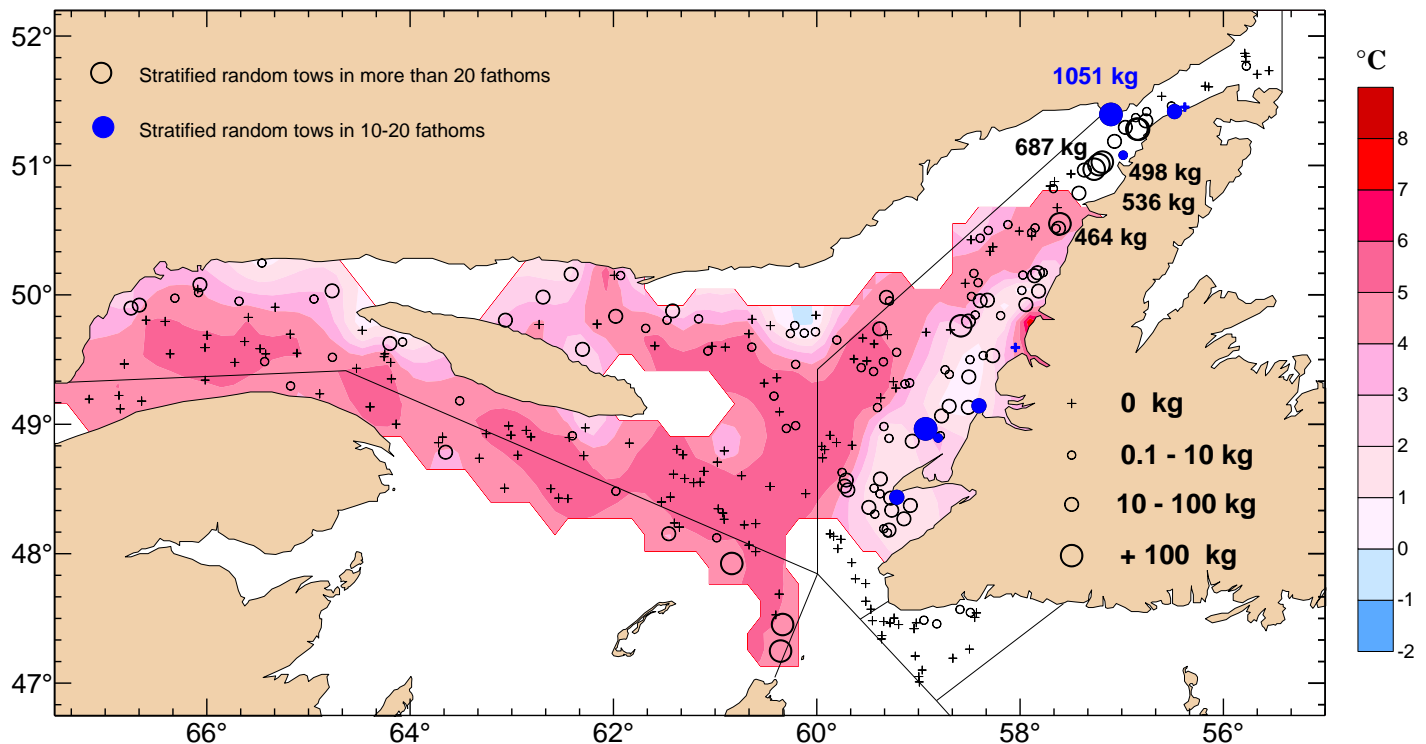


Figure 3: Bottom temperature and observed catch rate (kg / standard tow) distribution of cod for the July 2010 stratified random survey in 3Pn Subdivision and 4RST Divisions. Catches greater than 400 kg are identified on the map.

Redfish

For Unit 1 redfish stock (4RST Divisions), the July sentinel survey series (1995-2010) indicates a higher minimum trawlable biomass estimate between 1996 and 1999 (Figure 4). From 2000, we see a constant decrease in the biomass index, down to the lowest value of the series in 2009 with 30 021 tons. In 2010, the minimum trawlable biomass estimate is increasing (primarily in 4S) to 41 283 tons but still remains among the lowest values of the series.

As in earlier years, the redfish was concentrated for the most part in the channels of the Northern region of the Gulf (Figure 5). In July 2010, some concentrations of redfish were found in 3Pn. This area is not part of the redfish stock of Unit 1 management (4RST) between the months of June to December.

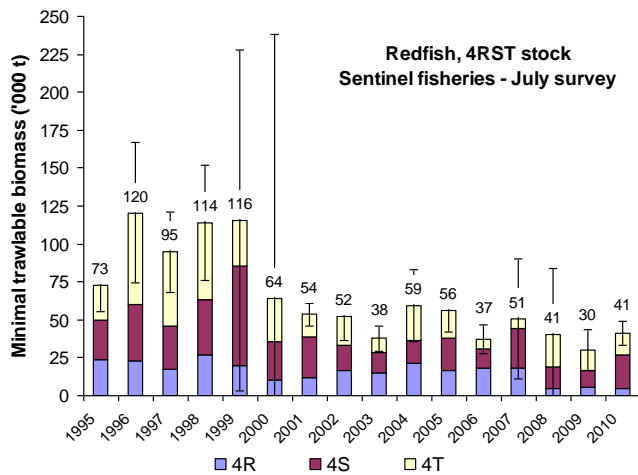


Figure 4: Minimum trawlable biomass index for redfish in 4RST based on the July stratified random survey (1995 – 2010).

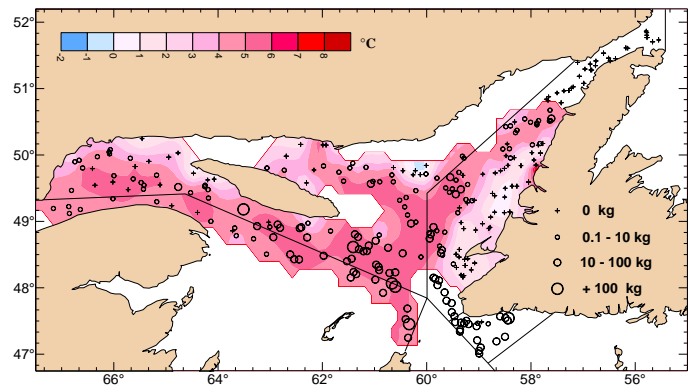


Figure 5: Bottom temperature and catch rate (kg / standard tow) distribution of redfish for the July 2010 stratified random survey in 3Pn and 4RST.

Turbot (*Greenland Halibut*)

For the Gulf of St. Lawrence turbot stock (4RST Divisions), the July sentinel survey series (1995 – 2010) shows a general increase in biomass from 1995 to 2005 with a relative stability up to 2008 (Figure 6). However, the minimum trawlable biomass estimate shows an important decrease in 2009 followed by an increase up to 26 409 tons in 2010. This value compares to those observed in 2003 and 2004.

Turbot was concentrated mostly in the Estuary and in the Laurentian Channel, around Anticosti Island and in the Northern portion of the Esquiman Channel (Figure 7). The distribution of Greenland halibut is overall similar to those of earlier years. The mobile sentinel survey does not sample the Estuary where turbot is found in abundance in the August DFO's annual scientific survey and in the commercial fishery.

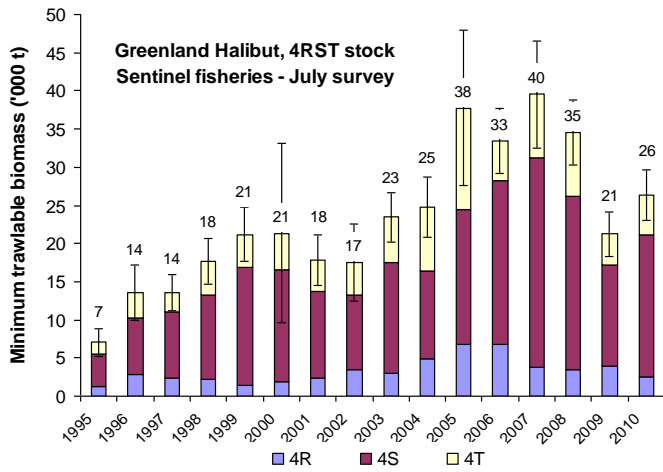


Figure 6: Minimum trawlable biomass index for Greenland halibut based on the July stratified random survey (1995–2010).

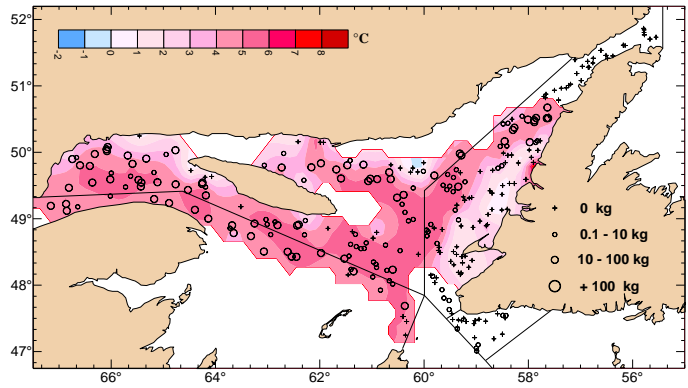


Figure 7: Bottom temperature and catch rate (kg/standard tow) distribution of Greenland halibut for the July 2010 stratified random survey in area 3Pn, 4RST.

Atlantic Halibut

The minimum trawlable biomass index for Atlantic halibut based on the sentinel survey shows a low and stable biomass between 1995 and 2003 with a gradual increase up to 2009. In 2010, the biomass estimate slightly decreases to 4 212 tons compared to the 2009 value of 5 327 tons. The 2010 minimum trawlable biomass index is the third highest of the series (Figure 8).

The catch distribution map of Atlantic halibut shows its presence in the Esquiman, Laurentian and Anticosti channels (Figure 9).

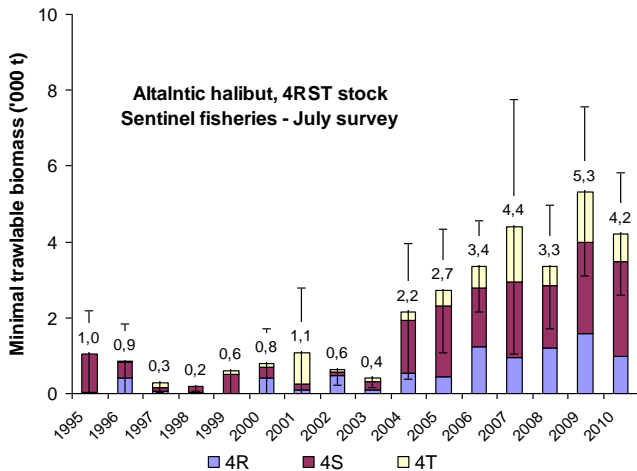


Figure 8: Minimum trawlable biomass index for Atlantic halibut based on the July stratified random survey (1995–2010).

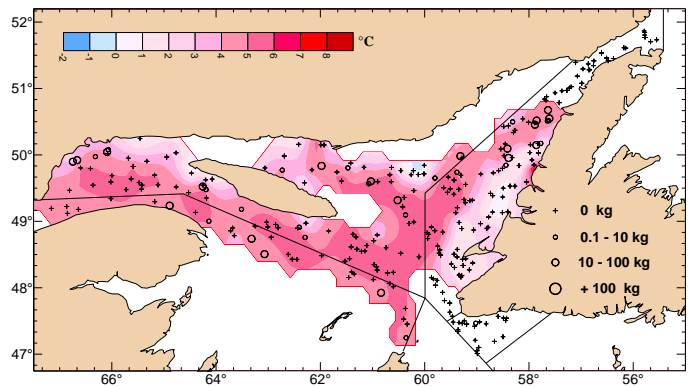


Figure 9: Bottom temperature and catch rate (kg/standard tow) distribution of Atlantic halibut for the July 2009 stratified random survey in area 3Pn, 4RST.

2. Sampling and Analysis

The catches were sorted by species, weighted and/or counted. The sampling of biological data (length, sex and weight) was completed for cod, redfish, Greenland halibut, Atlantic halibut and witch flounder.

Otoliths

Otoliths were taken from cod in 3Pn and 4RS divisions. The otoliths are used to determine the age of individual specimens and these data will be included in the next cod stock assessment. Age is one of the key parameter in the study of fish population dynamics and in the evaluation of the abundance for the northern cod of St. Lawrence (3Pn, 4RS). The abundance is actually assessed with a model that has age-structured data as inputs. Such models allow a better monitoring of the evolution of the stock dynamic. These models are named Sequential Population Analysis models (SPA).

Stomachs

Atlantic halibut stomachs were collected to study fish diet. Frozen samples were sent to the Maurice Lamontagne Institute where Diane Archambault and Denis Chabot's group will analyse stomach contents.

Witch Flounder

In addition to the total weight per set, length frequencies per sex were collected for the witch flounder's assessment. Douglas Swain of the Gulf Fisheries Center in Moncton (DFO) is the scientist responsible for the stock assessment of that specie.

Acknowledgements

We wish to acknowledge the dedicated work of all the skippers, crewmembers, observers, technicians, and coordinators who contributed in reaching the objectives of the 16th annual July sentinel survey.

Table 2. List of the skippers (*boat name*), crewmembers, technicians, and observers (company) who contributed to the July 2010 sentinel survey:

3Pn, 4R			4S, 4T		
Skipper	Crew	Observer	Skipper	Crew	Observer
Winsor Hedderson (<i>Northern Tip</i>)	Milton Lawless Jason Saunders Shane Hedderson	Brent Hedderson(FFAW)	Jean-Pierre Élément (<i>Rémy Martin</i>)	Rémy Élément Martin Élément	André Rioux (Biorex)
Garfield Warren (<i>885-77</i>)	Leonard Warren Enos Gaulton Curtis Dredge	Monty Way (FFAW)	Clément Samuel (<i>Sciène</i>)	Samuel Normand Michel Champion	Jean-Luc Samuel (Biorex)
Dereck Coles (<i>Tracey Martina</i>)	Dillon Ryan Ron Smith Lloyd Coles	Jason Spingle(FFAW)	Marcel Roy (<i>Sextan</i>)	Jean-Guy Côté Paul-René Clavet Mathieu Roy	Christian Girard (Biorex)
Murray Lavers (<i>Sally Kathryn</i>)	Warren House Barry Ryan Philip Ryan	Loomis Way(FFAW)	Jean-Marc Legault (<i>Franche-Mer</i>)	Jason Dubé Bobby Smith	Marcel Boucher (Biorex)
Dan Genge Jr. (<i>NFLD Storm</i>)	Kevin Genge Hank Poole Daniel Genge Gregory Genge Robin Genge	Angus Fillier (Seawatch)			

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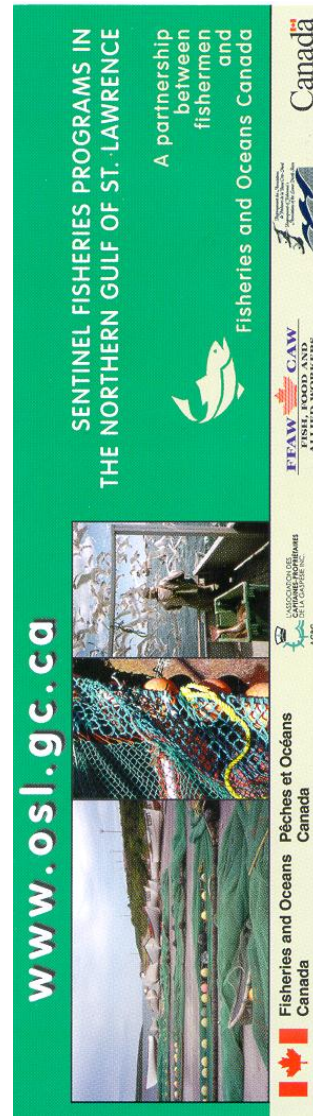
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