



## **SCALLOP FISHERY AREA/TIME CLOSURE TO REDUCE YELLOWTAIL FLOUNDER BY-CATCH ON GEORGES BANK IN 2012**

### **Context**

An area of Georges Bank, approximately 100 nautical miles<sup>2</sup>, was closed to the offshore scallop fishery during June 2011 to reduce yellowtail flounder by-catch. The closure area was determined following a review of yellowtail flounder distribution, particularly at spawning time via observed groundfish trips from the otter trawl fleet (2005–2010) and observed scallop fishing trips on Georges Bank (2001–2010, except 2003). Temporal trends in the distribution of the offshore scallop fishery between 1997 and 2010 were also considered.

This report provides an update to the 2011 report (DFO, 2011) on the scallop fishery area/time closure to reduce yellowtail flounder by-catch on Georges Bank. This report considers the combined 2011 observed by-catch and directed fishery data (three directed trips in total: two in September and one in October) from the groundfish otter-trawl fishery in 5ZEj and 5ZEm, along with observed by-catch from the scallop fishery. The spatial distribution of the scallop fishery in 2011 is also presented. Data from 2011 was used to ascertain possible trends in yellowtail flounder distribution. This is especially important during the second quarter (April to June) since yellowtail flounder discard rates in the scallop fishery are traditionally at seasonal highs during this period and yellowtail flounder are known to spawn at this time (O'Brien et al., 1993).

### **Response**

#### **Yellowtail Flounder By-Catch in the Groundfish Fishery**

While observer coverage of the otter trawl fishery extends back to earlier years, the time series of by-catch rates used to examine the spatial distribution of yellowtail flounder starts in 2005 when coverage increased significantly. Adult yellowtail flounder biomass was estimated to be 9300 mt, at the beginning of 2011. This is significantly lower than the biomass estimate provided last year, due to the reduction in the estimated strength of the 2005 yellowtail flounder year class and changes in the estimation procedures (TRAC, 2011).

In 2011, there was a directed yellowtail fishery. This fishery was required to have 100% observer coverage and its season was June 1, 2011 to December 31, 2011. In total, three trips were identified as being part of the directed fishery, however, for this analysis, observer data from the directed fishery could not be separated from the regular otter trawl fishery. Observer coverage in 2011, which includes data from bycatch (20% coverage) and a directed fishery (100% coverage; two trips in September and one trip in October), for the groundfish otter trawl fleet increased to 1572 sets (Table 1) from 1301 sets in 2010. In 2011, the majority (81%) of the observed sets were from 5ZEj and were limited to the northern part of 5ZEj except for the period of June to October. Observed sets occurred in all months except March, April and May (Table 1; note: there is no Canadian groundfish fishery on 5Z from mid-February to the end of May). Of the 1572 sets

observed in 2011, 84% caught no yellowtail flounder, compared to 80% in 2010, 79% in 2009, 69% in 2008, 76% in 2007, and 78% in 2006. As in previous years, by-catch rates were standardised to catch per hour (kg/hour). It is possible to compare by-catch rates across month and cells (5 minutes longitude x 3.33 minutes latitude) since set locations are provided. Yellowtail flounder were present in the observed sets for all months except February, November and December.

In 2011, the highest monthly average catch rates per set occurred in September and October for 5ZEm. This is largely attributed to the directed fishery (59.53 and 87.41 kg/hour, respectively; Figure 1) and is considerably higher than previous years, which ranged from 5.00 kg/hour in 2010 to 18.55 kg/hour in 2009. For 5ZEj, the highest monthly average catch rate occurred in September and was 0.77 kg/hour, which is much lower than in 5ZEm. The highest monthly average catch rate in 5ZEj for the previous four years ranged from 2.30 kg/hour in 2009 to 7.83 kg/hour in 2008.

The 2011 maximum catch rate per set in 5ZEj (65.00 kg/hour; Table 1) was similar to 2010 (64.76 kg/hour), while the maximum catch rate in 5ZEm (177.95 kg/hour) increased substantially from 2010 (31.10 kg/hour); most likely due to the inclusion of the directed fishery data. In 2011, the maximum catch rate occurred in September for 5ZEj and October for 5ZEm. For previous years, the maximum catch rate occurred in June for 2005, 2006, 2009, and 2010 for 5ZEm and 5ZEj, while they occurred in July for 2007. In 2008, the maximum catch rate per set occurred in June for 5ZEm and in July for 5ZEj. In 2011, cells with catch rates equal to or greater than 5 kg/hour occurred from June to October (Figure 2). Due to the increase in catch rates for September and October, additional plots are provided with a larger scale (see Figure 3).

Observed otter trawl sets in June from 2005 to 2011 covered all of 5ZEj and the western portion of 5ZEm (Figure 4). In Figure 4, cells are shaded according to the annual average by-catch rate for the month of June from 2005 to 2011 combined. Seven cells, labelled in descending order, on the Canadian portion of Georges Bank have an average by-catch rate greater than 10 kg/hour. These range from 10.50 (cell 7) to 165.44 kg/hour (cell 1). Four of these high catch rate cells (2, 3, 4, and 6) in 5ZEm are in the vicinity of what is known as the Yellowtail Hole. The three high catch rate cells in 5ZEj (1, 5 and 7) are relatively close together.

The by-catch rate of cell 1 is extremely high (165.44 kg/hour) compared to the other cells. This estimate is driven by observations in June 2006 (320 kg/hour). The by-catch rate of cell 7, adjacent to cell 1, is significantly lower at 10.50 kg/hour. By-catch rates for cells 6 to 2 range from 10.96 to 26.67 kg/hour during the period considered.

### Yellowtail Flounder By-Catch in the Offshore Scallop Fishery

Throughout 2011, one to two fishing trips per month were observed in the offshore scallop fleet. In 2011, there was a single cell (5 minutes longitude x 3.33 minutes latitude) that had a by-catch rate greater than 5 kg/dredge in May and in June, and this cell was in the same location (Figure 5). The 2011 offshore scallop monthly by-catch data was combined with the data from 2001 to 2010, except 2003. From this scenario, there was one cell with catch rates greater than 50 kg/dredge, which occurred in April (Figure 6).

Estimated annual discards of yellowtail flounder in the scallop fishery decreased in 2011 to 51 mt from 200 mt in 2010. Estimated annual discards were 246 mt, 504 mt, 95 mt, 117 mt, and 84 mt for 2005 to 2009, respectively (Gavaris et al., 2009, Van Eeckhaute et al., 2010).

Monthly average by-catch rates from observed scallop trips from 2001 to 2011 are much less indicative of yellowtail flounder distribution than otter trawl observed trips. This is due to less extensive spatial coverage of the observed scallop trips and by-catch avoidance protocols put in place by the offshore scallop fleet.

### Catches of the Offshore Scallop Fishery

Georges Bank second quarter scallop catch data for 2011 (Figure 7) was integrated with the past years' series where the catch data for the second quarter of the year was aggregated in (5 minutes longitude x 3.33 minutes latitude) cells (Figure 8). Second quarter catches (1828 mt of meats) comprised 40% of the total landings in 2011, with fishing activities highly concentrated in zone 5ZEj (Figure 7). The 1997 to 2011 second quarter catch data (Figure 8) are consistent with previously observed spatial patterns (e.g. see DFO, 2011). Cells in the northern part of Georges Bank have higher scallop catches than cells located in the southern part. No fishing occurred on Georges Bank 'b' in 2011. With the inclusion of the 2011 catch data, the cells with an average catch over 50 mt are the same as in the previous yellowtail closure report (DFO, 2011).

## **Conclusions**

Yellowtail flounder by-catch trends from observed groundfish otter trawl fishery and scallop fishery trips for the last seven years (2005–2011) can be used to determine areas of high yellowtail densities. In general, monthly maximum by-catch rates for the otter trawl fishery increased substantially in 2011 compared to 2010, particularly for 5ZEm (except for the month of June). This is likely due to the directed yellowtail flounder fishery that occurred in 2011. In 2011, the highest average yellowtail flounder catch rate occurred in September for 5ZEj and in October 5ZEm, again most likely reflecting the peak of the directed fishery (three directed trips in total: two in September and one in October). In the 2011 scallop fishery there was only one cell (April and May, same cell) with a yellowtail flounder by-catch rate greater than 5 kg/dredge.

Impacts of the June 2011 area/time closure were as follows: three cells were closed in 5ZEj (which were also closed in 2010), which correspond to cells 1, 5, and 7 in Figure 4 of this document, causing fishing activities to be displaced. In 2010, the three cells that were closed in 2009 were closed again, plus an additional cell was closed on the north-west portion of the bank (which was part of the scallop fishery voluntary closure area known as the peanut). For 2011, the five cells located in the vicinity of the Yellowtail Hole did not require closing as the offshore scallop fleet did not plan to fish this area in June.

Given the by-catch rates from the otter trawl fishery as an established proxy for yellowtail flounder density and distribution, seven cells with rates greater than 10 kg/hour could qualify for an area/time closure in 2012. This is reduced from nine cells in 2011. The seven cells indicated in Figure 4 are the same locations as cells in 2011, although the rankings have changed. The closure of the cluster of cells 2, 3, 4, and 6 located in the vicinity of the Yellowtail Hole would likely have a minimal impact on scallop fishing activities (Figure 9). The majority of scallop fishing activity in 2011 took place in 5ZEj northwest of where cells 1, 5 and 7 are located; however, these three cells are located in areas of important commercial scallop aggregations.

## Sources of Information

DFO. 2011. Update for Scallop Fishery Area/Time Closure to Reduce Yellowtail Flounder By-Catch on Georges Bank in 2011. DFO Can. Sci. Advis. Sec. Sci. Resp. 2011/011.

TRAC. 2011. Georges Bank Yellowtail Flounder. TRAC Status Report 2011/01.

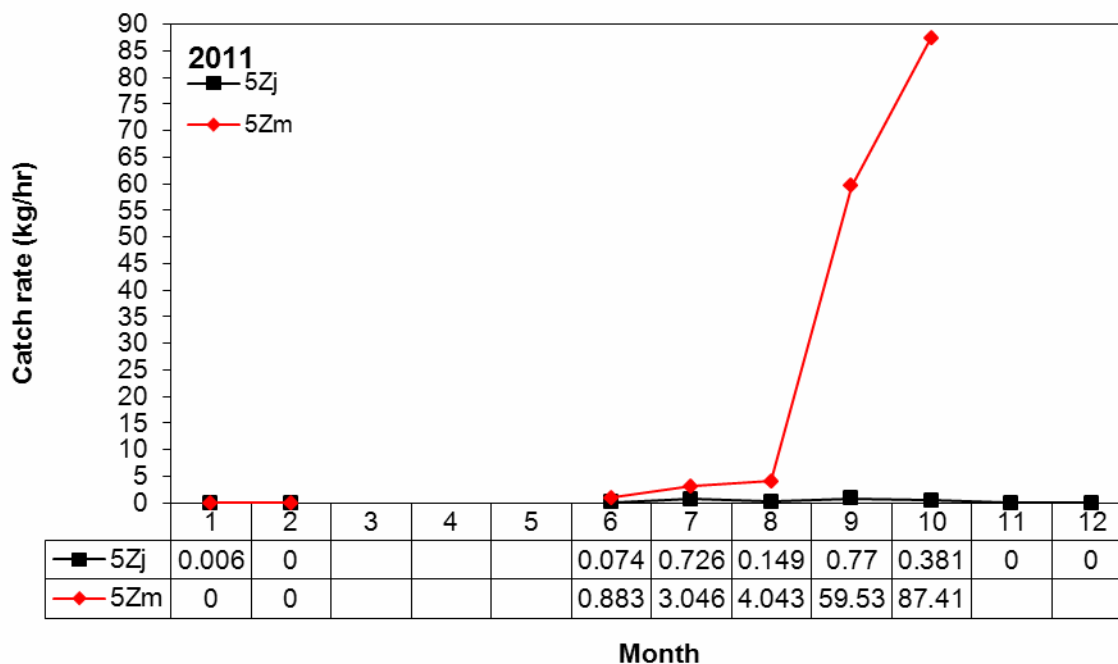
Van Eeckhaute, L., Sameoto, J., and A. Glass. 2010. Discards of Atlantic Cod, Haddock, and Yellowtail Flounder from the 2009 Canadian Scallop Fishery on Georges Bank. TRAC Ref. Doc. 2010/10.

Gavaris, S., Sameoto, J., Glass, A., and I. Jonsen. 2009. Discards of Atlantic Cod, Haddock, and Yellowtail Flounder from the 2008 Canadian Scallop Fishery on Georges Bank. TRAC Ref. Doc. 2009/06.

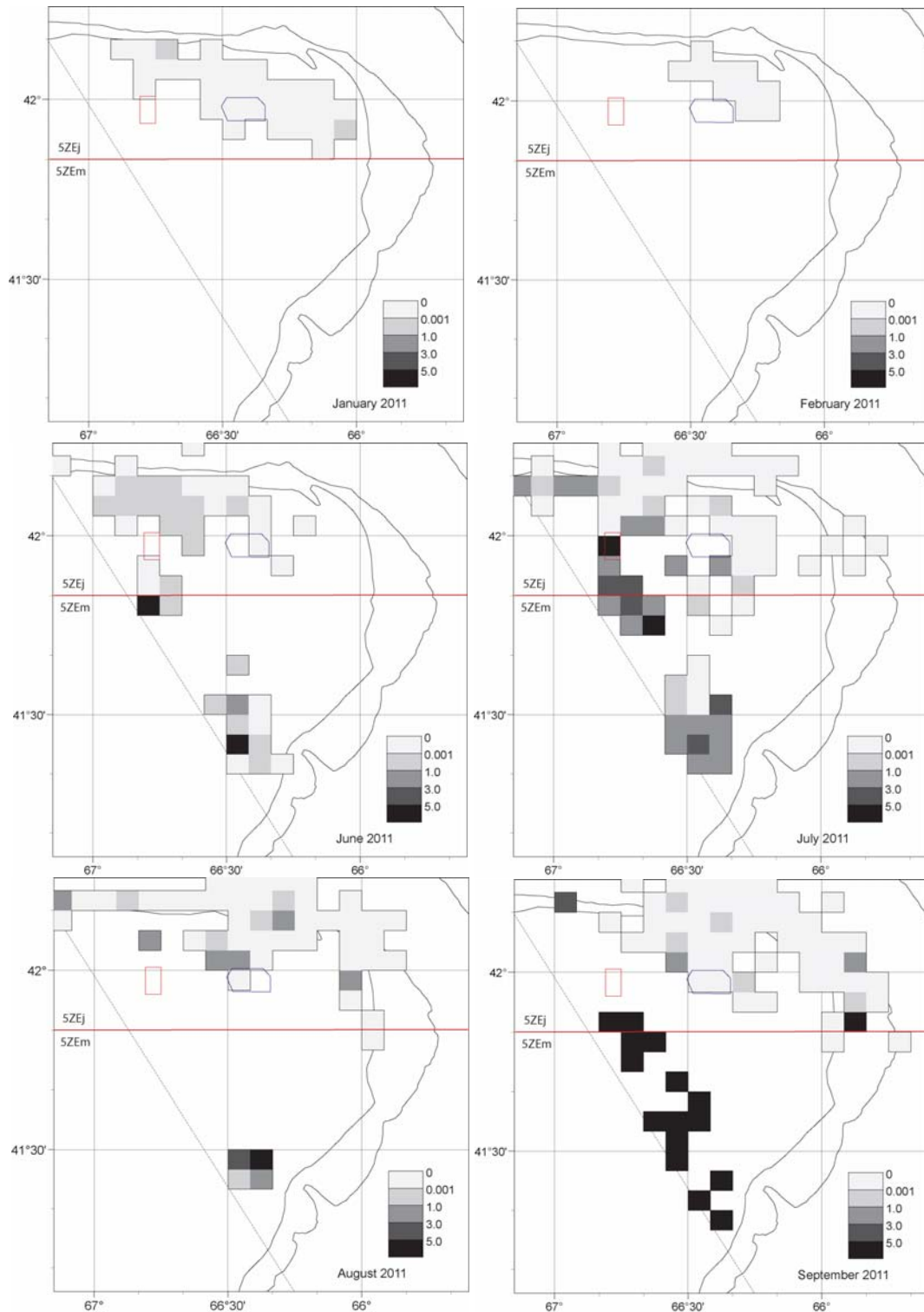
O'Brien L., Burnett, L.J., and R.K. Mayo. 1993. Maturation of nineteen species of finfish off the Northeast coast of the United States, 1985-1990. NOAA Technical Report NMFS 113. 66 p.

**Table 1:** Number of observed otter trawl sets and maximum yellowtail flounder catch rate (kg/hour) by month in 2011 in unit areas 5ZEj and 5ZEm, including the directed yellowtail fishery. Note: There was no groundfish fishery from February 8 to May 31, 2011.

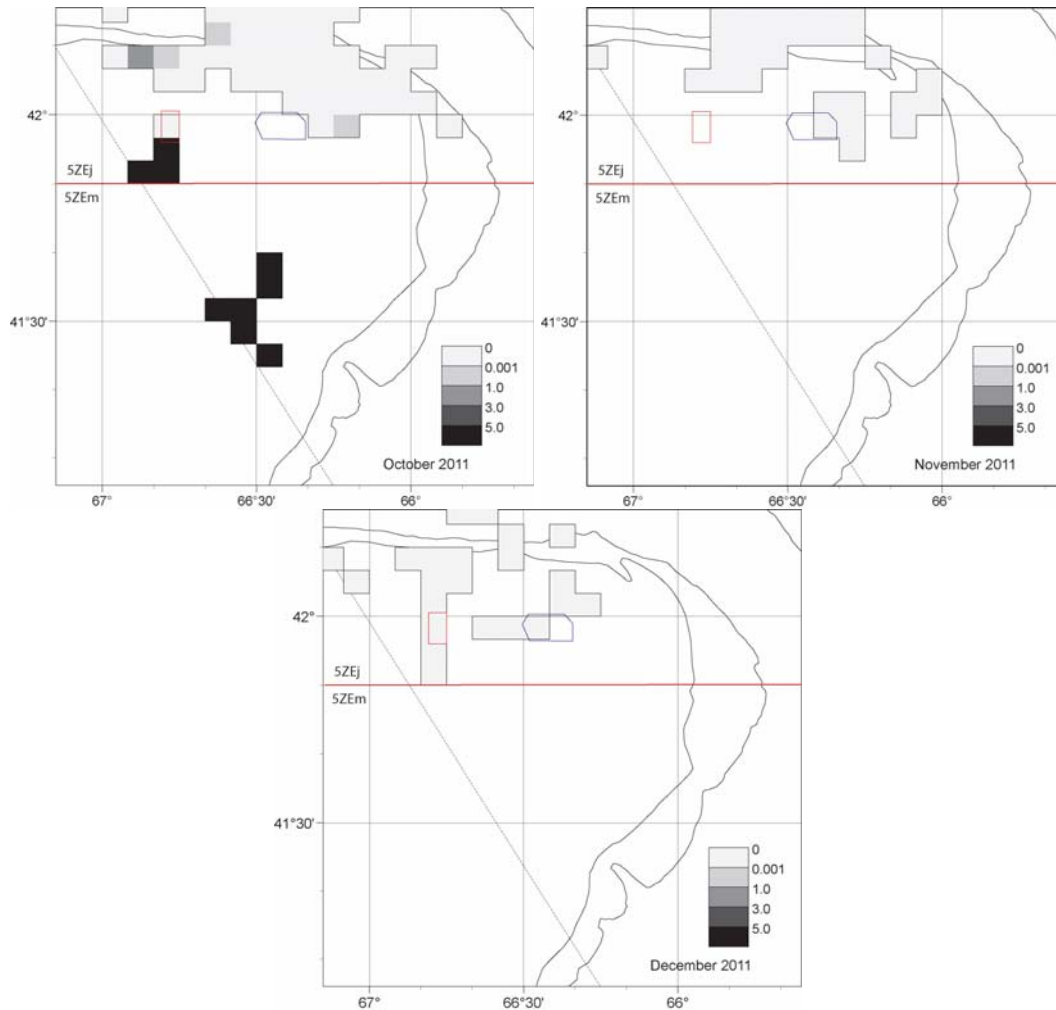
| Month | Number of sets |     |       | Maximum catch rate<br>(kg/hour) |        |
|-------|----------------|-----|-------|---------------------------------|--------|
|       | Unit Area      |     | Total | Unit Area                       |        |
|       | 5Zj            | 5Zm |       | 5Zj                             | 5Zm    |
| 1     | 179            |     | 179   | 0.79                            |        |
| 2     | 24             |     | 24    |                                 |        |
| 3     |                |     |       |                                 |        |
| 4     |                |     |       |                                 |        |
| 5     |                |     |       |                                 |        |
| 6     | 144            | 61  | 205   | 2.69                            | 16.19  |
| 7     | 164            | 167 | 331   | 36.16                           | 58.39  |
| 8     | 243            | 19  | 262   | 8.53                            | 40.27  |
| 9     | 178            | 27  | 205   | 65.00                           | 129.23 |
| 10    | 157            | 18  | 175   | 33.94                           | 177.95 |
| 11    | 144            |     | 144   |                                 |        |
| 12    | 47             |     | 47    |                                 |        |
| Total | 1280           | 292 | 1572  |                                 |        |



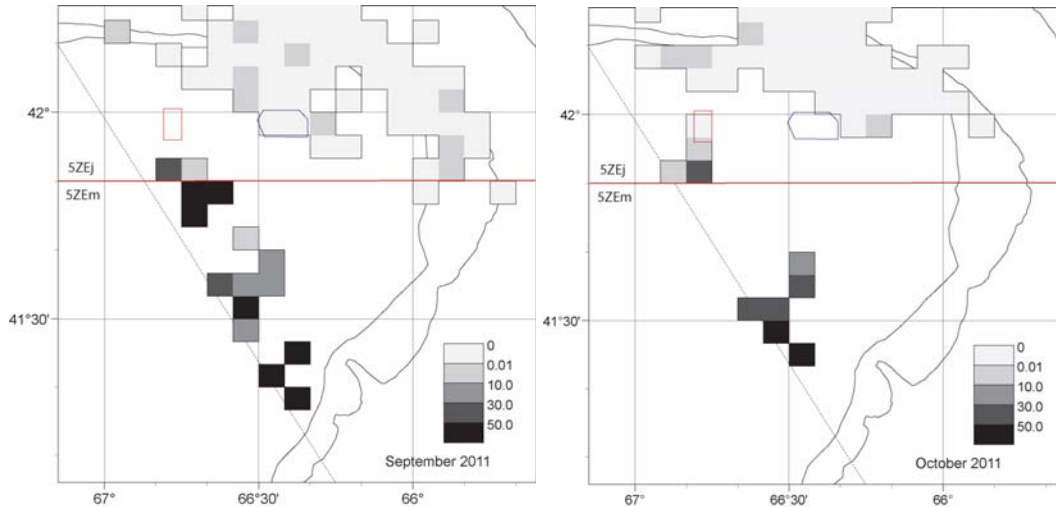
**Figure 1:** Average yellowtail flounder catch rate (kg/hour) by month and NAFO unit area for observed otter trawl sets in 2011 (by-catch and three directed trips: two trips in September and one trip in October).



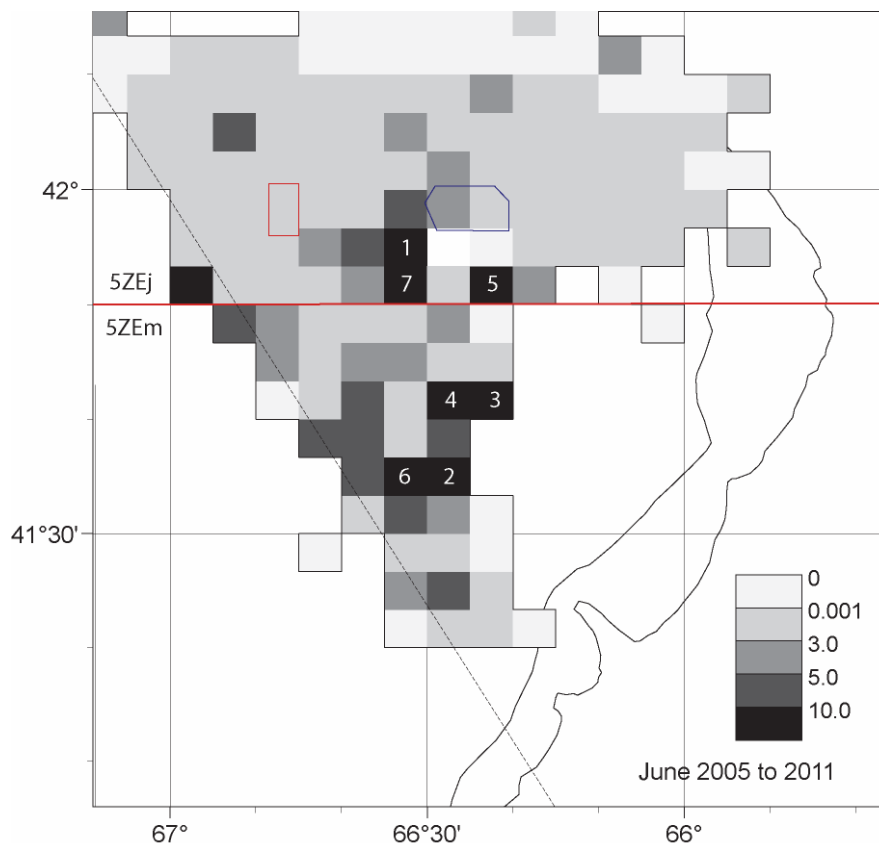
**Figure 2:** Average by-catch rates (kg/hour) for yellowtail flounder in 2011 for observed otter trawl sets on Georges Bank. The areas outlined in red (seed) and blue (grow-out) are the voluntary scallop closure areas that were implemented in January 2012. The horizontal red line indicates the NAFO divisions 5ZEj and 5ZEm. There was no groundfish fishery from February 8 to May 31, 2011.



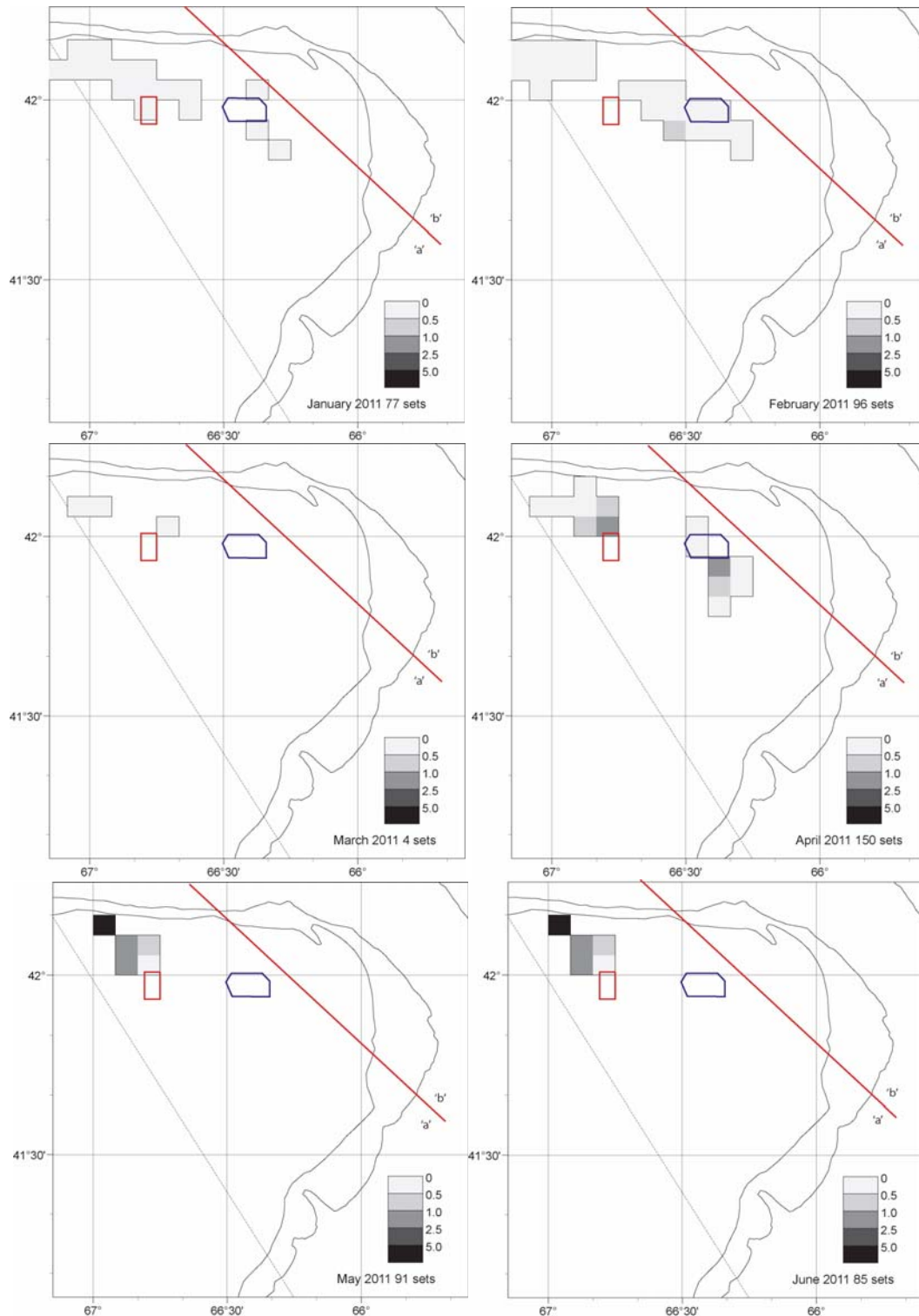
**Figure 2 (continued):** Average by-catch rates (kg/hour) for yellowtail flounder in 2011 for observed otter trawl sets on Georges Bank. The areas outlined in red (seed) and blue (grow-out) are the voluntary scallop closure areas that were implemented in January 2012. The horizontal red line indicates the NAFO divisions 5ZEj and 5ZEm. There was no groundfish fishery from February 8 to May 31, 2011.



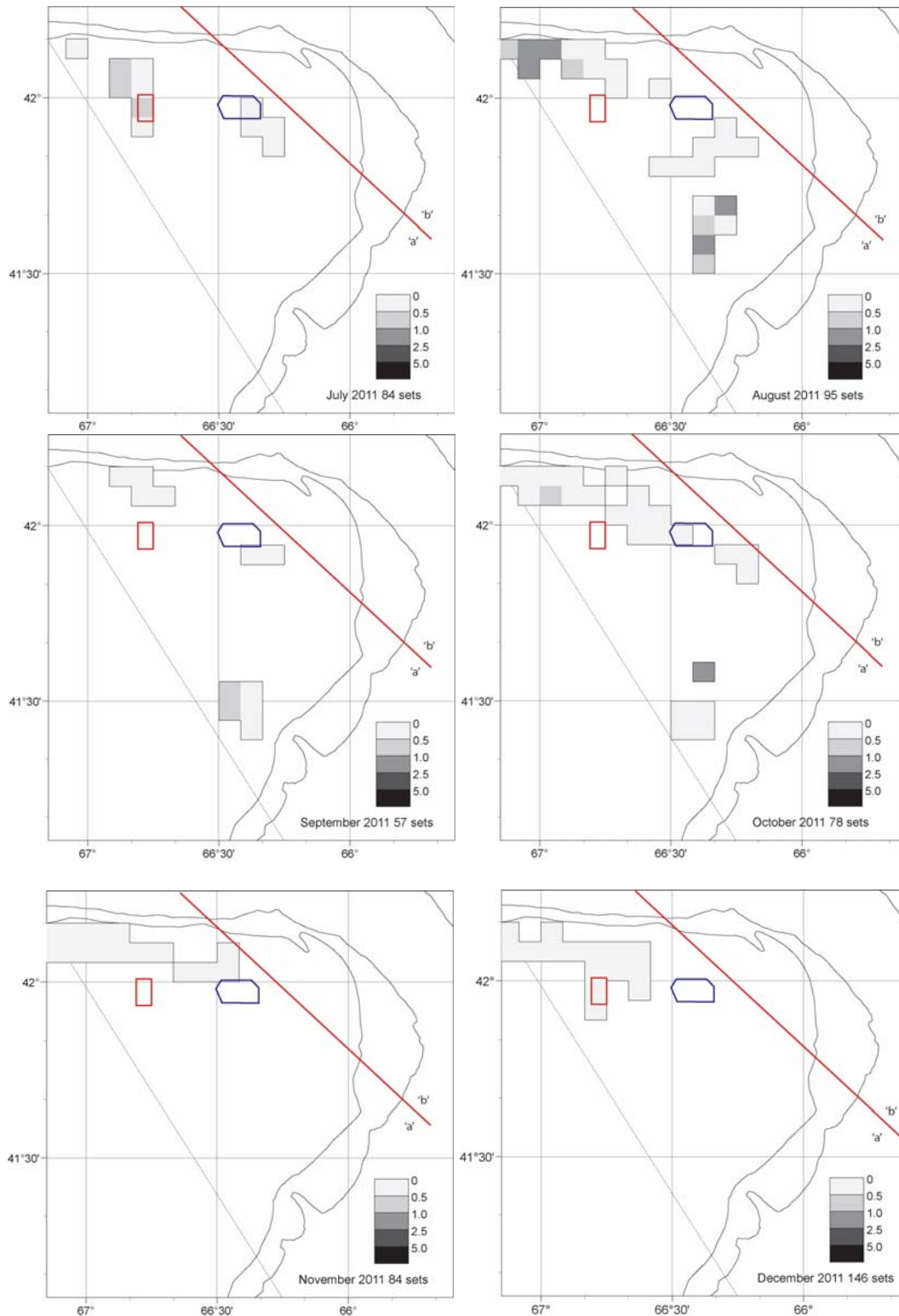
**Figure 3:** Average by-catch rates (kg/hour) for yellowtail flounder in 2011 for observed otter trawl sets on Georges Bank for September and October with increased scale to reflect higher catch rates. The areas outlined in red (seed) and blue (grow-out) are the voluntary scallop closure areas that were implemented in January 2012. The horizontal red line indicates the NAFO divisions 5ZEj and 5ZEm. There was no groundfish fishery from February 8 to May 31, 2011.



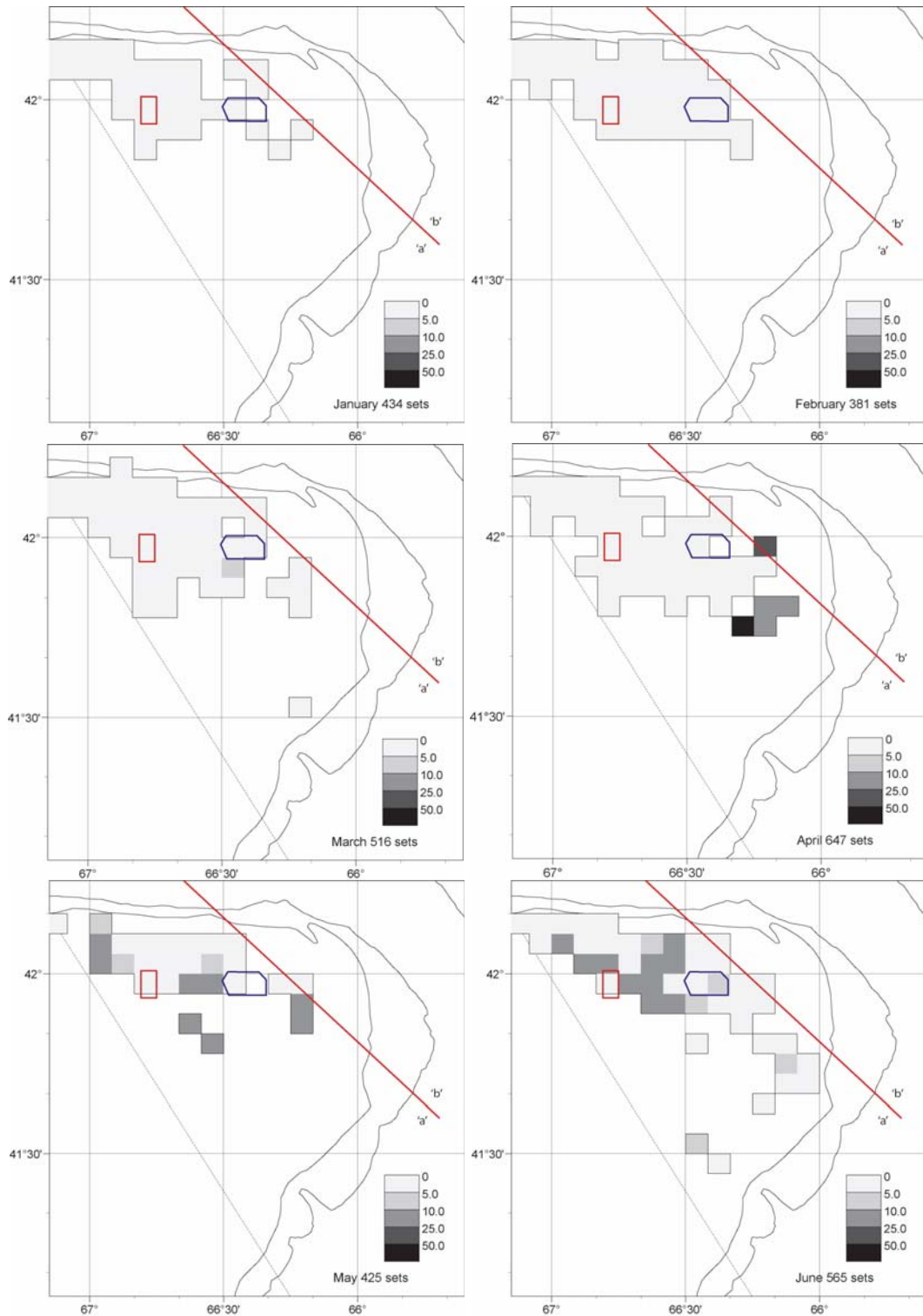
**Figure 4:** Average yellowtail flounder by-catch rates (kg/hour) for the months of June during 2005 to 2011 for observed otter trawl sets on Georges Bank. Cells located on the Canadian side with rates greater than 10 kg/hour are labelled in descending order. The areas outlined in red (seed) and blue (grow-out) are the voluntary scallop closure areas that were implemented in January 2012. The horizontal red line indicates the NAFO divisions 5ZEj and 5ZEm.



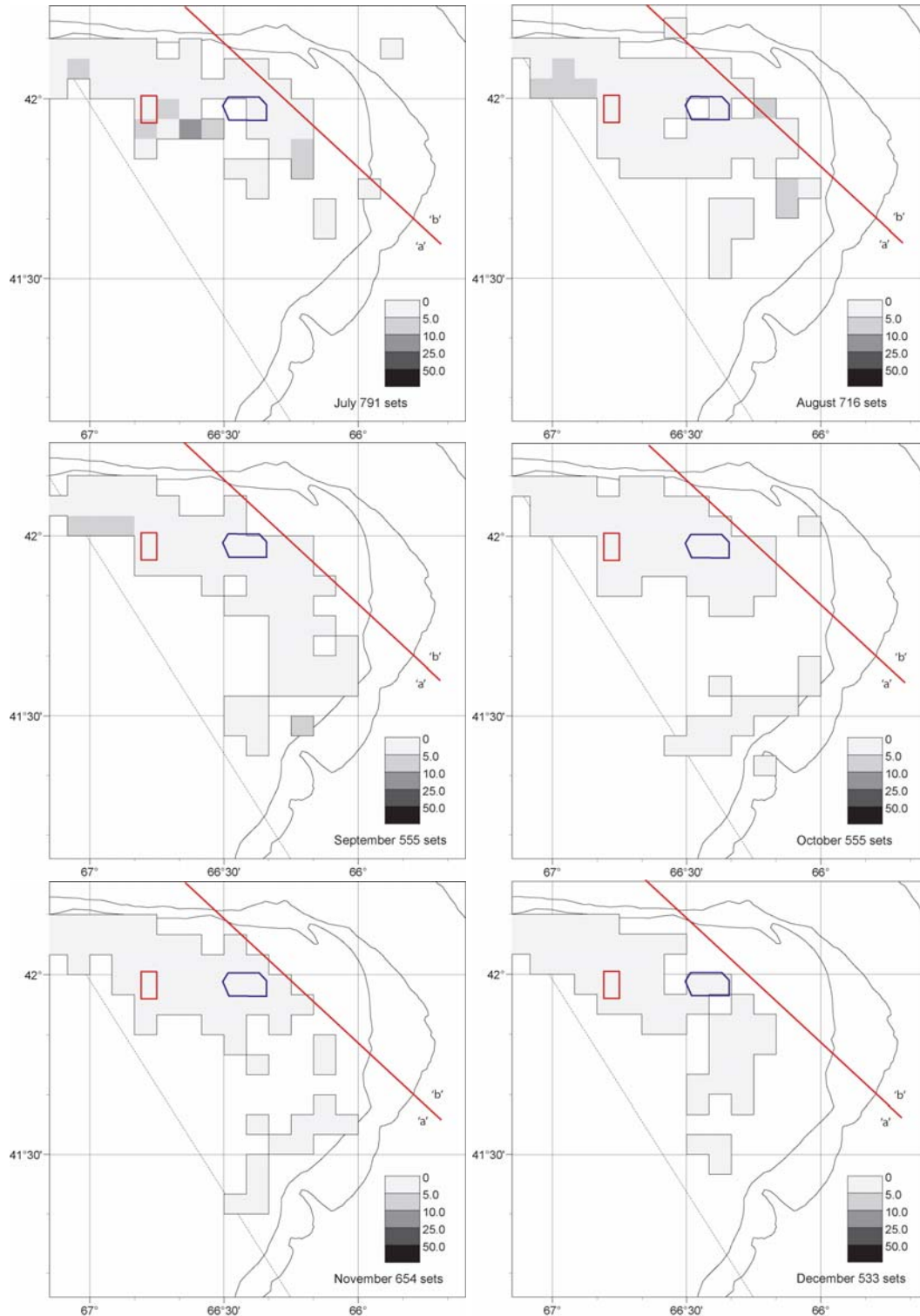
**Figure 5:** Average by-catch rates (kg/dredge) of yellowtail flounder on a monthly basis in 2011 from observed scallop trips on Georges Bank. The areas outlined in red (seed) and blue (grow-out) are the voluntary scallop closure areas that were implemented in January 2012. The diagonal red line indicates the division between the scallop management areas of Georges Bank 'a' and Georges Bank 'b'.



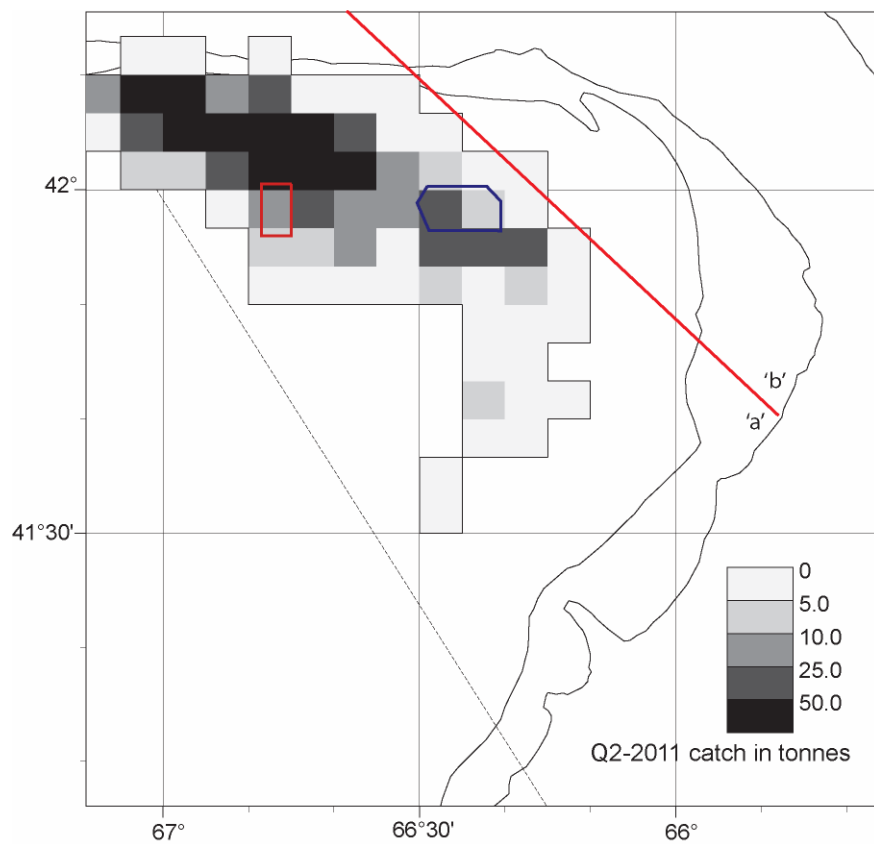
**Figure 5 (continued):** Average by-catch rates (kg/dredge) of yellowtail flounder on a monthly basis in 2011 from observed scallop trips on Georges Bank. The areas outlined in red (seed) and blue (grow-out) are the voluntary scallop closure areas that were implemented in January 2012. The diagonal red line indicates the division between the scallop management areas of Georges Bank 'a' and Georges Bank 'b'.



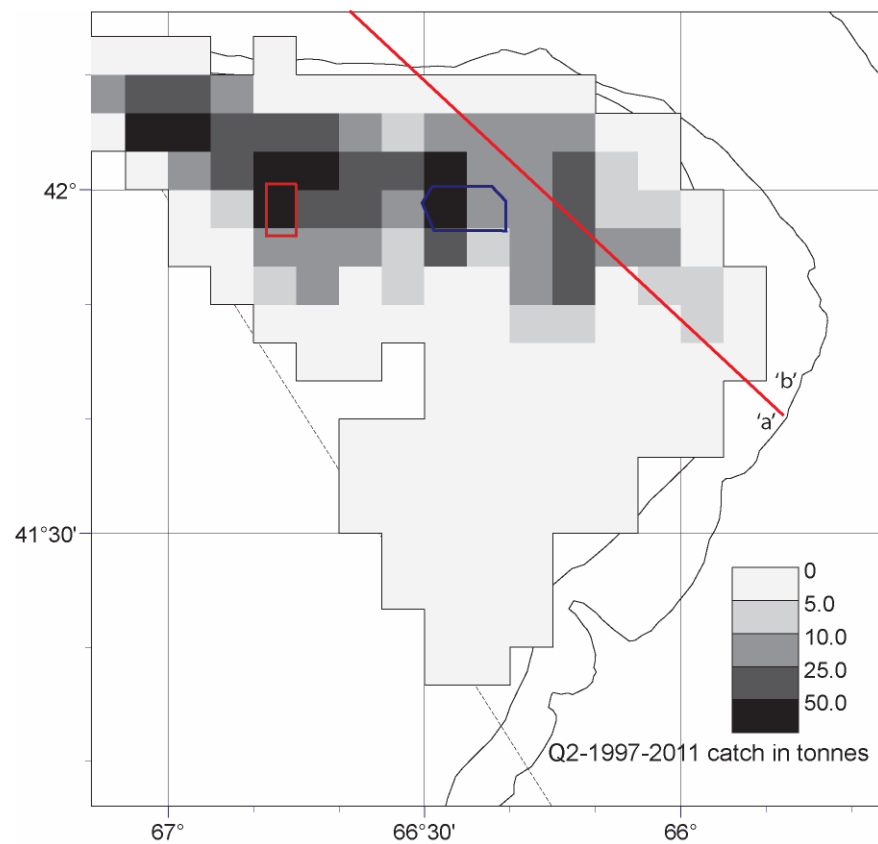
**Figure 6:** Average catch rates (kg/dredge) for yellowtail flounder from observed scallop trips from 2001 to 2011 (except 2003) on Georges Bank. The areas outlined in red (seed) and blue (grow-out) are the voluntary scallop closure areas that were implemented in January 2012. The diagonal red line indicates the division between the scallop management areas of Georges Bank 'a' and Georges Bank 'b'.



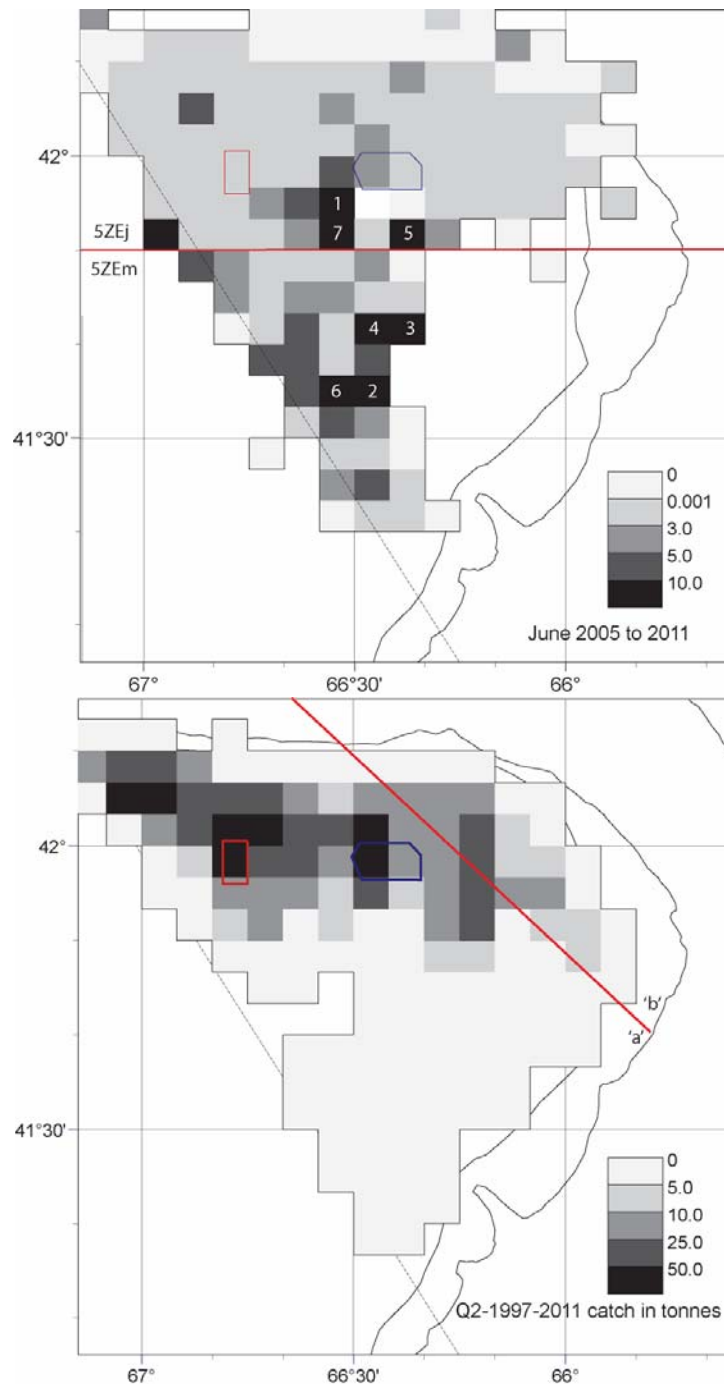
**Figure 6 (continued):** Average catch rates (kg/dredge) for yellowtail flounder from observed scallop trips from 2001 to 2011 (except 2003) on Georges Bank. The areas outlined in red (seed) and blue (grow-out) are the voluntary scallop closure areas that were implemented in January 2012. The diagonal red line indicates the division between the scallop management areas of Georges Bank 'a' and Georges Bank 'b'.



**Figure 7:** Distribution of offshore scallop catches (mt of meats) during the second quarter of 2011. The areas outlined in red (seed) and blue (grow-out) are the voluntary scallop closure areas that were implemented in January 2012. The diagonal red line indicates the division between the scallop management areas of Georges Bank 'a' and Georges Bank 'b'.



**Figure 8:** Average scallop catch (mt of meats) per cell during the second quarter of the period 1997 to 2011. The areas outlined in red (seed) and blue (grow-out) are the voluntary scallop closure areas that were implemented in January 2012. The diagonal red line indicates the division between the scallop management areas of Georges Bank 'a' and Georges Bank 'b'.



**Figure 9:** (Top Panel): Average yellowtail flounder by-catch rates (kg/hour) for the months of June during 2005 to 2011 for observed otter trawl sets on Georges Bank. Cells located on the Canadian side with rates greater than 10 kg/hour are labelled in descending order. The horizontal red line indicates the NAFO divisions 5ZEj and 5ZEm.

(Bottom Panel): Average scallop catch (tonnes of meats) per cell during the second quarter of the period 1997 to 2011. The diagonal red line indicates the division between the scallop management areas of Georges Bank 'a' and Georges Bank 'b'.

The areas outlined in red (seed) and blue (grow-out) are the voluntary scallop closure areas that were implemented in January 2012.

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