Mapping Inshore Lobster Landings and Fishing Effort on a Maritimes Region Statistical Grid (2012–2014)

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ABSTRACT

This report describes an analysis of Maritimes Region inshore lobster logbook data reported at a grid level, including Bay of Fundy Grey Zone data reported at the coordinate level. Annual and composite (2012–2014) grid maps were produced for landings, number of license-days fished, number of trap hauls, and the same series standardized by grid area, as well as maps of catch weight per number of trap hauls as an index of catch per unit effort (CPUE). Spatial differences in fishing pressure, landings, and CPUE are indicated, and potential mapping applications are outlined. Mapping the distribution and intensity of inshore lobster fishing activity has management applications for spatial planning and related decision support. The lack of region-wide latitude and longitude coordinates for lobster effort and landings limits the utility of commercial logbook data for marine spatial planning purposes.

RÉSUMÉ

Le présent rapport décrit une analyse des données provenant des journaux de bord de la pêche côtière au homard dans la région des Maritimes déclarées à l'échelle du quadrillage, y compris des données relatives à la zone grise de la baie de Fundy consignées sous forme de coordonnées. On a dressé des cartes annuelles et combinées (2012–2014) avec quadrillage pour consigner les débarquements, le nombre de jours de pêche, le nombre de casiers levés et la même série d'éléments normalisés par zone des grilles. En outre, on a dressé des cartes indiquant le poids des prises par nombre de casiers levés comme indice des prises par unité d'effort. Les différences spatiales relatives à la pression de la pêche, aux débarquements et aux prises par unité d'effort figurent dans les cartes; on y décrit également les applications de cartographie possibles. La cartographie de la répartition et de l'intensité des activités de pêche au homard côtière a des applications de gestion pour la planification spatiale et l'aide à la prise de décision connexe. L'absence de coordonnées de latitude et de longitude à l'échelle régionale pour l'effort et les débarquements de homard limite l'utilité des données des journaux commerciaux pour des fins de planification spatiale marine.

INTRODUCTION

In 2013, a Fisheries and Oceans Canada (DFO) technical report mapped inshore lobster landings and fishing effort in DFO Maritimes Region on a modified statistical grid using 2008–2011 data (Coffen-Smout et al. 2013). The current report updates inshore lobster landings and effort mapping with 2012–2014 logbook data displayed on the original, unmodified statistical grid to reflect the full extent of region-wide Lobster Fishing Areas (LFAs).

Mapping the spatial distribution of inshore lobster fishing activity at effective planning scales provides the potential for multiple applications in the context of integrated oceans and coastal management and planning as mandated under Canada's *Oceans Act*. The spatial distribution of inshore lobster fishing in the Maritimes Region is constrained by the lack of region-wide coordinate data reporting requirements for fisheries effort and landings. This report describes the analysis of Maritimes Region lobster logbook data reported at a grid level, including Bay of Fundy Grey Zone data reported at the coordinate level as a condition of license. Annual and composite (2012–2014) grid maps were produced for landings, number of license-days fished (i.e., licenses fished per grid cell per day as a metric for use intensity / fishing vessel presence), number of trap hauls, and the same series standardized by grid area, as well as maps of catch weight per number of trap hauls as an index of catch per unit effort (CPUE), see Appendix 1. Spatial differences in fishing pressure, landings and CPUE are indicated, and mapping applications are outlined.

Tremblay et al. (2011) noted that the coastal distribution of American lobster (*Homarus americanus*) ranges from the southern tip of Labrador to Maryland, U.S.A., with dominant inshore fisheries concentrated in the Gulf of St. Lawrence and the Gulf of Maine (Figure 1). Lobster distribution in the Maritimes Region has been determined by summer research vessel surveys from 1999 to 2016 as shown in Figure 2. Lobsters inhabit deep water (< 750 m) in the Gulf of Maine and along the edge of the continental shelf from Sable Island to North Carolina, U.S.A. The deep-water distribution is due to the presence of warm slope water that keeps the slope and deep basins in the Gulf of Maine warm year-round. Warm, deep water is typically not found on the eastern Scotian Shelf, in the Gulf of St. Lawrence, or off Newfoundland (Tremblay et al. 2011).

In the Maritimes Region there are 12 regulated Lobster Fishing Areas (LFAs) that comprise the inshore lobster fishery. They are found from the northern tip of Cape Breton, along the Atlantic Coast of Nova Scotia, and into the Bay of Fundy. An independent statistical grid overlaying the LFAs acts as the smallest reporting unit for fishers' logbook data (Figure 3). The statistical grid is not coincident with all LFA boundaries, particularly in the Bay of Fundy.

Historic lobster landings records (1892–1946) were reported by calendar year and summarized by county, while annual landings from 1947 to 1995 were summarized by statistical districts (Tremblay et al. 2011). In 1995, the mandatory catch reporting system changed for all LFAs in the Maritimes Region, with fishers reporting daily catch by port of landing and date. The spatial reporting of lobster fishing activity started in November 1998 when fishers in LFA 34, off southwest Nova Scotia, adopted a Lobster Catch and Settlement Report requiring them to submit spatial information on daily catch and effort by reference to a 10 x 10-minute statistical grid system that provided the first visual portrayal of landings and effort distribution in LFA 34 (Figure 3). This 10-minute statistical grid reporting system was later implemented in LFAs 35–38 in the Bay of Fundy in 2003 (DFO 2007; Robichaud and Pezzack 2007) and was in full use for LFAs 34–38 by 2005. Similar data were obtained in 2004 and 2005 during a pilot project in LFAs 27–32 (i.e., the Eastern Shore of Nova Scotia to northern Cape Breton), using a non-uniform statistical grid of inshore-offshore rectangles along the Atlantic coast of Nova Scotia as shown in Figure 3. By 2006 (2005–2006 for LFA 33, i.e., Baccaro Point to Halifax), a mandatory Lobster Catch and Settlement Report was introduced to all fishers in LFAs 27–33 and participation rates increased thereafter. The percentages of licenses reporting at the statistical grid level did not consistently exceed 70% until 2008 (John Tremblay, pers. comm.).

The terms 'statistical grid' and 'grid' are used interchangeably, and 'statistical grid cell' and 'grid cell' both refer to the individual reporting units within that grid. It should be noted that lobster landings and effort data from the offshore LFA 41 fishery were not incorporated in this grid analysis. The offshore LFA 41 fishery occurs beyond LFAs 33, 34 and 40 in the areas of southeast and southwest Browns Bank, Georges Basin, Georges Bank, and Crowell Basin (Pezzack et al., 2015).

Applications of Lobster Mapping to Oceans Management

Spatial analysis and mapping the distribution and intensity of inshore lobster fishing activity are important information sources in management applications beyond classifying fishing pressure, harvest levels, and potential differences in lobster production. In an oceans management and planning context, lobster mapping products fulfill coastal and marine spatial planning applications such as: mitigating human use conflicts with seabed cables and marine shipping terminals; informing environmental emergency response operations and protocols; monitoring compliance and threats in marine protected areas; assessing use intensity in the context of ecosystem approaches to management, e.g., cumulative impacts assessment; providing advice in Marine Stewardship Council sustainability eco-certification processes; assessing the risk and relative probability of interactions with Schedule 1-listed species under the *Species at Risk Act*, e.g., North Atlantic right whales; informing federal and provincial government-mandated environmental assessment processes; addressing marine conservation objectives and planning a bioregional marine protected areas network; and decision support in the sectoral management of aquaculture development and ocean renewable (tidal, wind and wave) energy projects.

METHODS

Lobster Logbook Data

Logbook data for January 2012 to December 2014 from the Commercial Data Division, DFO Policy and Economics Branch, were used in the analysis. The data included date fished, traps fished, and catch weight (kg) per grid cell. Within the 2012–2014 logbook grid data, 7.5% of records did not report in which statistical grid cell the fishing occurred. As a result, these data could not be included in the analysis and were removed. The removal meant that, over three years, 11.5% of the total catch weight and 16.8% of total trap hauls could not be attributed to the correct grid cells. This underestimation should be noted as it affects the analysis described later. For a detailed breakdown of the excluded data by LFA and by year, see Appendix 2.

Grey Zone Logbook Data

In addition to the grid-level logbook data reported in the Bay of Fundy Grey Zone in LFA 38, some lobster fishing in the Grey Zone is reported as latitude and longitude coordinates (see Figure 4). Multiple positional errors exist in the Grey Zone latitude and longitude data as illustrated by the green points in Figure 4 outside the Grey Zone (see red-lined polygon) in Canadian and U.S. waters. There were also 8.5% of Grey Zone records with no reported coordinates for 2012–2014. The Grey Zone landings and effort data in the MARFIS system for LFA 38 are complementary to the Grey Zone statistical grid record data and are considered in this analysis. The coordinate information was used to isolate those records that fell within the statistical grid between 2012 and 2014, and to assign a statistical grid number to each record. The statistical grid cells that contained the Grey Zone records were: 49, 61, 62, 74, 75, 86 and 87. For each grid cell, the total numbers of license-days fished, trap hauls, and catch weight (kg) were calculated for each year and the three-year interval and then combined with the grid-level logbook data.

Preparation of the Grid

Unlike the previous inshore lobster mapping report by Coffen-Smout et al. (2013) that modified the statistical grid in fishing areas east of Halifax, the current report used the original, non-uniform statistical grid of inshore-offshore rectangles in LFAs 27–32. It is important to note that in some rectangular grids along the Eastern Shore of Nova Scotia (i.e., east of Halifax in LFAs 27–32) lobster fishing extends only to the 100-m depth contour, and in others there may be occasional exploratory effort outside the 100-m depth contour but still inside the LFA outer boundary. For the standardized grid area maps, all area calculations for grid cells abutting the coastline were based on trimming to the coastline of the statistical grid.

Data Processing

Data discovery of the dataset revealed cases of null values for individual grid cells in single years during 2012 to 2014, but not across all three years. For purposes of comparison, grid cells with no reported data (null values) in single years were treated as zero values during the classification and are noted as such with black-lined, white-filled grids in annual maps. Missing grid cell data could mean the following: 1) no fishing activity occurred in the grid cell during those years; 2) fishing activity occurred in the grid cell, but it was unreported; 3) fishing activity occurred in the grid cell, but it was reported in an adjacent grid cell(s); and 4) as observed, reporting for the grid cell was inconsistent, e.g., numbers of license-days fished and catch weight were reported, but the number of trap hauls was unreported. In particular, 3.5% of the grid records and 52% of the Grey Zone coordinate data had catch weights but no trap hauls.

Annual and composite maps were produced for catch weight, fishing effort expressed as numbers of trap hauls and license-days fished, and for CPUE based on catch weight per number of trap hauls. In order to produce effort and landings map products standardized by area, annual values for the number of trap hauls, the number of license-days fished, and catch weight in kilograms were divided by the area (km^2) per corresponding grid cell to calculate trap hauls/km^2, license-days fished/km^2, and catch weight (kg)/km^2 respectively. A 'trap fished' as reported in the database is equated with a 'trap haul' for the purposes of this analysis.

Fishers can report activity in up to three grids per day, with no obligation to report time spent fishing in each grid. For the purposes of calculating the number of license-days fished per grid cell, if any fishing occurred in a given grid cell on a given day, that grid cell was assigned a value of one license-day fished. License-days fished are calculated by summing the number of licenses per grid cell per day as a metric for human use intensity / fishing vessel presence, i.e., if five licenses fish the same grid cell per day, it equals five license-days. While this approach is appropriate to understand how many license-days fishing occurred in any given grid cell, it is worth cautioning that one license-day of fishing may not represent the same level of effort in each grid cell.

In order to calculate CPUE, the relationship between catch weight and the corresponding trap hauls was calculated. Catch weight and trap hauls were used to derive CPUE ratios per logbook record, which were then averaged for each individual grid cell per year and for the three-year composites. Records with null trap hauls and reported catch (3% of grid records) were removed from CPUE ratio calculations to avoid bias, while records with reported trap hauls and no catch (0.3% of grid records) were retained to estimate CPUE ratios.

Data were divided into five classification intervals using modified quantile breaks, i.e., combining data for all three years and assigning the same class intervals for each year to allow for comparisons between years; however, only one set of yearly maps is included in this report, namely for 2014. The five quantile class breaks were calculated from a pool of all values from the three years of data to account for the full possible range of values. These class breaks were then manually applied to the data for individual years. Landings and effort values were totalled on a calendar-year basis rather than on a fishing-season basis, which extends over two calendar years in LFAs 33, 34, 35, 36, and 38. Calendar-year maps were produced for consistency with other publicly available fisheries mapping series produced by the Oceans and Coastal Management Division. The official open season dates and the variable number of fishing days per season by LFA are listed in Table 5, Appendix 2 (Atlantic Fishery Regulations, 1985).[1] As noted above, grid cells with no reported data in individual years and for all three years in the composites are black-lined, white-filled grids in all maps.

To comply with Government of Canada privacy policy (Treasury Board Directive, 2010), privacy assessments were conducted on all annual map layers to identify LFAs containing data from less than five vessel IDs, license IDs and fisher IDs. If the "Rule of Five" threshold was not met, confidential information such as catch weight and fishing effort were withheld from the affected LFAs to protect the identity or activity of individual vessels or companies. In 2014, LFA 28 (Bras d'Or Lakes) was the only LFA in three years with less than five vessel IDs, license IDs and fisher IDs. Consequently, the 2014 maps show screened areas for privacy policy compliance.

[1] The number of fishing days can vary from one season to the next, particularly in LFAs 33–38 where weather delays can affect the opening date and reduce the overall season length.

Five data deficiencies related to inshore lobster fishing activity are discussed below. Deficiencies relate to data not being available, effort duplication in the dataset, or data not being collected at a scale that allows comparisons between grid cells. Combined, these data deficiencies contribute to a potential underestimation of the true fishing effort and landings associated with the entire inshore lobster fishery.

First, data deficiencies relate to the disputed lobster fishing area known as the Grey Zone in the Bay of Fundy, southwest of Grand Manan, New Brunswick, which is fished by both Canadian and Maine-based lobster fishers. Canadian effort and landings are well represented in the Grey Zone data; however, enquiries with U.S. federal and state authorities indicated there were no data reporting requirements at a scale or frequency in the Grey Zone that would enable pooling U.S. and Canadian lobster logbook data. Hence, only Canadian data are used in the analysis, and the grid data classifications of Grey Zone lobster effort and landings are likely underestimated due to unknown U.S. fishing activity. Eight grid cells or portions thereof are potentially affected by missing U.S. data, namely grids 49, 61–63, 74–75 and 86–87. Missing U.S. data reporting in the Grey Zone may result in spurious data analysis.

As discussed earlier, another data deficiency relates to the reported trap haul and catch weight logbook data that did not have associated grid cell information. In order to help quantify the resulting annual and composite underestimation, the total trap hauls and catch weight were summarized by LFA for 2012–2014 (Tables 1 to 4, Appendix 2).

A third data deficiency is the potential for effort data duplication, particularly in LFA 34 where catch may be greater than 4,999 lbs per license holder per day early in the fishing season. If a single catch entry is greater than 4,999 lbs, the Dockside Monitoring Company was supposed to split the record into two effort entries, i.e., add a second effort entry, with the same date, the same grid cells, splitting the catch as necessary, and the trap count split proportionally between the effort entries based on weight. However, effort values for the second record entry were often duplicated from the first entry, resulting in errors in the effort values. There were 239 split records in LFA 34 where trap haul effort was greater than 1,126 hauls for one license holder per day. Trap haul values greater than 1,126 per license per day were assumed to be data entry errors. We excluded trap haul data (126,021 trap hauls) from these records for the effort and CPUE map layers, but retained the associated catch weights for use in the landings maps. A partnership or stacked license in LFA 34 is authorized to fish 563 traps from the season opening till March 31st, therefore 1,126 trap hauls is equivalent to the trap limit being hauled twice per 24-hour day, (i.e., approximately 47 trap hauls per hour).

Another data gap in the mapping analysis is effort and landings data from DFO Gulf Region fishers in northwest Cape Breton who fish lobster off northern Cape Breton in LFA 27. This data, which is managed by DFO Gulf Region in Moncton, was not accessed by the authors. Gulf-based landings during 2012–2014 in LFA 27 by 39 license holders averaged 181 tonnes (DFO, 2016).

A final data deficiency stems from incomplete data from the Aboriginal Food, Social and Ceremonial (FSC) fishery. DFO Aboriginal Fisheries Management advised that the effort level in these fisheries is a small fraction (< 0.5%) of the total number of traps in the commercial fishery (Gary Weber, pers. comm.). During the 2014–2015 fishing season, 31,212 lbs (14,187 kg) of lobster were reported harvested in LFAs 25–38. In the 2011–2012 fishing season, 27,790 lbs (12,631 kg) of lobster were reported harvested in the same LFAs. It is noted that LFAs 25 and 26 do not fall within the DFO Maritimes Region study area, but the data reporting method does not allow quantification of catch weight by LFA or grid cell. As the time period of FSC-reported data occurs before and after the 2012–2014 date range, it is not possible to limit those records from the 2011–2012 fishing season that occurred in 2011, or the 2014–2015 fishing season that occurred in 2015. While the Aboriginal FSC fishery constitutes a small portion of the overall inshore lobster harvest (< 0.5% of total traps), it is a source of underestimation bias in the analysis.

RESULTS AND DISCUSSION

Composite catch weight and catch weight standardized by area for 2012–2014 are shown in Figures 5 and 6 respectively. The highest composite catches (Class 5 in red) in Figure 5 include a large proportion of LFA 34 grids off southwest Nova Scotia, grids in LFA 33 (south shore of Nova Scotia) and in the Bay of Fundy, and grids in LFAs 27 and 31 (eastern Nova Scotia). LFA 34 has the highest number (n = 31) of 10-minute grids with Class 5 catches. The standardization by area analysis for catch weight in Figure 6 reduced the number of Class 5 grids in eastern Nova Scotia from Figure 5. Standardized area grids with the lowest catch (Class 1 in green) are off the northern tip of Cape Breton, the Bras d'Or Lakes (LFA 28), in LFAs 30–32, offshore in LFAs 33 and 34, and the upper Bay of Fundy in Minas Basin.

CPUE over three years as measured by composite catch weight per number of trap hauls in Figure 7 is highest in the Bay of Fundy (LFAs 35, 36 and 38), in offshore southwest Nova Scotia (LFA 34), and an offshore LFA 33 grid east of Browns Bank adjacent to the offshore lobster fishery. Although the near-coastal grids in LFA 34 have the highest catch over three years, the CPUE here is lower, likely due to the relatively high levels of effort in terms of both license-days fished (Figures 8 and 9) and the number of trap hauls (Figures 10 and 11), resulting in lower LFA 34 yields relative to unit of effort. Grids in LFAs 33 and 34 (south and southwest shore of Nova Scotia), LFA 31A (eastern Nova Scotia), and LFA 27 (eastern Cape Breton) also have higher levels of effort in terms of license-days fished (Figures 8 and 9) and trap hauls (Figures 10 and 11). Grids with the lowest numbers of license-days fished and trap hauls correlate with the lowest catch weight grids, namely in northern Cape Breton (LFA 27), the Bras d'Or Lakes (LFA 28), offshore LFA 33 grids, and the upper and mid-Bay of Fundy (LFAs 35 and 36). CPUE in Figure 7 compared with trap hauls in Figure 10 illustrates higher numbers (Class 5 in red) of trap hauls associated with low CPUE (Classes 1–3) in LFA 27 and inshore LFA 34 grids, indicating high levels of exploitation. Figures 10 and 11 also suggest that where trap haul effort is lower (Classes 2–3) such as in the Bay of Fundy, CPUE is higher (Class 5 in red). Figures 8 and 9 confirm the expected general correlation between the highest numbers of license-days fished and trap hauls respectively in LFAs 27, 33 and 34. The standardization by area analysis for license-days fished and trap hauls respectively in Figures 9 and 11 noticeably reduced the number of Class 5 grids in LFA 27. Spatial differences that emerge from the standardization by area analyses are sensitive to the interpretations made regarding the size of actively fished areas (e.g., the fact that grids east of Halifax are only fished to the 100-m contour line yet the LFA boundaries extend beyond actively fished areas). If the actual areas fished are different, then the pattern of spatial differences may change.

Yearly region-wide maps in the data series were produced for all three years (2012–2014), however, the only annual maps included in this report are for 2014 (see Figures 12 to 18). The spatial patterns observed in the 2012–2014 composite map series described above are also reflected in the 2014 maps. For example, the highest 2014 catch weights per grid in Figure 12 are from LFA 34 grids off southwest Nova Scotia, LFA 35–38 grids in the Bay of Fundy, and some grids in LFAs 27 and 31A in eastern Nova Scotia. Grids in the Bras d'Or Lakes and offshore LFA 34 have no reported 2014 catch weight and trap hauls data, while grids in the Bras d'Or Lakes, offshore LFA 34, northern Cape Breton and St. Paul Island have no reported 2014 license-days fished data. CPUE in 2014 (Figure 14) is highest in the Bay of Fundy (LFAs 35–38), in offshore southwest Nova Scotia (LFA 34), and in LFA 30 off southern Cape Breton. LFAs 27, 31A, 33 and 34 have the highest numbers of license-days fished and trap hauls in 2014 as shown in Figures 15 and 17 respectively. Effort in 2014 in terms of license-days fished and trap hauls was also highest in LFA 31A grids off Canso, southwest Nova Scotia and in grids near southwest New Brunswick. It is important to note that visualization of catch and effort distributions is time-sensitive, is not static, and year-to-year differences may result from future changes in the fishery, including climate change-driven habitat suitability changes that impact lobster distribution. Accordingly, updates of these fishing activity maps should be produced every three to five years.

Finer scale maps may be used in ocean management and spatial planning to assess use intensity in the context of ecosystem approaches to management, to identify risks and interactions with other potential ocean uses, e.g., aquaculture development and marine renewable energy, and to address marine conservation objectives and marine protected area network planning. Hence, sub-regional analyses conducted for management applications in coastal areas could be made more relevant by integrating finer spatial and temporal scales and by reclassifying the data with modified quantile classifications for specific spatial scales.

Limitations and potentially confounding factors in the analysis include region-wide variations among LFAs in terms of the timing of fishing seasons, the number of active licenses, the number of traps per license, and variable fishing season length in days (Table 5). No effort was made to standardize for these factors in this regional mapping analysis.

Overall, the spatial analysis was limited by the application of combining a 10-minute grid with a non-uniform, rectangular statistical grid to produce a regional data classification on irregular-sized polygons. The region-wide adoption of latitude and longitude coordinate reporting in logbooks for catch weight and effort would enhance spatial information for marine spatial planning and related decision support, as well as for environmental emergency responses. This shift may require increased capacity in government (e.g., management and analysis of large datasets), as well as discussions with industry (e.g., to provide high resolution effort data).

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APPENDIX 1: Maps

Figure 1.—Lobster distribution based on known fishing areas and DFO and NMFS bottom trawl surveys. Prepared by D. Pezzack, DFO Science, 2010. Source: Tremblay et al. 2011.

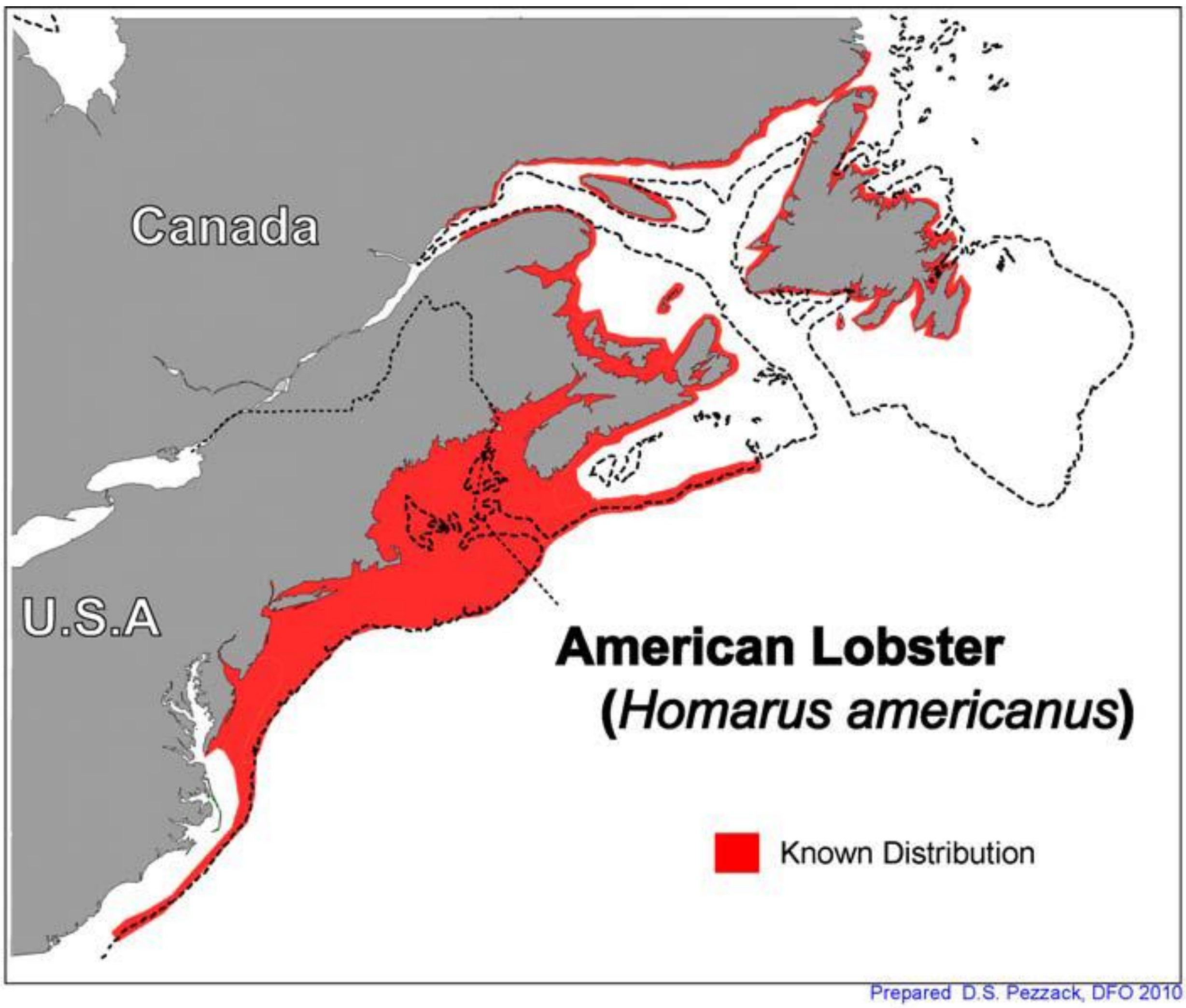


Figure 2.—Composite lobster catch in summer research vessel surveys, 1999–2016 (stratified random survey; average adjusted total number). Crosses indicate zero catches. Source: DFO Research Vessel Survey Database, November 2016. The survey does not include areas off coastal or southwest Nova Scotia.

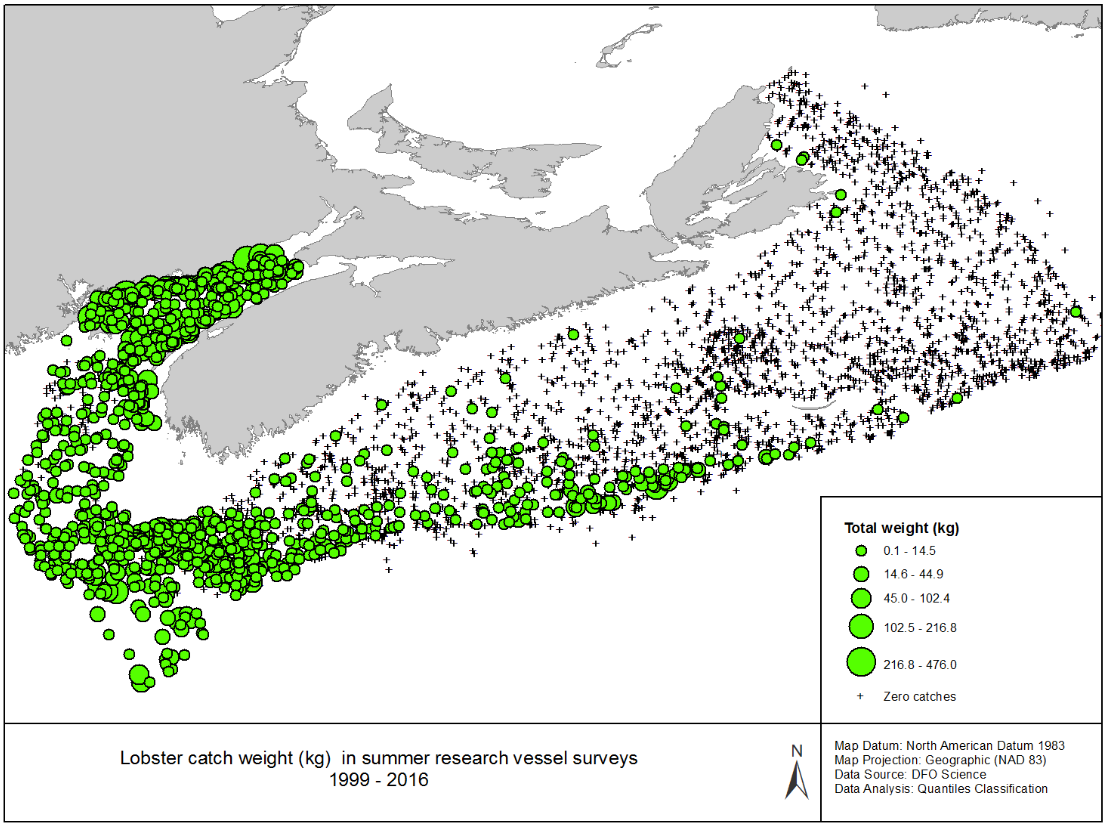


Figure 3.—Lobster Fishing Areas with statistical grids

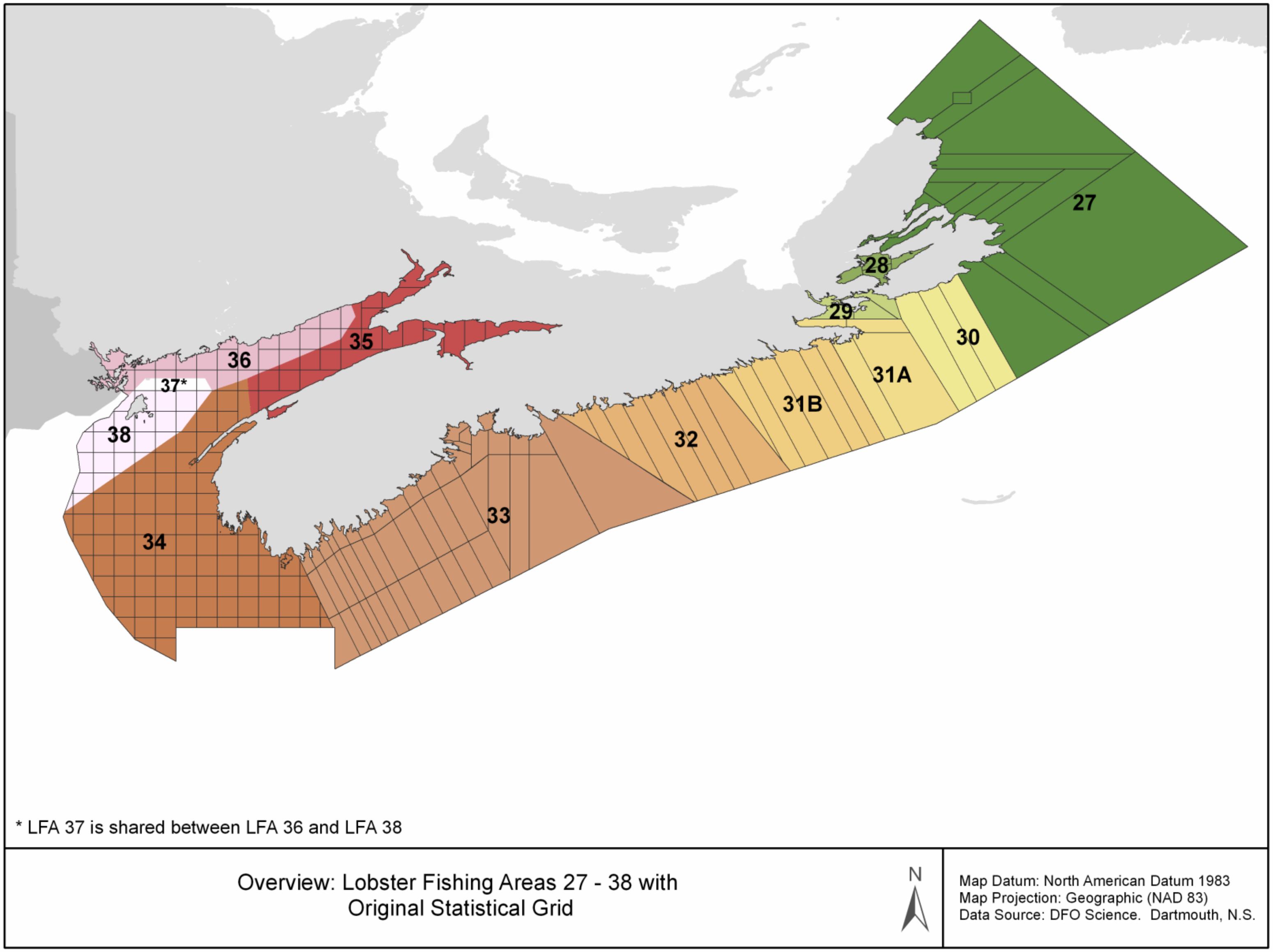


Figure 4.—Location of Maritime Fishery Information System (MARFIS) data (green) in relation to the statistical grid and red-lined Grey Zone.

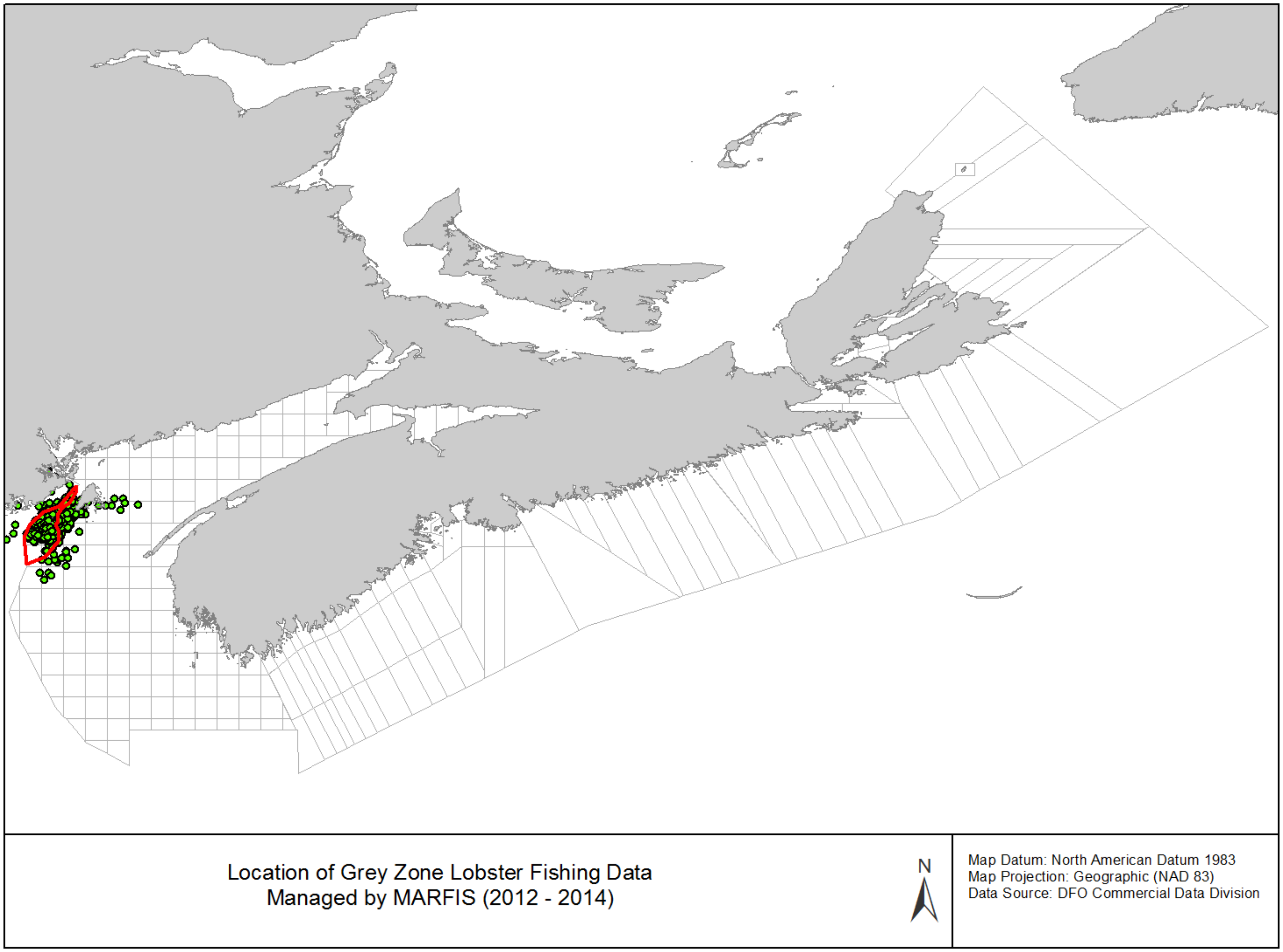


Figure 5.—Composite catch weight, 2012–2014

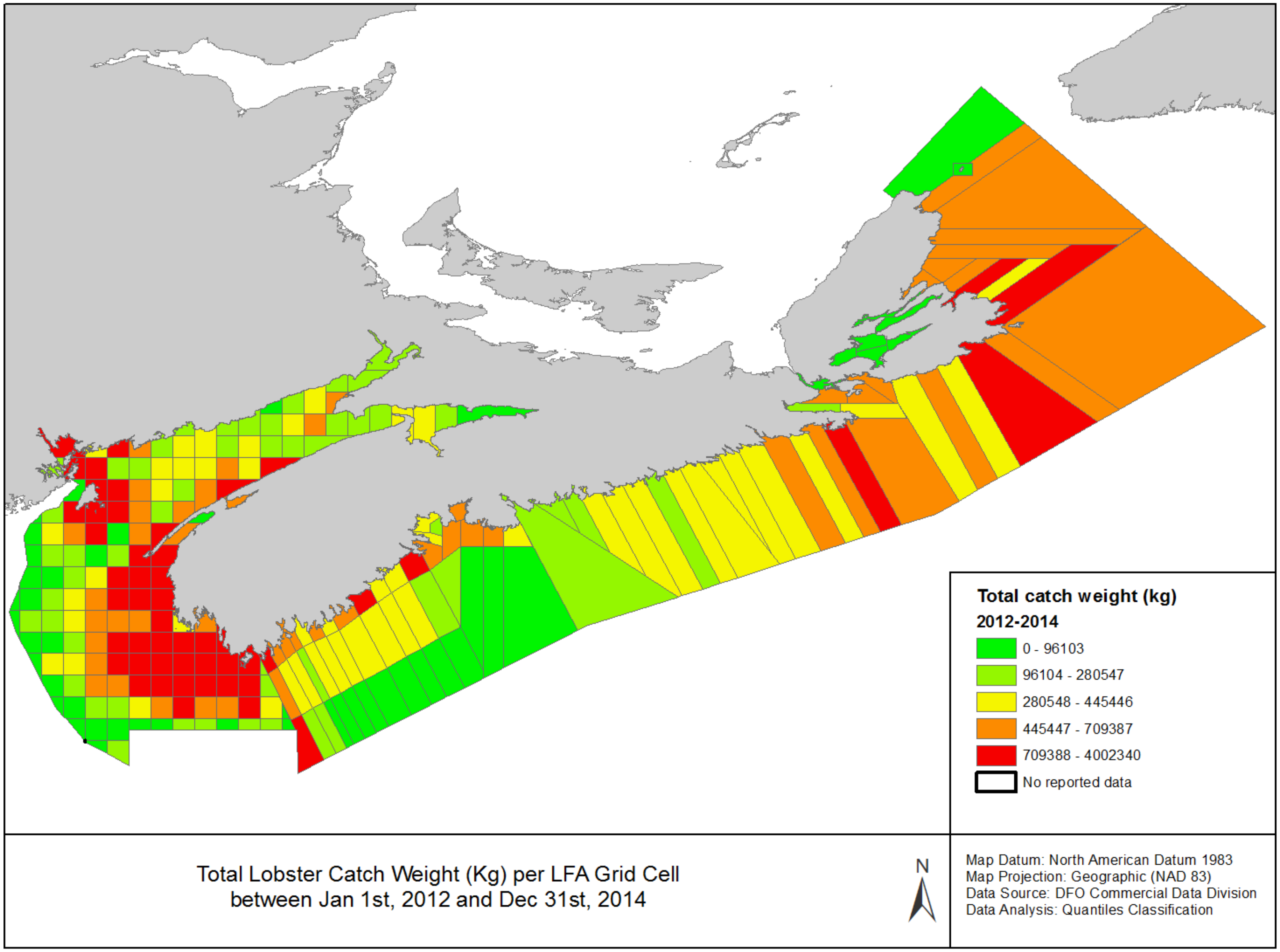


Figure 6.—Composite catch weight standardized by area, 2012–2014

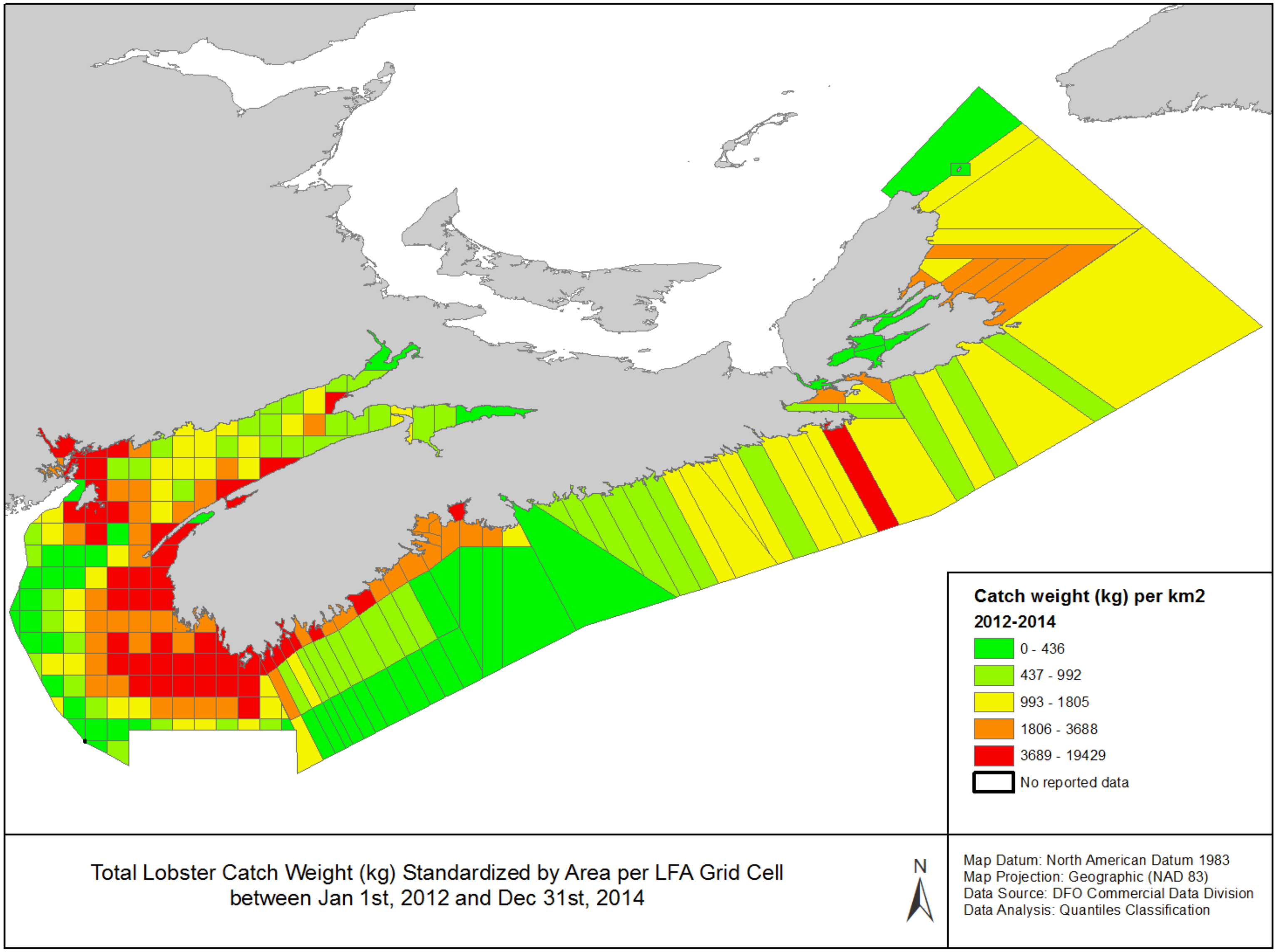


Figure 7.—Composite catch weight per trap haul (CPUE), 2012–2014

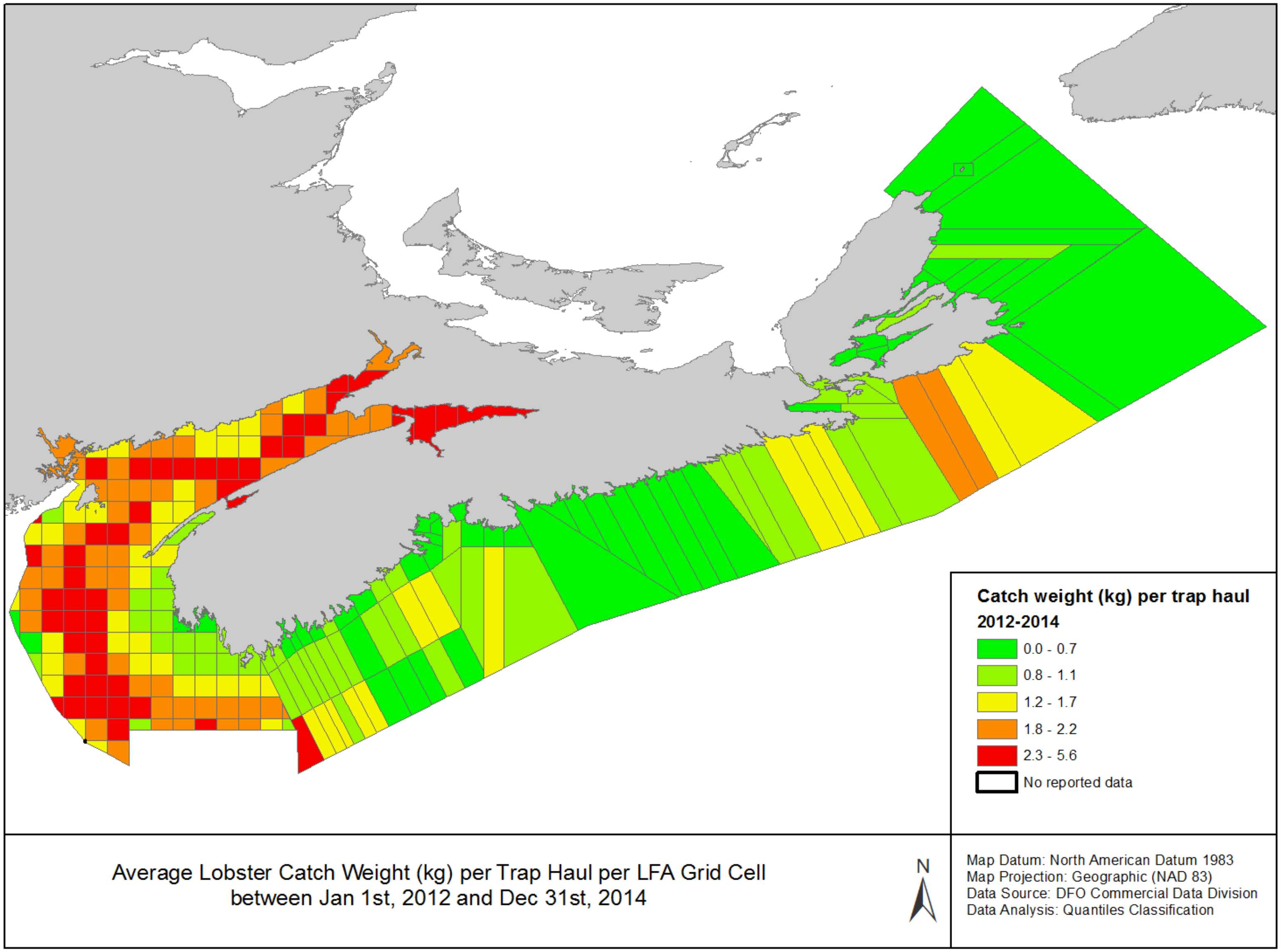


Figure 8.—Composite number of license-days fished, 2012–2014

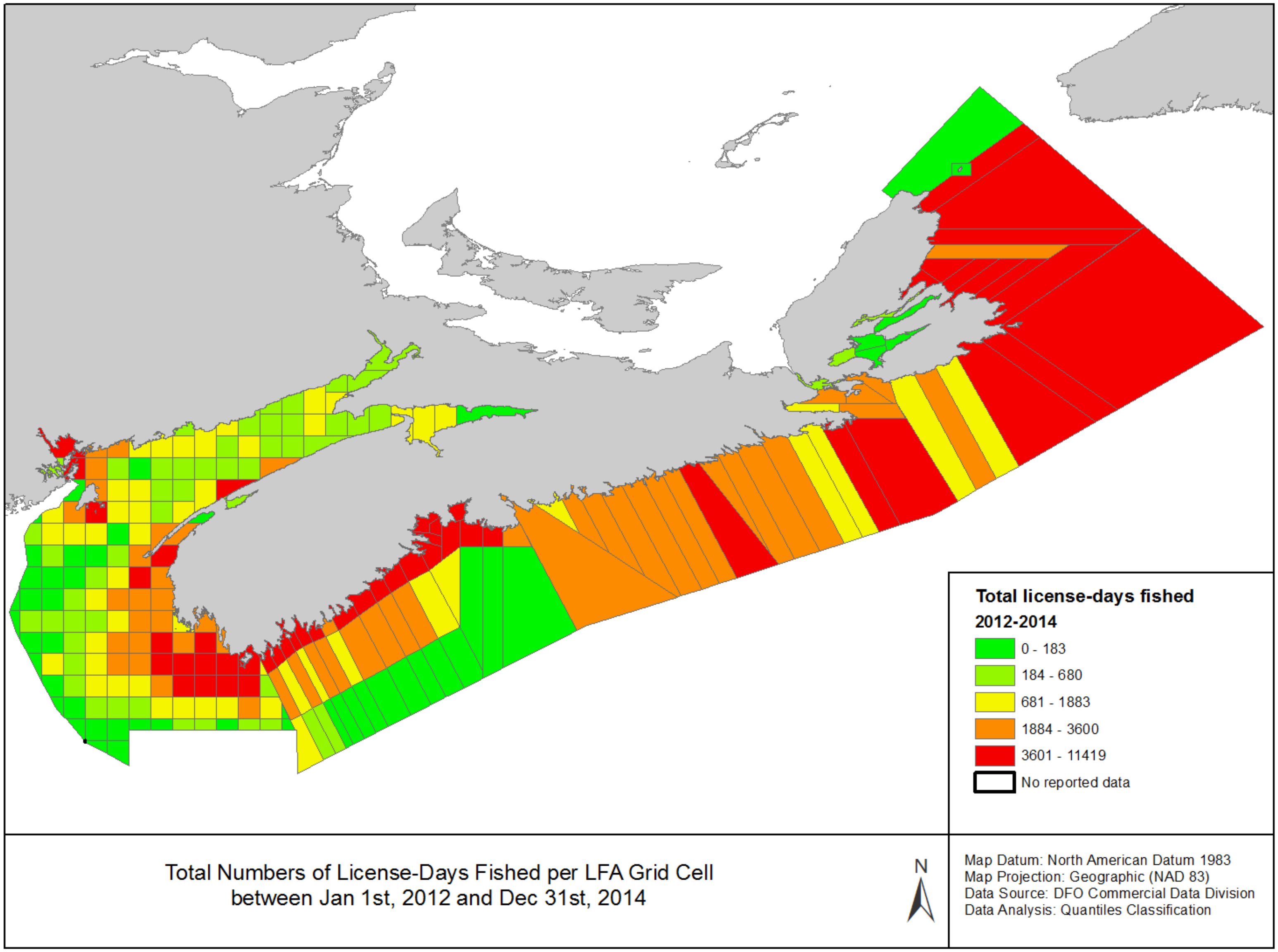


Figure 9.—Composite number of license-days fished standardized by area, 2012–2014

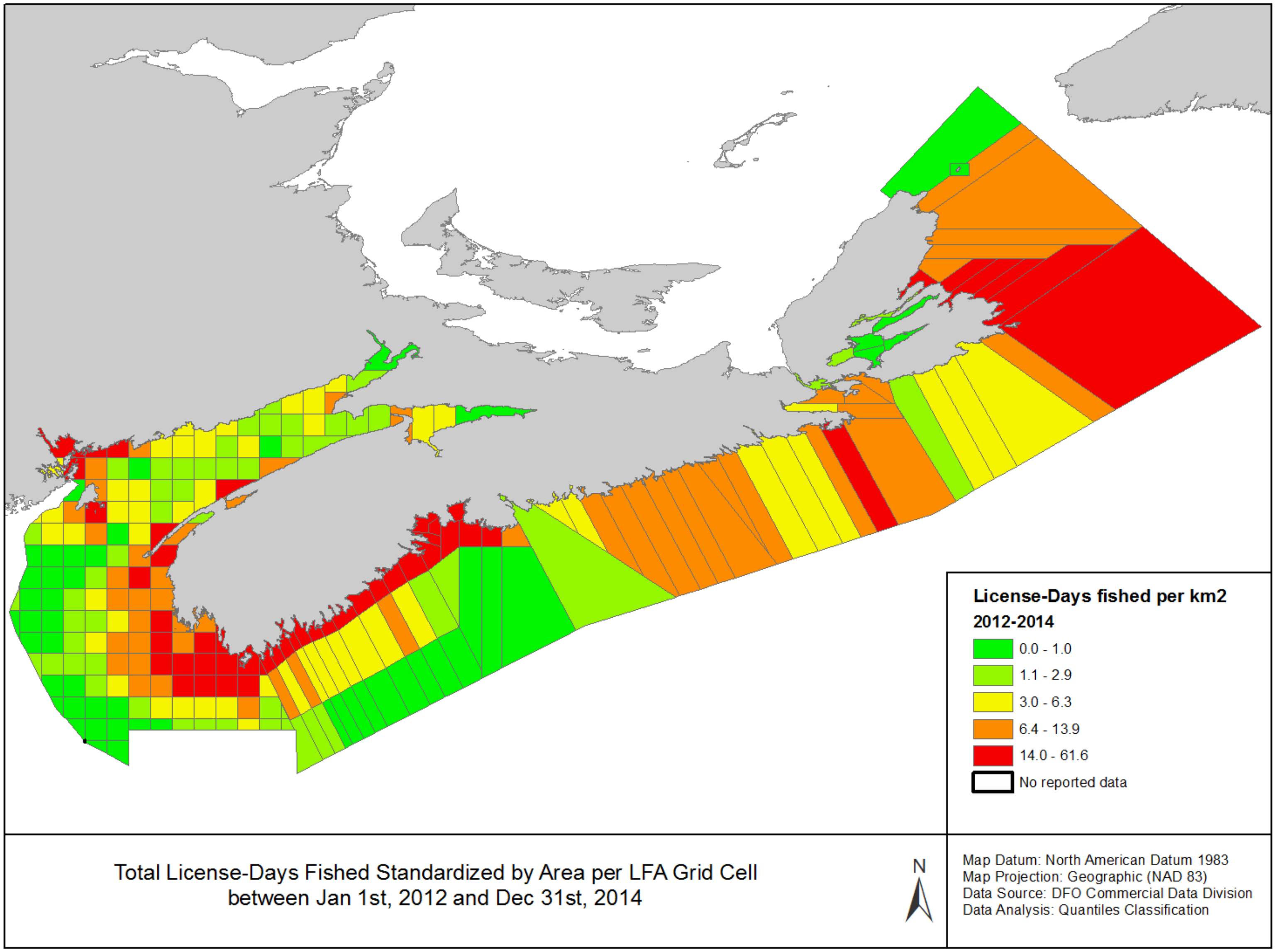
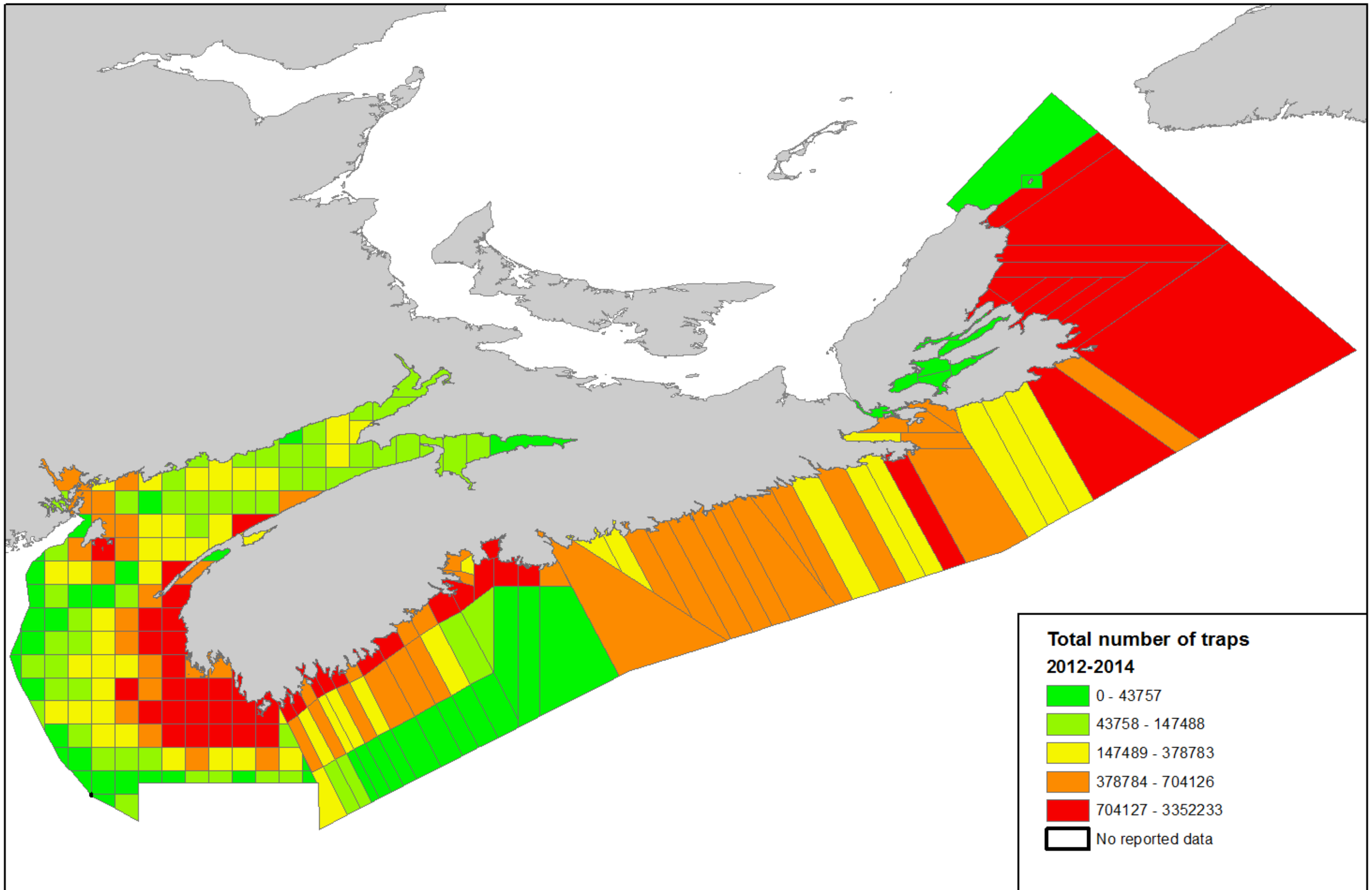


Figure 10.—Composite number of trap hauls, 2012–2014



Total Number of Lobster Traps Hauled per LFA Grid Cell
between Jan 1st, 2012 and Dec 31st, 2014

N

Map Datum: North American Datum 1983
Map Projection: Geographic (NAD 83)
Data Source: DFO Commercial Data Division
Data Analysis: Quantiles Classification

Figure 11.—Composite number of trap hauls standardized by area, 2012–2014

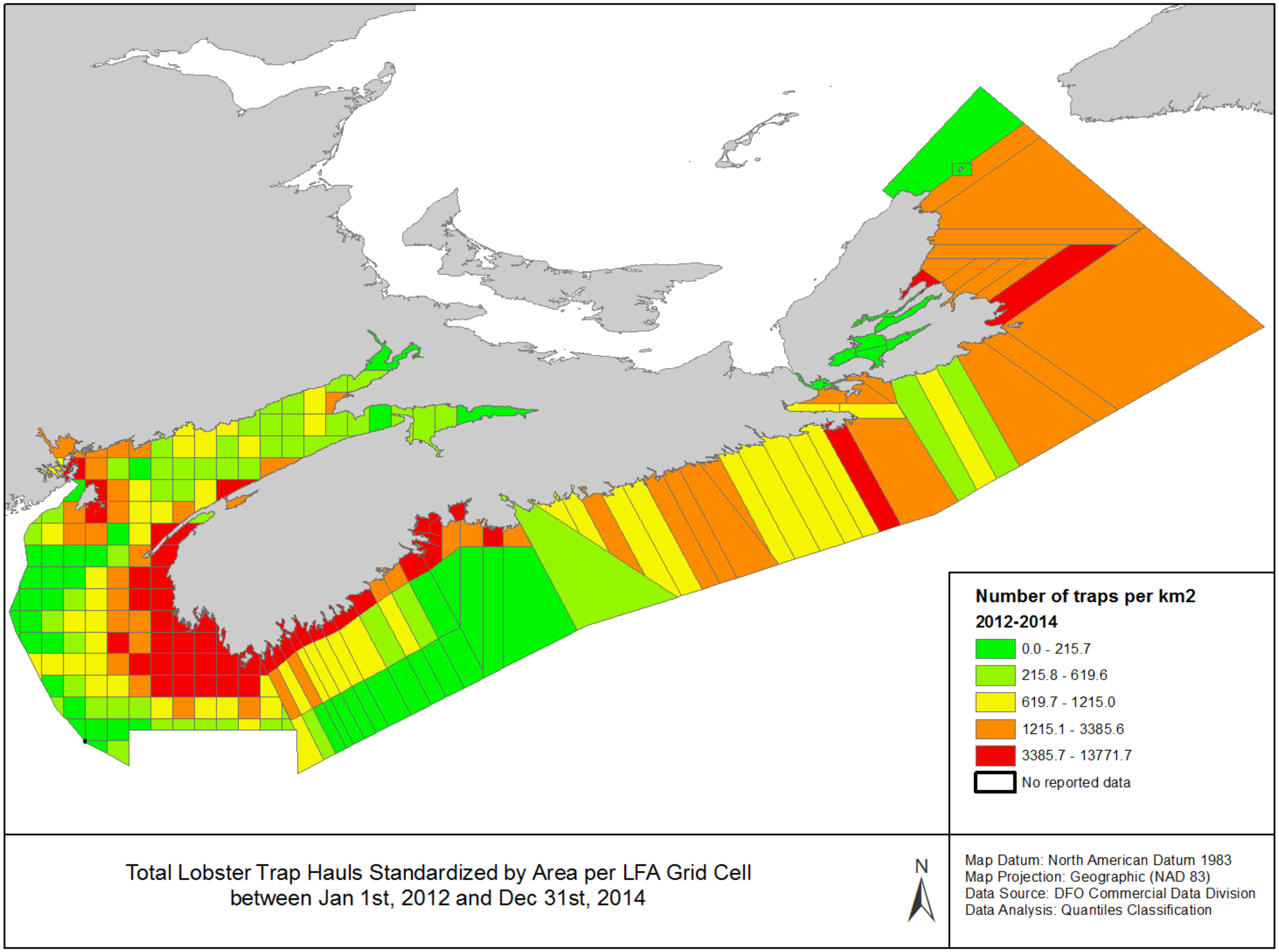


Figure 12.—Annual catch weight, 2014

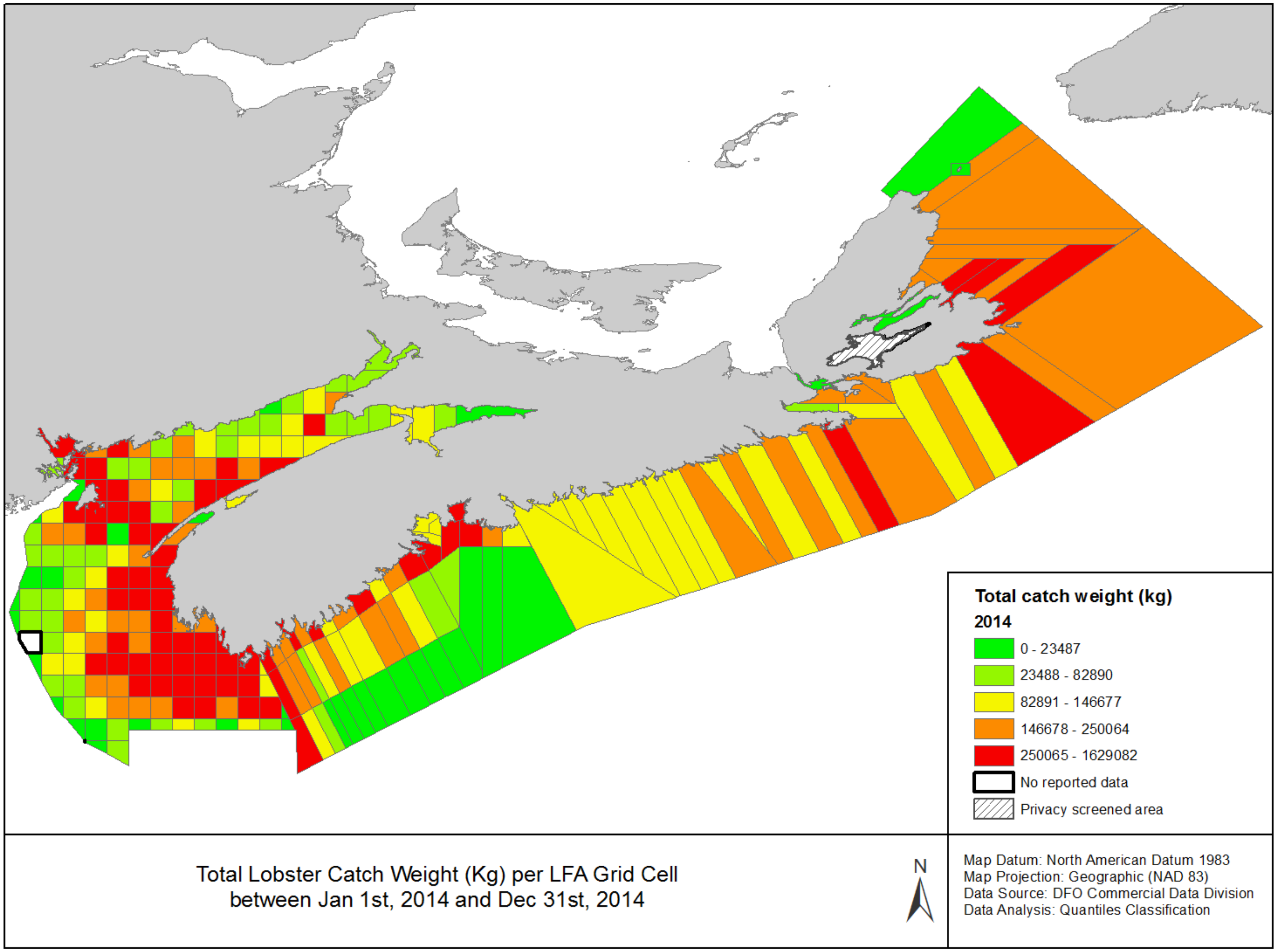


Figure 13.—Annual catch weight standardized by area, 2014

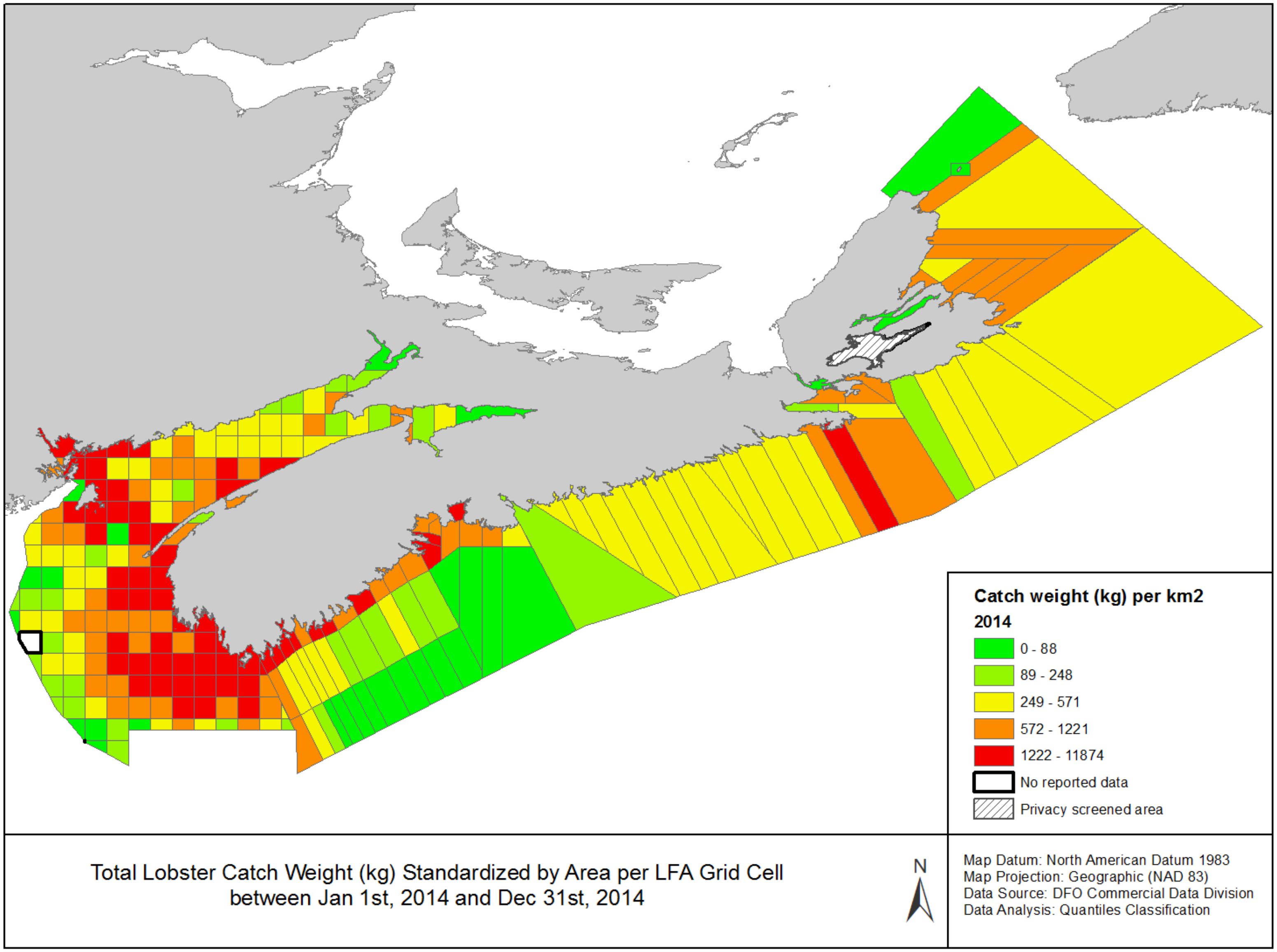


Figure 14.—Annual catch weight per trap haul (CPUE), 2014

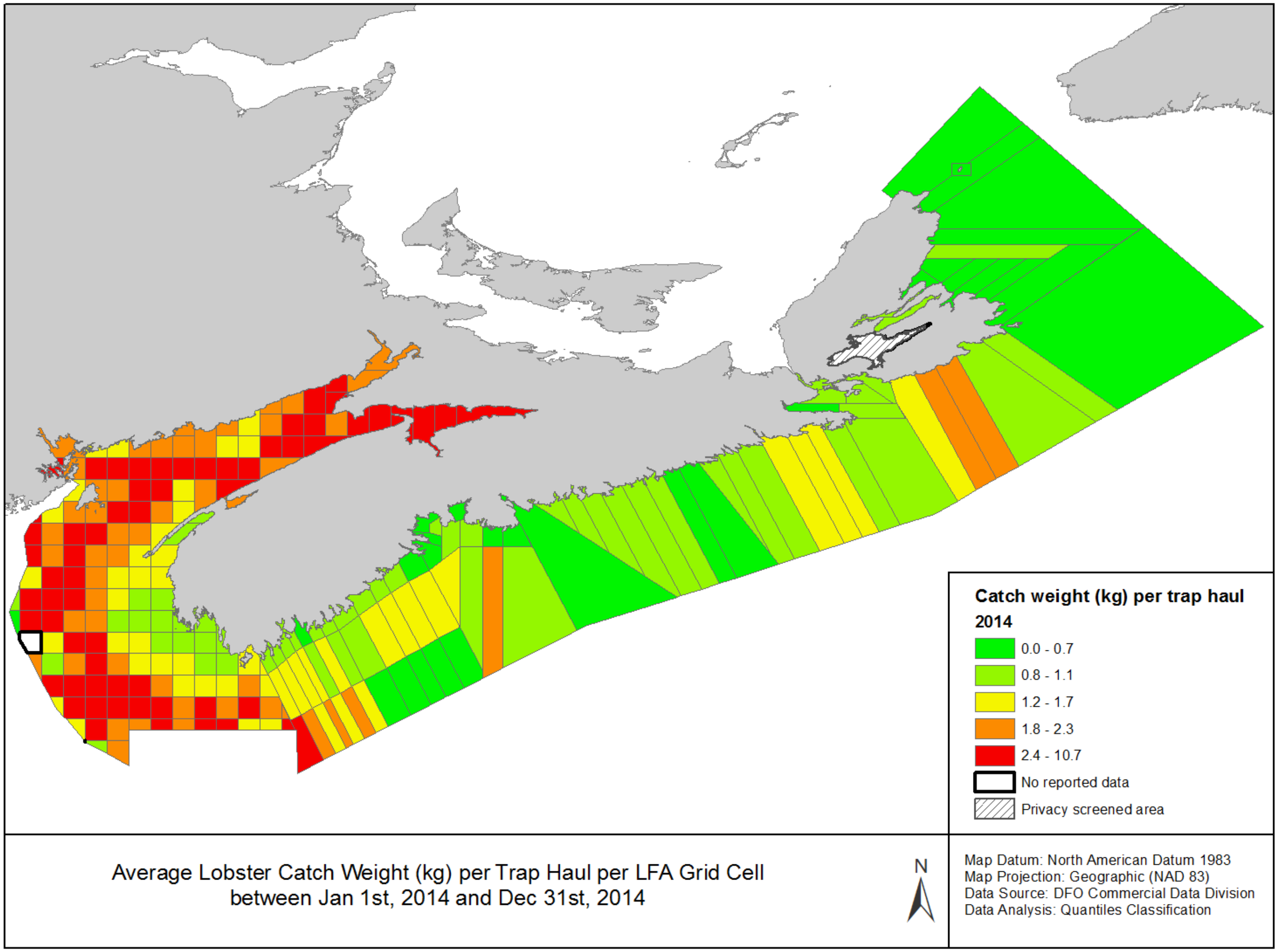


Figure 15.—Annual number of license-days fished, 2014

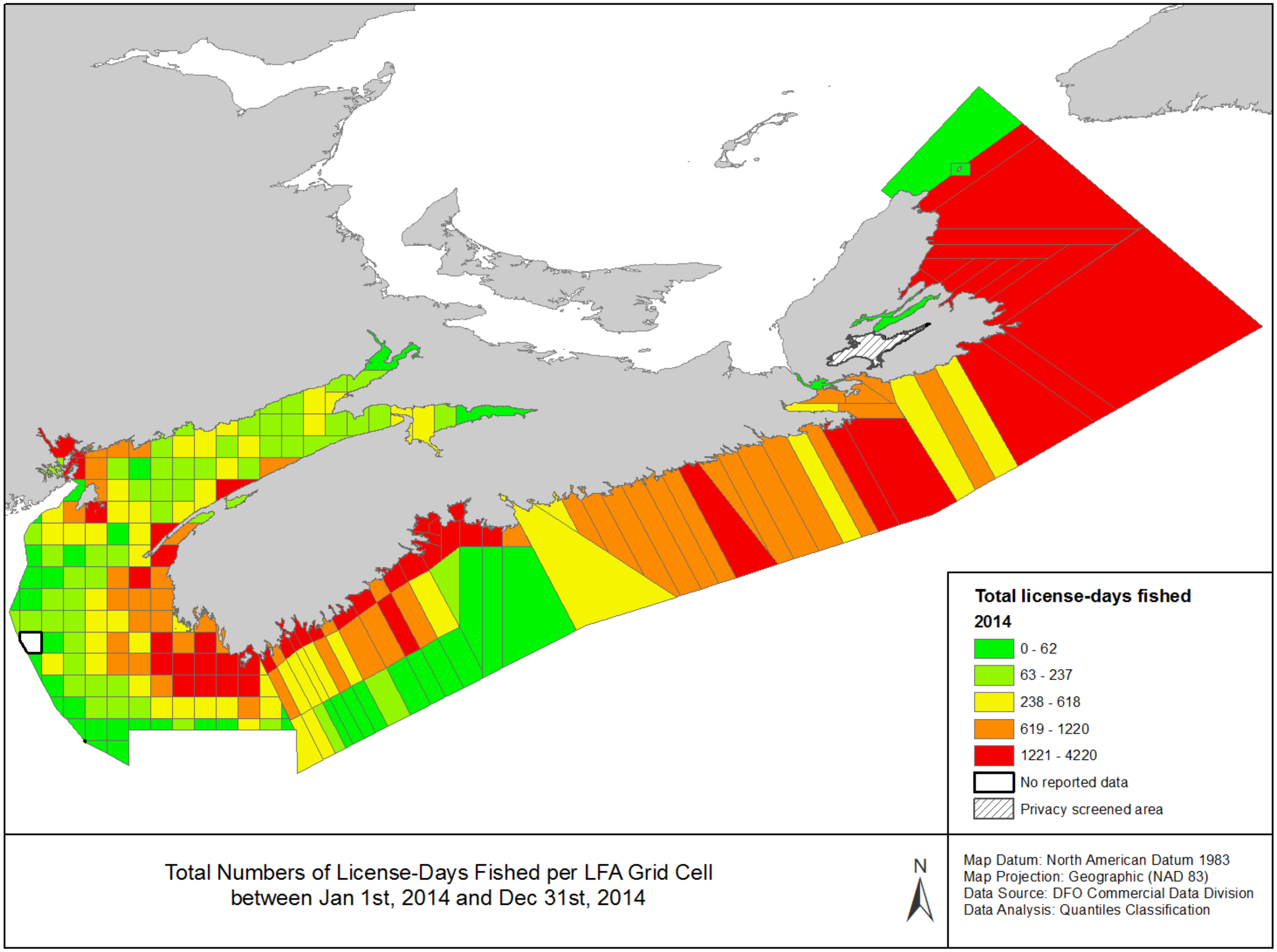


Figure 16.—Annual number of license-days fished standardized by area, 2014

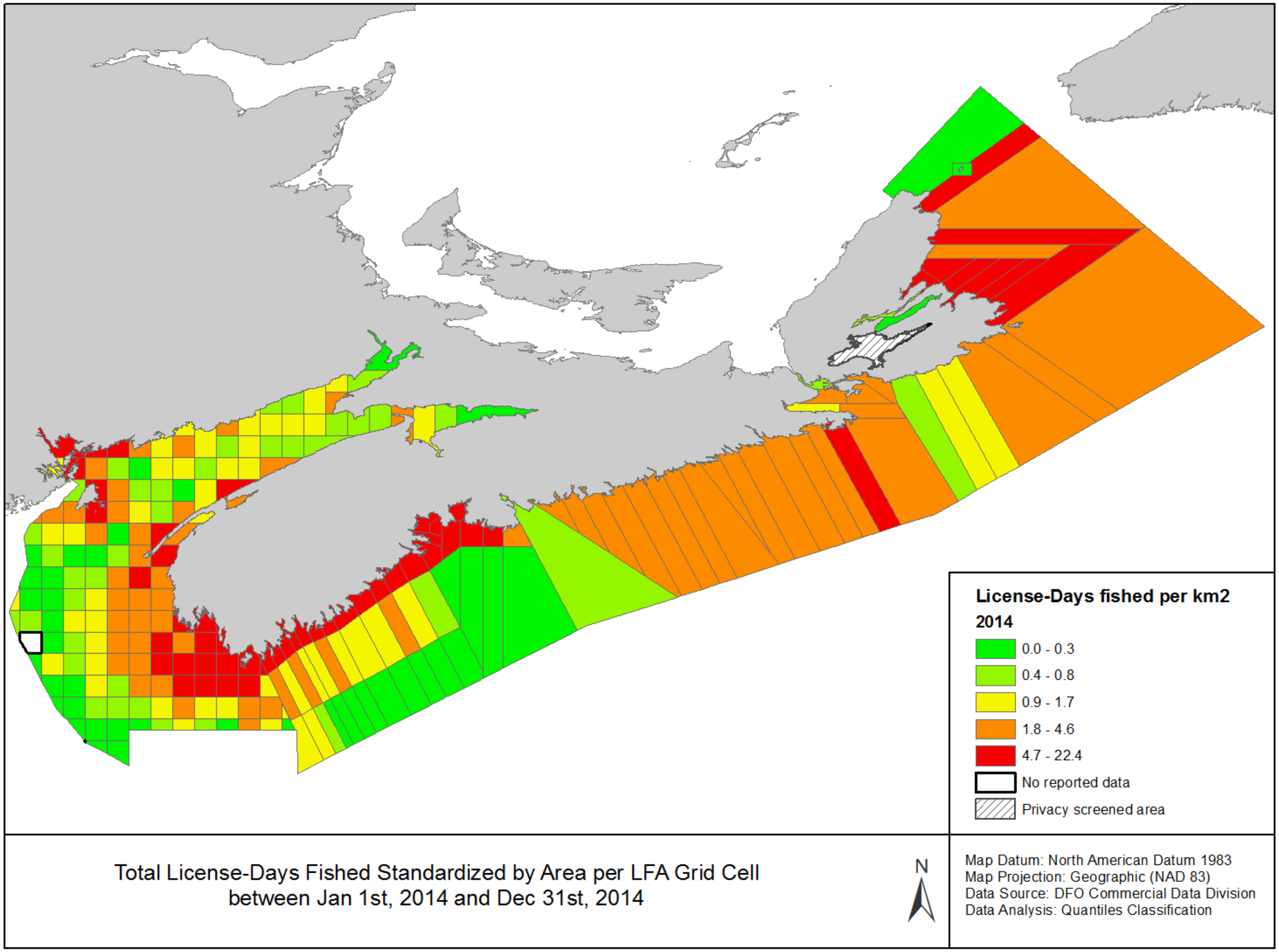


Figure 17.—Annual number of trap hauls, 2014

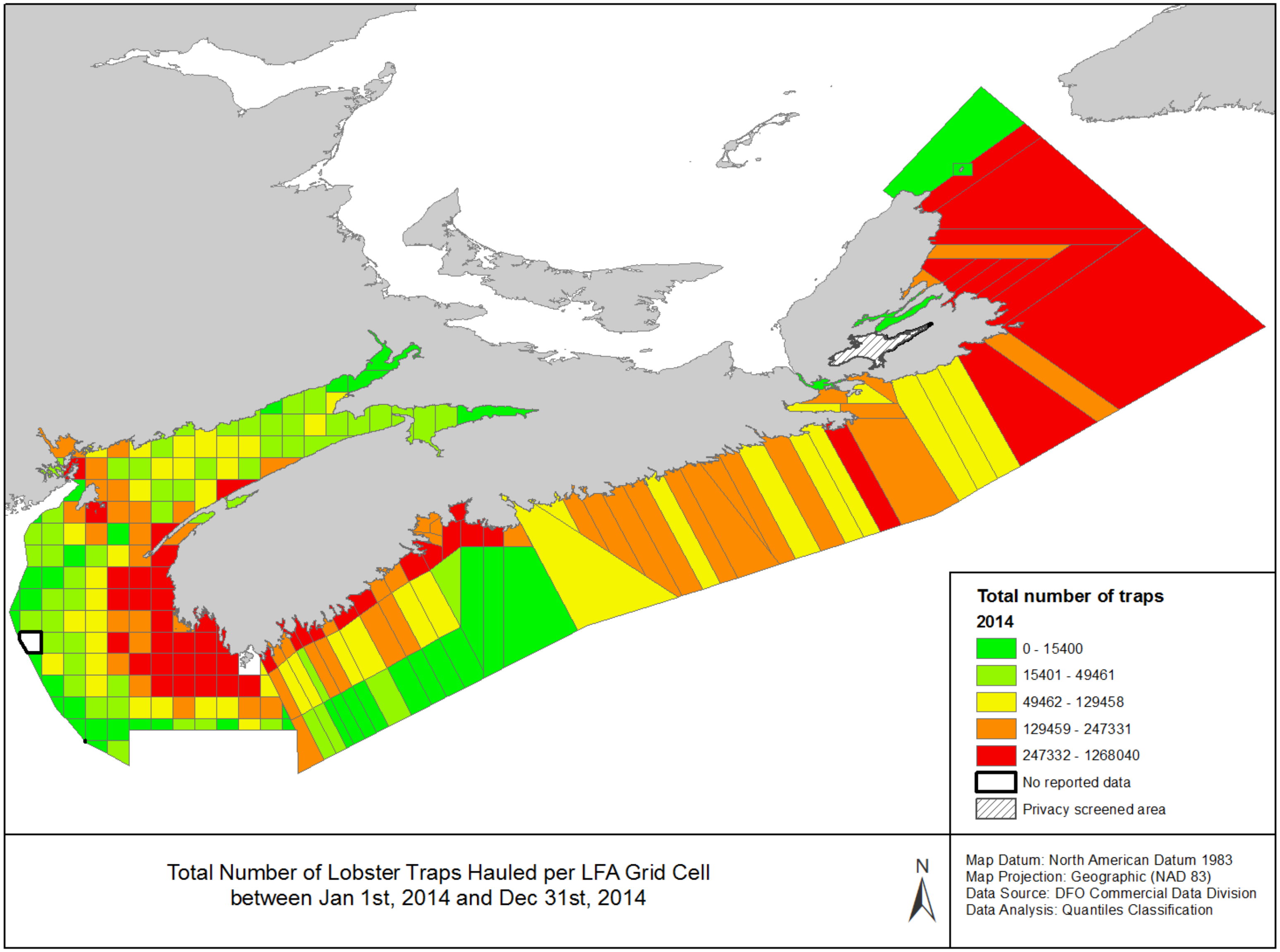
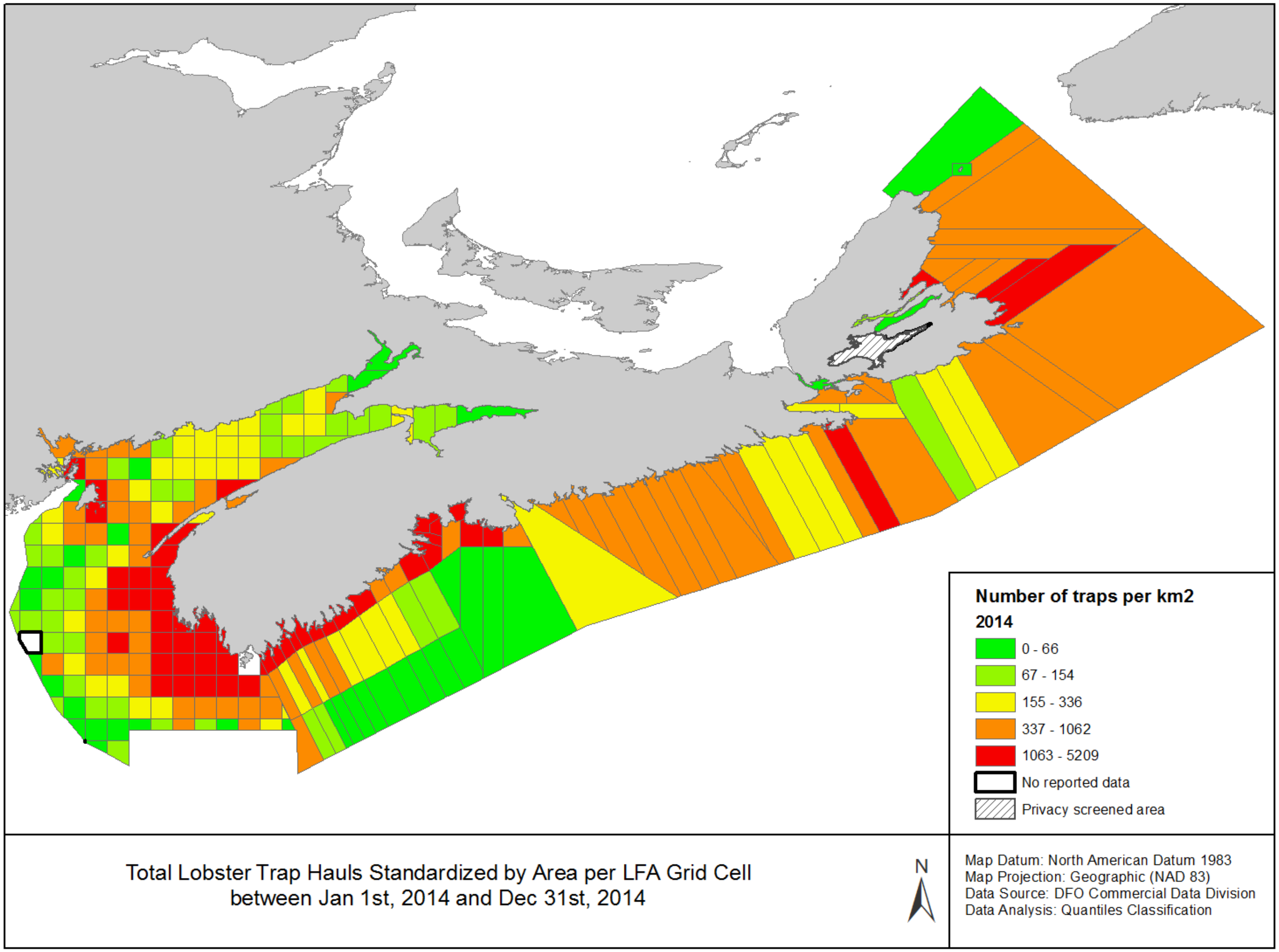


Figure 18.—Annual number of trap hauls standardized by area, 2014



APPENDIX 2: Summary of Lobster Logbook Data between 2012 and 2014.

Table 1.—Summary of reported logbook catch weight (kg) data with reported grid cells

LFA	2012	2013	2014	Total
27	2280489	3188599	3225414	8694502
28	8460	11506	N/A*	N/A*
29	632664	516959	614678	1764300
30	412259	432648	434722	1279628
31A	708862	605729	697366	2011958
31B	938911	660177	1023869	2622957
32	723634	723829	986308	2433771
33	5512069	4360448	7793184	17665702
34	23076556	20777145	26124459	69978160
35	3081829	3012401	3510415	9604645
36	2268511	2720633	3347146	8336290
38	2536992	3290080	5052295	10879367
Total	42181236	40300154	N/A*	N/A*

∗ Not available for confidentiality.

Table 2.—Summary of reported logbook catch weight (kg) data without reported grid cells

LFA	2012	2013	2014	Total
27	214242	289072	349130	852444
28	2436	0	N/A*	N/A*
29	59100	37864	73459	170422
30	0	0	17861	17861
31A	75334	52907	94242	222483
31B	72803	40326	71242	184370
32	165761	128867	198640	493268
33	127294	83939	150797	362030
34	1975040	1632030	2124713	5731783
35	358625	655774	876966	1891364
36	346009	307201	337863	991072
38	197581	188014	429451	815047
Not reported	6085	34856	58361	99301
Total	214242	289072	N/A*	N/A*

∗ Not available for confidentiality.

Table 3.—Summary of reported logbook trap haul data with reported grid cells

LFA	2012	2013	2014	Total
27	4478383	4039587	4359999	12877969
28	25537	19623	N/A*	N/A*
29	635802	519685	564254	1719741
30	236095	205077	201335	642507
31A	749994	722034	742022	2214050
31B	839503	726415	789789	2355707
32	1270875	1182349	1334496	3787720
33	8008895	7114894	8291134	23414923
34	18568118	16998184	19110330	54676632
35	1355681	1281903	1252941	3890525
36	1223793	1233836	1382094	3839723
38	1561989	1708225	1876648	5146862
Total	38954665	35751812	N/A*	N/A*

∗ Not available for confidentiality.

Table 4.—Summary of reported logbook trap haul data without reported grid cells

LFA	2012	2013	2014	Total
27	364109	333229	451675	1149013
28	0	125	N/A*	N/A*
29	46445	38944	49382	134771
30	0	0	10275	10275
31A	73121	56890	83155	213166
31B	45260	30334	32453	108047
32	255659	182510	231589	669758
33	186197	84599	93956	364752
34	1130852	937208	875348	2943408
35	127188	166865	264570	558623
36	154306	124216	115619	394141
38	85422	82029	108133	275584
Not reported	0	15447	4765	20212
Total	2468559	2052396	N/A*	N/A*

∗ Not available for confidentiality.

Table 5.—Inshore LFA Open Dates and Number of Fishing Days*

Inshore LFA	**Open Dates as per *Atlantic Fishery Regulations, 1985***	**Fishing Days per Season**	**Comments**
27	May 15 – July 15	62	
28	May 9 – July 9	62	Typically varied to April 30 to June 30
29	May 10 – July 10	62	Typically varied to April 30 to June 30
30	May 19 – July 20	63	
31A	April 29 – June 30	63	
31B	April 19 – June 20	63	
32	April 19 – June 20	63	
33	Last Monday in Nov – May 31	185	
34	Last Monday in Nov – May 31	185	
35	Oct 14 – Dec 31 and Last day in Feb – July 31	234	
36	Second Tuesday in Nov – Jan 14 March 31 – June 29	159	
37	Second Tuesday in Nov – Jan 14 March 31 – June 29	159	
38	Second Tuesday in Nov – June 29	234	
38B	June 30 – Friday before second Tuesday in Nov	128	

* The number of fishing days can vary from one season to the next, particularly in LFAs 33–38 where weather delays can affect the opening date and reduce the overall season length.