Northwest Atlantic Fisheries Organization

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Delineation of Existing Bottom Fishing Areas in the NAFO Regulatory Area

by

NAFO Secretariat

Introduction

In 2007, the United Nations General Assembly (UNGA Res. 61/105, paragraph 83) requested Regional Fisheries Management Organizations to regulate bottom fisheries that cause a significant adverse impact on vulnerable marine ecosystems. Guidelines on implementation drafted by FAO during 2007–2009 call for the mapping of existing bottom fisheries (FAO, 2009, section 5). Fisheries Commission (FC) drafted a new chapter for the NAFO Conservation and Enforcement Measures (NCEM) in 2008 that calls for the submission of maps identifying bottom fishing areas in the NRA for 1987-2007 with trawl activity given priority (NCEM, 2009, Chapter 1bis, Article 2bis). The Secretariat received the relevant information from Flag states and presented the compiled maps to FC and Scientific Council (SC) during the September 2008 Annual Meeting in Vigo, Spain (FC WP 08/25, 08/25 Addendum, 08/25 Addendum 2). Owing to the presence of anomalous fishing positions, FC requested flag States to "submit or re-submit their respective footprint data" (FC Doc. 08/22, section V, paragraph 13). The Working Group of Fishery Managers and Scientists (FCWG FMS), during its meeting held in Vigo, Spain during March 2009 (FC Doc. 09/02), reviewed a draft presentation by the NAFO Secretariat on data submitted by flag States for the delineation of the existing fishing footprint (FCWG WP 09/2 Revised and FC Doc. 09/02 Annex 5). It was decided that the Secretariat would proceed with preparing a draft footprint map that includes boundary coordinates for review by SC in June 2009 and then FC in September 2009. Russia and Spain submitted their point data, respectively, during and soon after the FCWG FMS March 2009 meeting. The working paper (FCWG WP 09/2 Revised and addendum) provided a framework for the development of NAFO's bottom fishing footprint.

Submissions

Ten flag States provided bottom fishing activity coordinates, three of which (Portugal, Japan, and Norway) further provided speed information. Germany's submitted an image of their fishing activity that did not contain bottom fishing in the NRA during the 1987–2007 period, and was thus omitted in the analysis. A summary of flag State submissions is given in Table 1.

The Vessel Monitoring System (VMS) dataset covering years 2003-2007, held by the NAFO Secretariat, was not used in the delineation of the footprint since this information had already been included in the

flag State submissions. A visual examination of area of fishing activity derived from the Secretariat's VMS data showed that this was well within the footprint defined by the flag State submissions.

Table 1. Summary of flag State submissions on bottom fishing activities in the NRA for the period 1987-2007.

	Submission Information		Data Supplied				Filter
Flag State	Date	Data format	Years	Lat/Lon[1]	Date/time	Speed (knots)	Speed (knots)
Canada	18-Sep-08	point data	1987-2007	dec	year	-	-
Estonia	12-Sep-08	haul data	1996-2007	dec	year	-	-
Faroe Is.	16-Sep-08	haul data	2003-2007	dec	year	-	-
Germany	03-Mar-09	-	2001-2007	-	-	-	-
Greenland	10-Sep-08	haul data	1993-2008	deg	year	-	-
Iceland[2]	19 (23) Sep 08	point data	1993-2006	dec	-	-	-
Japan	24-Nov-08	point data	2001-2007	dec	date/time	0-6.9	1.0-4.0
Norway	30-Dec-08	point data	2000-2007	dec	year/month	1.0-5.0	1.0-4.0
Portugal	12-Sep-08	point data	1997-2007	deg	date/time	0-14.0[4]	1.0-4.0
Russia[3]	16-Apr-09	point data	1987-2007	dec	year/month/day	-	-
Spain[3]	24-Apr-09	point data	1987-2007	dec	year	-	-

[1] dec: decimal degrees as DD.dddd; deg: DDMMdd
[2] Iceland re-submitted their information after the September 2008 Annual meeting.
[3] Russia and Spain submitted their point data, respectively, during and soon after the FCWGFMS March 2009 meeting.
[4] Submission indicated maximum speed of 28.0 knots which is assumed to be an outlier.
- not submitted or no information.

Depth distribution of trawl fishery

An analysis of the Secretariat's VMS data (2003-2007) for fishing vessels travelling at 2.0-4.0 knots, that were assumed to be actively trawling at these speeds, showed a bimodal peak with very little evidence of fishing beyond 1600m. The shallow water component (0-700m) represents a variety of groundfish and shrimp, whereas the deepwater component of this fishery is mainly Greenland halibut (Figure 1).

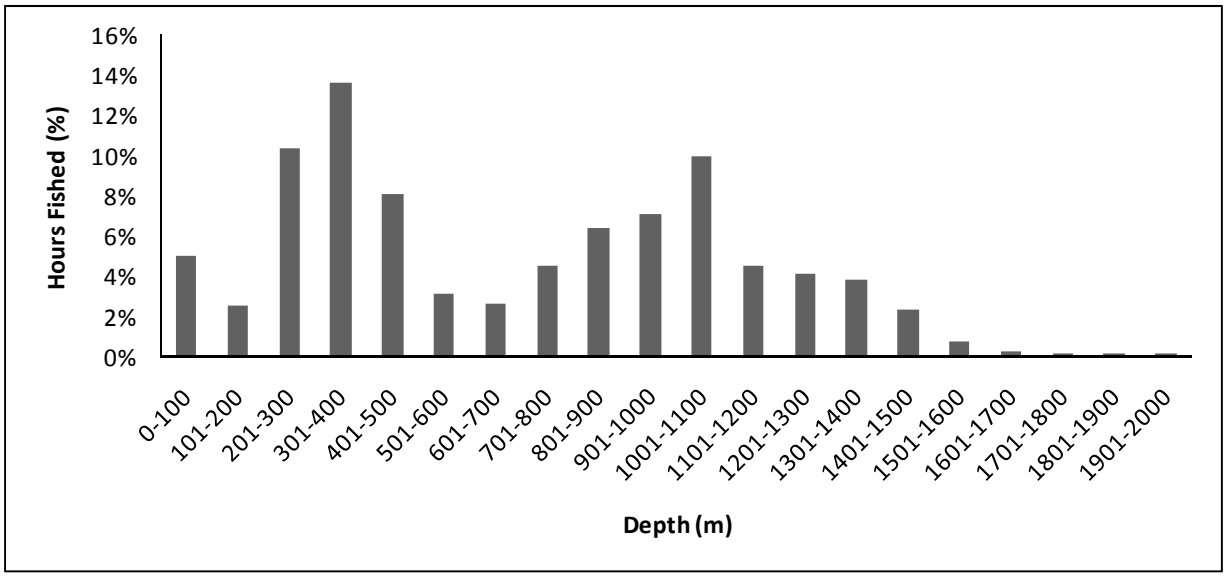

Figure 1. Percentage of fishing activity, assumed to be trawling, by depth within the NRA. The source data was the Secretariat's VMS data for 2003-2007.

Seamounts

There has been some bottom fishing on seamounts within the NRA (SCR Doc 07/06). Also, examination of the VMS dataset reveals that there had been bottom fishing activities in the Corner Rise seamounts as reflected in Figure 4a of FCWG WP 09/2 Revised. Only one of the Corner Rise seamounts would have had enough fishing activity to qualify as an existing fishing area, with fishing activity in the Newfoundland and New England seamounts likely falling below the threshold level for inclusion. However, these seamounts are now closed to all bottom fishing activities until a review is carried out in 2010.

Footprint Map

An existing bottom fishing area is defined as "areas where VMS data and/or other available geo-reference data indicating bottom fishing activities have been conducted at least in two years within a reference period of 1987 to 2007 (NCEM, 2009, Chapter 1bis paragraph 3). The data received by the Secretariat from Flag states were therefore combined based on year and filtered to include only coordinates that appeared in at least two different years. Data received from flag States with speed included (Japan, Norway and Portugal) were filtered to include actual fishing activity. A coordinate with a corresponding speed of between 1.0 and 4.0 knots was deemed to be fishing. Conversely, coordinates with associated speeds outside of this 1.0-4.0 knots range were excluded from the footprint map as they were deemed to be from vessels dodging bad weather or steaming (WGDEC, 2008). A plot comparison of the originally submitted (unfiltered) and filtered data-points is shown in Figure 2a and 2b.

The data received by the Secretariat from Flag states includes both point and haul data from varying sources i.e. VMS, logbook, and observers. In order to standardize the information and create a composite map, all haul-by-haul data start and end coordinates were combined and plotted as distinct points.

Latitude and longitude coordinates were plotted based on the WGS 84 datum. Contours were derived from an interpolation (kriging) of GEBCO (1x1 minute) bathymetric data, and correspond closely to those on the Gulf of Maine Canadian Hydrographic Service chart No. 4001.

For the purpose of plotting, a grid is defined as the unit for a "fishing spot". Plots of various grid sizes were prepared, shown in Figures 3a-c. A 5nm×5nm square was chosen as the basis for delineating the footprint because this is the largest grid size that would not double count 2-hourly reported VMS data (noting that a trawler would travel 6-7nm during a 2 hour tow). The delineation of the footprint boundary was achieved by simply drawing a boundary around the observed fishing activity. The footprint map is shown in Figure 4a and Figure 4b.

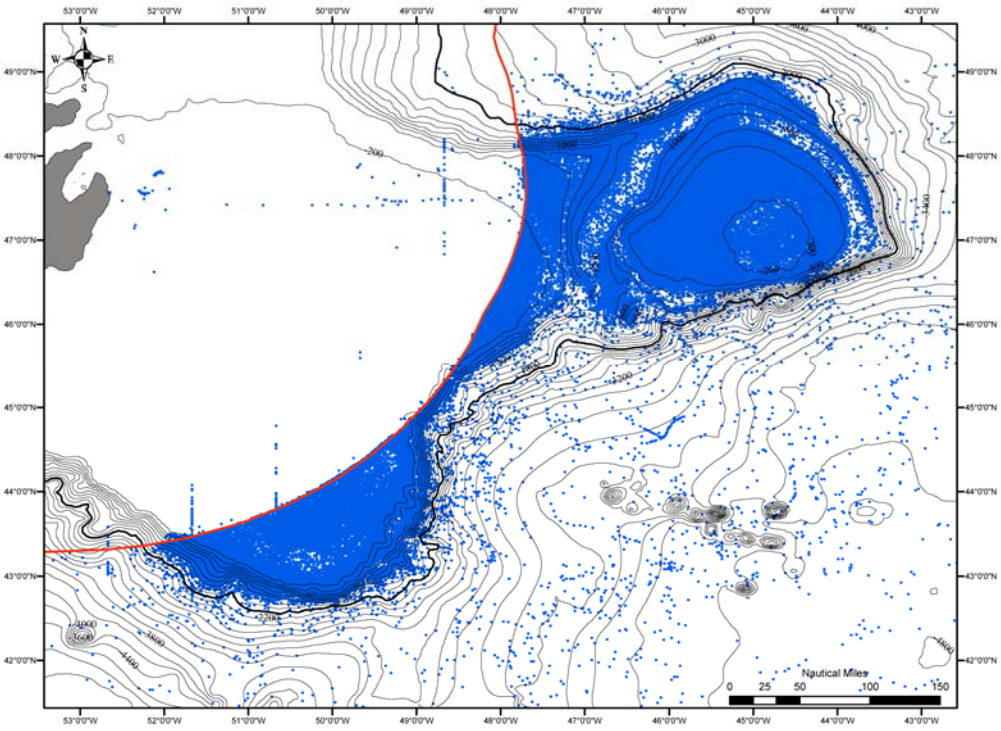

Figure 2a. Composite plot of coordinates of bottom fishing activity data submitted by all flag States for 1987-2007 (unfiltered).

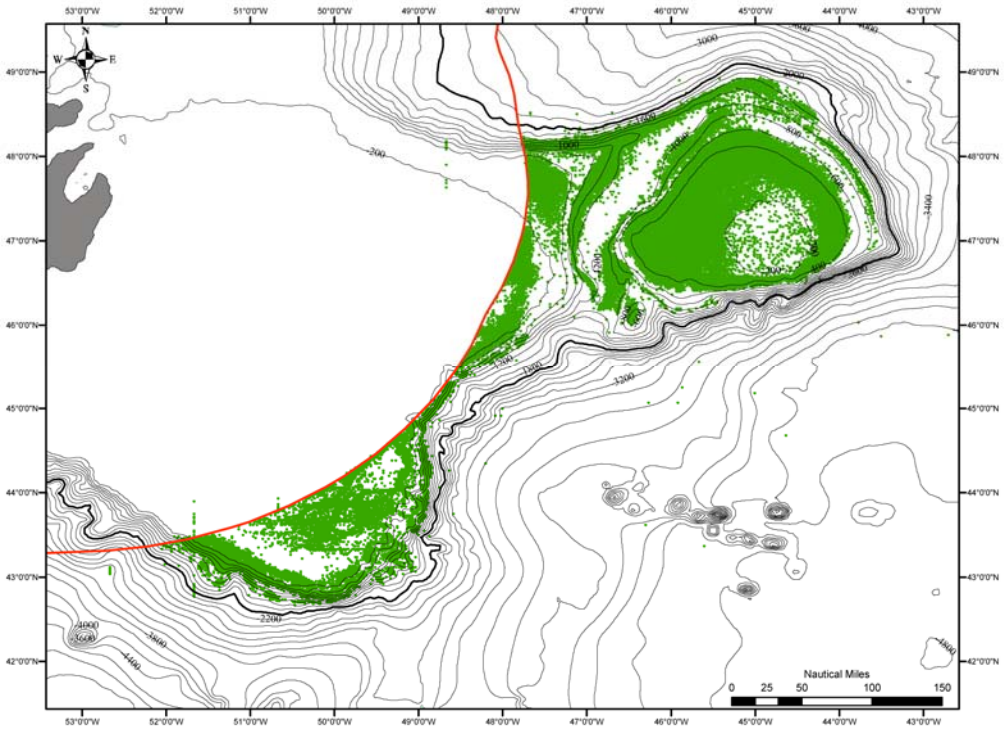

Figure 2b. Composite plot of coordinates of bottom fishing activity data submitted by all flag States for 1987-2007 filtered by criteria of occurrence (at least in least two different years) and speed (1.0-4.0 knots).

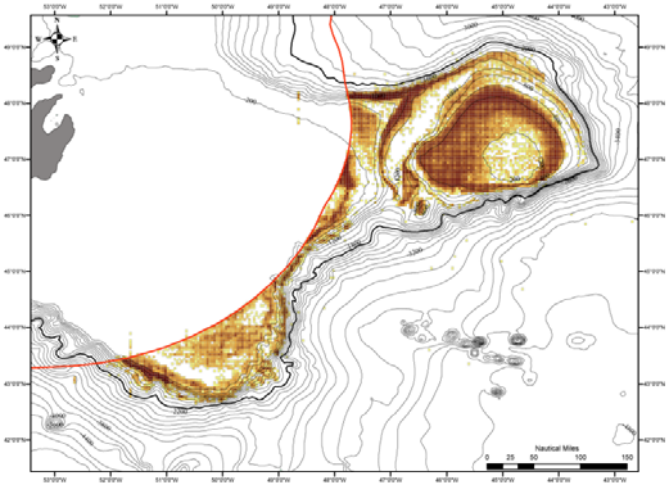

Figure 3a. Footprint map using the 2.5 x 2.5 nm grid.

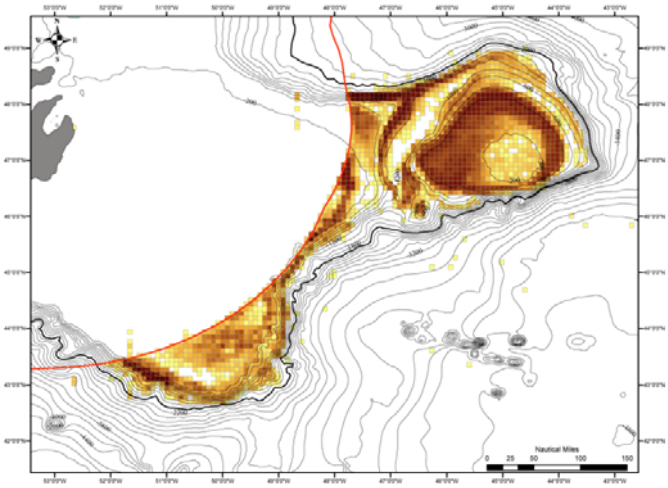

Figure 3b. Footprint map using the 5 x 5 nm grid.

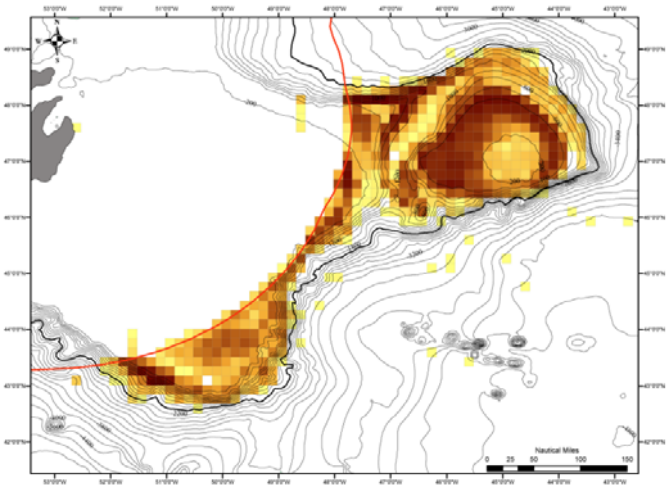

Figure 3c. Footprint map using the 10 x 10 nm grid

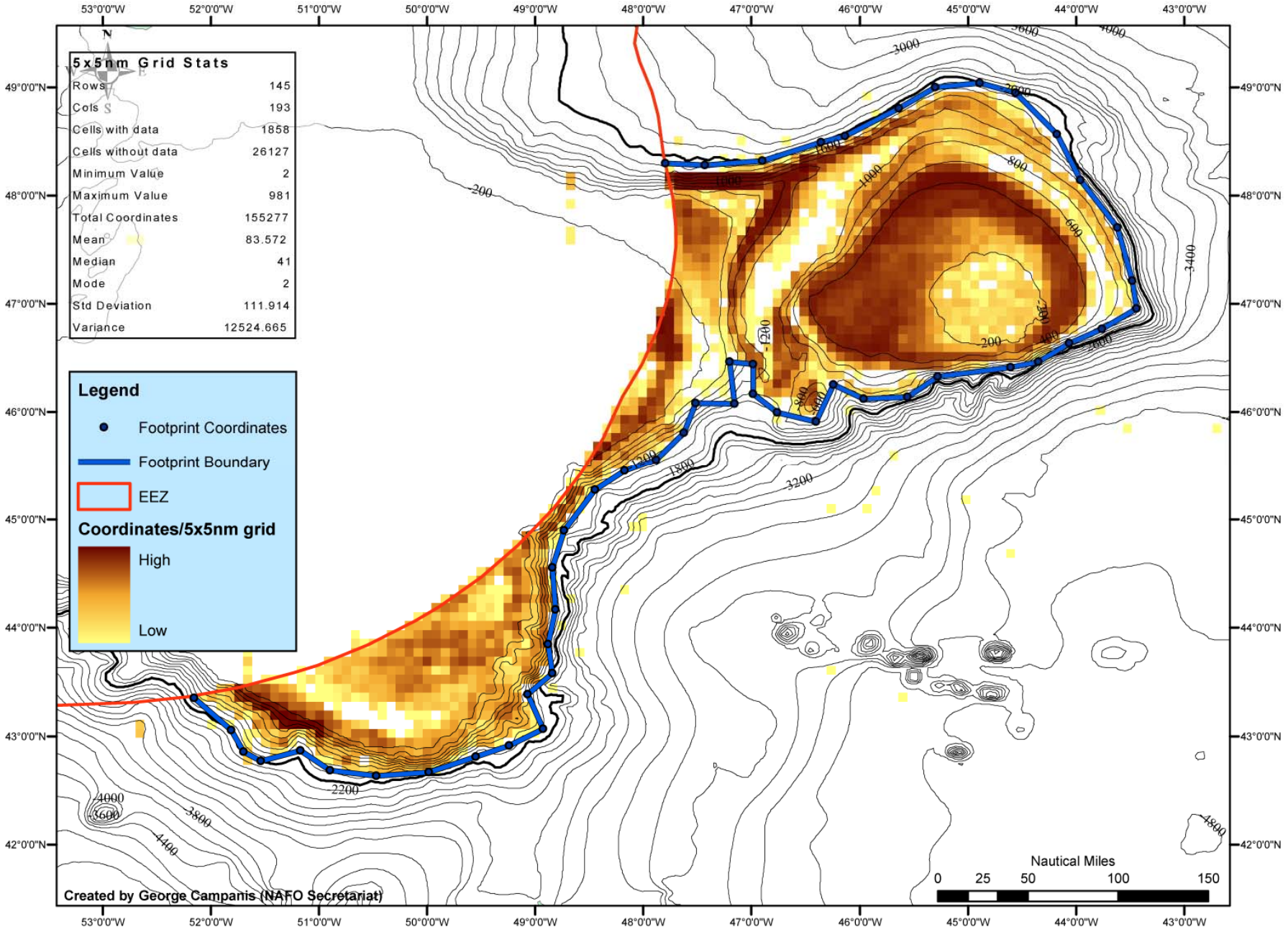

Figure 4a. Footprint map based on 5 x 5 nm grid, showing relative intensity of bottom fishing activities.

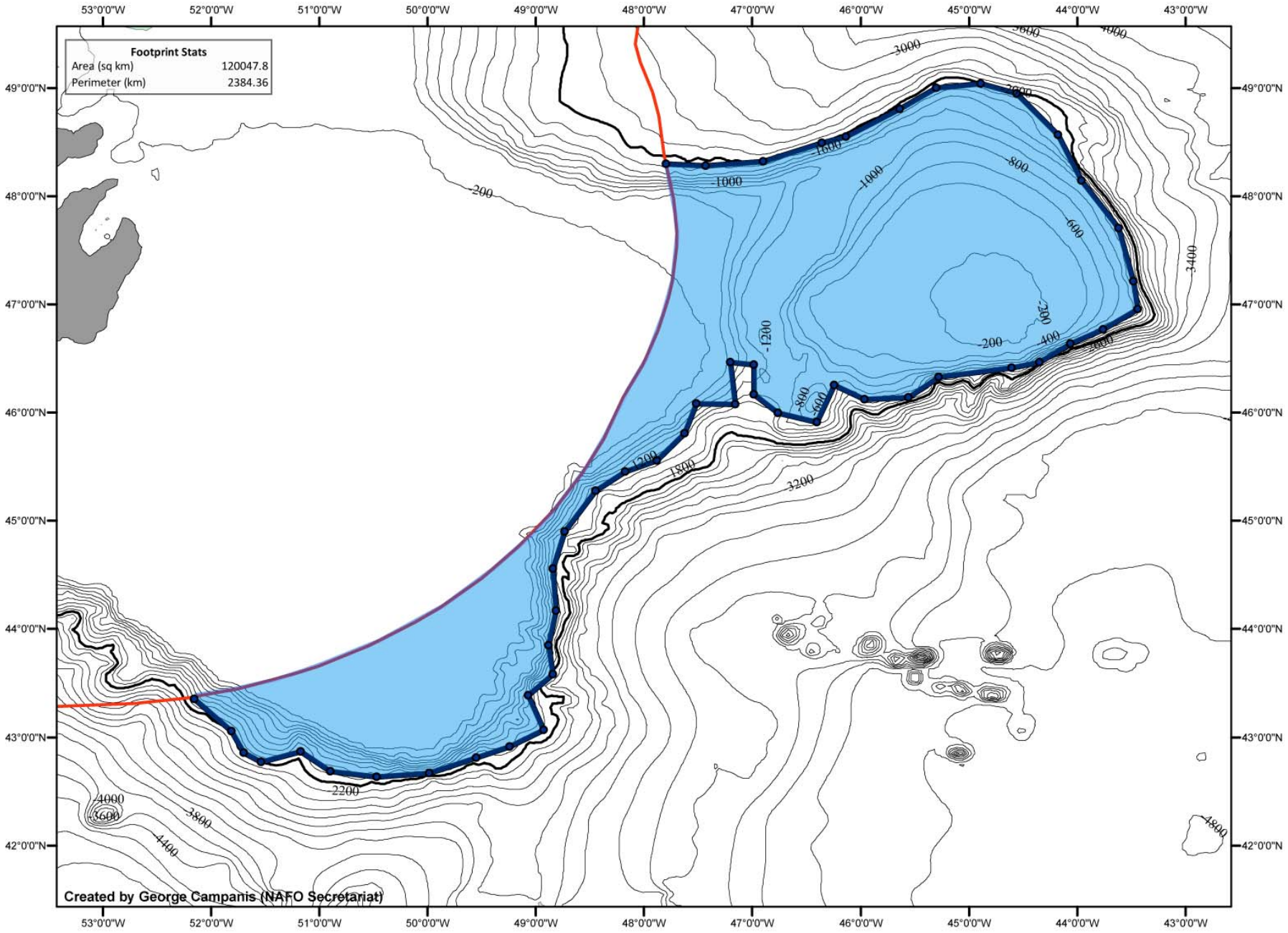

Figure 4b. Footprint map based on 5 x 5 nm grid with calculated total area and perimeter (UTM NAD 83 Zone 23 projection).

Proposed Footprint Boundary Coordinates

Coordinate points defining the boundary of the footprint (Figures 4a and b) are presented in Table 2. The boundary intersects the Canadian EEZ and therefore only coordinates east of the EEZ are presented. Coordinates 1 and 50 represent the northern and southern intersect with the Canadian EEZ, respectively.

Table 2. Boundary points delineating the footprint in the NRA.

The Canadian EEZ boundary of the western side to the following coordinates within the NRA on the eastern side:

Point No.	Latitude	Longitude
1	48°17'39"N	EEZ boundary[1]
2	48°16'51"N	47°25'37"W
3	48°19'15"N	46°53'48"W
4	48°29'21"N	46°21'17"W
5	48°32'43"N	46°08'04"W
6	48°48'10"N	45°37'59"W
7	48°59'54"N	45°17'46"W
8	49°02'20"N	44°53'17"W
9	48°56'46"N	44°33'18"W
10	48°33'53"N	44°10'25"W
11	48°08'29"N	43°57'28"W
12	47°42'00"N	43°36'44"W
13	47°12'44"N	43°28'36"W
14	46°57'14"N	43°26'15"W
15	46°46'02"N	43°45'27"W
16	46°38'10"N	44°03'37"W
17	46°27'43"N	44°20'38"W
18	46°24'41"N	44°36'01"W
19	46°19'28"N	45°16'34"W
20	46°08'16"N	45°33'27"W
21	46°07'13"N	45°57'44"W
22	46°15'06"N	46°14'21"W
23	45°54'33"N	46°24'03"W
24	45°59'36"N	46°45'33"W
25	46°09'58"N	46°58'53"W
26	46°26'32"N	46°58'53"W
27	46°27'40"N	47°12'01"W
28	46°04'15"N	47°09'10"W
29	46°04'53"N	47°31'01"W
30	45°48'17"N	47°37'16"W
31	45°33'14"N	47°52'41"W
32	45°27'14"N	48°10'15"W
33	45°16'17"N	48°26'50"W
34	44°54'01"N	48°43'58"W
35	44°33'10"N	48°50'25"W
36	44°09'57"N	48°48'49"W
37	43°50'44"N	48°52'49"W
38	43°34'34"N	48°50'12"W
39	43°23'13"N	49°03'57"W
40	43°03'48"N	48°55'23"W
41	42°54'42"N	49°14'26"W
42	42°48'18"N	49°32'51"W
43	42°39'49"N	49°58'46"W
44	42°37'54"N	50°28'04"W
45	42°40'57"N	50°53'36"W
46	42°51'48"N	51°10'09"W
47	42°45'59"N	51°31'58"W
48	42°51'06"N	51°41'50"W
49	43°03'56"N	51°48'21"W
50	43°22'12"N	EEZ boundary[2]

[1] approximately 47°47'45"W
[2] approximately 52°09'46"W

Discussion

The submitted data did not distinguish between mobile and static fishing gears, and therefore only a generalized fishing footprint can be given. The ICES-NAFO WGDEC developed vessel speed criteria in discerning the activity of the fishing vessel. If the vessel was travelling between 1-2 knots, it could be either dodging in poor weather, laying gillnets or laying longlines; between 2-4 knots, it could be bottom trawling. Thus the speed range of 1.0–4.0 knots was used as the filtering criteria. The inclusion of speeds between 1-2 knots may account for the static gears like gillnets and longlines.

The delineated fishing footprint in Figure 4a-b is based on the submitted bottom fishing activity by Flag states over a 20 year period and satisfying the criteria of twice within a 5nm×5nm square and does not closely follow a particular depth contour. Both the depth histogram (Figure 1) and the footprint map (Figure 4a-b) show that fishing is much reduced below 1600m.This would approximate to the maximum depth at which a trawl normally operates.

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