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Analysis of the by-catch of the moratorium stocks in the NRA

by

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Abstract

In 2017 the Commission approved the Action Plan for the Management and Minimization of by-catch and discards. The Action Plan cited the NAFO Secretariat to conduct the annual mapping of by-catch in NAFO from 2016 onwards using HbH data. The Secretariat presented the results of by-catch analysis of the haul by haul reports of 2016-2019. This analysis was carried out based on the interactions of directed fisheries (non-moratorium stocks) – by-catch stock (moratorium stock). The present document presents an analysis based on the moratoria species/stocks. For each of the species/stocks in moratorium, the main fisheries that catch it as by-catch are identified and analyzed to observe if there are temporal/spatial patterns of the by-catch of stocks in moratorium. These two analyses: moratorium species/fishery, together with the analysis carried out by the Secretariat, fishery/moratorium species, are complementary and will allow a better response to the Action Plan task 3.2: "Areas where there is a risk of causing serious harm to by-catch species. Identify areas, times and fisheries where bycatch and discards, notably of moratoria species, that have a higher rate of occurrence".

One of the objectives of this document is to search, for the different stocks in moratorium, spatio-temporal patterns of the by-catches carried out by the different fisheries. The seasonal/space catch analysis based on the HbH data will be restricted to: American plaice Div. 3M, American plaice Div. 3LNO and cod Div. 3NO, since they are the stocks in moratorium that have some level of catches and are not mainly distributed within national waters. The conclusions on the last two stocks are partial since the data analyzed only cover part of their distribution (NRA).

The general conclusion of this analysis is that there are no remarkable spatial differences between the hauls with and without by-catch of the moratoria stocks of the different directed fisheries. It can be observed that the directed fisheries that have a higher frequency of by-catch of these species/stocks in moratorium are those that are carried out less than 200 meters deep: yellowtail flounder Div. 3LNO, skates Div. 3LNO and cod Div. 3M in the shallowest part of the Flemish Cap. In some fisheries, it is possible to observe variations in the frequencies of sets with moratoria species by-catch by quarter, this temporal pattern is related to the displacement of the directed fishery to different areas.

Introduction

In 2017 the Commission approved the Action Plan for the Management and Minimization of by-catch and discards (NAFO, 2017). The Action Plan required support from the NAFO Secretariat for the analysis of by-catch data, notably haul-by-haul (HbH) data. This Plan established different objectives to be achieved through different actions to be carried out by different NAFO bodies, such as the WGBDS, SC and STACTIC.

The Action Plan cited the NAFO Secretariat to conduct the annual mapping of by-catch in NAFO from 2016 onwards using HbH data. The Secretariat presented the results of by-catch analysis of the haul by haul reports of 2016-2019 (NAFO, 2020). This analysis was carried out based on the interactions of directed fisheries (non-moratorium stocks) – by-catch stock (moratorium stock). This approach, target fishery – by-catch of moratoria species, produces a large number of combinations, 11 of which were analyzed by the Secretariat. And for each of the combinations, a large number of maps would be necessary to detect the spatial-temporal patterns of the by-catch of the moratoria species for each of the target fishery.

This document presents an analysis based on the moratoria species/stocks. For each of the species/stocks in moratorium, the main fisheries that catch it as by-catch are identified and analyzed to observe if there are temporal/spatial patterns of the by-catch of stocks in moratorium.

These two analyses: moratorium species/fishery, together with the analysis carried out by the Secretariat, fishery/moratorium species, are complementary and will allow a better response to the Action Plan task 3.2: "Areas where there is a risk of causing serious harm to by-catch species. Identify areas, times and fisheries where bycatch and discards, notably of moratoria species, that have a higher rate of occurrence".

Material and methods

Haul by haul data (logbook information)

The Action Plan establishes that the base data for the analysis of by-catch data are the HbH data. NAFO Secretariat has compiled since 2016 the HbH data of all fleets fishing in the NAFO Regulatory Area (NRA). No data is available at this time to perform these analyses within national waters. The HbH data compiled by the Secretariat contains at a minimum the information outlined in the Annex II.N of the NAFO Conservation and Enforcement Measures (NCEM) (NAFO, 2021). The HbH data for the period 2016-2020 are analyzed in this document.

As defined in Article 5.2 of the NCEM: for any one haul, the species which comprises the largest percentage by weight of the total catch in the haul shall be considered as being taken in a directed fishery for the stock concerned. Table 1 presents the list of directed fisheries with more than 1% of the 2016-2020 total HbH catches of any of the moratoria stocks. The table presents the fishery code used in this document, which includes the targeting species and the fishery gear.

The analysis presented in this document focuses on the HbH 2016-2020 total catches of different stocks. Total catches comprise the retained and discarded catches. Available information of the HbH data on the discards may be very limited due to undocumented discards, of which quantity and frequency are unknown.

One of the objectives of this document is to search, for the different stocks in moratorium, spatio-temporal patterns of the by-catches carried out by the different fisheries. The temporal patterns that are sought are intra-annual patterns, rather than inter-annual trends. For this reason, it has been decided to analyze the data for the period 2016-2020 jointly and not annually, as this simplifies the results and helps to draw general conclusions.

For the main stocks in moratorium, the NRA hauls of the different directed fisheries are analyzed. The different maps show the sets without by-catch, the sets with by-catch and the sets in which the by-catch of the moratorium species comprises more than 5% of the total catch in weight. The percentage of 5% has been chosen for all stocks since it is the most usual threshold percentage used in the NCEM, although in the NCEM this percentage may vary depending on the moratoria stock, ranging between 4% and 15%.

Moratoria species/stock

In this paper, analysis is limited to the by-catch as defined in NCEM Article 5.2.b, which states: a species listed in Annex I.A shall be classified as by-catch when it is taken in a Division where a ban on fishing for a particular stock is in force (moratorium).

Table 2 shows the stocks under moratorium in 2020 and the total catches by stock approved by the NAFO Joint Commission–Scientific Council Catch Estimation Strategy Advisory Group (CESAG), used in the NAFO SC Standing Committee on Fisheries Science (STACFIS) assessments. It can be seen that the following stocks have a very low or almost zero level of catches in the years in which they have been in moratorium: shrimp Div. 3LNO, shrimp Div. 3M, capelin Div. 3NO and alfonsino Div. 6G. The stocks in moratoria with some catch levels are: cod Div. 3NO, American plaice Div. 3LNO, cod Div. 2J3KL, witch flounder Div. 2J3KL and American plaice Div. 3M. Catches approved by CESAG are not exactly equal to those based on HbH data but are quite similar. As mentioned above, the analysis made in this document will be based on HbH data as it is the only data available with individual hauls information. Of these stocks under moratorium with some catch levels, cod Div. 2J3KL and witch flounder Div. 2J3KL are distributed mainly within Canadian national waters and the HbH data available is very limited. Therefore, the seasonal/space catch analysis based on the HbH data will be restricted only to the following moratorium stocks: American plaice Div. 3M, American plaice Div. 3LNO and cod Div. 3NO. The conclusions on the last two stocks are partial since the data analyzed only cover part of their distribution (NRA).

Results and Discussion

American Plaice Div. 3M

Figure 1 presents the percentage of the HbH catches of American plaice in Div. 3M by fishery for the period 2016-2020. The main fisheries catching American plaice in Div. 3M as by-catch are the cod trawl fishery, which represents the 54% in weight of the American plaice total Div. 3M HbH catches, and the redfish trawl fishery, with the 44%.

Table 3 contains the HbH catches (tons) of American plaice in Div. 3M by fishery for the period 2016-2020. This table also shows, for Div. 3M, the frequency and number of sets of each fishery that have caught American plaice and the ones that have exceeded the percentage of 5% American plaice by-catch. Directed fisheries that represent less than 1% of the total by-catch of American plaice in the period 2016-2020 have been grouped into “Others”. In Div. 3M, 53% of sets targeting cod and 38% of sets targeting redfish caught America plaice as by-catch. The frequency of sets of these main fisheries that exceed the 5% by-catch of American plaice is very small, 2% in sets directed to cod and less than 1% in hauls targeting redfish.

Table 4 shows, for the main fisheries catching American plaice in Div. 3M, the frequency of sets of each fishery with by-catch of American plaice by quarter for the period 2016-2020.

Figure 2 presents, by quarter and for the period 2016-2020 in Div. 3M, the spatial distribution of the hauls targeting cod and Figure 3 the spatial distribution of hauls targeting redfish. Hauls targeting cod or redfish and with no American plaice by-catch are in black, hauls targeting cod or redfish and with a level of American plaice by-catch below the 5% of the total catch are in green, and hauls targeting cod or redfish and with a level of American plaice by-catch above the 5% of the total catches of the haul are in red. The layers with the different

haul types are plotted in that order. In these maps, some hauls outside of the Div. 3M can be observed; they are probably hauls carried out in the Div. 3M but with wrong positions in the HbH database.

In Table 4, it can be observed that the frequency of sets targeting cod with American plaice by-catch in Div. 3M presents a clear increasing trend by quarter. It is quite low in the first quarter (26%), in the second the frequency increases and is similar to the annual average (45%) and in the third and fourth quarters this frequency is quite high (>75%). This trend may be due to the fact that during the second half of the year the cod fishery moves from deeper waters in the south west of Flemish Cap to shallower waters in the center-east of the bank, where American plaice is most abundant according to the results of the Flemish Cap survey (González Troncoso *et al.*, 2021). Although differences in the frequency and distribution of by-catch are observed among quarters, there are no differences in the distribution of sets with and without American plaice by-catch within quarters in Div. 3M, according to the maps presented in Figure 2. These maps show an increase in the number of sets with by-catch of American plaice above 5% of the total catch in the second half of the year. In the analysis presented in the WG BDS (NAFO, 2019) most of these sets directed to cod where the by-catch of American plaice was greater than 5% of the total catch of the set occurred in 2019.

Figure 3 shows that the redfish fishery in Div. 3M is mainly conducted in the first and third quarters of the year in the western part of Flemish Cap at depths of 300-600 meters. In the case of sets targeting redfish, the frequency of these hauls with American plaice by-catch is much more constant throughout the year, around 30%-40% (Table 4). In the fourth quarter there is only information from a single haul, so the frequency is not representative. Spatially, the distribution of sets targeting redfish with and without American plaice by-catch are very similar. Highlight the low frequency of sets directed to redfish with the 5% of by-catch of American plaice exceeded (Table 3).

American plaice Div. 3LNO

Figure 4 presents the percentage of American plaice in NRA Div. 3LNO total by-catches by directed fisheries for the period 2016-2020. The main fisheries that catch American plaice in NRA Div. 3LNO as by-catch are yellowtail flounder, with the 43% of the NRA Div. 3LNO total catches of American plaice, redfish (36%) and skates (15%), and in a lesser extent the trawl fishery directed Greenland halibut (3%).

Table 5 shows the by-catches (tons) of American plaice in NRA Div. 3LNO by directed fisheries for the period 2016-2020 based on the HbH data. The table also shows, by directed fishery, the frequency and number of hauls that have caught American plaice in NRA Div. 3LNO and the frequency of hauls that have exceeded the 5% percentage of the moratoria species by-catch. The directed fisheries that represent less than 1% of the total by-catch of American plaice in the period 2016-2020 have been grouped into "Others". In these Divisions, 75% of sets targeting yellowtail flounder, 57% of sets targeting redfish and 87% of the hauls targeting skates caught America plaice as by-catch. The frequencies of sets of these main fisheries that exceed the 5% of American plaice by-catch are quite important in two fisheries: 44% of sets targeting yellowtail flounder and 11% of hauls targeting skates. It should be noted that in the 2016-2010 period there are 34 sets where the main catch of the set is the species in moratorium.

Table 6 shows, for the main fisheries catching American plaice in NRA Div. 3LNO, the frequency of sets of each fishery with by-catch of American plaice by quarter for the period 2016-2020.

Figure 5 shows the spatial distribution of the hauls targeting yellowtail flounder, Figure 6 hauls targeting redfish and Figure 7 hauls targeting skates in NRA Div. 3LNO by quarter for the period 2016-2020. Hauls targeting yellowtail flounder (Figure 5a), redfish or skates with no American plaice by-catch are in black, hauls targeting yellowtail flounder, redfish or skates with American plaice by-catch below the 5% of the total catch are in green, and hauls targeting yellowtail flounder, redfish or skates with American plaice by-catches above

the 5% of the total catches of the haul are in red. The layers with the different haul types are plotted in that order. In the case of sets directed to the yellowtail flounder, another graph is presented (Figure 5b) with the sets with a percentage greater than 15% since for this fishery the allowed limit of American plaice by-catch established in the NCEM is 15%. In these maps, some hauls outside of the NRA Div. 3LNO can be observed; they are probably hauls carried out in NRA Div. 3LNO but with wrong positions in the HbH database.

It can be observed in Table 6 that the frequency of sets targeting yellowtail flounder and skates with American plaice by-catch in NRA Div. 3LNO is quite different depending on the quarter. This frequency presents a general growing trend throughout the year, with the lowest frequency of the hauls with American plaice by-catch being observed in the first quarter, raising in the second quarter and reaching the highest levels in the third and fourth quarters. In the redfish fishery, the trend of the frequency of the hauls with American plaice by-catch is quite stable except in the third quarter, when is much lower.

Although the frequency of sets with by-catch of American plaice varies widely by quarter in the hauls targeting yellowtail flounder and skates, the maps presented in Figures 5 and 7 do not show different spatial patterns for sets with and without American plaice by-catch. A lower frequency of sets targeting skates with by-catch of American plaice above 5% of the total catch in the first quarter of the year can be observed in Figure 7. In the case of the yellowtail flounder, the frequency of sets with American plaice by-catch above 5% is very high (44%). This percentage decreases to 4% in the case of sets with more than 15% by-catch of American plaice. In both cases (Figures 5a and 5b, respectively), the frequency of sets targeting yellowtail flounder with American plaice by-catch is lower in the first quarter. Regarding the redfish fishery, Figure 6 shows that the highest percentage of hauls with American plaice by-catch above 5% occurs in the second and fourth quarters.

According to Figures 5 to 7, the yellowtail flounder and skates fisheries in NRA Div. 3LNO are mainly conducted at depths shallower than 200 meters and at these depths the frequency of appearance of American plaice is much higher than at the greater depths where the redfish fishery is carried out.

Cod Div. 3NO

Figure 8 presents the percentage of by-catches of cod in NRA Div. 3NO by fishery for the period 2016-2020. The main fisheries that catch cod in NRA Div. 3NO as by-catch are the redfish trawl fishery, representing the 54% of the cod total catches in this area, skates (22%) and yellowtail flounder (16%), and in a lesser extent the longliners targeting Atlantic halibut (2%).

Table 7 contains the by-catches (tons) of cod in NRA Div. 3NO by fishery for the period 2016-2020 based on the HbH data. This table also shows, by directed fishery, the frequency and total number of hauls that have caught cod and the frequency of hauls that have exceeded the 5% percentage of catch of the species in moratoria in NRA Div. 3NO. Although the NCEM establishes 4% as the by catch threshold for this stock, in the analysis presented in this document the percentage of 5% has been chosen to be able to compare it with the other stocks. The hauls of the directed fisheries that represent less than 1% of the NRA total by-catch of cod in the period 2016-2020 have been grouped into “Others”. Although the total catch of cod as by-catch is higher in the redfish fishery, the frequency of sets where cod is caught as by-catch is higher in the skates directed fishery (73%), followed by the redfish fishery (62%) and yellowtail flounder fishery (43%). The frequencies of sets of these main fisheries that exceed the level of 5% of by-catch of cod in NRA Div. 3NO are not as high as in other stocks in moratorium, being the skates fishery the one with the highest frequency (10%). It should be noted that in the 2016-2010 period there are 22 sets where the main catch of the set is the species in moratorium.

Table 8 shows, for the main fisheries catching cod in NRA Div. 3NO, the frequency of sets of each fishery with cod by-catch by quarter for the period 2016-2020.

Figure 9 represents the spatial distribution of the hauls targeting redfish, Figure 10 hauls targeting skates and Figure 11 hauls targeting yellowtail flounder in NRA Div. 3NO by quarter for the period 2016-2020. Hauls targeting redfish, skates or yellowtail flounder with no cod by-catch are in black, hauls targeting redfish, skates or yellowtail flounder with cod by-catch below the 5% of the total catch are in green, and hauls targeting redfish, skates or yellowtail flounder with cod by-catches above the 5% of the total catches of the haul are in red. The layers with the different haul types are plotted in that order. In these maps, some hauls outside of the NRA Div. 3NO can be observed; they are probably hauls carried out in NRA Div. 3NO but with wrong positions in the HbH database.

Table 8 shows that the frequency of sets targeting redfish, skates and yellowtail flounder with cod by-catch in NRA Div. 3NO does not present a very clear pattern throughout the year. But in Figures 10 and 11 it can be observed certain quarters in the skates fisheries (first quarter) and in the yellowtail flounder fishery (third quarter) where the percentage of these sets with cod by-catch greater than 5% is lower.

Figures 10 and 11 show that the yellowtail flounder and skates fisheries in NRA Div. 3NO are mainly conducted in similar areas, in depths shallower than 200 meters. It should be noted that although the fisheries are carried out in similar areas, the frequency of catches of cod as by-catch is higher in the fishery directed to skates than in the fishery directed to yellowtail flounder (Table 7).

Conclusions

The general conclusion of this analysis is that there are no remarkable spatial differences between the hauls with and without by-catch of the moratoria stocks of the different directed fisheries. The directed fisheries that have a higher frequency of by-catch of these species/stocks in moratorium are those that are carried out less than 200 meters deep: yellowtail flounder and skates in Div. 3LNO and cod in Div. 3M at the shallowest part of the Flemish Cap. In some fisheries, it is possible to observe variations in the frequencies of sets with moratoria species by-catch by quarter: cod Div. 3M fishery-American plaice Div. 3M by-catch, yellowtail flounder Div. 3LNO fishery-American plaice Div. 3LNO by-catch, skates Div. 3LNO fishery-American plaice Div. 3LNO by-catch. In some cases this temporal pattern is related to the displacement of the directed fishery to different areas, as in the case of the cod fishery in Division 3M, which in the second semester moves to shallower areas of Flemish Cap increasing the by-catch frequency of America plaice.

Acknowledges

Catch data have been supplied by the NAFO Secretariat.

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NAFO, 2021. Conservation and Enforcement Measures 2021. NAFO/COM Doc. 21-01 Serial No. N7153.

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Table 1. Directed fisheries list with more than 1% of by-catch in weight of any of the analyzed moratoria stocks. The table presents the fishery code used in the tables of this document, the target species and the fishery gear.

Fishery code	Target species	Gear
COD_OTB	Cod	Trawl
HAL_LL	Atlantic halibut	Longliners
PLA_OTB	American Plaice	Trawl
RED_OTB	Redfish	Trawl
SKA_OTB	Skates	Trawl
YEL_OTB	Yellowtail flounder	Trawl
GHL_OTB	Greenland halibut	Trawl

Table 2. Species and moratoria stocks total by-catches for the period 2016-2020 by stock and year approved by CESAG and used in the STACFIS assessments. Shaded, the years where the stock was not under moratorium.

		By-catches (tons)				
Species	Moratoria stock	2016	2017	2018	2019	2020
Cod	2J3KL	10110	13152	9518	10556	10224
	3NO	666	637	401	526	588
American plaice	3M	200	200	200	300	187
	3LNO	1664	1172	1002	1200	1171
Witch flounder	2J3KL	117	136	178	56	
Capelin	3NO	5	1	2	2	1
Shrimp	3LNO	0	0	0	0	0
	3M	0	0	0	0	79
Alfonsino	6G	127	51	2	1	0

Table 3. By-catches (tons) of American plaice in Div. 3M by fishery for the period 2016-2020 based on the HbH data. The table also shows by directed fishery: the percentage of hauls that have caught American plaice **(% Haul_PLA**), the percentage of sets that have exceeded the percentage of 5% of the species in moratorium (**% Haul_PLA>5%**) and the number of hauls that have caught American plaice (**PLA Hauls (n)**) as by-catch. Directed fisheries that represent less than 1% of the total by-catch of American plaice in the period 2016-2020 have been grouped into "Others".

Fishery	Ctotal (Tn)	% Haul_PLA	% Haul_PLA>5%	PLA Hauls (n)
COD_OTB	586	53.2	1.9	3719
RED_OTB	384	37.6	0.4	2600
Others	26	7.3	0.2	129
Total	**996**	**10.4**	**0.3**	**6500**

Table 4. Hauls percentage of the main fisheries with American plaice by-catch in Div. 3M by quarter for the period 2016-2020. The 100% of the redfish fishery in the fourth quarter is not representative as it comes from a single haul.

	% Hauls Div. 3M with PLA by-catch_			
Fishery	**1st Q**	**2nd Q**	**3rd Q**	**4th Q**
COD_OTB	26.4	44.9	85.9	75.5
RED_OTB	45.1	37.6	30.8	100

Table 5. By-catches (tons) of American plaice in NRA Div. 3LNO by directed fishery for the period 2016-2020 based on the HbH data. The table also shows by directed fishery: the percentage of sets that have caught American plaice **(% Haul_PLA**), the percentage of sets that have exceeded the percentage of 5% of the species in moratorium (**% Haul_PLA>5%**) and the number of sets that have caught American plaice (**PLA Hauls (n)**). Directed fisheries that represent less than 1% of the total by-catch of American plaice in the period 2016-2020 have been grouped into "Others".

Fishery	**Ctotal (Tn)**	**% Haul_PLA**	**% Haul_PLA>5%**	**PLA Hauls (n)**
YEL_OTB	1934	74.9	44.12	3318
RED_OTB	1615	56.7	1.25	7446
SKA_OTB	649	86.8	11.13	3946
GHL_OTB	116	8.8	0.67	742
PLA_OTB	68	100.0	100.00	34
Others	72	31.3	1.0	603
Total	**4454**	**49.6**	**8.4**	**16089**

Table 6. Frequency of sets of the main fisheries with by-catch of American plaice in NRA Div. 3LNO by quarter for the period 2016-2020.

	Quarter			
Fishery	**1st**	**2nd**	**3rd**	**4th**
YEL_OTB	49.2	75.1	97.9	82.6
RED_OTB	68.3	61.9	34.9	67.1
SKA_OTB	66.8	85.8	92.8	92.8

Table 7. By-catches (tons) of cod in NRA Div. 3NO by directed fishery for the period 2016-2020 based on the HbH data. The table also shows by directed fishery: the percentage of sets that have caught cod (**% Haul_COD**), the percentage of sets that have exceeded the percentage of 5% of the species in moratorium **(% Haul_COD>5%**) and the number of sets that have caught cod i (**COD Hauls (n)**). Directed fisheries that represent less than 1% of the total by-catch of cod in the period 2016-2020 have been grouped into "Others".

Fishery	Ctotal (Tn)	% Haul_COD	% Haul_COD>5%	COD Hauls (n)
RED_OTB	1209	61.7	2.5	5882
SKA_OTB	486	72.5	10.1	3293
YEL_OTB	368	42.6	4.4	1886
COD_OTB	59	100.0	100.0	22
HAL_LL	48	50.0	29.2	248
Others	84	23.3	4.6	639
Total	**2252**	**55.0**	**5.4**	**11970**

Table 8. Frequency of sets of the main fisheries with by-catch of cod in NRA Div. 3NO by quarter for the period 2016-2020.

	Quarter			
Fishery	**1st**	**2nd**	**3rd**	**4th**
RED_OTB	73.1	64.8	28.9	70.1
SKA_OTB	66.4	77.9	72.6	70.2
YEL_OTB	46.4	45.4	57.5	35.1

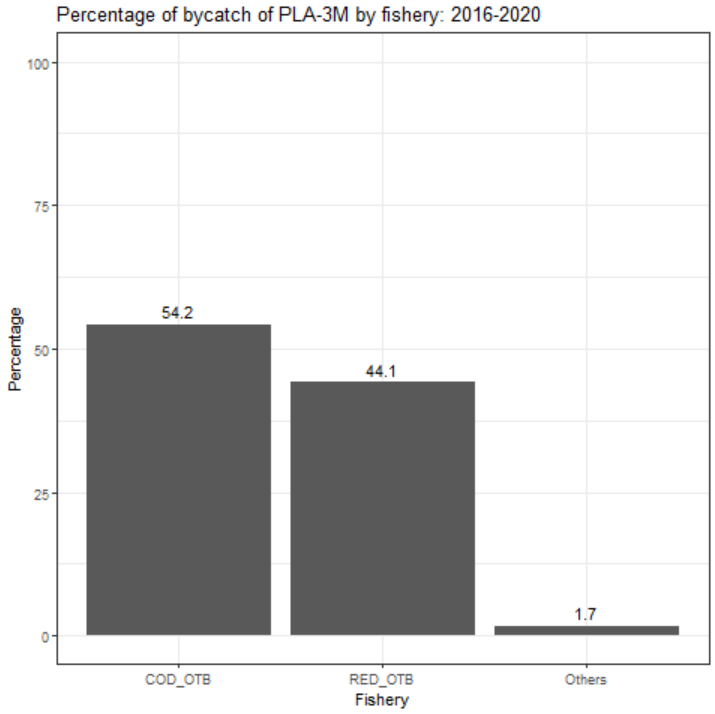

Figure 1. Percentage of by-catches of American plaice in NRA Div. 3M by directed fishery for the period 2016-2020. In this figure, all fisheries representing less than 1% are grouped in "Others".

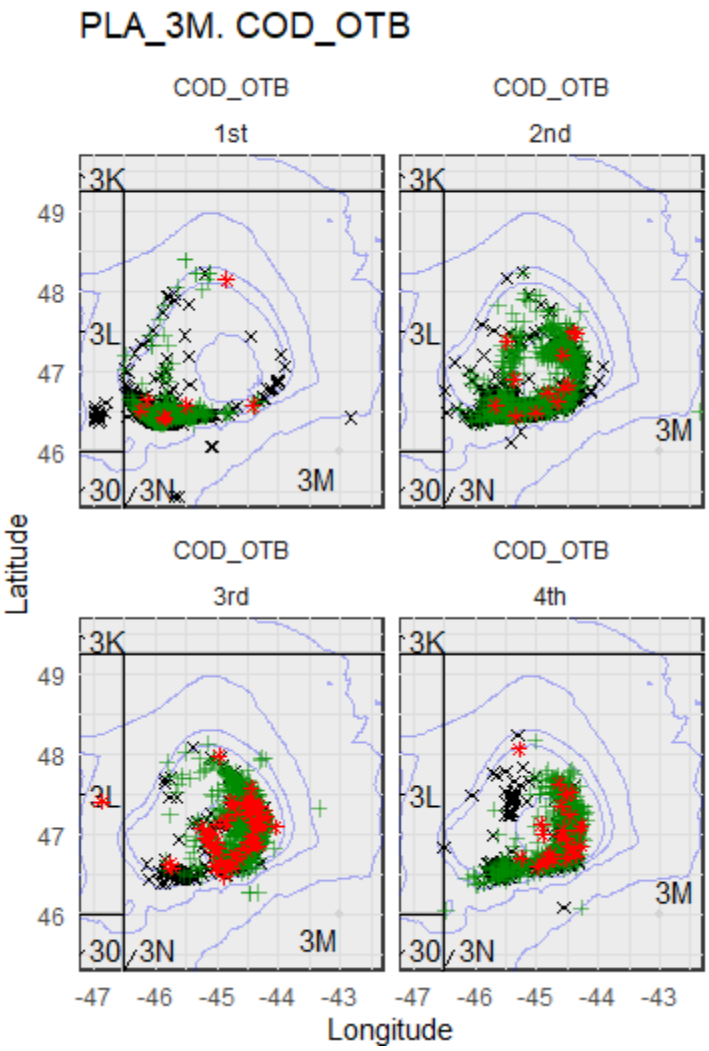

Figure 2. Hauls targeting cod in Div. 3M by quarter for the period 2016-2020. Hauls targeting cod and with no American plaice by-catch are in black, hauls targeting cod and with American plaice by-catch below the 5% of the total catch are in green, and hauls targeting cod and with American plaice by-catch above the 5% of the total catches of the haul are in red. Some sets are observed outside the division limits, maybe due to miss-recording of positions in the logbook.

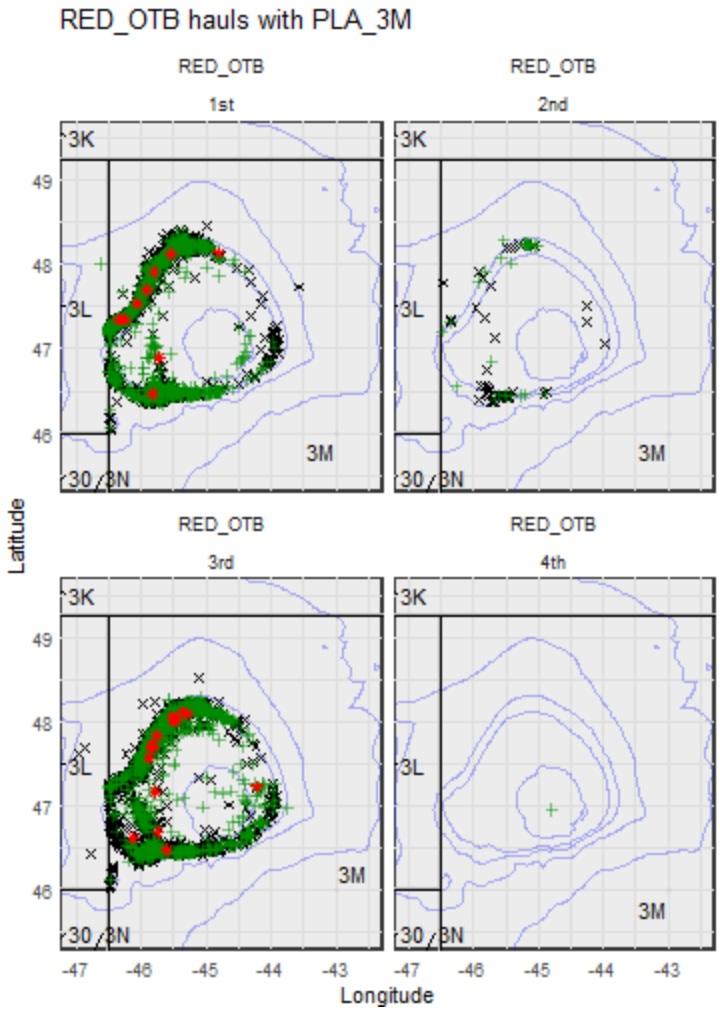

Figure 3. Hauls targeting redfish in Div. 3M by quarter for the period 2016-2020. Hauls targeting redfish and with no American plaice by-catch are in black, hauls targeting redfish and with American plaice by-catch below the 5% of the total catch are in green, and hauls targeting redfish and with American plaice by-catch above the 5% of the total catches of the haul are in red. Some sets are observed outside the division limits, maybe due to miss-recording of positions in the logbook.

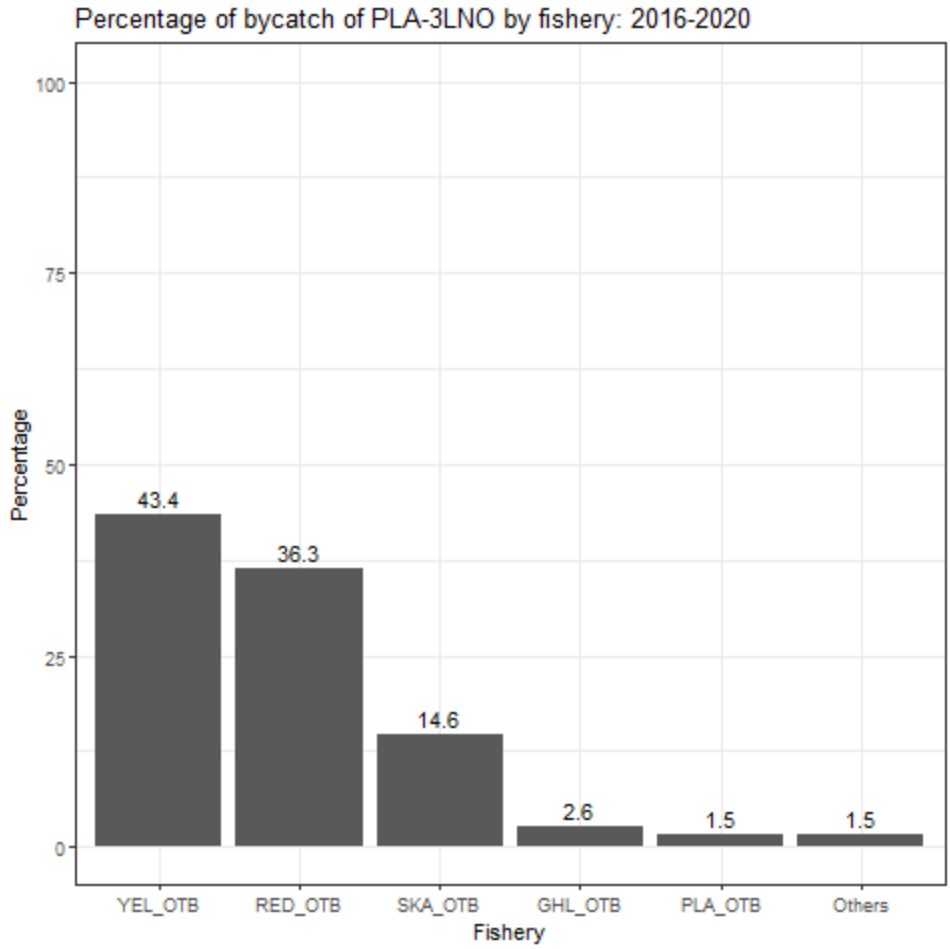

Figure 4. Percentage of by-catches of American plaice in NRA Div. 3LNO by fishery for the period 2016-2020. In this figure, all fisheries representing less than 1% are grouped in "Others".

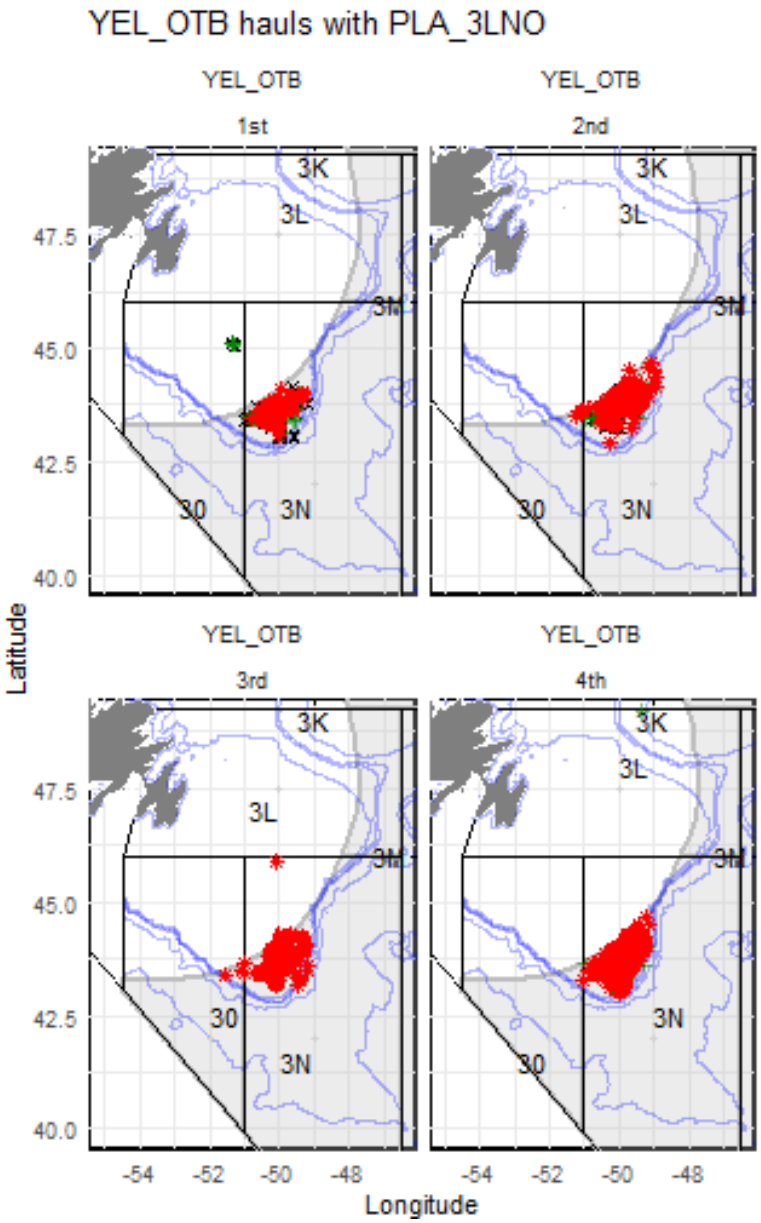

Figure 5.a. Hauls targeting yellowtail flounder in NRA Div. 3LNO by quarter for the period 2016-2020. Hauls targeting yellowtail flounder and with no American plaice by-catch are in black, hauls targeting yellowtail flounder and with American plaice by-catch below the 5% of the total catch are in green, and hauls targeting yellowtail flounder and with American plaice by-catches above the 5% of the total catches of the haul are in red. Some sets are observed outside the NRA Div. 3LNO limits, maybe due to miss-recording of positions in the logbook.

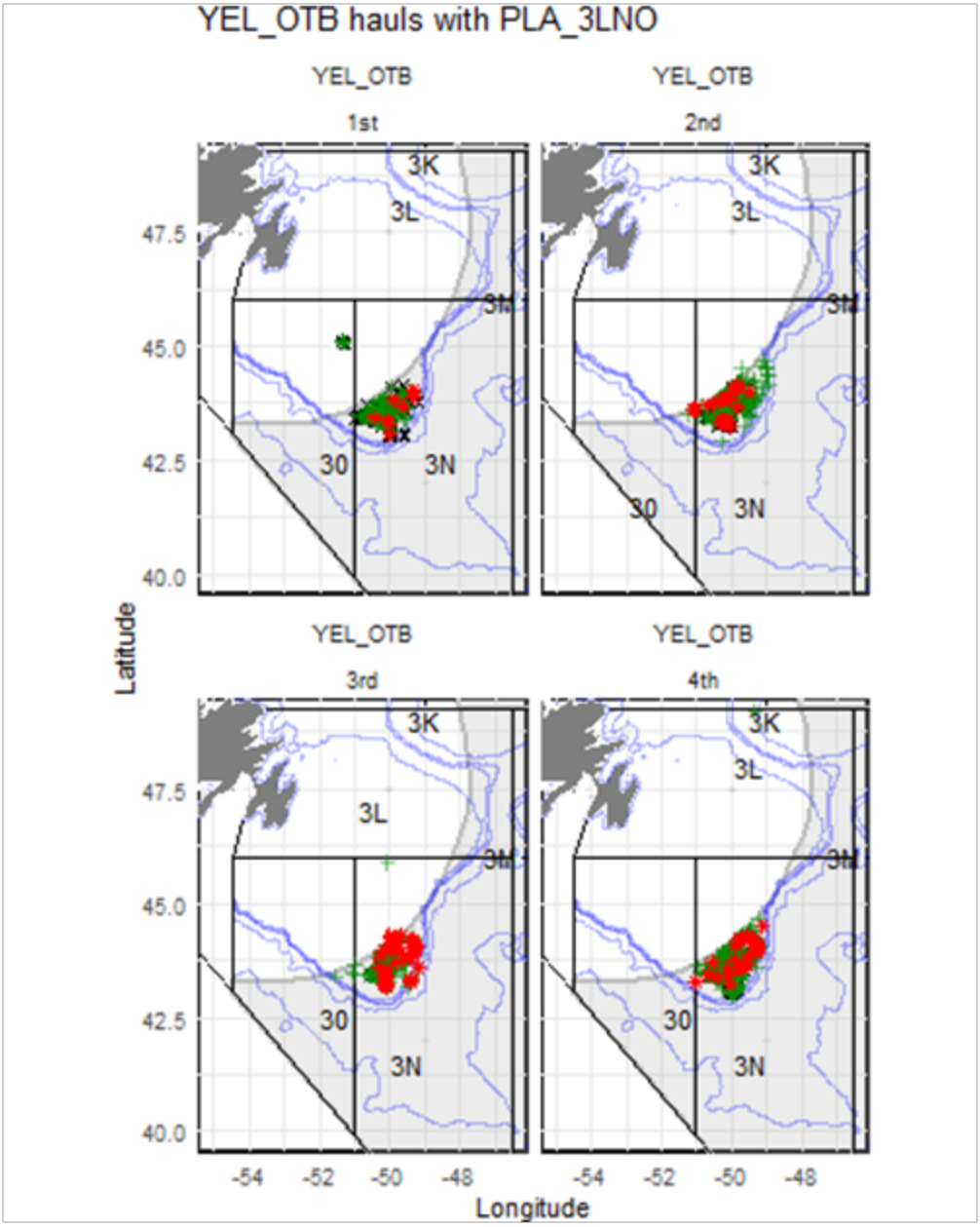

Figure 5.b. Hauls targeting yellowtail flounder in NRA Div. 3LNO by quarter for the period 2016-2020. Hauls targeting yellowtail flounder and with no American plaice by-catch are in black, hauls targeting yellowtail flounder and with American plaice by-catch below the 15% of the total catch are in green, and hauls targeting yellowtail flounder and with American plaice by-catches above the 15% of the total catches of the haul are in red. Some sets are observed outside the NRA Div. 3LNO limits, maybe due to miss-recording of positions in the logbook.

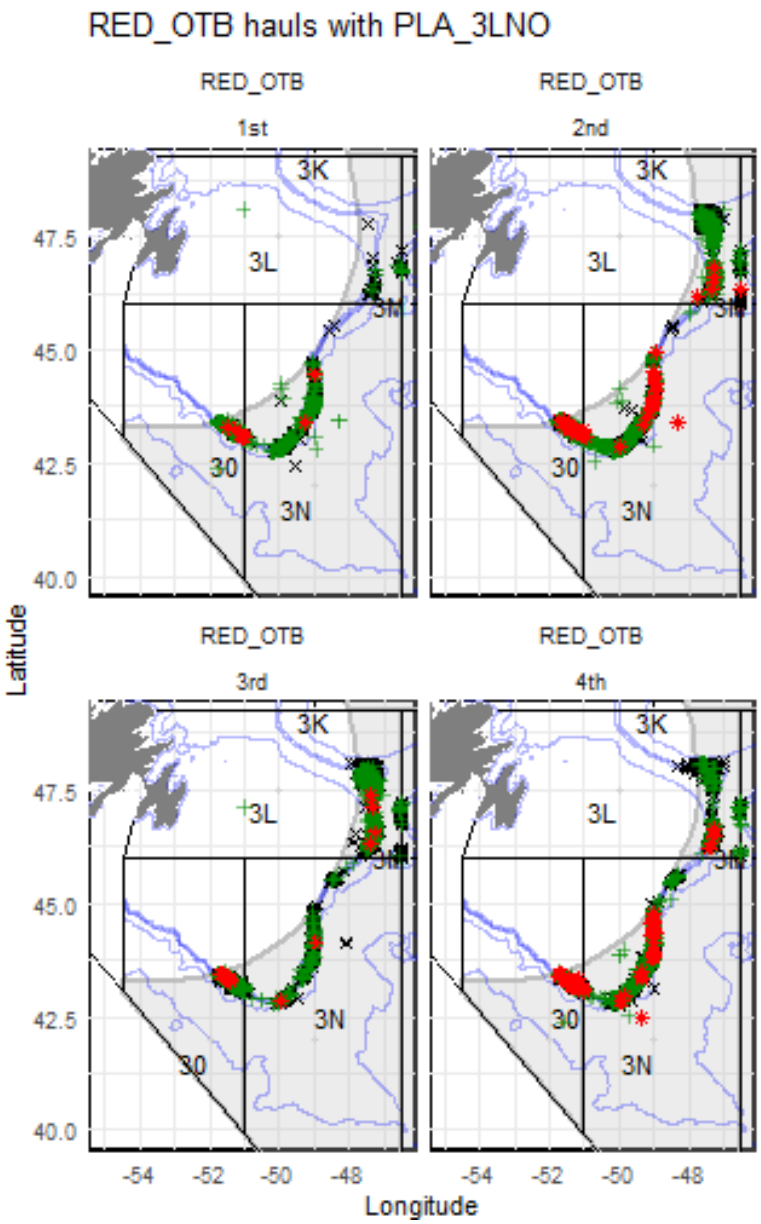

Figure 6. Hauls targeting redfish in NRA Div. 3LNO by quarter for the period 2016-2020. Hauls targeting redfish and with no American plaice by-catch are in black, hauls targeting redfish and with American plaice by-catch below the 5% of the total catch are in green, and hauls targeting redfish and with American plaice by-catches above the 5% of the total catches of the haul are in red. Some sets are observed outside the NRA Div. 3LNO limits, maybe due to miss-recording of positions in the logbook.

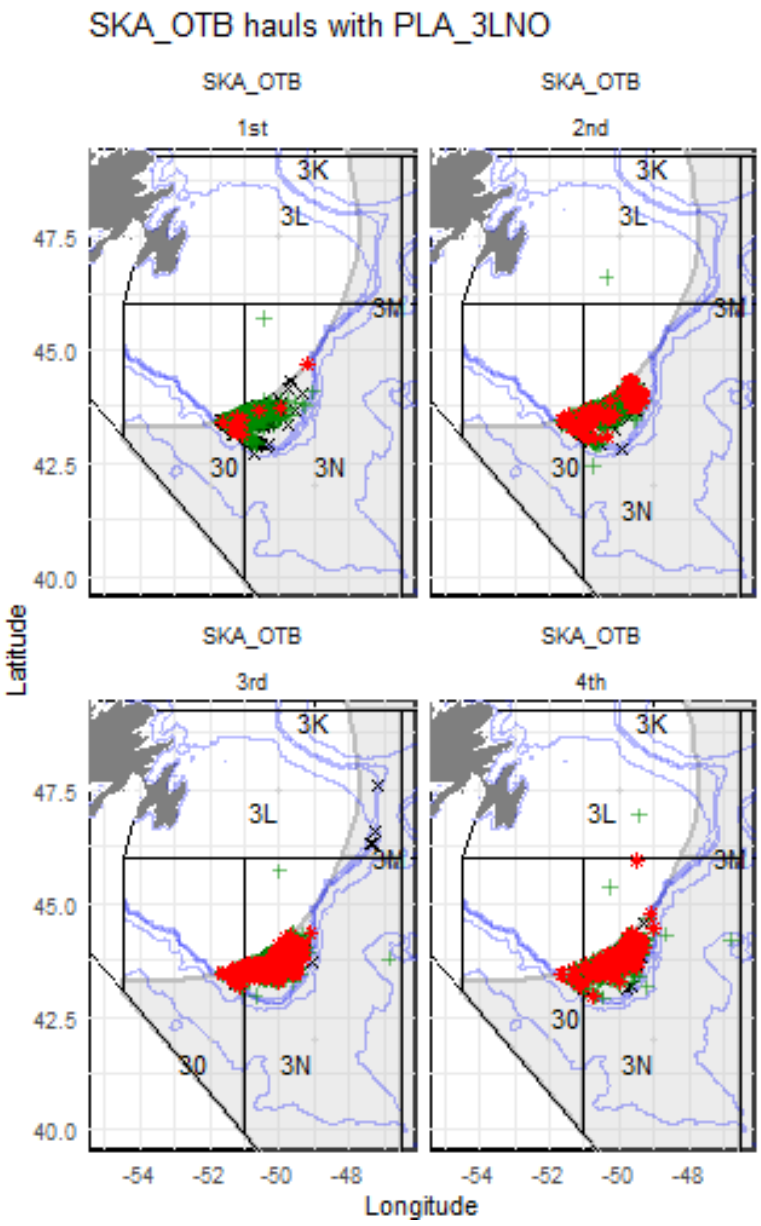

Figure 7. Hauls targeting skates in NRA Div. 3LNO by quarter for the period 2016-2020. Hauls targeting skates and with no American plaice by-catch are in black, hauls targeting skates and with American plaice by-catch below the 5% of the total catch are in green, and hauls targeting skates and with American plaice by-catches above the 5% of the total catches of the haul are in red. Some sets are observed outside the NRA Div. 3LNO limits, maybe due to miss-recording of positions in the logbook.

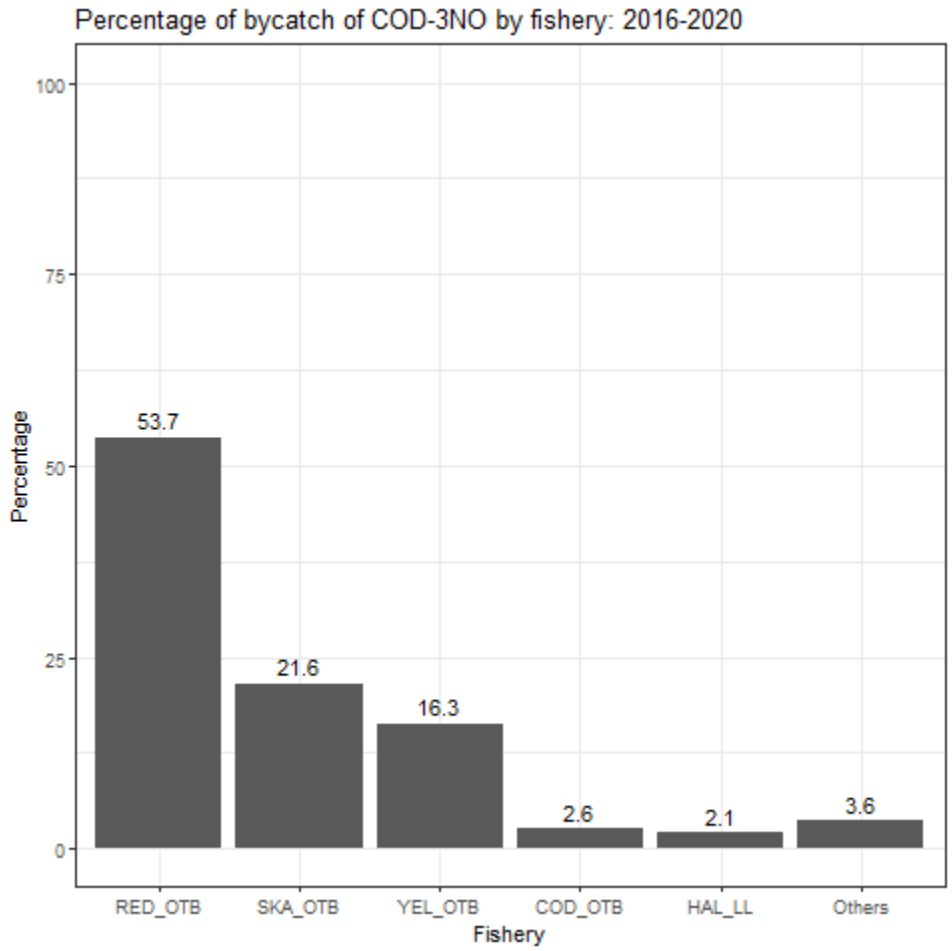

Figure 8. Percentage of by-catches of cod in NRA Div. 3NO by fishery for the period 2016-2020. In this figure, all fisheries representing less than 1% are grouped in "Others".

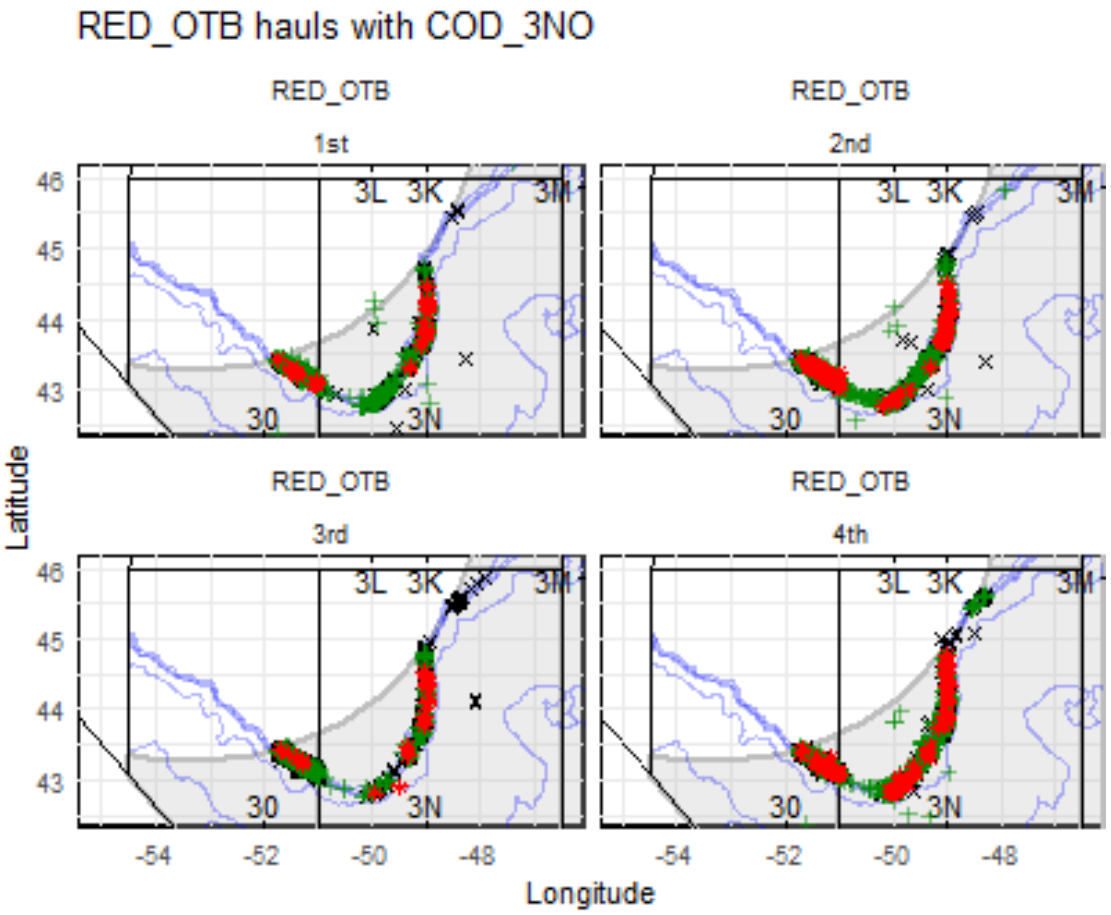

Figure 9. Hauls targeting redfish in NRA Div. 3NO by quarter for the period 2016-2020. Hauls targeting redfish and with no cod by-catch are in black, hauls targeting redfish and with cod by-catch below the 5% of the total catch are in green, and hauls targeting redfish and with cod by-catches above the 5% of the total catches of the haul are in red.

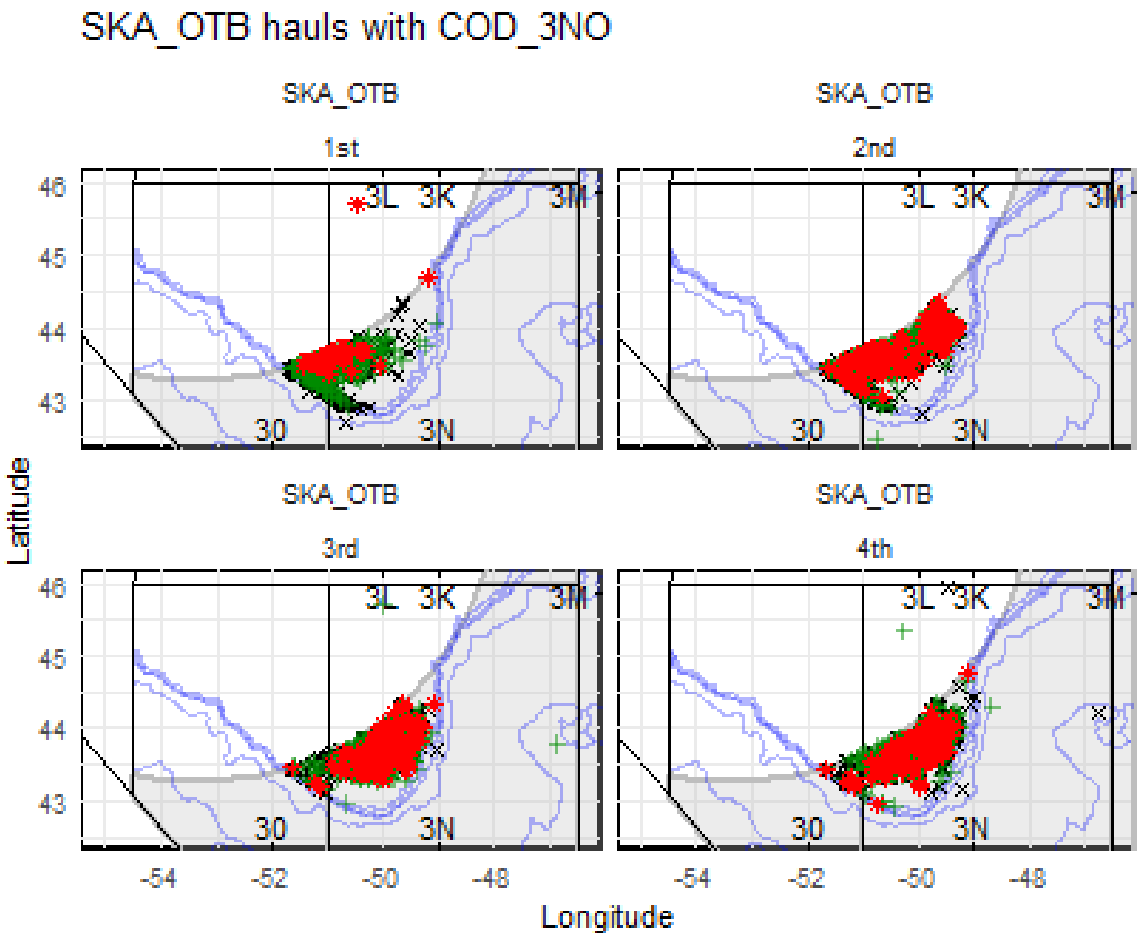

Figure 10. Hauls targeting skates in NRA Div. 3NO by quarter for the period 2016-2020. Hauls targeting skates and with no cod by-catch are in black, hauls targeting skates and with cod by-catch below the 5% of the total catch are in green, and hauls targeting skates and with cod by-catches above the 5% of the total catches of the haul are in red. Some sets are observed outside the NRA Div. 3NO limits, maybe due to miss-recording of positions in the logbook.

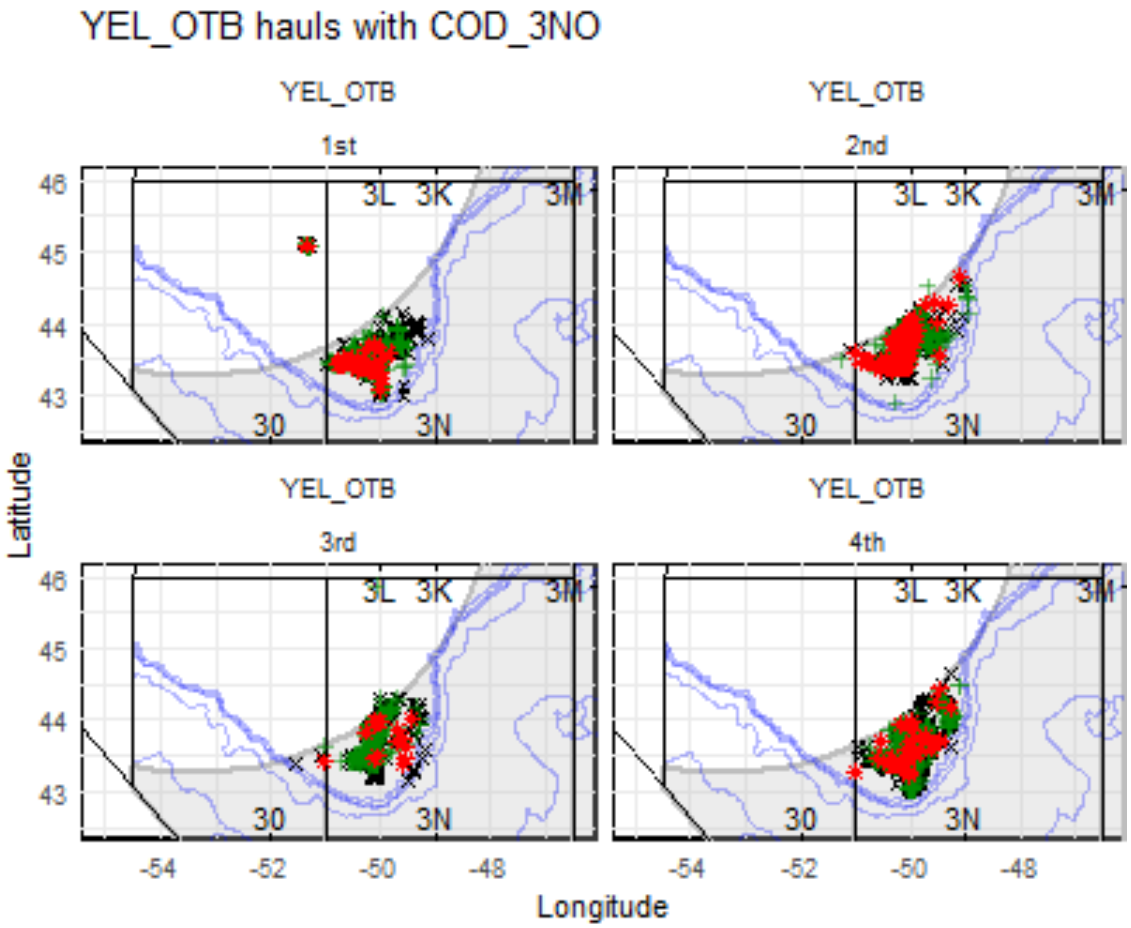

Figure 11. Hauls targeting yellowtail flounder in NRA Div. 3NO by quarter for the period 2016-2020. Hauls targeting yellowtail flounder and with no cod by-catch are in black, hauls targeting yellowtail flounder and with cod by-catch below the 5% of the total catch are in green, and hauls targeting yellowtail flounder and with cod by-catches above the 5% of the total catches of the haul are in red. Some sets are observed outside the NRA Div. 3NO limits, maybe due to miss-recording of positions in the logbook.