SCIENTIFIC COUNCIL MEETING –JUNE 2025

Results for Greenland halibut survey in NAFO Divisions 1C-1D for the period 1997-2017, 2019 and 2022-2024

Henrik Christiansen[1], Adriana Nogueira[2]

[1]Greenland Institute of Natural Resources, Box 570, 3900 Nuuk, Greenland
[2]Centro Oceanográfico de Vigo, Instituto Español de Oceanografía (IEO), CSIC, Subida a Radio Faro 50, Vigo 36390, Spain

2025-06-05

Greenland initiated a survey series in 1997 covering NAFO Divisions 1CD at depths between 400 and 1500 m. The survey has been conducted with RV Paamiut, using an Alfredo III gear. In 2017, RV Paamiut was retired and no survey has been conducted in 2018. In 2019, the annual trawl survey was conducted with a chartered vessel, the CV Helga Maria. All standard gear from RV Paamiut was used in order to make the 2019 survey as identical as possible to the previous year's surveys, but the gear was working different at depths > 700m. No vessel has been available in 2020 and 2021 to conduct the survey. In 2022 the survey was carried out with a new vessel owned by the Greenland Institute of Natural Resources: RV Tarajoq, using also a new trawl gear, Bacalao 476. Comparative trawling between RV Paamiut and RV Tarajoq was not possible. The survey was designed as a Stratified Random Bottom Trawl Survey aimed primarily at Greenland halibut (*Reinhardtius hippoglossoides*) and roundnose grenadier (*Coryphaenoides rupestris*). Here, biomass and abundance estimates, and length frequencies from the survey are provided for Greenland halibut, roundnose grenadier, roughhead grenadier (*Macrourus berglax*), and deep-sea redfish (*Sebastes mentella*) together with a list of recorded fish species. In 2024, 80 valid hauls were conducted.

Introduction

During 1987-1995 the Japan Marine Fishery Resources Research Center (JAMARC) and the Greenland Institute of Natural Resources (GINR), jointly conducted 12 bottom trawl surveys at depths down to 1500 m (O. A. Jørgensen, 1998a) and four pelagic surveys (O. A. Jørgensen, 1997) at West Greenland, in 1BCD, as part of a joint venture agreement on fisheries development and fisheries research in Greenland waters. The bottom trawl surveys were aimed primarily at Greenland halibut (*Reinhardtius hippoglossoides*) in NAFO Div. 1B-1D. In 1997, GINR continued the bottom trawl survey series with the institute's own vessel, RV Paamiut, which had been rigged for deep-sea trawling. Unfortunately, no calibration experiments between the Japanese research vessel Shinkai Maru and RV Paamiut were performed, making comparisons between both vessels impossible. The Paamiut survey traditionally covered NAFO Div. 1CD, but in 2001 the survey area was

expanded to include Div. 1A (to 74 °N) and Div. 1B, and in 2004 the northernmost part of Baffin Bay (73° N-77°N) (Div. 1A) was also surveyed. In 2010, Div. 1A was surveyed to 75.30 °N (SCR 11/010). In 2013, the survey only covered Div. 1D. In 2018 no survey was undertaken due to the retirement of RV Paamiut and the survey in 2019 was conducted with the chartered CV Helga Maria. All standard gear from RV Paamiut (such as the Alfredo III trawl along with doors, bridles, etc., and the Marport sensors used on doors and headlines) was used to make the 2019 survey as identical as possible compared to previous years (Table 1). However, comparative studies of gear performance between the vessels showed that the gear has been working differently at depths > 700m (**A. Nogueira and Treble, 2020**). In 2022, the new vessel owned by GINR, RV Tarajoq with a Bacalao 476 trawl, began a new survey series.

Methods

Stratification

The survey covered NAFO Div. 1CD between the 3-nm and the mid-line to Canada at depths between 400 and 1500 m. The survey area was stratified within NAFO divisions in 6 depth strata: 401-600, 601-800, 801-1000, 1001-1200, 1201-1400, and 1401-1500 m. The depth stratification was based on Greenland Geological Survey's 10 m depth contour maps, Canadian maps and depth soundings made during previous surveys. The area of each stratum was measured using "MapInfo Version 4.0". A list of the number of valid hauls per strata and area is given in Tables 2, 3, and 4.

The survey was planned as a Stratified Random Bottom Trawl Survey with a total of 70 hauls. A minimum of two randomly placed hauls were conducted per stratum (**Bishop, 1994**). From 1997 to 2019, the remaining hauls were allocated to strata based on the stratum area and on predictions of catch variability from past surveys, in order to minimize standard error of the total survey biomass estimate of Greenland halibut, given the predicted stratum variance. This method was reviewed in 2020 and realized that because biomass over-represents larger Greenland halibut, it is not optimized for multiple size classes, and small Greenland halibut in particular. That resulted in insufficient coverage in shallow strata where small-sized Greenland halibut are found. It was decided to change the station allocation for a more equitable distribution of stations across strata (**A. Nogueira and Treble, 2020**). From 2022, the number of stations is proportional to the total area (1/750km2), and the survey is planned with 71 hauls. In 2004, the placing of stations independently and randomly was replaced by buffered random sampling. This method combines the use of a minimum between-stations distance rule (buffer zone) with a random allocation scheme (**Kingsley et al., 2004**). Because the seabed in Division 1D stratum 601-800 m is muddy and soft, and generally not suitable for trawling, stations are fixed in that stratum.

Vessel and gear

From 1997 to 2017, the survey was conducted by the 1084 GT trawler RV Paamiut. However, in the beginning of 2018, it was decided that RV Paamiut had to be scrapped owing to increasing maintenance expenses. No survey has been conducted in 2018. In 2019, the survey was carried out with the chartered CV Helga Maria. All standard gear has been maintained (Table 1). The survey used an Alfredo III trawl with a mesh size of 140 mm and a 30-mm mesh-liner in the cod-end. The ground gear is of the rockhopper type. The trawl doors are Greenland Injector weighing 2700 kg. The Injector otter doors replaced the Greenland Perfect doors that have been used until 2003. The average net height was, in 2014, 20 cm higher with the new doors compared to the old, but the difference was not statistically significant (95% level), and it was concluded that the net performance has not changed by the introduction of the new doors. Further information about trawl and gear is given in Jørgensen (**1998b**). The effect of the vessel change on the 2019 survey was examined by looking at gear performance variables [e.g. net height and door distance; A. Nogueira and Treble (**2020**)]. Data reviewed for the 1CD survey suggests the change in vessel in 2019 had an effect on the performance of the Alfredo III trawl gear at depths > 701 m, where Greenland halibut are known to be abundant. Therefor, indices must be compared with caution. In 2022, RV Tarajoq (2896 GT) began a new survey series using a Bacalao 476 trawl with a mesh size of 136 mm and a 30-mm mesh-liner in the cod-end (Table 1). The same doors as on RV Paamiut are used on RV Tarajoq.

Swept area calculation

A MarPort net sonde mounted on the head rope measured net height. MarPort sensors measured the distance between the trawl doors. Wing spread, taken as the distance between the outer bobbins, was calculated as:

$$DBOB = 10.122 + DBTD * 0.142$$

where DBOB is the distance between outer bobbins, and DBTD is the distance between trawl doors in m. This relationship was estimated based on flume tank measurements of the trawl and rigging used in the survey (**O. A. Jørgensen, 1998b**).

In 2022, the gear was changed to a Bacalao 476 trawl. The wing spread for a tow was calculated from the mean door spread and the geometry of the trawl as if the shape would be a triangle. V has been calculated as follows; Where the trawl and the trawl plus bridles are assumed to form two similar triangles, bridles and wings making a straight line:
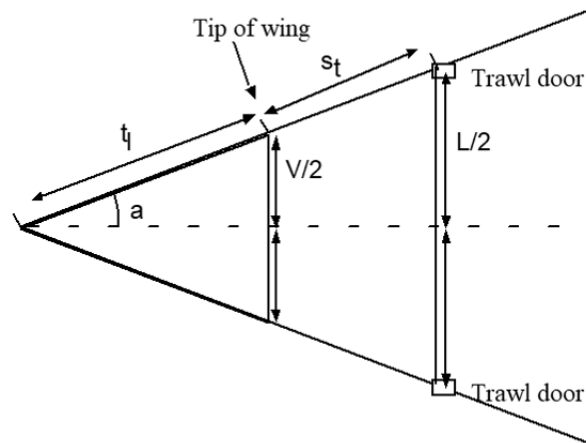
and the lengths of the bridles (s) and the trawl wings (t) are known. The wingspread V is then calculated as:

$$V = (tl * L)/(tl + st)$$

where L is the distance between the doors (door spread). The trawl wing is 26.83 m and the length of the bridles is 129 m. Because the shape of the Bacalao gear is not a triangle, a constant based on sensor measurements during the Canadian survey at the same depths was applied. Scanmar sensors measured wing spread during the deep Canadian survey in Subarea 0A. The difference between our estimation and the sensor measurements in each depth stratum has been added as a constant in our wingspread calculations.

Bottom temperature

Near-bottom temperature was measured, by 0.1 °C, by a Seastar sensor mounted on one of the otter doors.

Trawling procedure

Trawls were towed for 30 min at a speed of 3.0 knots. However, hauls > 15 min are considered acceptable. Trawl distance was estimated from the start and end positions of the haul. Trawling takes place day and night.

Handling of the catch

The catch of each haul was sorted, weighed, and recorded by species. Total length (TL) of all fish species was measured to 1.0 cm below. Grenadiers were measured as pre-anal fin length (AFL) to 0.5 cm below from 1997

to 2008, and in 2019, and 1.0 cm below from 2009 to 2017, and 2020 to present. In case of large catches, subsamples of the catch were measured.

Biomass and abundance

Biomass and abundance estimates were obtained by applying the swept area method (trawled distance * estimated bobbin spread), assuming a catchability coefficient of 1.0. All catches were standardized to 1 km² swept area prior to further calculations.

In strata with one haul, the standard deviation (SD) was estimated as:

$$SD = \frac{Meancatch}{MeanCV} * 100$$

Results and discussion

A total of 80 valid hauls were made (Figure 1). Haul-by-haul information on catches of Greenland halibut, roundnose grenadier, roughhead grenadier, and deep-sea redfish is given in Appendix A Table 17. The distribution of hauls by strata is given in Table 3 and 4. Date of completion of the survey is given in Table 2. A total of 97 fish species were recorded (Appendix B Table 18).

Greenland halibut (Reinhardtius hippoglossoides)

The Greenland halibut stock in Subareas 0 and 1 is considered part of a biological stock complex, which includes Subarea 2 and Div. 3KLMNO. Abundance and biomass indices are available from research vessel surveys by Canada in Subarea 0A South (1999, 2001, 2004, 2006, 2008, 2010, 2012, 2014-2019, and 2022-2024); Canada in OB (2000, 2001, 2011, 2013, 2014, 2015, 2016, and 2022-2024), Greenland in Divisions 1CD from 400 to 1500 m (1987-1995, 1997-2017, 2019, and 2022-2024), and Greenland in Divisions 1A-1F offshore, from 100 to 600 m (1988-2020, and 2022-2024).

From 1979 to 1994, the assessment included SA 0+1, including Div. 1A inshore. In 1994, it was decided to conduct a separate assessment for the inshore part of the stock in Div. 1A and for SA 0-1 Div. 1 offshore + Div. 1B-F based on tagging experiments. The TAC has been increasing since then (**Treble and Nogueira, 2018**). In 2020, based on historical catches and tagging experiments, it was also decided to separate, the stocks inshore from Div.1B-F, in three separate management units, i.e. 1BC, 1D, and 1EF (**Nygaard et al., 2020**).

In 2016 and 2018 the assessment was based on survey indices. The ICES guidance on data-limited stocks (DLS) method 3.3 (**ICES, 2012b**, **2012a**, **2014**) was applied for the advice on SA0+1 Greenland halibut. The index in 2019 could not be used to assess the stock status because its comparability with the earlier time series was questionable, and the assessment in 2020 was qualitative. Because no research surveys were carried out in 2020 and 2021, the precautionary approach was applied to give advice in 2022 and 2023. In 2024 an analytical assessment using a SPiCT model was applied for the first time to provide advice for the SA 0+1 stock (**Nogueira A et al., 2024**).

In the 2024 Greenland survey in 1CD Greenland halibut was caught in all but one haul (Figure 2 and Appendix A Table 17). From 1997 to 2017, the biomass in 1CD has been almost constant for the entire time series with few fluctuations. A gradual decrease in biomass was observed from 2011 (87,205 t) to 2014 (58,665 t), but then increased in 2015. The biomass in 2019 with CV Helga Maria was 82,940 t. With RV Tarajoq the first biomass estimate in 2022 was 102,349 t and increased to 133,260 in 2023 and 140,291 t in 2024 (Table 5 and Figure 3).

In 2013 the survey covered only Division 1D. Therefore, total biomass and abundance in Division 1C in 2013 were estimated by a GLM (model: $lnbiomass = year * division$) using data from 2010-2014 as explained previously (**Nogueira A and Estévez-Barcia, 2024**).

Roughhead grenadier (Macrourus berglax)

There is no directed fishery for roughhead grenadier. Most of the catches are taken as bycatch in the trawl fishery for Greenland halibut. In 2024 roughhead grenadier was caught in 53 hauls (Figure 5, Appendix A Table 17). The biomass increased in the beginning of the time sires to 7,369 t in 2000, then decreased in 2001, and in 2002 it reached the highest value of the time series (8,101 t). Since 2003, it has been decreasing with some fluctuations until 2017. From 2022 to 2024 there was slightly increasing trend with a biomass of 4,067 t in 2024 (Tables 8 and 9, Figure 6). The highest density in 2024 was found between 1201-1400 m in 1D. The abundance followed a similar trend as the biomass. It increased from 1997 (5,013*10^3 individuals) to 2000 (20,991* 10^3 individuals). Since then, it has been decreasing with fluctuations from 2001 to 2017 and with a slightly increasing trend with the new vessels. In 2024, the abundance was 8,137*10^3 (Tables 8 and 9, Figure 6). In 2024, pre anal fin length ranged from 2 to 34 cm, and the overall length distribution showed a mode at 18 cm (Figure 7 and Table 10).

Roundnose grenadier (Coryphaenoides rupestris)

There is no directed fishery for roundnose grenadier. Most of the catches are taken as bycatch in the trawl fishery for Greenland halibut. In 2024 roundnose grenadier was caught in all but one of the 80 hauls (Appendix A Table 17; Figure 8). The biomass has been low since 2001 (Tables 11 and 12, Figure 9), and far below the level found in the late 80s. The highest biomass was found from 1997 to 2000, then it sharply decreased by five orders of magnitude, from 7,534 t (in 2000) to 1,589 (in 2001). Since then, it has maintained low values. In 2024, the biomass was 1,107 t (Table 11). The highest density was found between 401-600 m in 1D (Table 12). The abundance, in 2024, was estimated at 11,935*103 indiv. (Table 11). Table 13 and Figure 10 show the length distribution. In 2024 pre anal fin length ranged from 1 to 20 cm. The mode was found at 5 cm.

Deep-sea redfish (Sebastes mentella)

There is no directed fishery for deep-sea redfish in West Greenland Divisions 1A-F. In 2024 deep-sea redfish was caught in 38 of the 80 valid hauls (Figure 11, Appendix A Table 17). The biomass was very low from 1997 to 2007 (426 t), then it peaked in 2008 (13,255 t). Since then, the biomass has fluctuated at a higher level than before 2008. The biomass decreased slightly from 2016 (11,334 t) to 2017 (9,001 t) and to 2019 (8,249 t). In 2022, with the new R/V Tarajoq, the biomass was 20,202 t, two times the biomass found from 2015 (Table 14 and Figure 12). In 2023 it more than tripled to 75,516 t, but with very high uncertainty (SE 41,719 t). In 2024, the biomass decreased to 10,019 t, which is more similar to what was observed in 2015-2019. In general, the aggregating behaviour of this species can likely explain some of the very high interannual variations. The highest density in 2024 was found between 401 to 600 m in 1D (Table 15). The abundance followed a similar trend as the biomass. Until 2007 the abundance was very low, then it increased from 1,892*10^3 individuals in 2007, to 53,046*10^3 individuals in 2008. Since 2009, the abundance has been fluctuating, reaching a high at 65,978*10^3 individuals in 2014. It decreased by factor 10 from 2014 (65,978*10^3) to 2017 (16,423*10^3) (Table 14 Figure 12). A slight increase was observed in 2019 and 2022. In 2023 a very strong increase with very high SE was observed, similar to biomass. In 2024, the abundance decreased again to 27,935*10^3 individuals, which is similar to 2022. In 2024 the length distribution ranged from 18 to 76 cm, with a mode at 28 cm (Table 16 and Figure 13).

Temperature

The bottom temperature ranged from 1.0 to 5.3 ºC (Appendix A Table 17). The mean temperature decreased in 1D with depth as in previous years (Figure 14 and Figure 15).

Tables

Table 1.   Gear specifications and survey protocol details for RV Paamiut and RV Tarajoq in NAFO Div. 1C and 1D.

Procedure	Specifications	
Vessel	**RV Paamiut**	**RV Tarajoq**
TRB	1084 GT	2896 GT
Dimensions	LOA 58.61m, Beam 11.21 m	LOA 61.4 m, Beam 16.3 m
Main engine	2000BHP, Diesel 257, 1471KW	3943/4896 BHP, Diesel 475, 2900/3600 KW
Survey area	1CD (401-1500 m)	1CD (401-1500 m)
Years	1998-2016 (no survey 2001)	2022-2024
Time of year	August/September	September/October/November
Number of days	15	15
Towing speed (knots)	3	3
Tow duration	30 min	30 min
Gear	Alfredo 3	Bacalao 476
Vertical trawl opening (m)	5.6	4.5
Distance between doors (m)	120 -145 m	151.80000000000001
Wing spread	10.122 + distance between the doors * 0.142.	$V = (tl * L) / (tl + st) + constant$
Mesh size (mm)	140	136
Door until 2003	Greenland Perfect (370*250 cm)	Shark injector (353*273)
Door from 2004	Shark injector (353*273)	
Door type (kg)	2400 kg with extra 20 kg	2850
Mesh size (mm)	44	44
Mesh-line in the cod-end (mm)	30	30
Sampling design	Buffered Random Stratified	Buffered Random Stratified & Fixed
Number of stations	70	71
Number of strata	14	14
Trawling schedule	24 hours	
Criteria for rejecting a haul	Snag of the trawling gear in the bottom	
	Damage in the cod-end or severe damage in large sections of the wings or belly	
	Less than 15 minutes of effective trawling time	
	Gear malfuntion	
Criteria for change haul position	Wrong depth interval	
	Poor bottom conditions	
Sampling species	All fish species and invertebrates	
Target species	Greenland halibut	

Table 2. Greenland halibut survey bottom trawls in NAFO Divisions 1C-D in the period 1997-2024. Depth strata are indicated in metres.

Year	Vessel	Tows 1C	Tows 1D	Total tows	Depth strata	Dates
1997	RV Paamiut	24	39	63	427-1469	Sep 24-Oct 08
1998	RV Paamiut	28	28	56	500-1494	Sep 23-Oct 07
1999	RV Paamiut	15	23	38	576-1457	Sep 23-Oct 01
2000	RV Paamiut	9	22	31	667-1464	Sep 27-Oct 04
2001	RV Paamiut	17	29	46	468-1458	Nov 05-Nov 15
2002	RV Paamiut	9	26	35	637-1490	Sep 17-Sep 23
2003	RV Paamiut	12	23	35	564-1449	Sep 17-Sep 24
2004	RV Paamiut	18	33	51	574-1468	Oct 28-Nov 05
2005	RV Paamiut	23	38	61	412-1485	Aug 31-Sep 11
2006	RV Paamiut	19	42	61	402-1486	Oct 11-Oct 22
2007	RV Paamiut	17	33	50	426-1468	Sep 19-Sep 30
2008	RV Paamiut	21	49	70	417-1458	Sep 19-Oct 01
2009	RV Paamiut	22	46	68	422-1468	Sep 19-Sep 30
2010	RV Paamiut	20	46	66	417-1482	Sep 07-Sep 20
2011	RV Paamiut	22	45	67	484-1472	Sep 01-Sep 17
2012	RV Paamiut	18	32	50	466-1473	Sep 12-Sep 22
2013	RV Paamiut	0	27	27	406-1492	Sep 12-Sep 17
2014	RV Paamiut	20	38	58	404-1464	Aug 31-Sep 16
2015	RV Paamiut	23	44	67	409-1458	Aug 26-Sep 05
2016	RV Paamiut	26	44	70	422-1462	Aug 31-Sep 12
2017	RV Paamiut	15	38	53	450-1476	Oct 10-Oct 21
2019	CV Helga Maria	27	43	70	417-1451	Jul 31-Aug 12
2022	RV Tarajoq	33	32	65	434-1480	Oct 13-Oct 26
2023	RV Tarajoq	31	36	67	414-1496	Nov 23-December 05
2024	RV Tarajoq	40	40	80	410-1490	Oct 3-Oct 12

Table 3. Hauls per year, division and stratum from 1997 to 2019.

Division	Stratum (m)	Area (km²)	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2019
1C	401-600	3,366	3	4	2	0	4	0	2	1	2	2	1	3	2	2	1	2	0	1	2	2	0	2
1C	601-800	16,120	11	14	7	3	8	4	4	5	8	6	4	5	5	4	5	3	0	5	6	9	6	10
1C	801-1000	6,066	8	8	6	4	3	4	4	10	11	9	10	11	13	12	14	11	0	12	13	13	7	13
1C	1001-1200	611	2	2	0	2	2	1	2	2	2	2	2	2	2	2	2	2	0	2	2	2	2	2
1D	401-600	903	2	1	0	0	0	0	0	0	2	3	2	2	2	2	2	2	1	1	2	2	2	2
1D	601-800	1,940	2	2	1	0	0	0	0	2	1	2	0	2	2	2	2	1	1	2	2	3	2	2
1D	801-1000	3,874	4	4	2	2	3	4	2	3	3	4	5	4	4	5	5	3	4	3	4	4	4	4
1D	1001-1200	10,140	18	11	11	11	13	12	10	12	14	13	12	18	18	19	17	14	11	15	20	19	16	19
1D	1201-1400	6,195	8	8	7	7	10	7	7	12	12	14	9	16	15	13	14	9	7	13	11	12	10	12
1D	1401-1500	3,091	5	2	2	2	3	3	4	4	6	6	5	7	5	5	5	3	3	4	5	4	4	4
Total			63	56	38	31	46	35	35	51	61	61	50	70	68	66	67	50	27	58	67	70	53	70

Table 4.   Hauls per year, division and stratum from 2022 to 2024.

Division	Stratum (m)	Area	2022	2023	2024
1C	0401-0600	3,649	4	4	6
1C	0601-0800	16,831	19	17	21
1C	0801-1000	5,303	8	9	9
1C	1001-1200	611	2	1	4
1D	0401-0600	545	2	3	3
1D	0601-0800	1,694	2	4	3
1D	0801-1000	3,303	5	4	5
1D	1001-1200	10,774	13	13	17
1D	1201-1400	6,138	6	8	8
1D	1401-1500	2,113	4	4	4
Total			65	67	80

Table 5. Estimates of catch, biomass and abundance for Greenland halibut during surveys performed from 1997 to 2024 in NAFO Div. 1CD.

Year	Area	Vessel	SMC.B	SE	Biomass	SE	SMC.A	SE	Abundance	SE
1997	52,306	PA	1,102.6	90.8	57,674	4,751.0	1,054.4	87.3	55,150	4,566.0
1998	52,306	PA	1,509.4	174.2	78,950	9,113.0	1,383.2	145.9	72,349	7,632.0
1999	50,792	PA	1,274.1	127.1	64,713	6,456.0	1,194.0	118.2	60,646	6,005.0
2000	46,097	PA	1,309.6	131.7	60,368	6,070.0	1,371.4	139.5	63,216	6,430.0
2001	49,463	PA	1,428.7	216.9	70,666	10,729.0	1,502.9	246.5	74,336	12,193.0
2002	46,097	PA	1,569.8	129.8	72,362	5,982.0	1,559.3	133.5	71,881	6,153.0
2003	49,463	PA	1,389.3	129.6	68,718	6,411.0	1,466.9	157.0	72,557	7,764.0
2004	51,403	PA	1,443.6	101.0	74,205	5,191.0	1,428.8	106.0	73,446	5,448.0
2005	52,306	PA	1,554.8	164.4	81,327	8,600.0	1,396.4	144.0	73,042	7,533.0
2006	52,306	PA	1,482.8	117.8	77,560	6,159.0	1,360.9	106.1	71,182	5,550.0
2007	50,366	PA	1,488.2	187.1	74,957	9,421.0	1,338.8	168.7	67,432	8,497.0
2008	52,306	PA	1,610.7	107.3	84,252	5,612.0	1,401.2	98.4	73,293	5,145.0
2009	52,306	PA	1,326.9	90.5	69,407	4,735.0	1,194.2	84.5	62,464	4,422.0
2010	52,306	PA	1,442.9	103.2	75,474	5,397.0	1,240.2	103.0	64,871	5,390.0
2011	52,306	PA	1,667.2	99.2	87,205	5,189.0	1,433.4	90.3	74,976	4,724.0
2012	52,306	PA	1,250.4	199.7	65,403	10,444.0	1,037.1	193.4	54,248	10,116.0
2013	26,143	PA	1,577.6	176.7	41,244	4,620.0	1,243.2	116.2	32,501	3,038.0
2014	52,306	PA	1,121.6	82.9	58,665	4,336.0	859.2	64.8	44,939	3,388.0
2015	52,306	PA	1,520.5	130.8	79,532	6,843.0	1,178.8	116.0	61,657	6,069.0
2016	52,306	PA	1,465.0	92.0	76,629	4,811.0	1,140.9	71.3	59,676	3,729.0
2017	48,940	PA	1,612.0	124.0	78,892	6,070.0	1,228.2	102.8	60,107	5,031.0
2019	52,306	HM	1,585.7	121.1	82,940	6,336.0	1,252.3	84.4	65,501	4,414.0
2022	50,960	TJ	2,008.4	172.9	102,349	8,813.0	1,483.0	137.2	75,575	6,991.0
2023	50,960	TJ	2,615.0	265.5	133,260	13,531.0	1,850.6	165.5	94,308	8,436.0
2024	50,960	TJ	2,753.0	202.8	140,291	10,333.0	2,101.3	150.4	107,080	7,664.0

Table 6. Estimates of catch, biomass and abundance for Greenland halibut during the 2024 survey per depth stratum.

Subarea	Stratum (m)	Area (km²)	Tow number	Mean Catch	Biomass	SE	Mean Number	Abundance	SE
1C	401-600	3,649	6	754.3	2,753	1,044	757	2,761	1,124
1C	601-800	16,831	21	1,806.0	30,397	3,666	1,762	29,664	3,806
1C	801-1000	5,303	9	4,366.0	23,152	3,232	3,268	17,329	2,276
1C	1001-1200	611	4	4,413.3	2,697	672	3,381	2,066	482
1D	401-600	545	3	398.1	217	207	512	279	275
1D	601-800	1,694	3	1,285.5	2,177	279	787	1,334	134
1D	801-1000	3,303	5	3,242.8	10,710	1,087	2,412	7,965	864
1D	1001-1200	10,774	17	3,601.1	38,799	4,287	2,466	26,565	3,128
1D	1201-1400	6,138	8	2,798.9	17,179	2,073	1,855	11,384	1,518
1D	1401-1500	2,113	4	5,779.9	12,211	7,574	3,660	7,733	4,965
TOTAL		50,961	80	202.8	140,292	10,333	150	107,080	7,664

Table 7. Length distribution (3 cm groups) and total abundance (Ab) estimated number (000's) with SE (weighted by survey area), and stratified mean number (N) with SE, for Greenland halibut, in Division 1CD, for the period 2015-2024.

Length Class (3cm)	2015	2016	2017	2019	2022	2023	2024
6	16	6	0	6	0	0	0
9	0	8	20	0	11	0	54
12	0	23	0	0	0	11	0
15	42	98	30	40	75	13	13
18	0	74	0	60	55	40	0
21	0	399	0	548	131	45	95
24	104	286	30	400	100	86	503
27	98	276	103	270	98	132	426
30	163	470	31	402	165	245	270
33	117	267	95	143	123	374	498
36	281	519	120	686	396	726	1,373
39	370	650	458	1,515	1,154	1,608	2,412
42	1,303	1,507	1,144	2,106	3,461	4,331	5,891
45	3,895	3,977	3,597	3,714	6,752	9,190	10,767
48	9,751	7,855	8,337	7,927	10,124	13,260	15,266
51	15,292	13,001	14,119	13,206	12,487	16,536	17,673
54	14,288	13,122	13,756	14,470	14,752	16,084	16,927
57	8,202	7,855	9,441	9,774	11,513	13,207	14,298
60	3,220	4,117	4,115	4,372	6,341	7,914	9,024
63	1,491	1,727	1,700	2,138	3,193	3,974	4,351
66	865	1,177	936	1,339	1,633	2,188	2,602
69	514	707	628	741	889	1,356	1,364
72	465	401	448	496	559	802	943
75	292	258	303	216	334	464	542
78	176	219	110	190	210	366	272
81	153	120	150	152	117	300	353
84	118	140	120	130	122	210	193
87	62	94	58	128	223	251	173
90	152	154	35	87	107	108	254
93	47	63	20	94	136	169	178
96	95	20	28	52	112	115	125
99	36	31	53	51	82	53	87
102	31	22	54	14	61	54	63
105	15	15	52	14	47	33	43
108	3	7	0	21	0	18	46
111	0	13	14	0	12	26	0
114	0	0	0	0	0	17	0
Abundance	61,657	59,676	60,107	65,501	75,575	94,308	107,080

Length Class (3cm)	2015	2016	2017	2019	2022	2023	2024
S.E	6,069.0	3,729.0	5,031.0	4,414.0	6,991.0	8,436.0	7,664.0
Mean Number	1,178.8	1,140.9	1,228.2	1,252.3	1,483.0	1,850.7	2,101.3
S.E	116.0	71.0	103.0	84.0	137.0	166.0	150.4

Table 8. Estimates of catch, biomass and abundace for roughhead grenadier during surveys performed from 1997 to 2024 in NAFO Div. 1CD.

Year	Area	Vessel	MeanbioT	SEMC.kg	Biomass	SE	MeanAbuT	SEMC.num	Abundance	SE
1997	52,306	PA	47.6	8.6	2,487	448	95.8	13.8	5,013	723
1998	52,306	PA	86.4	7.0	4,519	367	226.9	18.7	11,868	979
1999	50,792	PA	99.8	16.5	5,068	839	272.4	40.2	13,835	2,043
2000	46,097	PA	158.5	32.7	7,307	1,507	455.4	104.8	20,991	4,833
2001	49,463	PA	94.1	7.7	4,656	380	274.8	24.9	13,593	1,231
2002	46,097	PA	175.7	19.2	8,101	885	435.2	42.5	20,063	1,958
2003	49,463	PA	114.4	14.2	5,658	701	310.7	52.0	15,367	2,573
2004	51,403	PA	82.0	8.3	4,217	429	218.8	27.0	11,245	1,388
2005	52,306	PA	107.1	8.2	5,604	431	268.1	26.5	14,022	1,384
2006	52,306	PA	98.0	11.9	5,125	622	228.0	20.8	11,928	1,088
2007	50,366	PA	69.5	7.5	3,501	376	162.5	21.6	8,185	1,085
2008	52,306	PA	91.3	22.3	4,776	1,167	195.5	30.6	10,226	1,601
2009	52,306	PA	72.4	5.7	3,787	297	156.8	12.8	8,200	671
2010	52,306	PA	77.2	10.8	4,037	565	156.9	21.1	8,205	1,101
2011	52,306	PA	58.3	5.0	3,050	264	141.2	12.4	7,385	650
2012	52,306	PA	80.2	22.4	4,194	1,173	160.9	51.7	8,416	2,705
2013	26,143	PA	86.3	22.1	2,255	578	159.1	44.0	4,159	1,151
2014	52,306	PA	55.8	5.1	2,921	266	149.6	13.2	7,827	692
2015	52,306	PA	62.5	4.3	3,271	226	178.7	13.2	9,346	689
2016	52,306	PA	54.9	5.4	2,872	282	130.3	11.5	6,814	604
2017	48,940	PA	31.5	5.6	1,544	276	70.0	7.2	3,425	351
2019	52,306	HM	68.4	5.0	3,580	260	155.9	10.7	8,156	561
2022	50,960	TJ	54.2	5.9	2,764	302	91.8	7.3	4,679	371
2023	50,960	TJ	66.4	6.3	3,381	319	114.8	7.5	5,851	382
2024	50,960	TJ	79.8	8.0	4,067	409	159.7	14.9	8,137	759

Table 9.   Estimates of catch, biomass and abundance for roughhead grenadier during the 2024 survey per depth stratum.

Subarea	Stratum (m)	Area (km²)	Tow number	Mean Catch	Biomass	SE	Mean Number	Abundance	SE
1C	401-600	3,649.0	6.0	74.9	273.0	117.0	157.0	573.0	198.0
1C	601-800	16,831.0	21.0	91.3	1,537.0	340.0	199.0	3,351.0	668.0
1C	801-1000	5,303.0	9.0	39.2	208.0	117.0	92.0	490.0	158.0
1C	1001-1200	611.0	4.0	70.8	43.0	14.0	194.0	119.0	40.0
1D	401-600	545.0	3.0	53.4	29.0	18.0	105.0	57.0	20.0
1D	601-800	1,694.0	3.0	58.0	98.0	21.0	120.0	203.0	20.0
1D	801-1000	3,303.0	5.0	30.1	99.0	13.0	52.0	173.0	22.0
1D	1001-1200	10,774.0	17.0	68.0	733.0	116.0	136.0	1,460.0	137.0
1D	1201-1400	6,138.0	8.0	132.2	811.0	83.0	224.0	1,377.0	193.0
1D	1401-1500	2,113.0	4.0	111.2	235.0	55.0	158.0	334.0	79.0
TOTAL		50,961.0	80.0	8.0	4,066.0	409.0	14.9	8,137.0	759.0

Table 10. Length distribution (1 cm groups) and total abundance estimated number (000's) with SE (weighted by survey area), and stratified mean number (N) with SE, for roughhead grenadier, in Division 1CD, for the period 2015-2024.

length	2015	2016	2017	2019	2022	2023	2024
1	0	14	0	6	0	0	0
2	8	20	0	0	11	9	27
3	12	27	0	8	13	0	15
4	75	34	14	15	93	7	21
5	81	47	8	6	43	66	21
6	211	179	78	103	35	73	119
7	425	174	165	81	59	140	184
8	369	294	68	226	151	181	253
9	767	539	217	315	165	148	529
10	629	284	121	373	112	152	436
11	806	458	196	557	125	284	425
12	945	497	327	677	121	325	395
13	933	531	189	860	138	250	351
14	605	409	260	812	264	199	411
15	504	381	278	796	352	354	358
16	470	565	160	474	486	497	512
17	555	412	281	732	449	478	657
18	455	505	331	718	516	695	1,155
19	328	344	185	322	381	633	662
20	270	302	133	243	248	356	353
21	268	96	51	138	303	180	292
22	101	133	24	91	92	172	299
23	94	109	81	80	88	94	136
24	134	62	22	88	84	130	137
25	74	79	15	13	23	131	54
26	67	56	75	81	80	38	79
27	19	43	67	60	38	44	84
28	25	69	15	60	44	45	81
29	29	41	17	22	11	74	10
30	39	13	0	79	63	0	11
31	6	19	0	37	0	34	0
32	13	19	13	28	35	26	39
33	0	39	0	17	6	0	10
34	10	21	0	0	6	8	23
35	7	0	0	10	28	9	0
36	14	0	29	7	0	0	0
37	0	0	4	6	7	17	0
38	0	0	0	0	0	0	0
39	0	0	0	8	7	0	0
40	0	0	0	0	0	0	0

length	2015	2016	2017	2019	2022	2023	2024
41	0	0	0	0	0	0	0
42	0	0	0	0	0	0	0
43	0	0	0	0	0	0	0
44	0	0	0	0	0	0	0
45	0	0	0	6	0	0	0
Abundance	9,346	6,814	3,425	8,156	4,679	5,851	8,137
S.E	689.0	604.0	351.0	561.0	371.0	382.0	759.0
Mean Number	178.7	130.3	70.0	155.9	91.8	114.8	159.7
S.E	13.0	12.0	7.0	11.0	7.0	7.0	15.0

Table 11. Estimates of catch, biomass and abundace for roundnose grenadier during surveys performed from 1997 to 2024 in NAFO Div. 1CD.

Year	Area	Vessel	MeanbioT	SEMC.kg	Biomass	SE	MeanAbuT	SEMC.num	Abundance	SE
1997	52,306	PA	109.6	17.9	5,731	936	669.5	152.2	35,020	7,964
1998	52,306	PA	145.2	45.8	7,593	2,395	1,439.2	493.7	75,279	25,823
1999	50,792	PA	55.7	8.9	2,828	452	577.8	180.2	29,349	9,154
2000	46,097	PA	163.4	60.3	7,534	2,780	2,890.0	1,273.2	133,222	58,690
2001	49,463	PA	32.1	10.4	1,589	516	502.2	177.6	24,843	8,783
2002	46,097	PA	35.5	10.1	1,635	467	407.7	191.9	18,793	8,845
2003	49,463	PA	16.0	2.9	794	142	139.5	25.7	6,901	1,272
2004	51,403	PA	12.2	1.9	629	97	206.3	49.2	10,605	2,529
2005	52,306	PA	14.1	2.2	740	115	232.9	71.6	12,181	3,747
2006	52,306	PA	12.7	3.5	662	182	203.4	76.9	10,641	4,020
2007	50,366	PA	17.5	4.2	879	209	261.4	89.4	13,164	4,505
2008	52,306	PA	10.6	1.6	555	81	91.2	13.3	4,770	698
2009	52,306	PA	22.1	9.9	1,154	516	316.8	191.1	16,568	9,998
2010	52,306	PA	11.5	1.8	603	93	129.7	34.3	6,784	1,796
2011	52,306	PA	19.5	5.0	1,021	260	221.2	88.8	11,572	4,644
2012	52,306	PA	31.4	16.7	1,644	874	465.5	273.5	24,348	14,307
2013	26,143	PA	18.8	8.1	490	212	150.3	88.5	3,930	2,314
2014	52,306	PA	11.8	4.4	615	230	99.7	43.0	5,217	2,249
2015	52,306	PA	15.6	3.2	814	168	140.5	43.6	7,348	2,281
2016	52,306	PA	16.5	5.3	860	275	122.1	34.5	6,389	1,803
2017	48,940	PA	13.7	6.9	673	337	75.2	36.0	3,682	1,760
2019	52,306	HM	13.7	1.7	716	90	97.3	18.7	5,089	977
2022	50,960	TJ	15.6	2.9	794	145	131.9	18.0	6,720	920
2023	50,960	TJ	52.0	41.2	2,648	2,099	224.0	112.7	11,415	5,741
2024	50,960	TJ	21.7	4.7	1,107	240	234.2	66.2	11,935	3,376

Table 12. Estimates of catch, biomass and abundance for roundnose grenadier during the 2024 survey per depth stratum.

Subarea	Stratum (m)	Area (sq.km)	Tow number	Mean Catch	Biomass	SE	Mean Number	Abundance	SE
1C	401-600	3,649.0	6.0	0.0	0.0	0.0	0.0	0.0	0.0
1C	601-800	16,831.0	21.0	14.6	246.0	133.0	308.0	5,183.0	2,909.0
1C	801-1000	5,303.0	9.0	22.1	117.0	42.0	568.0	3,010.0	1,550.0
1C	1001-1200	611.0	4.0	24.4	15.0	5.0	455.0	278.0	126.0
1D	401-600	545.0	3.0	563.4	307.0	183.0	1,441.0	785.0	489.0
1D	601-800	1,694.0	3.0	25.0	42.0	23.0	131.0	222.0	81.0
1D	801-1000	3,303.0	5.0	25.4	84.0	22.0	156.0	517.0	190.0
1D	1001-1200	10,774.0	17.0	16.9	183.0	53.0	156.0	1,679.0	476.0
1D	1201-1400	6,138.0	8.0	18.4	113.0	30.0	42.0	261.0	83.0
1D	1401-1500	2,113.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL		50,961.0	80.0	4.7	1,107.0	240.0	66.2	11,935.0	3,376.0

Table 13. Length distribution (1 cm groups) and total abundance estimated number (000's) with SE (weighted by survey area), and stratified mean number with SE, for roundnose grenadier, in Division 1CD, for the period 2015-2024.

length	2015	2016	2017	2019	2022	2023	2024
1	0	0	0	0	0	9	10
2	37	17	11	11	64	132	84
3	413	187	34	207	427	709	538
4	961	660	174	788	653	885	2,232
5	1,084	1,201	215	629	857	1,222	3,554
6	1,044	923	283	664	1,437	906	2,383
7	1,172	557	235	675	1,037	527	976
8	862	621	223	466	685	514	433
9	793	726	342	464	447	495	228
10	407	536	420	294	266	1,183	233
11	196	508	375	310	193	1,801	211
12	95	124	750	207	225	1,374	295
13	76	175	252	217	155	951	300
14	99	81	239	50	157	477	152
15	69	28	88	79	30	156	191
16	14	29	16	8	49	55	24
17	0	0	0	13	7	19	60
18	19	0	0	7	12	0	28
19	0	6	23	0	7	0	0
20	7	9	0	0	7	0	3
21	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0
Abundance	7,348	6,389	3,682	5,089	6,720	11,415	11,935
S.E	2,281.0	1,803.0	1,760.0	977.0	920.0	5,741.0	3,376.0
Mean Number	140.5	122.2	75.2	97.3	131.9	224.0	234.2
S.E	44.0	34.0	36.0	19.0	18.0	113.0	66.2

Table 14. Estimates of catch, biomass and abundance for deep-sea redfish during surveys performed from 1997 to 2024 in NAFO Div. 1CD.

Year	Area	Vessel	MeanbioT	SEMC.kg	Biomass	SE	MeanAbuT	SEMC.num	Abundance	SE
1997	52,306	PA	46.6	14.9	2,435	780	277.5	103.9	14,514	5,435
1998	52,306	PA	58.3	17.3	3,052	907	352.2	96.4	18,424	5,045
1999	50,792	PA	49.5	19.1	2,515	972	256.3	80.4	13,016	4,083
2000	46,097	PA	17.1	5.6	790	256	77.5	20.4	3,571	941
2001	49,463	PA	36.8	13.1	1,822	649	297.1	94.4	14,697	4,670
2002	46,097	PA	6.9	0.9	317	41	30.3	7.2	1,395	332
2003	49,463	PA	30.2	13.8	1,493	684	144.2	62.2	7,130	3,077
2004	51,403	PA	45.3	24.5	2,330	1,259	259.7	139.5	13,348	7,172
2005	52,306	PA	48.7	32.2	2,546	1,683	139.0	60.4	7,268	3,159
2006	52,306	PA	37.9	13.8	1,981	720	297.6	163.7	15,565	8,564
2007	50,366	PA	8.5	3.6	426	181	37.6	15.1	1,892	762
2008	52,306	PA	253.4	123.7	13,255	6,468	1,014.1	337.5	53,046	17,654
2009	52,306	PA	149.1	74.9	7,797	3,917	670.0	338.9	35,044	17,724
2010	52,306	PA	77.8	25.4	4,069	1,330	341.0	60.6	17,834	3,171
2011	52,306	PA	184.0	69.3	9,627	3,624	620.0	248.2	32,432	12,983
2012	52,306	PA	263.2	85.0	13,768	4,446	752.6	244.0	39,365	12,765
2013	26,143	PA	974.7	316.2	25,482	8,265	1,780.4	504.6	46,544	13,191
2014	52,306	PA	421.7	196.6	22,060	10,286	1,261.4	637.9	65,978	33,365
2015	52,306	PA	191.5	85.2	10,017	4,458	601.8	242.4	31,478	12,679
2016	52,306	PA	216.7	92.3	11,334	4,829	472.2	190.1	24,698	9,945
2017	48,940	PA	183.9	131.3	9,001	6,425	335.6	233.7	16,423	11,439
2019	52,306	HM	157.7	76.5	8,249	4,004	326.6	146.0	17,086	7,639
2022	50,960	TJ	396.4	108.7	20,202	5,541	500.6	123.2	25,513	6,276
2023	50,960	TJ	1,481.9	818.7	75,516	41,719	1,959.5	1,015.6	99,857	51,754
2024	50,960	TJ	196.6	70.4	10,019	3,586	548.2	138.3	27,935	7,045

Table 15. Estimates of catch, biomass and abundance for deep-sea redfish during the 2024 survey per depth stratum.

| Subarea	Stratum (m)	Area (sq.km)	Tow number	Mean Catch	Biomass	SE	Mean Number	Abundance	SE
1C	401-600	3,649.0	6.0	1,085.4	3,961.0	2,199.0	3,684.0	13,444.0	5,611.0
1C	601-800	16,831.0	21.0	214.5	3,611.0	2,583.0	693.0	11,659.0	4,090.0
1C	801-1000	5,303.0	9.0	1.9	10.0	7.0	7.0	39.0	30.0
1C	1001-1200	611.0	4.0	4.4	3.0	1.0	17.0	11.0	5.0
1D	401-600	545.0	3.0	4,114.8	2,242.0	1,147.0	4,659.0	2,539.0	1,180.0
1D	601-800	1,694.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0
1D	801-1000	3,303.0	5.0	0.5	2.0	2.0	3.0	10.0	10.0
1D	1001-1200	10,774.0	17.0	17.6	190.0	186.0	21.0	221.0	188.0
1D	1201-1400	6,138.0	8.0	0.2	1.0	1.0	2.0	12.0	12.0
1D	1401-1500	2,113.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL		50,961.0	80.0	70.4	10,020.0	3,586.0	138.2	27,935.0	7,045.0

Table 16. Length distribution (2 cm groups) and total abundance estimated number (000's) with SE (weighted by survey area), and stratified mean number with SE, for deep-sea redfish, in Division 1CD, for the period 1997-2024.

Length class	2015	2016	2017	2019	2022	2023	2024
6	0	0	0	0	0	12	0
8	0	0	0	0	0	0	0
10	0	0	0	0	0	11	0
12	0	0	0	0	0	0	0
14	0	0	0	0	0	2	0
16	0	0	0	0	0	0	0
18	0	0	0	0	0	48	3
20	0	0	0	0	0	82	41
22	5	0	0	0	11	188	18
24	16	0	0	0	85	731	2,838
26	45	0	0	22	221	685	3,422
28	192	23	0	0	61	799	3,475
30	437	14	0	6	14	456	2,677
32	706	23	0	26	11	488	1,954
34	1,053	183	0	48	0	219	1,456
36	1,850	271	46	80	0	167	861
38	2,911	690	12	6	11	22	715
40	3,014	1,139	168	69	14	36	212
42	2,397	1,474	336	219	28	50	61
44	7,294	4,257	1,452	1,133	66	316	224
46	2,410	2,264	1,098	1,340	114	485	131
48	2,238	1,935	1,161	1,330	467	1,009	248
50	1,450	2,073	1,251	1,259	951	2,219	206
52	2,234	1,805	1,489	1,570	1,348	5,193	418
54	711	1,546	1,382	1,592	2,174	8,121	728
56	658	1,181	1,539	1,742	2,257	9,596	853
58	258	1,389	1,398	1,448	2,040	13,710	1,045
60	299	1,068	1,059	1,570	1,450	11,680	1,042
62	174	1,225	1,200	1,358	1,369	6,435	900
64	132	679	674	1,183	2,480	4,965	848
66	412	878	1,303	763	4,695	14,525	1,369
68	94	483	652	230	3,699	12,568	1,325
70	103	10	123	20	1,540	4,867	619
72	30	67	31	69	294	161	153

Length class	2015	2016	2017	2019	2022	2023	2024
74	0	0	0	0	103	10	90
76	0	23	46	0	10	0	3
78	0	0	0	0	0	0	0
Abundance	31,478	24,698	16,423	17,086	25,513	99,857	27,935
S.E	12,679.0	9,945.0	11,439.0	7,639.0	6,276.0	51,754.0	7,045.0
Mean Number	601.8	472.2	335.6	326.6	500.6	1,959.5	548.2
S.E	242.4	190.1	233.7	146.0	123.2	1,015.6	138.2

Figures
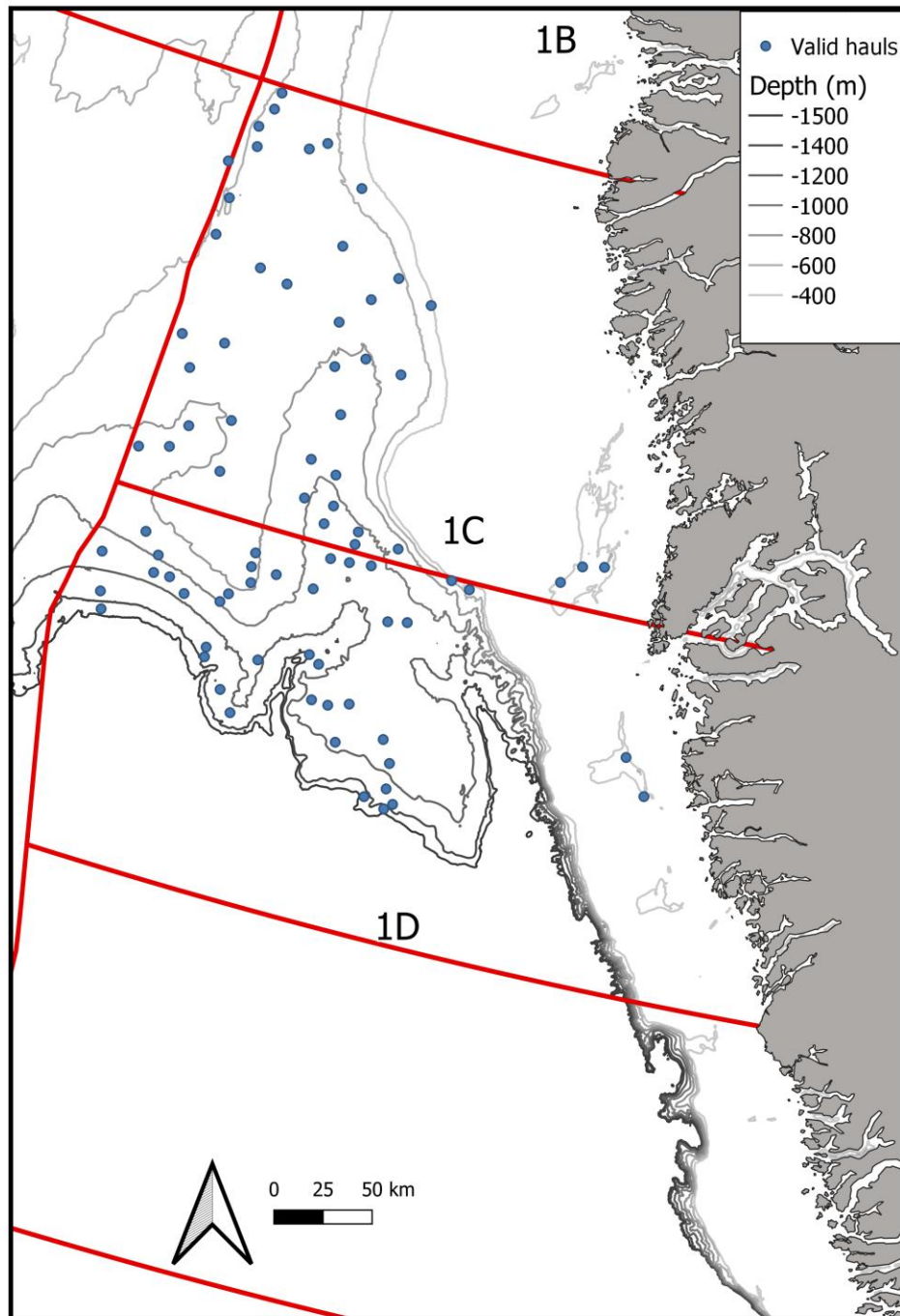
Figure 1.   Haul positions for the West Greenland halibut 2024 survey.
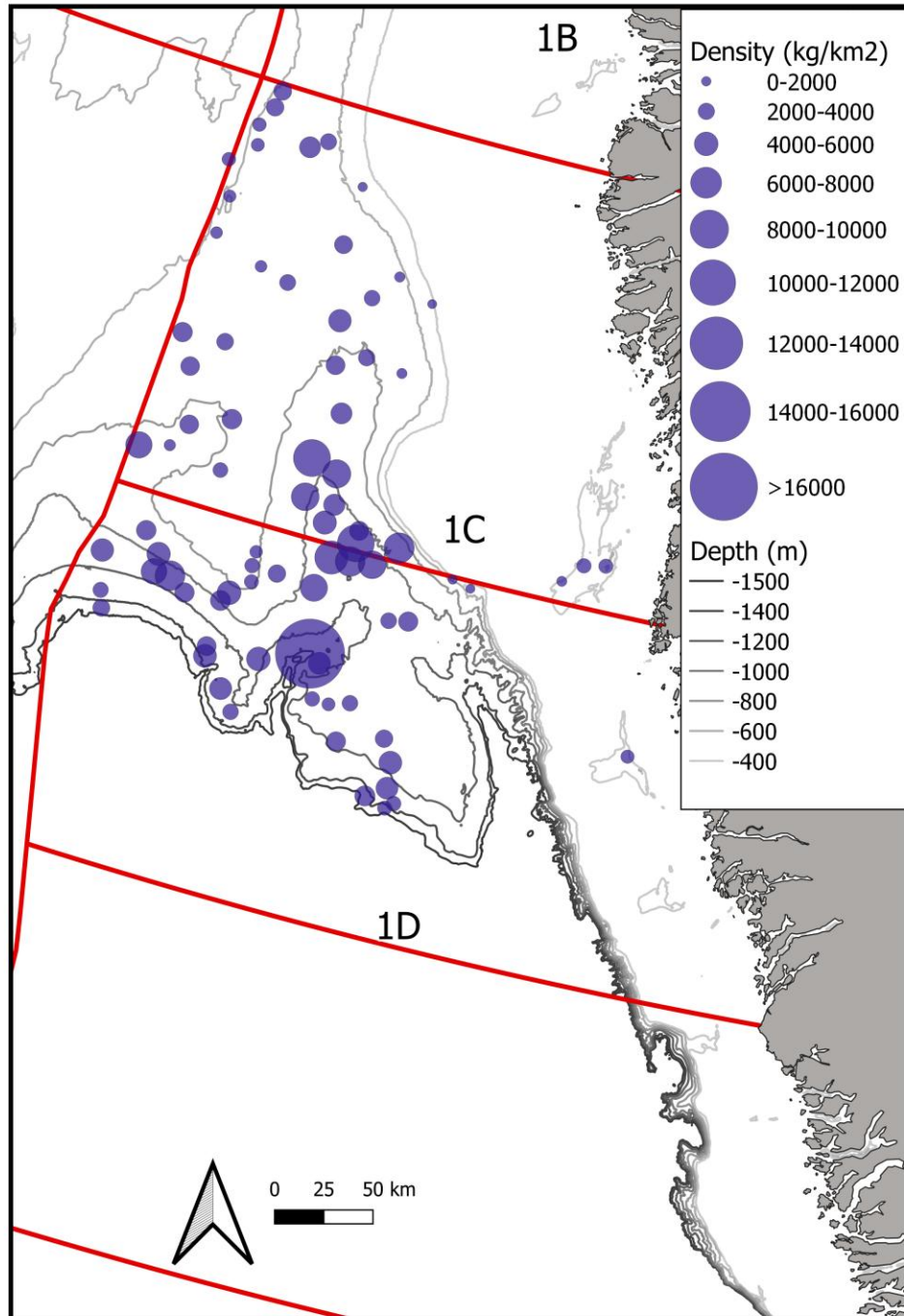
Figure 2. Distribution of catches (kg/km²) of Greenland halibut in 2024.
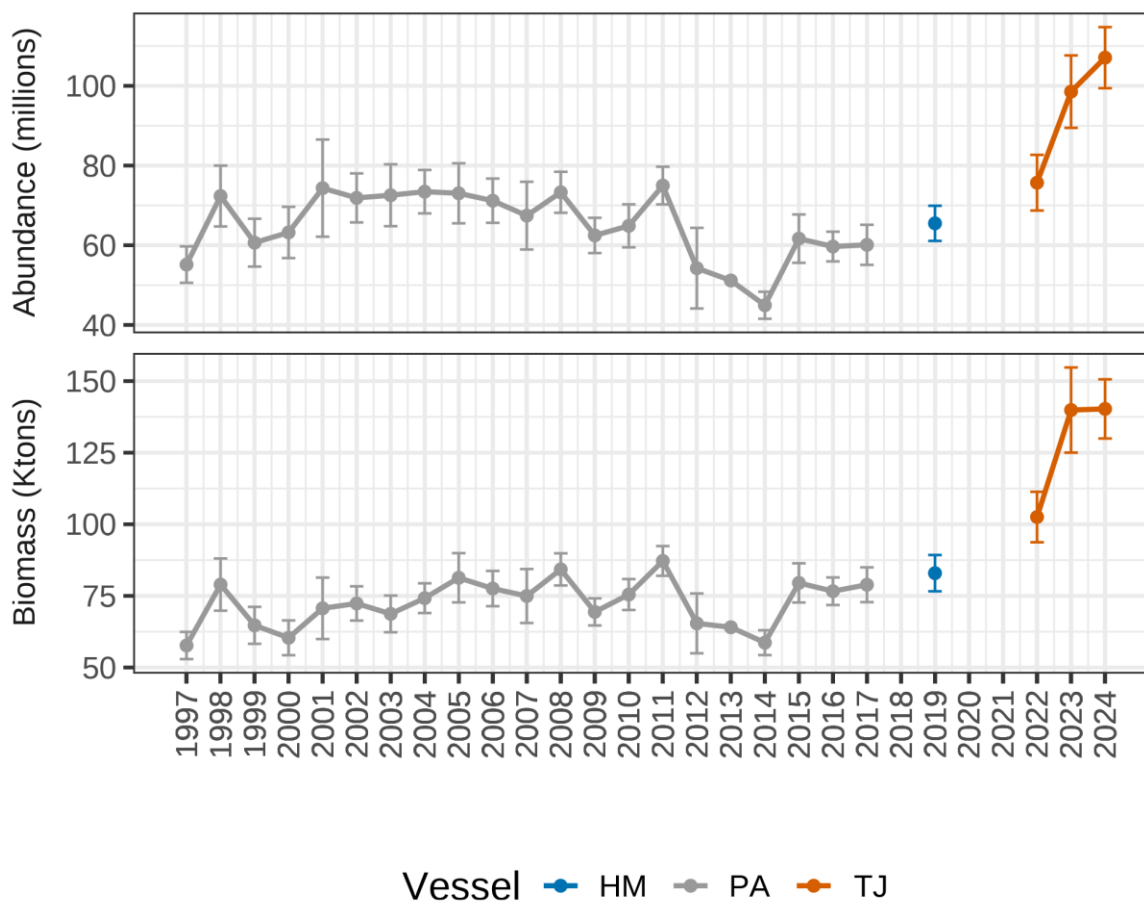
Figure 3. Greenland halibut biomass and abundance calculated by the swept area method per year for the period 1997-2024. Error bars show the standard error. The biomass and abundance in Division 1C, in 2013, were estimated by a GLM including data from 2010-2014 (Biomass = 64049 tons; Abundance = 51160 *10^3 individuals).
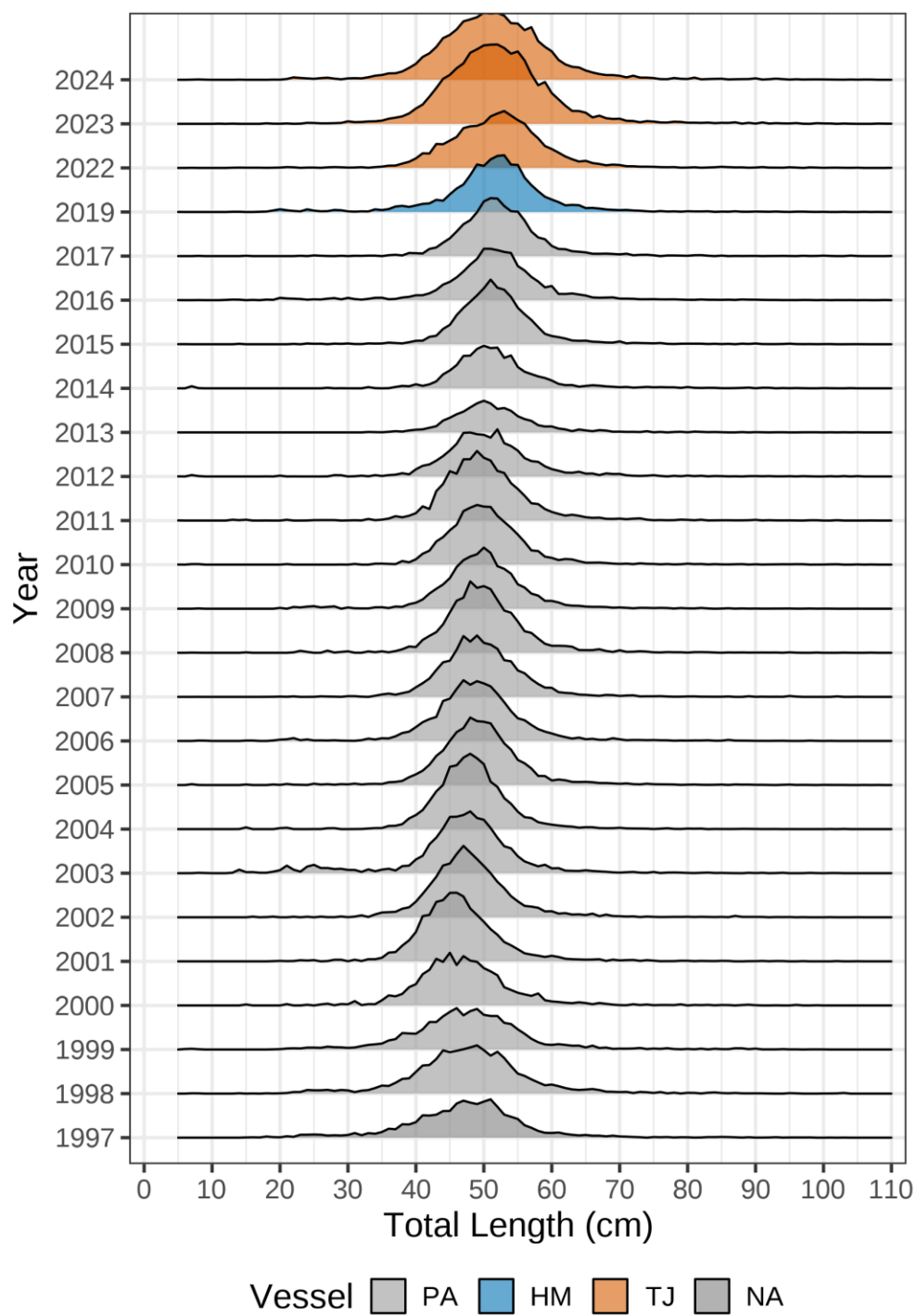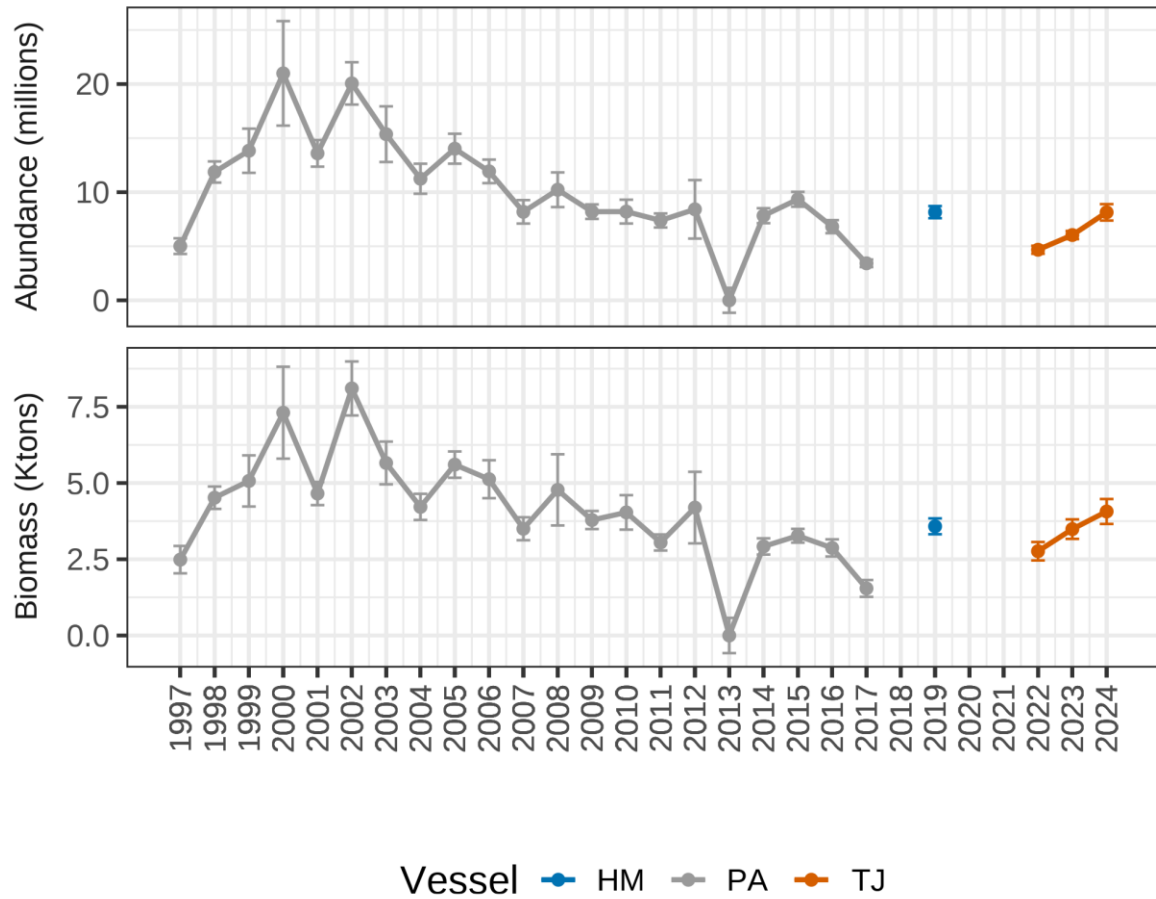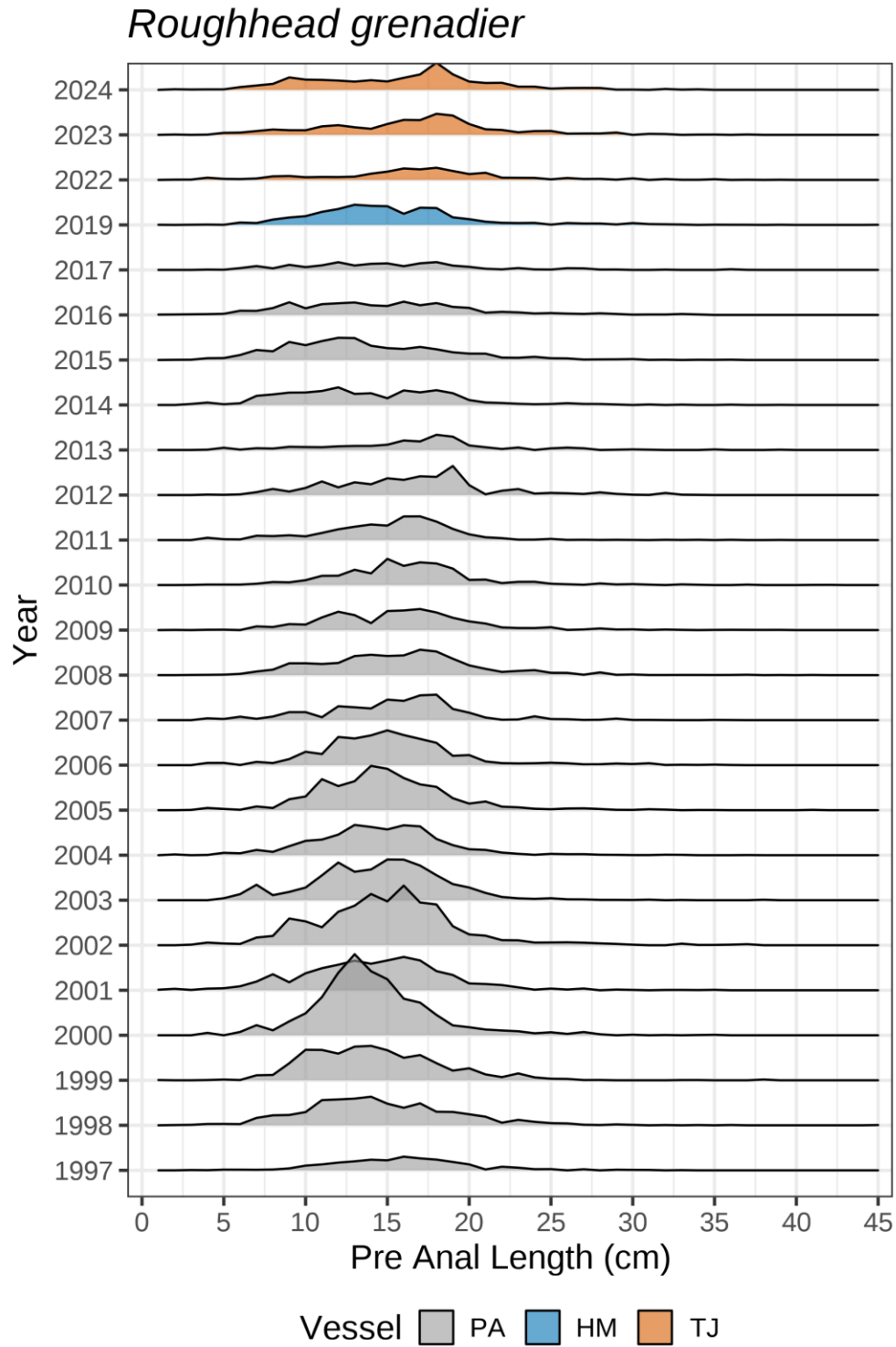
Figure 4. Greenland halibut length distribution (weighted to stratum area), NAFO Div. 1CD, for the period 1997-2024.
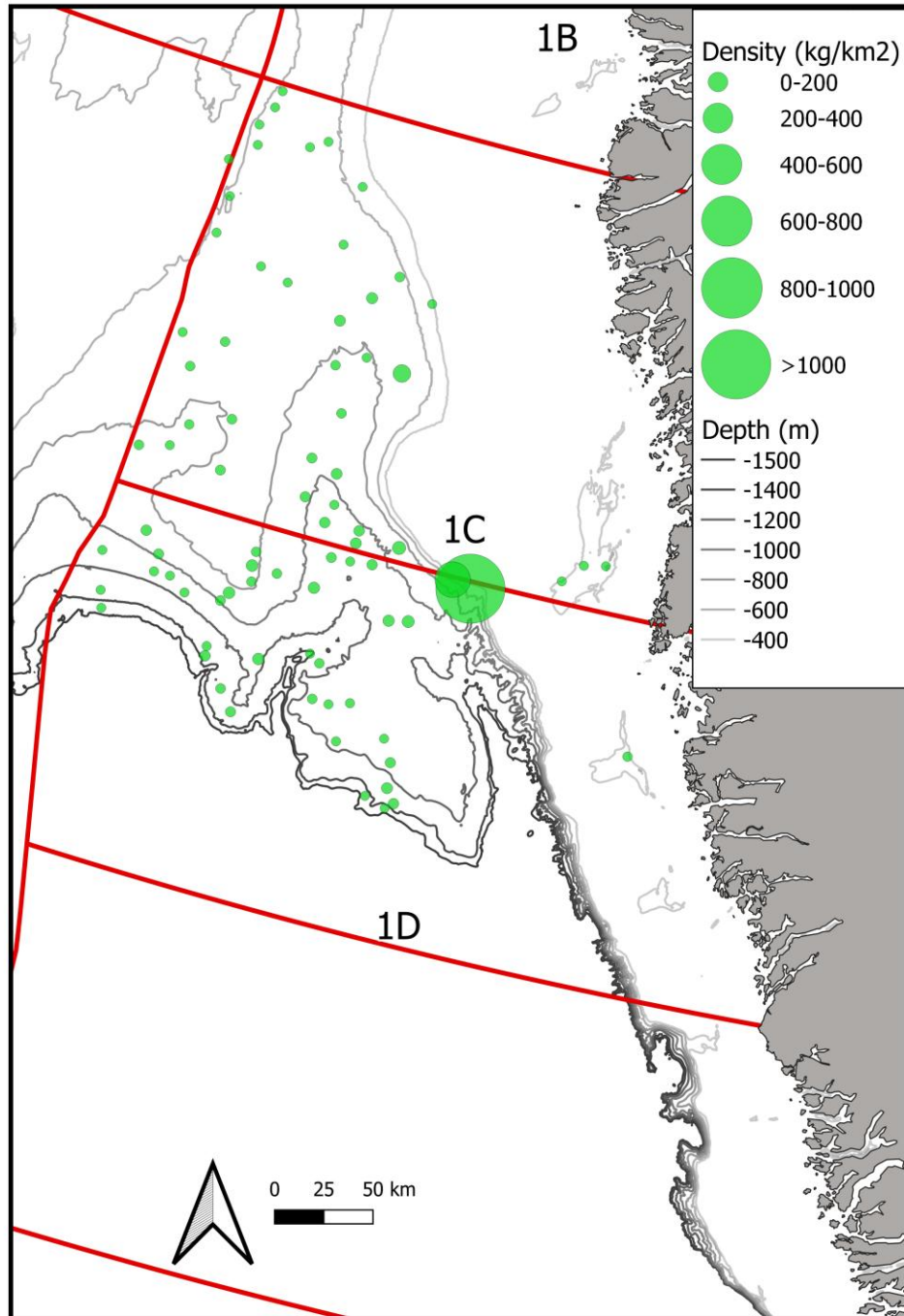
Figure 5. Distribution of catches (kg/km²) of roughhead grenadier in 2024.
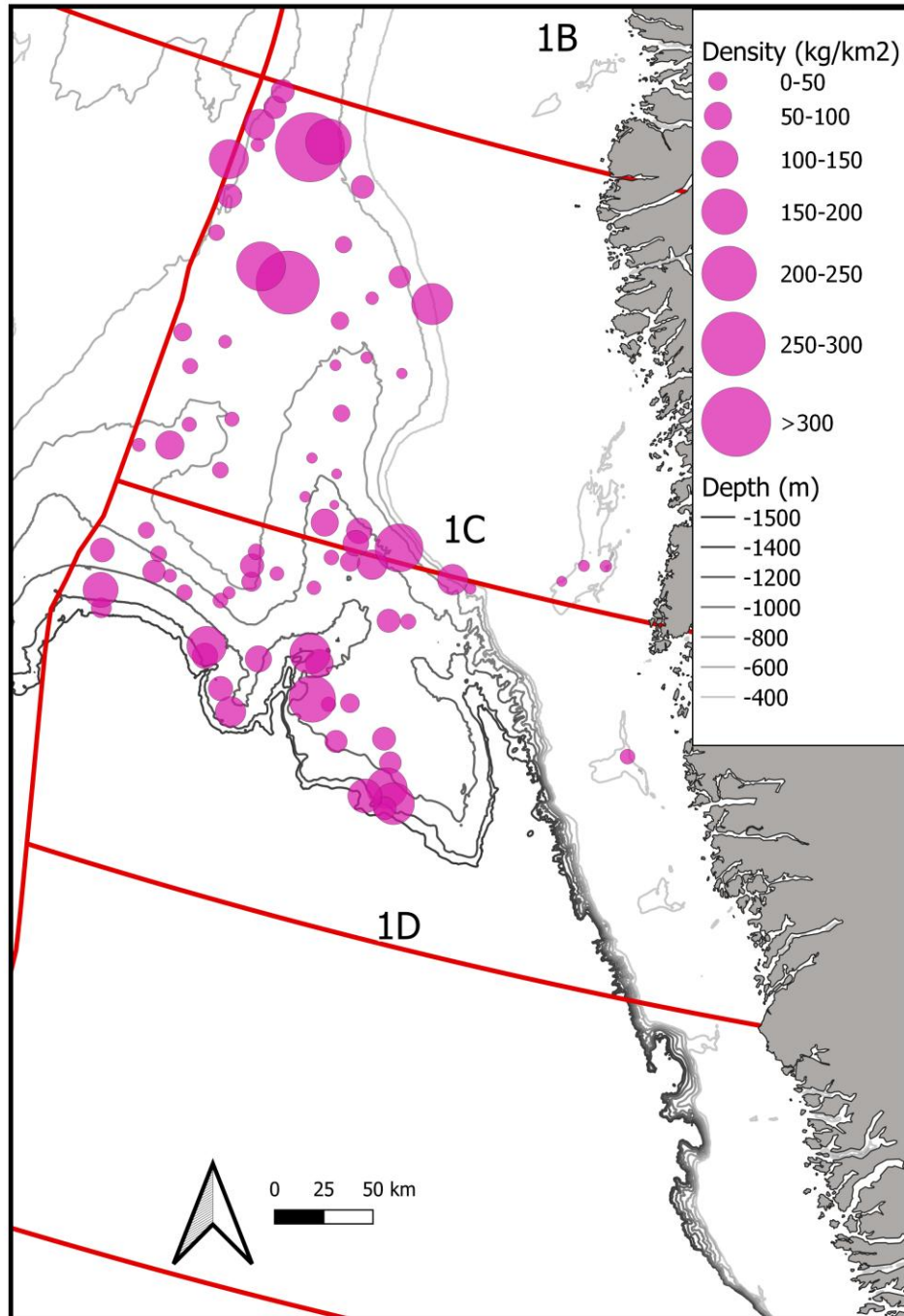
Figure 6. Roughhead grenadier biomass and abundance calculated by the swept area method per year for the period 1997-2024. Error bars show the standard error.
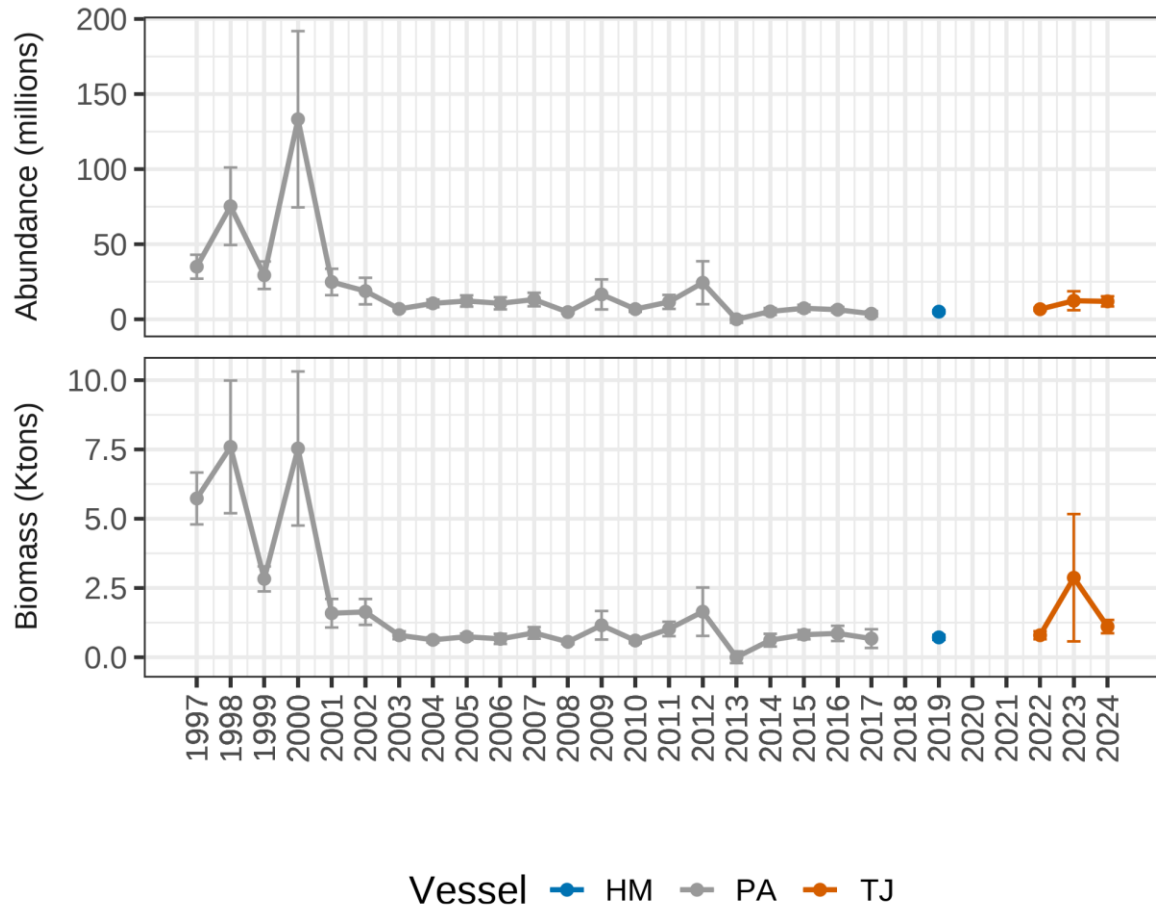
Figure 7. Roughhead grenadier length distribution (weighted to stratum area), NAFO Div. 1CD, for the period 1997-2024.

Figure 8. Distribution of catches (kg/km^2) of roundnose grenadier in 2024.

Figure 9. Roundnose grenadier biomass and abundance calculated by the swept area method per year for the period 1997-2024. Error bars show the standard error.

Figure 10. Roundnose grenadier length distribution (weighted to stratum area), NAFO Div. 1CD, for the period 1997-2024.
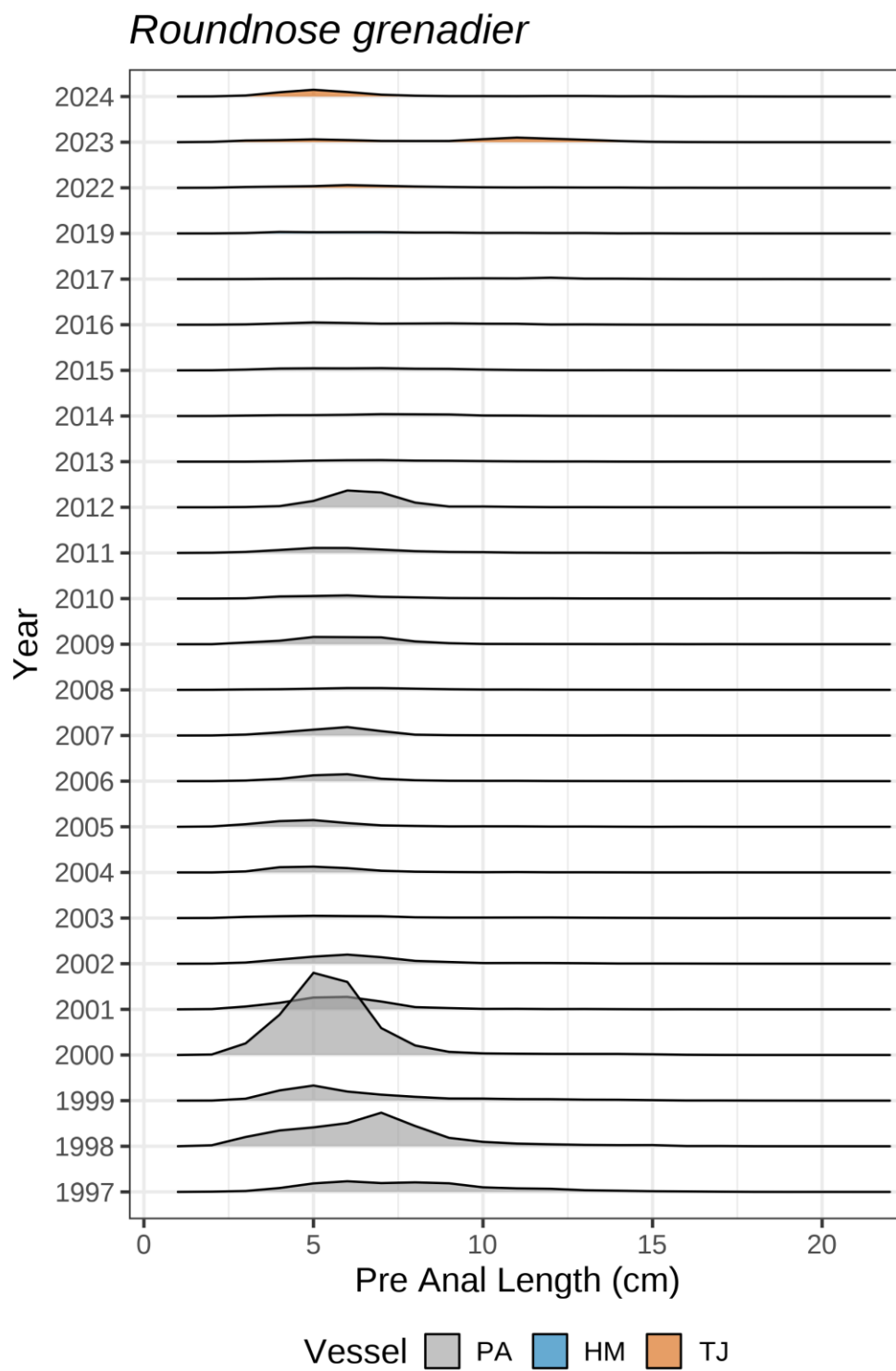
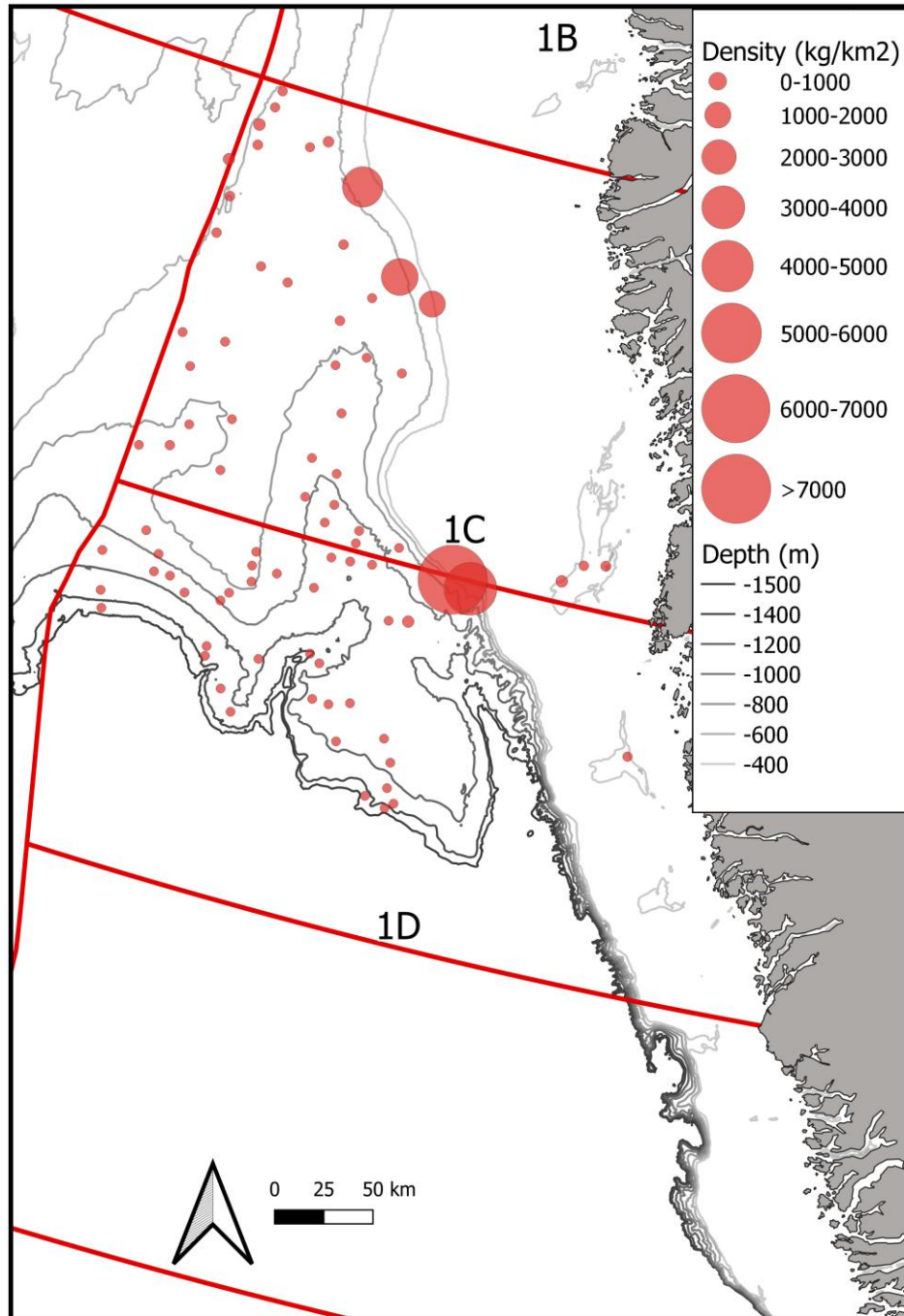**Figure 11.** Distribution of catches (kg/km²) of deep-sea redfish in 2024.

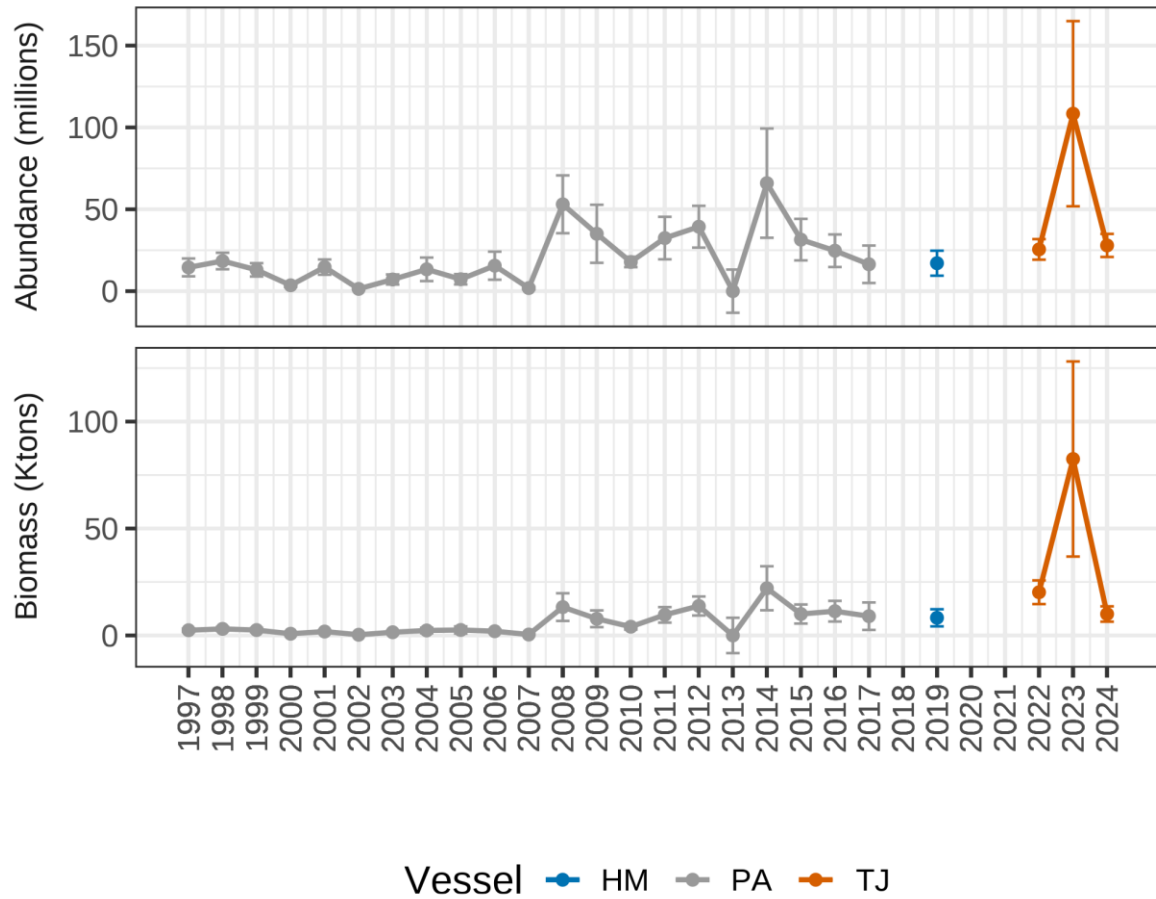**Figure 12.** Deep-sea redfish biomass and abundance calculated by the swept area method per year for the period 1997-2024. Error bars show the standard error.

Sebastes mentella
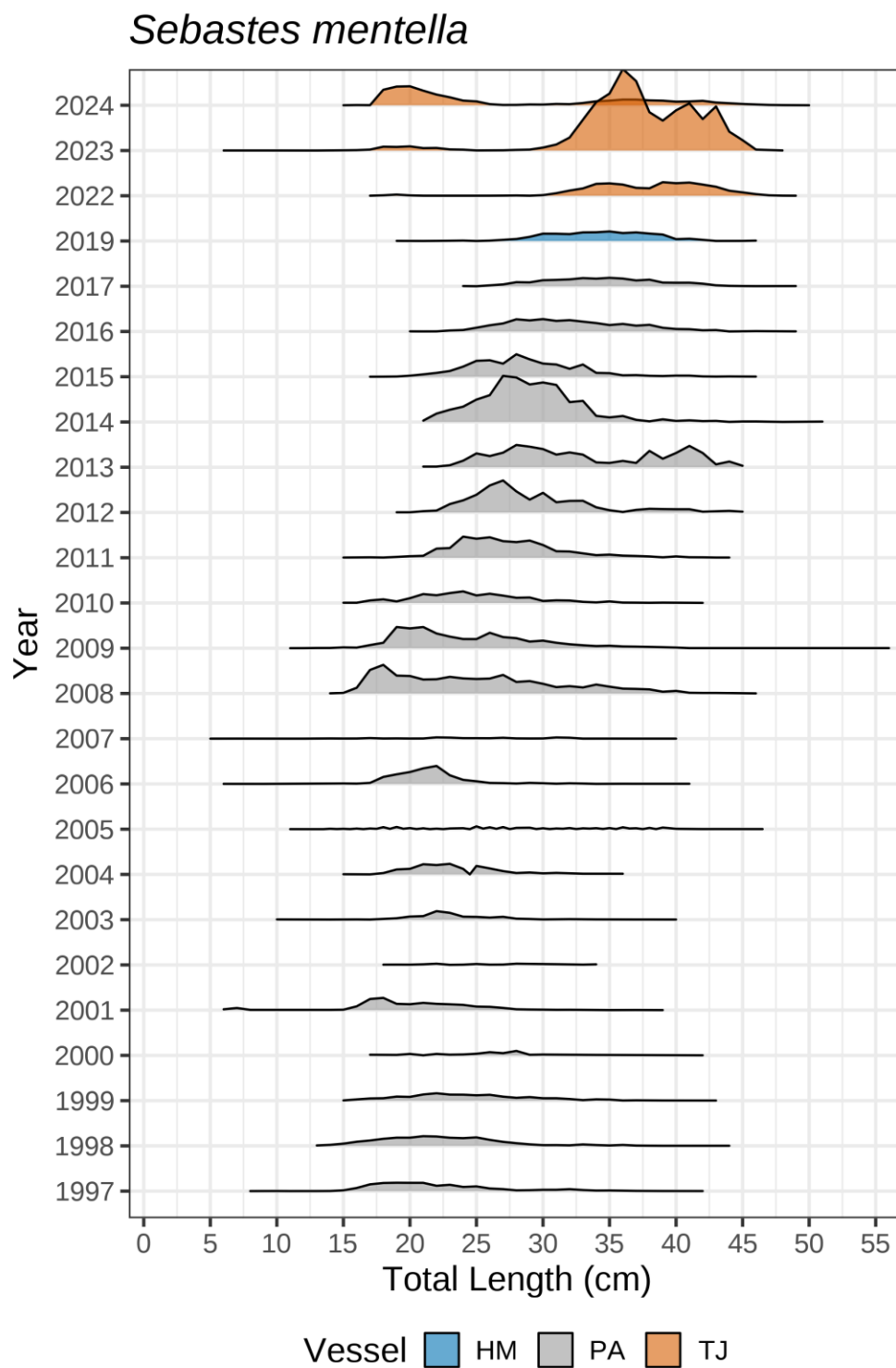
Figure 13. Deep-sea redfish length distribution (weighted to stratum area), NAFO Div. 1CD, for the period 1997-2024.
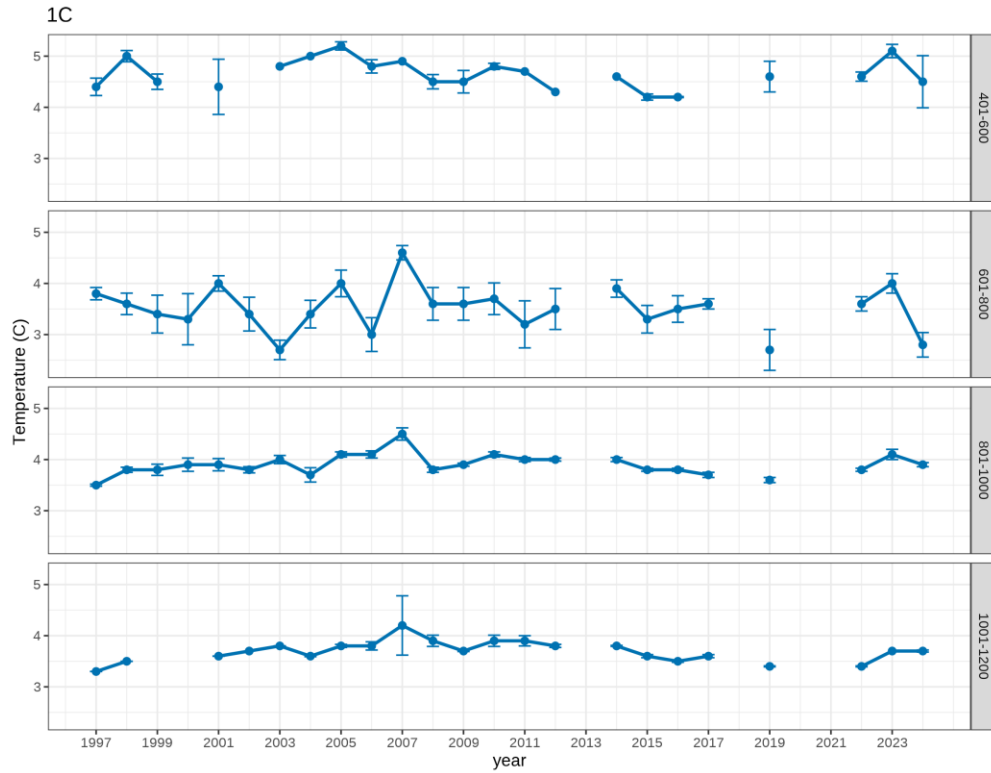
Figure 14. Mean temperatures with standard error in NAFO division 1C by depth and stratum for the period 1997-2024.
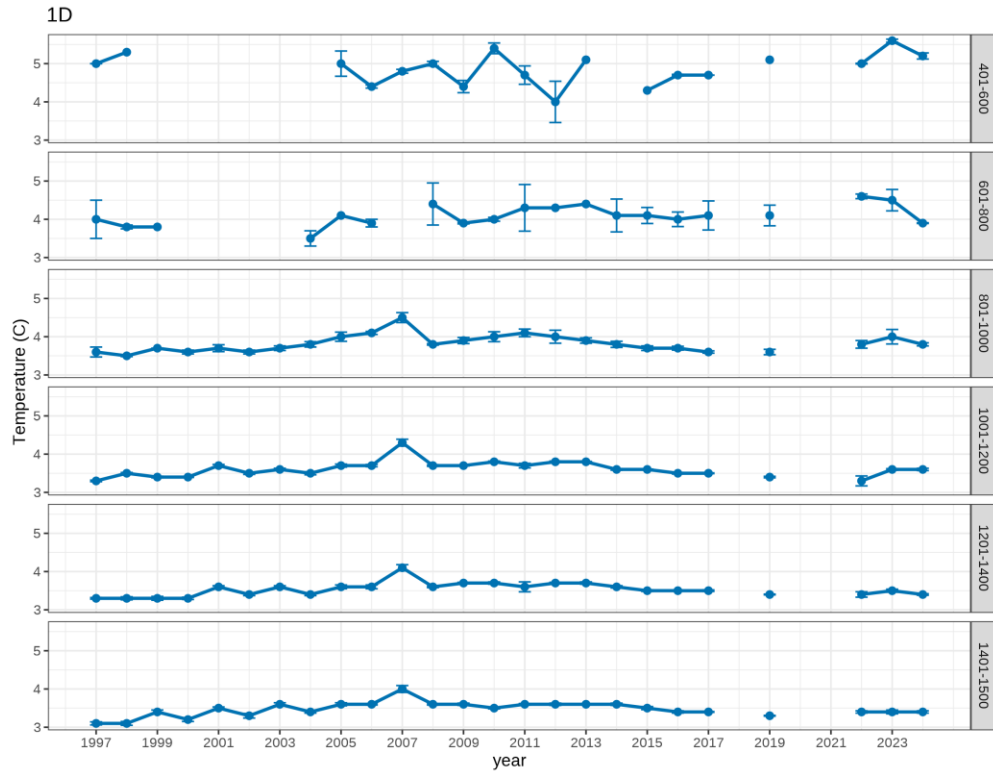
Figure 15. Mean temperatures with standard error in NAFO division 1D by depth and stratum for the period 1997-2024.

References

Bishop, C. A. (1994). Revisions and additions to stratification schemes used during research vessel surveys in NAFO Subareas 2 and 3. *NAFO SCR 94/43*.

ICES. (2012a). ICES implementation of advice for data-limited stocks in 2012 in its 2012 advice. *ICES CM 2012/ACOM 68*, 42 pp. https://doi.org/10.17895/ices.pub.5322

ICES. (2012b). *Report of the ICES advisory committee 2012* (p. 29pp).

ICES. (2014). Workshop on the development of quantitative assessment methodologies based on LIFE-history traits, exploitation characteristics, and other relevant parameters for data-limited stocks (WKLIFE IV). *ICES CM 2014/ACOM 54*, 223 pp. https://doi.org/0.17895/ices.pub.19283165

Jørgensen, O. A. (1997). Pelagic Occurrence of Greenland Halibut, *Reinhardtius hippoglossoides* (Walbaum), in West Greenland Waters. *Journal of Northwest Atlantic Fishery Science*, *21*, 39–50. https://doi.org/10.2960/J.v21.a3

Jørgensen, O. A. (1998a). Results of the Joint Japan/Greenland Trawl Surveys at West Greenland During 1987-95, Roundnose Grenadier (*Coryphaenoides rupestris* Gunnerus). *NAFO Scientific Council Studies*, *31*, 21–56.

Jørgensen, O. A. (1998b). Survey for Greenland Halibut in NAFO DivisionS 1C-1D, 1998. *NAFO SCR 99/30*.

Kingsley, M. C. S., Kanneworff, P., and Carlsson, D. M. (2004). Buffered random sampling: A sequential inhibited spatial point process applied to sampling in a trawl survey for northern shrimp pandalus borealis in west greenland waters. *ICES Journal of Marine Science*, *61*(1), 12–24. https://doi.org/10.1016/j.icesjms.2003.11.001

Nogueira, A, Berg, CW, and Boje, J. (2024). Applying a stochastic surplus production model (SPiCT) for Greenland halibut in 0+1 offshore. *NAFO SCR 24/021*.

Nogueira, A, and Estévez-Barcia, D. (2024). Results for Greenland halibut survey in NAFO Divisions 1C-1D for the period 1997-2017, 2019 and 2022-2023. *NAFO SCR 24/013*.

Nogueira, A., and Treble, M. A. (2020). Comparison of vessels used and survey timing for the 1CD and 0A-South deep-water surveys and the 1A-F west Greenland shelf surveys. *NAFO SCR 20/015rev3*.

Nygaard, R., Nogueira, A., and Zinglersen, K. (2020). Knowledge about the dynamics of the Greenland halibut in the fjords in NAFO subarea 1B to 1F inshore. *NAFO SCR 20/034rev*.

Treble, M. A., and Nogueira, A. (2018). Assessment of the Greenland Halibut Stock Component in NAFO Subarea 0 + Division 1A (Offshore) and Divisions 1B-1F. *NAFO SCR 18/040*.

Appendix A

Table 17.   Registered numbers per station for the four species in the 2024 survey in NAFO 1CD.

					R. hippoglossoides		M. berglax		C. rupestris		S. mentella	
St. No	Swept Area	Division	Depth	Bottom Temp.	Weight (kg)	Number	Weight (kg)	Number	Weight (kg)	Number	Weight (kg)	Number
1.0	0.0	1C	573.0	4.9	51.9	64.0	0.0	0.0	0.5	2.0	5.0	30.0
2.0	0.1	1C	524.0	5.0	82.0	66.0	0.0	0.0	0.7	3.0	3.5	26.0
3.0	0.1	1C	410.5	4.9	19.6	13.0	0.0	0.0	0.4	2.0	21.1	159.0
4.0	0.1	1D	503.5	5.3	0.0	0.0	72.8	194.7	0.7	2.0	322.5	421.0
5.0	0.1	1D	544.5	5.2	2.1	1.0	30.4	67.0	7.0	8.0	421.0	408.0
6.0	0.1	1D	1,079.5	3.7	180.3	116.0	3.6	16.0	2.2	5.0	18.8	19.0
7.0	0.1	1D	1,118.5	3.6	112.4	81.0	2.7	14.0	4.7	8.0	0.1	1.0
8.0	0.1	1D	1,123.5	3.4	121.7	90.0	0.2	3.0	3.6	10.0	0.0	0.0
9.0	0.1	1D	1,138.5	3.4	145.7	73.0	0.0	2.0	4.8	8.0	0.0	0.0
10.0	0.1	1D	1,164.5	3.5	238.4	168.0	1.4	27.0	4.4	8.0	0.0	0.0
11.0	0.1	1D	1,276.5	3.5	221.3	150.0	2.4	8.0	10.8	13.0	0.0	0.0
12.0	0.1	1D	1,353.5	3.4	93.9	48.0	1.7	3.0	10.6	13.0	0.0	0.0
13.0	0.1	1D	1,429.5	3.4	90.1	52.0	0.0	0.0	4.8	7.0	0.0	0.0
14.0	0.1	1D	1,476.0	3.4	178.6	108.0	0.0	0.0	8.0	9.0	0.0	0.0
15.0	0.1	1D	1,179.5	3.4	164.1	100.0	0.2	3.0	4.3	7.0	0.0	0.0
16.0	0.1	1D	1,131.5	3.5	75.6	45.0	0.1	4.0	2.1	4.0	0.0	0.0
17.0	0.1	1D	1,157.5	3.5	95.6	72.0	0.7	2.0	12.9	11.0	0.0	0.0
18.0	0.1	1D	1,287.5	3.5	226.3	151.0	0.6	2.0	6.6	13.0	0.0	0.0
19.0	0.1	1D	1,490.0	3.4	869.0	563.0	0.0	0.0	9.1	14.0	0.0	0.0
20.0	0.1	1D	1,141.5	3.7	242.4	182.0	2.9	9.0	5.7	9.0	0.0	0.0
21.0	0.1	1D	1,267.0	3.4	108.7	79.0	1.3	2.0	7.0	8.0	0.0	0.0
22.0	0.1	1D	1,229.0	3.5	208.0	132.0	0.8	1.0	4.9	8.0	0.0	0.0

St. No	Swept Area	Division	Depth	Bottom Temp.	R. hippoglossoides		M. berglax		C. rupestris		S. mentella	
					Weight (kg)	Number	Weight (kg)	Number	Weight (kg)	Number	Weight (kg)	Number
23.0	0.1	1D	1,369.5	3.4	247.5	179.0	2.1	2.0	5.9	12.0	0.0	0.0
24.0	0.1	1D	1,331.5	3.5	172.2	107.0	0.2	3.0	10.5	19.0	0.0	0.0
25.0	0.1	1D	1,441.0	3.3	126.8	76.0	0.0	0.0	3.5	6.0	0.0	0.0
26.0	0.1	1D	1,321.5	3.3	106.6	73.0	0.0	0.0	8.9	25.0	0.1	1.0
27.0	0.1	1D	1,096.5	3.5	241.5	187.0	0.0	0.0	5.3	14.0	0.0	0.0
28.0	0.1	1D	907.5	3.9	193.6	139.0	1.9	13.0	2.5	3.0	0.0	0.0
29.0	0.1	1D	971.5	3.6	239.5	188.0	1.2	3.0	2.3	2.0	0.0	0.0
30.0	0.1	1D	1,097.0	3.6	235.7	168.0	0.2	1.0	3.8	10.0	0.0	0.0
31.0	0.1	1D	1,066.0	3.6	366.4	280.0	0.0	0.0	1.4	7.0	0.0	0.0
32.0	0.1	1D	1,129.5	3.6	169.1	98.0	0.1	1.0	2.1	6.0	0.0	0.0
33.0	0.1	1D	985.0	3.8	190.2	132.0	1.1	8.0	2.0	4.0	0.2	1.0
34.0	0.1	1D	903.0	3.8	236.2	174.0	2.9	21.0	1.0	3.0	0.0	0.0
35.0	0.1	1D	767.5	3.8	88.7	51.0	0.7	4.0	3.7	7.0	0.0	0.0
36.0	0.1	1D	738.5	3.9	95.3	58.0	3.3	14.0	5.0	9.0	0.0	0.0
37.0	0.0	1D	767.5	3.9	35.7	24.0	0.4	4.0	1.4	4.0	0.0	0.0
38.0	0.1	1D	892.0	3.8	134.3	105.0	0.7	3.0	1.5	4.0	0.0	0.0
39.0	0.1	1D	1,048.0	3.8	265.0	176.0	2.5	30.0	1.4	4.0	0.0	0.0
40.0	0.1	1D	1,104.0	3.5	429.4	292.0	1.2	20.0	2.0	6.0	0.0	0.0
41.0	0.1	1D	1,130.5	3.5	320.1	217.0	0.1	1.0	3.3	8.0	0.2	2.0
42.0	0.1	1D	1,073.0	3.8	298.1	192.0	1.5	26.0	6.5	15.0	0.0	0.0
43.0	0.1	1C	918.0	4.1	343.1	214.0	4.7	167.1	12.6	19.0	0.4	3.0
44.0	0.1	1C	1,034.5	3.7	148.2	103.0	1.6	16.0	4.9	16.0	0.3	2.0
45.0	0.1	1C	1,053.5	3.7	242.2	192.0	1.8	62.1	6.2	15.0	0.0	0.0
46.0	0.1	1C	978.0	3.8	326.6	246.0	1.4	42.4	0.6	4.0	0.0	0.0
47.0	0.1	1C	973.5	3.8	329.6	256.0	2.1	44.0	0.3	3.0	0.0	0.0
48.0	0.1	1C	950.0	3.9	497.9	380.0	1.3	13.0	0.5	2.0	0.0	0.0

St. No	Swept Area	Division	Depth	Bottom Temp.	R. hippoglossoides Weight (kg)	R. hippoglossoides Number	M. berglax Weight (kg)	M. berglax Number	C. rupestris Weight (kg)	C. rupestris Number	S. mentella Weight (kg)	S. mentella Number
49.0	0.1	1C	794.5	3.8	104.2	74.0	1.2	29.0	2.5	6.0	0.0	0.0
50.0	0.1	1C	846.5	3.7	301.8	219.0	0.8	11.0	1.4	5.0	0.0	0.0
51.0	0.1	1C	815.0	3.9	169.2	130.0	0.5	6.0	1.9	7.0	0.0	0.0
52.0	0.1	1C	792.5	3.9	187.9	143.0	0.9	9.0	1.8	7.0	0.3	5.0
53.0	0.1	1C	763.5	3.8	167.5	129.0	0.6	6.0	2.1	4.0	0.0	0.0
54.0	0.1	1C	725.0	3.2	180.2	178.0	0.1	1.0	3.1	9.0	0.8	2.0
55.0	0.1	1C	737.5	3.9	127.9	102.0	0.5	7.0	1.2	3.0	1.1	4.0
56.0	0.1	1C	656.0	2.3	107.4	106.0	0.0	0.0	16.8	29.0	2.1	20.0
57.0	0.1	1C	638.0	3.0	43.7	47.0	0.0	0.0	13.2	41.0	2.1	22.0
58.0	0.1	1C	627.5	1.8	39.0	43.0	0.0	0.0	6.7	23.0	3.8	41.0
59.0	0.1	1C	614.5	1.7	45.6	45.0	0.0	0.0	2.2	7.0	4.1	45.0
60.0	0.1	1C	610.0	1.0	51.5	51.0	0.0	0.0	4.8	11.0	6.4	67.0
61.0	0.1	1C	586.5	1.9	74.9	79.0	0.0	0.0	9.9	20.0	17.0	186.0
62.0	0.1	1C	628.5	2.5	68.9	74.0	0.0	0.0	1.6	5.0	6.3	66.0
63.0	0.1	1C	619.0	2.4	69.9	74.0	0.0	0.0	6.8	8.0	17.7	198.0
64.0	0.0	1C	637.5	2.0	81.7	85.0	0.0	0.0	2.6	6.0	1.3	12.0
65.0	0.1	1C	629.5	1.6	134.0	177.0	0.0	0.0	4.3	9.0	2.5	22.0
66.0	0.1	1C	660.5	1.9	195.4	258.0	0.0	0.0	19.8	33.0	1.0	11.0
67.0	0.1	1C	631.0	2.4	123.0	135.0	0.0	0.0	12.6	20.0	12.5	69.0
68.0	0.1	1C	549.5	4.7	5.0	5.0	0.0	0.0	4.4	10.0	212.9	616.0
69.0	0.1	1C	700.0	3.0	145.2	146.0	0.1	5.0	2.4	5.0	4.5	11.0
70.0	0.1	1C	633.0	4.5	20.3	17.0	0.8	9.0	4.2	9.0	199.6	258.0
71.0	0.1	1C	431.0	5.3	0.0	0.0	0.0	0.0	8.9	15.0	102.0	237.0
72.0	0.1	1C	745.5	4.2	109.2	95.0	2.4	53.0	1.2	3.0	1.7	3.0
73.0	0.1	1C	767.5	1.1	234.5	183.0	2.3	64.0	2.9	9.0	4.7	8.0
74.0	0.1	1C	823.5	3.9	169.1	125.0	0.7	11.0	0.6	3.0	0.0	0.0

St. No	Swept Area	Division	Depth	Bottom Temp.	R. hippoglossoides		M. berglax		C. rupestris		S. mentella	
					Weight (kg)	Number	Weight (kg)	Number	Weight (kg)	Number	Weight (kg)	Number
75.0	0.1	1C	808.5	3.9	112.6	106.0	0.1	2.0	0.8	2.0	0.0	0.0
76.0	0.1	1C	743.5	4.5	17.1	21.0	9.2	197.0	0.5	1.0	0.5	1.0
77.0	0.1	1C	889.0	3.9	205.9	162.0	0.7	15.0	2.6	6.0	0.7	1.0
78.0	0.1	1C	1,022.0	3.7	212.0	183.0	0.2	2.0	0.0	0.0	0.5	1.0
79.0	0.1	1C	1,085.5	3.8	484.1	356.0	2.3	31.0	5.8	15.0	0.3	1.0
80.0	0.1	1D	528.0	5.0	70.9	93.0	0.5	4.0	1.9	9.0	3.4	20.0

Appendix B

Table 18.   Registered numbers per station for the four species in the 2024 survey in NAFO 1CD.

Species	Max. Weight (kg)	Max. Number	Depth Range	Temp. Range	Max. Latitude
Alepocephalus agassizii	20.4	25.0	1104-1490	3.7-3.3	64.2
Alepocephalus bairdii	0.5	3.0	633-1276	4.5-3.5	65.5
Ammodytes sp.	0.0	3.0	410-573	5-4.9	64.5
Anarhichas denticulatus	44.0	5.0	410-1430	5.3-1	66.1
Anarhichas minor	0.6	1.0	431-431	5.3-5.3	65.5
Anoplogaster cornuta	0.1	1.0	1034-1142	3.7-3.7	64.3
Antimora rostrata	28.2	36.0	528-1490	5-1	65.7
Arctozenus risso	2.1	23.0	410-1229	5.2-1	66.2
Argentina silus	3.2	7.0	431-824	5.3-3.9	65.5
Bajacalifornia megalops	0.4	1.0	1080-1332	3.7-3.5	64.0
Bathylaco nigricans	0.1	4.0	700-700	3-3	65.6
Bathylagus euryops	4.8	121.0	586-1490	4.6-1.1	65.8
Bathylagus sp.	0.1	3.0	892-1476	3.8-3.4	64.2
Bathyraja spinicauda	9.2	1.0	586-586	2-2	65.8
Benthos	0.0	18.0	1124-1138	3.4-3.4	63.6
Benthosema glaciale	2.5	129.0	410-1490	5.3-1	66.2
Boreogadus saida	0.0	30.0	504-660	5.3-1.6	66.2
Borostomias antarcticus	0.4	4.0	638-1476	3.9-1.9	66.0
Brosme brosme	1.0	1.0	544-544	5.2-5.2	64.2
Caulophryne jordani	0.1	1.0	1096-1096	3.5-3.5	63.9
Centroscyllium fabricii	19.2	17.0	431-1180	5.3-1.1	66.0
Ceratias holboelli	1.0	1.0	985-1097	3.8-3.6	63.9
Chauliodus sloani	0.2	4.0	725-1441	4.2-3.2	65.4
Chiasmodon harteli	0.2	4.0	614-1490	4.1-1.7	65.5
Coryphaenoides brevibarbis	0.1	9.0	1476-1490	3.5-3.4	63.7
Coryphaenoides guentheri	0.4	13.0	1073-1490	3.8-3.3	64.2
Coryphaenoides rupestris	72.8	197.0	504-1370	5.3-1.1	65.6
Cottunculus microps	0.2	1.0	586-586	2-2	65.8
Cottunculus thomsonii	1.1	1.0	660-1138	4.2-1.9	66.0
Cryptopsaras couesii	0.1	1.0	974-974	3.8-3.8	64.6
Cyclopterus lumpus	6.0	2.0	524-1288	5-3.5	64.4
Cyclothone microdon	0.0	42.0	550-1476	4.7-1.7	66.1
Eurypharynx pelecanoides	0.2	1.0	738-1430	3.9-3.3	65.0

Species	Max. Weight (kg)	Max. Number	Depth Range	Temp. Range	Max. Latitude
Gadus morhua	36.2	45.0	410-768	5.3-1	66.0
Gaidropsarus argentatus	0.3	2.0	610-1097	3.8-1	65.7
Gaidropsarus ensis	2.1	13.0	504-1490	5.3-1	66.2
Gaidropsarus sp	0.0	1.0	974-974	3.8-3.8	64.6
Glyptocephalus cynoglossus	0.1	1.0	410-573	4.9-4.9	64.5
Gonatus	0.0	1.0	700-700	3-3	65.6
Gonostoma bathyphilum	0.0	1.0	972-1441	3.6-3.3	64.0
Gonostoma sp.	0.2	1.0	950-950	3.9-3.9	64.6
Halargyreus johnsonii	0.6	3.0	1490-1490	3.4-3.4	63.7
Hippoglossoides platessoides	18.2	75.0	410-746	5.3-1	66.1
Hippoglossus hippoglossus	39.0	3.0	528-573	5-4.9	64.5
Holtbyrnia anomala	0.4	3.0	768-1490	3.8-3.3	64.4
Holtbyrnia macrops	0.0	1.0	631-631	2.4-2.4	66.0
Hydrolagus affinis	31.5	4.0	1267-1476	3.5-3.4	63.4
Lampadena speculigera	0.1	1.0	764-764	3.8-3.8	64.9
Lampanyctus macdonaldi	4.5	314.0	524-1490	5-1.1	66.2
Lepidion eques	0.0	1.0	544-544	5.2-5.2	64.2
Liparis fabricii	0.1	2.0	550-908	4.7-1.6	66.2
Lophodolos acanthognathus	0.0	2.0	1066-1267	3.6-3.5	63.9
Lycodes paamiuti	0.1	2.0	610-630	2.5-1	66.2
Lycodes terraenovae	0.3	1.0	1441-1441	3.3-3.3	63.7
Macrouridae	0.0	1.0	610-738	3.9-1	65.7
Macrourus berglax	19.8	41.0	410-1490	5.3-1	66.2
Malacosteus niger	0.1	1.0	768-1229	3.8-3.4	64.0
Melamphaidae	0.0	1.0	918-1138	4.1-3.4	64.3
Melanostigma atlanticum	0.0	1.0	1066-1066	3.6-3.6	63.9
Micromesistius poutassou	0.2	1.0	550-550	4.7-4.7	65.9
Molva dypterygia	6.0	3.0	431-918	5.3-4.1	65.5
Myctophidae	0.0	1.0	1229-1229	3.5-3.5	63.5
Myctophum punctatum	0.0	2.0	972-1476	3.8-3.3	64.3
Myxine glutinosa	0.2	1.0	524-524	5-5	64.4
Myxine jespersenae	0.1	1.0	918-918	4.1-4.1	64.3
Nezumia bairdii	0.2	1.0	889-1096	4.1-3.5	64.8
Notacanthus chemnitzii	5.9	8.0	550-1490	4.7-1.1	66.0
Notoscopelus kroyeri	0.1	6.0	410-1370	5.3-1.6	66.2
Oneirodes eschrichtii	0.1	1.0	1034-1158	3.7-3.5	64.3
Paraliparis copei	0.0	2.0	1022-1332	3.7-3.3	64.4

Species	Max. Weight (kg)	Max. Number	Depth Range	Temp. Range	Max. Latitude
Paraliparis garmani	0.0	3.0	631-1034	4.6-1.1	66.1
Paraliparis sp.	0.0	1.0	738-738	3.9-3.9	65.0
Photostylus pycnopterus	0.0	1.0	908-908	3.9-3.9	64.1
Phycis chesteri	0.3	1.0	524-528	5-5	64.4
Polyacanthonotus rissoanus	0.3	1.0	1164-1354	3.5-3.4	63.3
Poromitra capito	0.0	1.0	1158-1158	3.5-3.5	63.5
Raja bathyphila	1.7	1.0	1054-1124	3.7-3.4	64.3
Raja fyllae	0.4	1.0	638-1086	3.8-3	65.4
Raja radiata	1.2	1.0	528-630	5-1	66.2
Raja spinacidermis	0.7	2.0	792-792	3.9-3.9	64.7
Reinhardtius hippoglossoides	869.0	563.0	410-1490	5.2-1	66.2
Rhadinesthes decimus	0.2	1.0	1138-1138	3.4-3.4	63.4
Rouleina attrita	0.1	1.0	1130-1276	3.5-3.5	64.2
Scopelogadus beanii	0.0	1.0	808-889	3.9-3.9	65.1
Scopelosaurus lepidus	1.4	10.0	738-1490	4.6-3.3	65.1
Sebastes marinus	24.9	6.0	431-550	5.3-4.7	65.9
Sebastes mentella	421.0	616.0	410-1322	5.3-1	66.2
Sebastes sp.	5.8	87.0	410-1322	5.3-1	66.2
Sebastes viviparus	0.2	1.0	544-544	5.2-5.2	64.2
Serrivomer beanii	0.5	7.0	656-1490	4.1-2.3	65.4
Shrimp	3.1	0.0	410-1490	5.3-1	66.2
Somniosus microcephalus	794.0	1.0	1441-1441	3.3-3.3	63.7
Stomias boa	0.1	6.0	410-1490	5.3-2.3	66.0
Synaphobranchus kaupii	2.4	13.0	431-1476	5.3-1	66.2
Trachyrincus murrayi	1.7	4.0	846-1276	3.8-3.5	64.4
Triglops murrayi	0.0	3.0	431-431	5.3-5.3	65.5
Xenodermichthys copei	0.0	1.0	550-1288	4.7-2.3	65.9

Colophon

This version of the document was generated on 2025-06-05 11:39:34 using the R markdown template for SCR documents from **NAFOdown**.

The computational environment that was used to generate this version is as follows:

```
#> - Session info -----------------------------------------------------------
----
#>  setting  value
#>  version  R version 4.1.3 (2022-03-10)
#>  os       Windows 10 x64 (build 19045)
#>  system   x86_64, mingw32
#>  ui       RTerm
#>  language (EN)
#>  collate  Danish_Denmark.1252
#>  ctype    Danish_Denmark.1252
#>  tz       America/Godthab
#>  date     2025-06-05
#>  pandoc   2.17.1.1 @ C:/Program Files/RStudio/bin/quarto/bin/ (via rmarkdo
wn)
#>
#> - Packages ---------------------------------------------------------------
----
#>  package          * version date (UTC) lib source
#>  askpass            1.1     2019-01-13 [1] CRAN (R 4.1.3)
#>  assertthat         0.2.1   2019-03-21 [1] CRAN (R 4.1.3)
#>  backports          1.4.1   2021-12-13 [1] CRAN (R 4.1.2)
#>  bookdown           0.43    2025-04-15 [1] CRAN (R 4.1.3)
#>  broom              1.0.1   2022-08-29 [1] CRAN (R 4.1.3)
#>  cachem             1.0.7   2023-02-24 [1] CRAN (R 4.1.3)
#>  cellranger         1.1.0   2016-07-27 [1] CRAN (R 4.1.3)
#>  cli                3.6.1   2023-03-23 [1] CRAN (R 4.1.3)
#>  crayon             1.5.1   2022-03-26 [1] CRAN (R 4.1.3)
#>  data.table         1.14.8  2023-02-17 [1] CRAN (R 4.1.3)
#>  DBI                1.2.2   2024-02-16 [1] CRAN (R 4.1.3)
#>  dbplyr             2.2.1   2022-06-27 [1] CRAN (R 4.1.3)
#>  devtools           2.4.5   2022-10-11 [1] CRAN (R 4.1.3)
#>  digest             0.6.31  2022-12-11 [1] CRAN (R 4.1.3)
#>  dplyr            * 1.1.4   2023-11-17 [1] CRAN (R 4.1.3)
#>  ellipsis           0.3.2   2021-04-29 [1] CRAN (R 4.1.3)
#>  evaluate           1.0.3   2025-01-10 [1] CRAN (R 4.1.3)
#>  farver             2.1.1   2022-07-06 [1] CRAN (R 4.1.3)
#>  fastmap            1.1.1   2023-02-24 [1] CRAN (R 4.1.3)
#>  flextable        * 0.9.7   2024-10-27 [1] CRAN (R 4.1.3)
#>  fontBitstreamVera  0.1.1   2017-02-01 [1] CRAN (R 4.1.1)
#>  fontLiberation     0.1.0   2016-10-15 [1] CRAN (R 4.1.1)
#>  fontquiver         0.2.1   2017-02-01 [1] CRAN (R 4.1.3)
#>  forcats          * 0.5.2   2022-08-19 [1] CRAN (R 4.1.3)
#>  fs                 1.5.2   2021-12-08 [1] CRAN (R 4.1.3)
#>  ftExtra          * 0.6.4   2024-05-10 [1] CRAN (R 4.1.3)
#>  gargle             1.2.0   2021-07-02 [1] CRAN (R 4.1.3)
#>  gdtools            0.4.2   2025-03-27 [1] CRAN (R 4.1.3)
#>  generics           0.1.3   2022-07-05 [1] CRAN (R 4.1.3)
#>  ggplot2          * 3.5.2   2025-04-09 [1] CRAN (R 4.1.3)
#>  ggridges           0.5.6   2024-01-23 [1] CRAN (R 4.1.3)
#>  ggthemes           5.1.0   2024-02-10 [1] CRAN (R 4.1.3)
```

```
#>   glue               1.6.2    2022-02-24 [1] CRAN (R 4.1.3)
#>   googledrive        2.0.0    2021-07-08 [1] CRAN (R 4.1.3)
#>   googlesheets4      1.0.1    2022-08-13 [1] CRAN (R 4.1.3)
#>   gtable             0.3.6    2024-10-25 [1] CRAN (R 4.1.3)
#>   haven              2.5.1    2022-08-22 [1] CRAN (R 4.1.3)
#>   here             * 1.0.1    2020-12-13 [1] CRAN (R 4.1.3)
#>   hms                1.1.2    2022-08-19 [1] CRAN (R 4.1.3)
#>   htmltools          0.5.8.1  2024-04-04 [1] CRAN (R 4.1.3)
#>   htmlwidgets        1.6.4    2023-12-06 [1] CRAN (R 4.1.3)
#>   httpuv             1.6.9    2023-02-14 [1] CRAN (R 4.1.3)
#>   httr               1.4.4    2022-08-17 [1] CRAN (R 4.1.3)
#>   jsonlite           1.8.4    2022-12-06 [1] CRAN (R 4.1.3)
#>   knitr              1.50     2025-03-16 [1] CRAN (R 4.1.3)
#>   later              1.3.0    2021-08-18 [1] CRAN (R 4.1.3)
#>   lifecycle          1.0.4    2023-11-07 [1] CRAN (R 4.1.3)
#>   lubridate          1.8.0    2021-10-07 [1] CRAN (R 4.1.3)
#>   magrittr           2.0.3    2022-03-30 [1] CRAN (R 4.1.3)
#>   memoise            2.0.1    2021-11-26 [1] CRAN (R 4.1.3)
#>   mime               0.12     2021-09-28 [1] CRAN (R 4.1.1)
#>   miniUI             0.1.1.1  2018-05-18 [1] CRAN (R 4.1.3)
#>   modelr             0.1.9    2022-08-19 [1] CRAN (R 4.1.3)
#>   NAFOdown         * 0.0.1    2025-05-03 [1] Github (nafc-assess/NAFOdown@b
5689f8)
#>   officedown         0.4.0    2025-03-18 [1] CRAN (R 4.1.3)
#>   officer            0.6.8    2025-03-23 [1] CRAN (R 4.1.3)
#>   openssl            2.0.6    2023-03-09 [1] CRAN (R 4.1.3)
#>   pillar             1.10.2   2025-04-05 [1] CRAN (R 4.1.3)
#>   pkgbuild           1.4.4    2024-03-17 [1] CRAN (R 4.1.3)
#>   pkgconfig          2.0.3    2019-09-22 [1] CRAN (R 4.1.3)
#>   pkgload            1.4.0    2024-06-28 [1] CRAN (R 4.1.3)
#>   png                0.1-8    2022-11-29 [1] CRAN (R 4.1.3)
#>   profvis            0.3.7    2020-11-02 [1] CRAN (R 4.1.3)
#>   promises           1.2.0.1  2021-02-11 [1] CRAN (R 4.1.3)
#>   purrr            * 1.0.1    2023-01-10 [1] CRAN (R 4.1.3)
#>   R6                 2.6.1    2025-02-15 [1] CRAN (R 4.1.3)
#>   ragg               1.2.5    2023-01-12 [1] CRAN (R 4.1.3)
#>   RColorBrewer       1.1-3    2022-04-03 [1] CRAN (R 4.1.3)
#>   Rcpp               1.0.10   2023-01-22 [1] CRAN (R 4.1.3)
#>   readr            * 2.1.2    2022-01-30 [1] CRAN (R 4.1.3)
#>   readxl           * 1.4.1    2022-08-17 [1] CRAN (R 4.1.3)
#>   remotes            2.5.0    2024-03-17 [1] CRAN (R 4.1.3)
#>   reprex             2.0.2    2022-08-17 [1] CRAN (R 4.1.3)
#>   rlang              1.1.6    2025-04-11 [1] CRAN (R 4.1.3)
#>   rmarkdown          2.29     2024-11-04 [1] CRAN (R 4.1.3)
#>   rprojroot          2.0.4    2023-11-05 [1] CRAN (R 4.1.3)
#>   rstudioapi         0.14     2022-08-22 [1] CRAN (R 4.1.3)
#>   rvest              1.0.3    2022-08-19 [1] CRAN (R 4.1.3)
#>   rvg                0.3.5    2025-03-27 [1] CRAN (R 4.1.3)
#>   scales             1.4.0    2025-04-24 [1] CRAN (R 4.1.3)
#>   sessioninfo        1.2.2    2021-12-06 [1] CRAN (R 4.1.3)
#>   shiny              1.8.1.1  2024-04-02 [1] CRAN (R 4.1.3)
#>   showtext           0.9-5    2022-02-09 [1] CRAN (R 4.1.3)
#>   showtextdb         3.0      2020-06-04 [1] CRAN (R 4.1.3)
#>   stringi            1.7.6    2021-11-29 [1] CRAN (R 4.1.2)
#>   stringr          * 1.4.1    2022-08-20 [1] CRAN (R 4.1.3)
#>   sysfonts           0.8.8    2022-03-13 [1] CRAN (R 4.1.3)
#>   systemfonts        1.2.3    2025-04-30 [1] CRAN (R 4.1.3)
```

```
#>   textshaping          0.3.6   2021-10-13 [1] CRAN (R 4.1.3)
#>   tibble             * 3.2.1   2023-03-20 [1] CRAN (R 4.1.3)
#>   tidyr              * 1.2.0   2022-02-01 [1] CRAN (R 4.1.3)
#>   tidyselect           1.2.1   2024-03-11 [1] CRAN (R 4.1.3)
#>   tidyverse          * 1.3.2   2022-07-18 [1] CRAN (R 4.1.3)
#>   tzdb                 0.3.0   2022-03-28 [1] CRAN (R 4.1.3)
#>   urlchecker           1.0.1   2021-11-30 [1] CRAN (R 4.1.3)
#>   usethis              3.1.0   2024-11-26 [1] CRAN (R 4.1.3)
#>   uuid                 1.1-0   2022-04-19 [1] CRAN (R 4.1.3)
#>   vctrs                0.6.5   2023-12-01 [1] CRAN (R 4.1.3)
#>   withr                3.0.2   2024-10-28 [1] CRAN (R 4.1.3)
#>   xfun                 0.52    2025-04-02 [1] CRAN (R 4.1.3)
#>   xml2                 1.3.3   2021-11-30 [1] CRAN (R 4.1.3)
#>   xtable               1.8-4   2019-04-21 [1] CRAN (R 4.1.3)
#>   yaml                 2.3.7   2023-01-23 [1] CRAN (R 4.1.3)
#>   zip                  2.3.0   2023-04-17 [1] CRAN (R 4.1.3)
#>
#>  [1] C:/Users/hech/Documents/R/win-library/4.1
#>  [2] C:/Program Files/R/R-4.1.3/library
#>
#> -----------------------------------------------------------------------
----
```