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Update on Catch and Survey Information for Atlantic Cod (*Gadus morhua*) Stock in NAFO Subdivision 3Ps to 2023

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Foreword

This series documents the scientific basis for the evaluation of aquatic resources and ecosystems in Canada. As such, it addresses the issues of the day in the time frames required and the documents it contains are not intended as definitive statements on the subjects addressed but rather as progress reports on ongoing investigations.

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ABSTRACT

The status of the cod stock in the Northwest Atlantic Fisheries Organization (NAFO) Subdivision (subDiv.) 3Ps was assessed during a Fisheries and Oceans Canada (DFO) Regional Peer Review Process meeting held November 6–10, 2023. This document presents updated information on the commercial fishery, research vessel (RV) survey, and tagging information.

INTRODUCTION

This document gives an account of the catch and survey information presented at the 2023 assessment of the Atlantic Cod (*Gadus morhua*) stock in North Atlantic Fisheries Organization (NAFO) Subdivision (subDiv.) 3Ps, located off the south coast of Newfoundland, Canada (Figure 1, Figure 2). The French overseas territory of St. Pierre et Miquelon also lies within the boundaries of NAFO subDiv. 3Ps and only Canada and France have fished in this area since the extension of jurisdiction by each country to 200 miles in the late-1970s. The stock is jointly managed by Canada and France through formal agreements. Data from the commercial fishery (catch-at-age) and Fisheries and Oceans Canada (DFO) research vessel (RV) survey (indices, stock weights, maturity, condition) are integrated with other data in an age-structured integrated state space model for the assessment of this stock (see DFO 2024).

FISHERY

The cod stock in subDiv. 3Ps was subject to a moratorium on all fishing from August 1993 to the end of 1996. Excluding these years, the magnitude of the Total Allowable Catch (TAC) has varied considerably over time, ranging from 70,500 t in 1973, the initial year of TAC regulation, to 1,304 t in the ongoing 2023/24 season (Figure 3). Beginning in 2000, TACs have been established for seasons beginning April 1 and ending March 31 of the following year (during January-March 2000, an interim TAC was set to facilitate this change).

The TAC was set at 11,500 t for five consecutive management years (2009/10 to 2013/14) and was subsequently increased to 13,225 t for the 2014/15 management year. In 2015/16 Canada adopted a Conservation Plan and Rebuilding Strategy (CPRS) for 3Ps cod that included a harvest control rule (HCR) for suggesting the TAC level for the upcoming year. This rule was used in 2015/16 and 2016/17, but was suspended for the setting of the TAC in 2017/18 and has not been used since.

As part of a process to develop a new rebuilding plan for this stock, a management procedure (MP) was adopted in spring 2023 to recommend the annual TAC. This MP defines a fixed Fishing Mortality (F) level at F = 0.065 while the stock is in the Critical Zone. As agreed to by Canada and France, the TAC for 3Ps cod for 2023–24 is 1,304 t, in accordance with the MP's recommended total catch. Separate from this TAC, Canada has unilaterally set aside an amount of 100 t for unaccounted removals of 3Ps cod.

Full details of these and other conservation and management measures, which may differ among fleet sectors, are available from the DFO Fisheries and Aquaculture Management (FAM) branch in St. John's. Under the terms of the 1994 Canada France agreement, the Canadian and French shares of the TAC are 84.4% and 15.6%, respectively.

A description of the history of the fishery for this stock can be found in Ings et al. (2023). Table 1 through Table 5 provide landings information, with annual landings since 1959 reported in Table 1. Since 1997, most of the TAC has been landed by Canadian inshore fixed gear harvesters (where inshore is typically defined as unit areas 3Psa, 3Psb, and 3Psc; refer to Figure 1), with remaining catch taken mainly by the mobile gear sector fishing the offshore, i.e., unit areas 3Psd, 3Pse, 3Psf, 3Psg, and 3Psh. Most recent catches have come from unit area 3Psc (Placentia Bay) (Figure 4).

Total landings for the 2021/22 and 2022/23 management years (April 1–March 31) were 777 t and 922 t, respectively[1]. Excluding the moratorium years, 2021/22 landings were the lowest of the available time series.

CATCH-AT-AGE

The amount of landings sampled is highly variable among gear types and years, but generally the otter trawl fleet is sampled well compared to other fleets while inshore and offshore line trawl landings are sampled poorly (Table 6, Table 7). Restrictions associated with the COVID-19 pandemic impacted sampling in 2020/21. All sampling in 2021 was from the inshore fishery. In 2022 length and age samples were from the inshore gillnet and line trawl, and offshore otter trawl fisheries.

In 2021 (Table 8, Figure 5) and 2022 (Table 9, Figure 6), catch numbers-at-age (Table 10) were composed largely of age 6, and ages 6-7, respectively. This is a return to a more typical age distribution within the fishery and marks an end to the dominance of the 2011 cohort (age 11 in 2022) within the fishery that had been observed since 2017.

COMMERCIAL WEIGHT-AT-AGE

The time series of available mean weights-at-age in the fishery (including landings from commercial and sentinel) are given in Table 11 and Figure 7. Estimates of mean weights-at-age are derived from sampling of the catches stratified by gear type, unit area, and month. Seasonal age-length keys are applied to length frequency data to age the catch and calculate proportions-at-age. Weight-at-age of fish ages 8+ have been declining since the mid-1980s (Figure 7).

These data are no longer used for stock weights in the assessment model, as selectivity of the fishery has changed over time. Instead, stock weights are derived from the annual RV survey (see STOCK WEIGHTS below).

LOGBOOKS

Logbooks are completed by commercial fishers to record fishing effort and catches. Previous assessments of this stock have examined standardized catch indices (see Ings et al. 2023), however, in the 2021 assessment the standardization models showed poor fit and were not considered acceptable for use. These issues have not been remedied, and therefore logbook catch rates are not presented in the current assessment. Previous logbook data highlight differences across space; in any given year some areas may experience high catch rates, while others are low. There is considerable uncertainty in the interpretation of fishery catch rate data and these data are generally more reflective of changes in fishery performance or the nature of the fishery rather than differences in stock size.

RECREATIONAL CATCH ESTIMATION FROM TAGGING INFORMATION

The current Fisheries and Oceans Canada Newfoundland and Labrador Region (DFO NL) cod tagging program began in the late-1990s, with consistent methods and materials used throughout the time series. T-bar tags, each with a unique fish ID code, are deployed on Atlantic Cod >45 cm fork length in NL waters, including NAFO subDiv. 3Ps (Table 12). Tagging is carried out by DFO NL Groundfish and FFAW (Fish Food and Allied Workers) technicians. Each

[1] Reported landings values are provisional and subject to change

tag is associated with a financial reward (high = $100, low = $10 or $25) for return of the physical tag and associated information (e.g., fisher type, fishing gear, location of capture, length at recapture). Fisher type is recorded with all tag returns, with data fields for commercial fisher, sentinel fisher, plant worker, recreational fisher, and other (e.g., tags found on beaches).

Methods

Annual ratios of tags returned by commercial fishers and recreational fishers are included in the tag return data, allowing a simple ratio estimator to be used to calculate recreational catch based on annual reported landings using the following:

$$\frac{C_{rec,y}}{C_{comm,y}} = \frac{R_{rec,y}}{R_{comm,y}}$$

Where C_y is the total landings from recreational (rec) and inshore commercial ($comm$) fisheries in year (y) and R is the number of tags returned by recreational and commercial fishers in year (y). The total numbers of tags returned by each fishery is a function of the total number of tags reported, which is the number of high reward tags reported (NH), and the number of low reward tags reported (NS) adjusted by the fishery-specific ($type$) reporting rate (λ). E denotes the expected value.

$$E(R_{type,y}) = NH_{type,y} + \frac{NS_{type,y}}{\lambda_{type,y}}$$

Reporting rates ($\lambda_{type,y}$) are estimated with a random-walk model developed by Konrad et al. (2016), which are year-specific for the commercial fishery, and constant for the recreational fishery. Assuming that the proportion of tags removed from the two fisheries is estimated from the number of tags reported by each fishery, the number of tags returned by each fishery can be treated as a random variable, where Bin represents the binomial distribution:

$$R_{rec,y} \sim Bin\left(E(R_{rec,y}), \frac{E(R_{rec,y})}{E(R_{rec,y}) + E(R_{comm,y})}\right)$$

$$R_{comm,y} = (E(R_{rec,y}) + E(R_{comm,y})) - R_{rec,y}$$

To incorporate the random variables, random normal variates are drawn for annual reporting rates and random binomial variates are drawn for $R_{rec,y}$ to calculate the recreational catch ($C_{rec,y}$). This process is repeated 1,000 times to obtain a sample of $C_{rec,y}$ with a mean and standard deviation (SD) reported for each year.

This approach assumes that the general behaviour of the two fisheries is similar (i.e., if the commercial fishery requires 1,000 t of catch to return 10 tags, then 1,000 t of recreational catch would be needed to return the same number of tags).

Regulation of the NL recreational groundfish fishery has been consistent since 2016. The recreational fishery is open for 39 days per year – including weekends throughout the summer, one full week at the end of the summer, and one full week in the fall – with a retention limit of five groundfish per fisher per day. In 2016 and 2017 the recreational season was extended an additional week to 46 days in total. The recreational fishing season overlaps well with the most active period of the inshore commercial fishery, from summer through to the early fall.

The inshore commercial fishery occurs in NAFO subDiv. 3Ps statistical areas a, b, c. The recreational fishery is not restricted by regulation however due to practical limitations on small recreational vessels, it occurs within the same areas. The spatial distribution of tag returns is very consistent between the two fisheries (Figure 8).

Although the inshore commercial and recreational fisheries overlap well in space and time, they use different gear. The majority of the commercial catch is taken by gillnet, while the recreational fishery is conducted by handline. Gillnets are explicitly size selective. Hook size and fisher behavior will also lead to some size selectivity in the recreational catch. Length-at-recapture was compared for the recreational and inshore commercial fisheries since 2016 to confirm similar length distributions, with peaks for both fisheries between 55–65 cm (Figure 9).

Sensitivity Testing

Due to variability in annual tag deployments, TAC, and recreational fishing effort, annual tags returns are also variable (Table 12). As the number of tag returns from the recreational fishery is very low in some years (e.g., 4 returns in 2019), sensitivity testing was carried out to test the impact of small changes to the number of returned recreational tags to the recreational catch estimate. The 2022 recreational estimate was used as an example to address concern that the sample size was too small to be reliably used for catch estimation (e.g., explore whether the possible loss or delay of an individual tag return has a significant impact on the annual estimate).

Eight sensitivity scenarios were tested, wherein tags were added or removed from the 2022 recreational return database. For each scenario (S), reporting rate and recreational catch estimate including SD are presented in Table 13. Out of the eight scenarios run, only S_7 (two additional high reward and two additional low reward tags added to the recreational fishery tag returns) resulted in a recreational catch estimate more than one SD from the 2022 S_0 base estimate. These results provided reassurance that despite the small sample size, the recreational catch estimation is sufficiently stable to tolerate the possibility that a small fraction of the tags may not be processed due to unavoidable loss or delay without significant impact on the recreational catch estimate in a single year.

Recreational Catch Estimate Results

Annual reporting rate estimates are calculated for the commercial fishery. The estimated reporting rate of low reward tags from the inshore commercial fishery has gone through two periods of decline, from the time-series high of 0.85 to 0.73 between 2003–07 and again from 0.77 to 0.56 between 2012–22 (Figure 10). In 2022, the value of the low reward tag was increased from $10 to $25 to address the decline that has been observed throughout the DFO NL cod tagging program. Recreational reporting rate is estimated as a constant across the time series.

The proportion of the recreational returns has increased since the introduction of the tagging program (Table 14), however estimated recreational catch has varied without a long-term trend since 1998 (Figure 11). Recreational fishery catches are estimated to be between 135 t and 376 t (95% CI) with a geometric mean of 225 t based on values from 2016 to 2022, the period for which the current recreational fishery season has been in place. In 2022 it was estimated at 250 t (SD = 82 t).

RESEARCH VESSEL SURVEYS

Stratified-random surveys (Figure 12) have been conducted in the offshore areas of subDiv. 3Ps during the winter-spring period by Canada since 1972 and by France over 1978–92. The two surveys were similar with regard to the stratification scheme used, sampling methods and analysis, but differed in the type of fishing gear and the daily timing of trawls (daylight hours only for French surveys). Canadian surveys were conducted using the RVs Canadian Coast Guard Ship (CCGS) A.T. Cameron (1972–82), CCGS Alfred Needler (1983–84; 2009–19), and CCGS

Wilfred Templeman (1985–2008). From the limited amount of comparable fishing data available, it has been concluded that the three vessels had similar fishing power and no adjustments were necessary to achieve comparable catchability factors, even though the CCGS A.T. Cameron was a side trawler. Cadigan et al. (2006) found no significant differences in catchability for several species, including cod, between the Wilfred Templeman and Alfred Needler RVs. The CCGS Teleost has also been used during exceptional events (e.g., severe mechanical issues on the regular RV). Surveys by France were conducted using the RVs Cyros (1978–91) and Thalassa (1992) and the results are summarized in Bishop et al. (1994).

The Canadian RV surveys from 1983 to 1995 employed an Engel 145 high-rise bottom trawl. In 1996, research surveys began using the Campelen 1800 shrimp trawl. The Engel trawl catches for 1983–95 were converted to Campelen 1800 shrimp trawl-equivalent catches using a length-based conversion formulation derived from comparative fishing experiments (Warren 1996; Warren et al. 1997; Stansbury 1996, 1997). New RVs – the CCGS Capt Jacques Cartier and CCGS John Cabot – were introduced by DFO in 2021, and modifications were made to the Campelen 1800 trawl for use on these vessels going forward. Wheeland and Trueman (2024) found no significant difference in catchability for cod between these vessels and the Needler and Teleost.

The stratification scheme used in the DFO RV bottom-trawl survey in 3Ps is shown in Figure 12. Canadian surveys have covered strata ranging down to 300 fathoms (ftm) in depth (1 ftm = 1.83 m) since 1980. The time series that incorporates a random stratified design extends from 1983 to present. Five inshore strata were added to the survey in 1994 (stratum numbered 779–783) and a further eight inshore strata were added in 1997 (numbered 293–300) resulting in a combined 18% increase in the surveyed area. In the 2007 assessment, new indices using survey results from the augmented survey area were presented for the first time. Two survey time series are constructed from the catch data from Canadian surveys. The index from the expanded surveyed area from 1997 onwards including all inshore strata is referred to as the “all index strata”. The original smaller surveyed area is referred to as the “offshore” survey index. Both series follow similar trends. The assessment model uses the “offshore” index to 1996, and “all index strata” from 1997 to 2022.

The timing of the survey has varied considerably over the period (Table 15, Figure 13, Figure 14). In 1983 and 1984 the mean date of sampling was in April, in 1985 to 1987 it was in March, and from 1988 to 1992 it was in February. Both a February and an April survey were carried out in 1993; subsequently, the survey has generally been carried out in April. The change to April was aimed at reducing the possibility of stock mixing with cod from the adjacent northern Gulf (Div. 3Pn4RS) stock in the western portion of 3Ps. The stock mixing issue is described in more detail in previous assessments (e.g., Brattey et al. 2007).

SURVEY GAPS

Due to extensive mechanical problems with the RV, the survey in 2006 was not completed: only 48 of 178 planned sets were completed. Therefore, results for 2006 for the full survey area are not considered comparable to the remainder of the time series. There was no survey of 3Ps in 2020 due to the COVID-19 pandemic. Due to mechanical issues on the CCGS Alfred Needler, the 2021 survey took place aboard the CCGS Teleost. The CCGS Teleost was last used in 3Ps in 2016. The 2022 survey was completed by the CCGS John Cabot at an approximate 80% allocation of the full 178 survey sets. There was no survey of subDiv. 3Ps in 2023, primarily due to limited vessel availability.

ABUNDANCE AND BIOMASS

Survey indices of abundance and biomass are shown in Figure 15. A data correction resulted in a revision of the 2021 estimates of total biomass and abundance presented at the 2021 assessment. Estimates-at-age were not impacted.

The biomass index (Table 16) from the offshore strata was variable but exhibited a downward trend from the mid-1980s to the early-1990s. Values for most of the post-moratorium period from 1997 to 2004 were higher than those of the early-1990s, but not as high as those of the 1980s. Biomass estimates in recent years have been consistently low, remaining below the 1997–2021 average since 2014. The 2022 survey had the highest portion of survey biomass in the inshore strata observed since 1997 (Figure 16). Mean weight per tow in the survey catches was highest in and around Fortune Bay (Figure 17, Figure 18). Figure 19 shows the comparison of trends between “all index strata” and “offshore strata”.

The RV survey abundance index (Table 17) is variable. Abundance was below average through most of the 2000s but somewhat higher from 2009 to 2013 with four of these five years at or above average. Survey abundance was below the 1997–2021 average from 2016–21, similar to levels observed through most of the 2000s. The 2022 abundance estimate was at or above average.

Figure 20 shows survey indices at age. Length frequencies indicated a pulse of small (<20 cm) fish in 2021, coinciding with an increase in abundance at age 2 (Figure 21) in the survey. Abundance at age 2 (Figure 22) in the survey in 2021 was the highest since the emergence of the 2011 year class, but remains well below that level (age 2 survey abundance in 2021 was ~48% of age 2 abundance in 2013). This pulse carried forward into the 2022 index at age 3.

Length-at-age (Figure 23) in the survey shows recent declines in cod size, particularly at older ages. These values have been updated since the previous assessment following a data correction (Figure 24).

Cod condition (relative gutted condition) in the RV survey was at the time series average in 2022 (Figure 25). Size-at-maturity and estimate of age at 50% mature (A50) (Figure 26) showed a large change from the mid-1980s to the mid-1990s but has been relatively stable since.

STOCK WEIGHTS

Weights-at-age from the annual RV survey, rather than commercial weight data, are now used as the stock weights in the assessment model (as of the 2019 Framework, see Varkey et al. 2022). Weight-at-age is modelled using a random effects model, and uses a length-weight relationship for cod that has been applied to all cod stocks in the NL Region. Model results and diagnostics for model fit are shown in Figure 27, Figure 28, and Figure 29.

A correction was made to the estimate of length-at-age from the survey in 2021 (see Figure 24), resulting in a general downward revision of size-at-age and resulting stock weight for most age classes in this year (Figure 30).

Weight-at-age has remained near time series lows for most ages since 2015, generally remaining below values of the 2000s, and well below the highs that occurred around 1980 (Figure 27). Sample sizes for the oldest age groups (>10) are generally low due to the scarcity of older fish in the survey catch.

DISCONTINUED SURVEYS OF THIS STOCK

ESTIMATION DES RESSOURCES HALIEUTIQUES DE LA SUBDIVISION 3PS (ERHAPS) SURVEYS BY FRANCE

The assessment model incorporates bottom trawl data from the ERHAPS surveys by France that were conducted from 1978 to 1992 using the same stratification scheme as the Canadian offshore RV survey. There was a change in vessel in 1992 and there was no comparative fishing to compare the catchabilities of the two vessels. Therefore, the assessment uses only data from 1978 to1991. The ERHAPS survey was conducted in February-March using a Lofoten trawl in daylight hours only. When strata were missed during the survey, adjustments to the results of the survey were made using a multiplicative model (Champagnat and Vigneau personal communication).

GROUNDFISH ENTERPRISE ALLOCATION COUNCIL (GEAC) SURVEY

GEAC (presently Atlantic Groundfish Council) conducted a fall survey (Nov-Dec) within 3Ps from 1997 to 2007 using the same stratification scheme as the Canadian offshore RV survey (McClintock 2010). Twenty-four strata were sampled annually. An Engels 96 high lift trawl was used to conduct 30 minute tows. In the 11 year survey period, coverage was incomplete in 1997, the survey was not conducted in 2006, and in 2007 a different vessel was used and several additional strata were included. Eight years of data from this survey (1998–2005) are included in the assessment model.

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TABLES

Table 1. Reported landings of cod (t) from NAFO subDiv. 3Ps. Landings are presented by calendar year but note that since 2000 the TAC has been established for April 1–March 31. Catch estimates for 2023 are not provided as the year is in progress at the time of the assessment. See Healey et al. (2013) for pre-1980 data. Note that 1996 through 2006 include recreational and sentinel catch, while 2007 onwards does not include recreational catch.

Year	Total	TAC
1980	37,568	28,000
1981	38,892	30,000
1982	33,902	33,000
1983	38,451	33,000
1984	36,950	33,000
1985	51,367	41,000
1986	57,990	41,000
1987	59,204	41,000
1988	43,382	41,000
1989	39,540	35,400
1990	41,405	35,400
1991	43,589	35,400
1992	35,895	35,400
1993	15,216	20,000
1994	661	0
1995	821	0
1996	1,057	0
1997	9,420	10,000
1998	20,156	20,000
1999	27,997	30,000
2000	25,100	20,000
2001	16,546	15,000
2002	15,319	15,000
2003	15,260	15,000
2004	14,414	15,000
2005	14,776	15,000
2006	13,157	13,000
2007	12,959	13,000
2008	11,773	13,000
2009	9,762	11,500
2010	8,299	11,500
2011	6,876	11,500
2012	5,087	11,500
2013	4,366	11,500
2014	6,887	13,225
2015	6,460	13,490

Year	Total	TAC
2016	7,196	13,043
2017	6,641	6,500
2018	4,722	5,980
2019	3,529	5,980
2020[a]	2,228	2,691
2021[a]	826	1,346
2022[a]	909	1,346
2023	-	1,304

[a] Catches reported for the most recent three years are considered provisional and subject to change.

Table 2. Reported fixed gear catches of cod (t) from NAFO subDiv. 3Ps by gear type (includes non-Canadian and recreational catch). See Healey et al. (2013) for pre-1980 data.

Year	Gillnet	Longline	Handline	Trap	Total
1980	5,493	19,331	2,545	2,077	29,446
1981	4,998	20,540	1,142	948	27,628
1982	6,283	13,574	1,597	1,929	23,383
1983	6,144	12,722	2,540	3,643	25,049
1984	7,275	9,580	2,943	3,271	23,069
1985	7,086	10,596	1,832	5,674	25,188
1986	8,668	11,014	1,634	4,073	25,389
1987	9,304	11,807	1,628	4,931	27,670
1988	6,433	10,175	1,469	2,449	20,526
1989	5,997	10,758	1,657	5,996	24,408
1990	6,948	8,792	2,217	3,788	21,745
1991	6,791	10,304	1,832	4,068	22,995
1992	5,314	10,315	1,330	3,397	20,356
1993	3,975	3,783	1,204	3,557	12,519
1994	90	0	381	0	471
1995	383	182	0	5	570
1996	467	158	137	10	772
1997	3,760	1,158	1,172	1,167	7,258
1998	10,116	2,914	308	92	13,430
1999	17,976	3,714	503	45	22,237
2000	14,218	3,100	186	56	17,561
2001	7,377	2,833	2,089	57	12,357
2002	7,827	2,309	775	119	11,030
2003	8,313	2,044	546	35	10,937
2004	7,910	2,167	415	15	10,508
2005	8,112	2,016	626	6	10,760
2006	7,590	2,698	314	2	10,603
2007[2]	7,287	2,374	445	11	10,116
2008[2]	6,636	2,482	341	21	9,480
2009[2]	4,052	1,644	612	36	6,344
2010[2]	4,013	1,182	296	2	5,493
2011[2]	2,910	882	221	19	4,032
2012[2]	3,089	670	192	10	3,961
2013[2]	1,939	457	270	14	2,680
2014[2]	2,760	1,066	331	38	4,195
2015[2]	3,065	326	299	9	3,699
2016[2]	2,779	283	268	10	3,340
2017[2]	3,658	352	359	23	4,392
2018[2]	3,547	254	257	0	4,057
2019[2]	2,299	285	209	0	2,792

Year	Gillnet	Longline	Handline	Trap	Total
2020[1,2]	1,348	267	135	37	1,787
2021[1,2]	515	121	51	0	686
2022[1,2]	595	120	60	0	775

[1]provisional
[2]excluding recreational catch

Table 3. Reported Canadian (NL) monthly landings (t) of cod per unit area in NAFO subDiv. 3Ps in 2021. French catch is not available by unit area. Landings are provisional.

Month	3Psa	3Psb	3Psc	3Psd	3Pse	3Psf	3Psg	3Psh	Total
Jan	14.4	42.5	9.6	-	0.3	0.3	-	10.7	77.7
Feb	6.9	6.4	1.6	2.9	-	-	6.6	33.9	58.2
Mar	0.1	-	-	4.7	-	-	-	6.7	11.5
Apr	-	-	-	-	-	-	-	0.0	0.0
May	2.8	2.6	2.6	-	-	-	-	-	8.1
Jun	13.4	32.2	92.2	-	0.0	-	-	0.1	137.9
Jul	4.3	26.6	77.1	0.2	-	-	-	0.2	108.4
Aug	0.3	8.4	23.6	0.0	-	-	-	-	32.3
Sep	1.4	8.1	47.3	0.3	0.9	5.5	-	0.4	63.9
Oct	2.1	13.4	71.8	-	0.0	13.0	-	-	100.3
Nov	1.9	9.4	120.6	-	3.8	3.5	0.1	0.3	139.6
Dec	3.0	4.4	7.9	-	-	-	-	-	15.3
Total	50.7	153.9	454.2	8.1	5.0	22.2	6.6	52.3	753.2

Table 4. Reported Canadian (NL) monthly landings (t) of cod per unit area in NAFO subDiv. 3Ps in 2022. French catch is not available by unit area. Landings are provisional.

Month	3Psa	3Psb	3Psc	3Psd	3Pse	3Psf	3Psg	3Psh	Total
Jan	1.0	28.8	6.0	4.2	-	-	-	-	40.0
Feb	0.2	6.8	0.0	5.3	-	-	55.0	6.5	73.9
Mar	0.0	2.0	-	2.7	-	-	-	0.6	5.2
Apr	-	-	0.3	-	-	-	-	-	0.3
May	8.9	12.7	9.5	-	0.1	-	-	-	31.2
Jun	13.0	44.8	108.6	0.0	-	-	-	-	166.4
Jul	3.5	33.7	51.4	0.7	0.3	-	0.0	-	89.7
Aug	0.6	17.5	18.6	-	0.0	-	-	-	36.7
Sep	0.5	12.0	46.4	-	0.1	1.7	-	0.3	60.9
Oct	3.2	13.5	103.0	-	-	26.6	1.8	-	148.3
Nov	7.2	6.5	112.3	-	-	-	-	1.3	127.3
Dec	8.9	28.2	22.5	1.0	-	-	0.2	2.8	63.6
Total	47.0	206.6	478.7	13.9	0.5	28.3	57.1	11.4	843.6

Table 5. Reported Canadian (NL) monthly landings (t) of cod per unit area in NAFO subDiv. 3Ps in 2023, available at the time of the assessment. Cells marked as to be determined (TBD) were not available at the time of the assessment as the fishery is ongoing, and October values are for a portion of the month. French catch is not available by unit area. Landings are provisional and should be expected to be updated in subsequent assessments.

Month	3Psa	3Psb	3Psc	3Psd	3Pse	3Psf	3Psg	3Psh	Total
Jan	4.7	17.1	9.9	22.6	-	-	-	-	54.3
Feb	0.4	9.6	1.0	3.3	-	-	-	44.9	59.2
Mar	1.8	-	-	21.4	-	-	-	2.7	25.9
Apr	-	0.2	-	-	-	-	-	-	0.2
May	5.1	9.0	2.6	-	-	-	-	-	16.8
Jun	6.9	40.3	13.6	-	-	-	-	-	60.8
Jul	1.2	22.7	59.6	-	-	-	-	-	83.5
Aug	0.2	19.4	24.4	-	-	-	-	-	44.1
Sep	0.3	8.6	72.7	-	-	-	-	-	81.6
Oct*	0.2	4.2	25.5	-	-	-	-	-	29.9
Nov	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Dec	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Total, year to date	20.8	131.0	210.0	47.3	-	-	-	47.6	456.3

Table 6. Summary of sampling conducted on 3Ps cod landings during 2021.

Gear	Proportion of landings that were unsampled (%)	Number of Length measurements	Number of Otoliths collected
Inshore Handline	100%	0	0
Inshore Gillnet	70%	9,120	2,042
Inshore Line trawl	94%	4,067	1,279
Offshore Gillnet	100%	0	0
Offshore Line trawl	100%	0	0
Offshore Otter trawl	100%	0	0

Table 7. Summary of sampling conducted on 3Ps cod landings during 2022.

Gear	Proportion of landings that were unsampled (%)	Number of Length measurements	Number of Otoliths collected
Inshore Handline	100%	0	0
Inshore Gillnet	80%	5,971	2,392
Inshore Line trawl	81%	4,047	831
Offshore Gillnet	100%	0	0
Offshore Line trawl	100%	0	0
Offshore Otter trawl	49%	530	1,077

Table 8. Estimates of average weight, average length and the total numbers and weight of 3Ps cod caught at age from Canadian and French landings during 2021 (excludes recreational catch). Sum of products for catch at age = 0.98.

Age	Total Catch (numbers)	Average Weight (kg)	Average Length (cm)	Total Catch std error	Total Catch CV	Total Catch Weight (t)
1	0	-	-	-	-	0
2	7	0.25	31.0	0.00	0.56	2
3	371	0.62	41.1	0.06	0.17	229
4	7,454	0.92	47.0	4.07	0.55	6,820
5	47,771	1.30	52.6	19.81	0.41	62,198
6	167,192	1.75	58.0	30.50	0.18	292,252
7	40,752	2.04	60.9	20.38	0.50	83,256
8	29,065	2.41	63.9	11.25	0.39	70,018
9	50,876	2.29	63.0	20.97	0.41	116,303
10	37,145	2.17	60.9	17.37	0.47	80,642
11	20,796	2.59	65.4	11.01	0.53	53,882
12	4,039	3.65	72.6	1.28	0.32	14,759
13	1,587	4.32	76.4	0.68	0.43	6,856
14	6,206	2.67	66.7	4.75	0.77	16,582
15	0	0.00	0.0	0.00	0.00	0
16	407	1.46	55.0	0.41	1.01	593
17	0	0.00	0.0	0.00	0.00	0
18	4	8.40	97.0	0.00	1.22	34
19	176	5.59	85.0	0.18	1.04	983
20	0	-	-	-	-	0

Table 9. Estimates of average weight, average length and the total numbers and weight of 3Ps cod caught at age from Canadian and French landings during 2022 (excludes recreational catch). Sum of products for catch at age = 0.96.

Age	Total Catch (numbers)	Average Weight (kg)	Average Length (cm)	Total Catch std error	Total Catch CV	Total Catch Weight (t)
1	0	-	-	-	-	0

Age	Total Catch (numbers)	Average Weight (kg)	Average Length (cm)	Total Catch std error	Total Catch CV	Total Catch Weight (t)
2	1	0.33	34.0	0.00	0.89	0
3	571	0.66	42.4	0.33	0.57	375
4	14,257	1.44	53.9	2.11	0.15	20,502
5	46,281	1.75	57.8	5.98	0.13	80,992
6	99,483	2.15	61.9	9.52	0.10	213,590
7	93,083	2.33	63.4	9.32	0.10	216,418
8	49,599	2.41	64.2	7.19	0.14	119,732
9	33,388	2.56	65.3	6.60	0.20	85,306
10	20,165	2.55	65.2	3.77	0.19	51,461
11	27,709	2.70	66.7	5.65	0.20	74,897
12	943	3.17	69.6	0.28	0.29	2,990
13	3,224	2.59	65.3	2.68	0.83	8,344
14	67	3.96	76.0	0.05	0.76	265
15	0	-	-	-	-	0
16	0	-	-	-	-	0
17	0	-	-	-	-	0
18	0	-	-	-	-	0
19	0	-	-	-	-	0
20	0	-	-	-	-	0

Table 10. Numbers-at-age (000s) for the commercial cod fishery in NAFO subDiv. 3Ps since 2000 (ages 3–14 shown). Recreational catches excluded for 2007 onward (see text).

Year	Age 3	Age 4	Age 5	Age 6	Age 7	Age 8	Age 9	Age 10	Age 11	Age 12	Age 13	Age 14
2000	76	576	844	1,162	1,172	796	720	269	186	199	25	11
2001	112	591	1,416	1,283	1,009	788	451	372	112	79	81	8
2002	18	363	1,051	2,063	1,278	644	353	277	156	58	46	73
2003	66	144	714	1,826	1,855	665	281	165	82	44	14	18
2004	70	427	634	1,106	1,653	1,236	598	157	114	45	25	6
2005	47	279	927	992	911	1,155	727	324	95	40	24	7
2006	63	279	756	1,122	875	540	575	485	178	54	42	18
2007	9	212	642	1,314	1,069	653	351	329	208	110	27	12
2008	20	131	914	1,037	841	469	223	102	93	66	45	12
2009	8	404	590	1,301	741	399	208	80	24	68	34	9
2010	28	152	922	912	893	362	169	64	27	21	8	6
2011	10	80	202	723	646	398	143	64	22	32	4	9
2012	10	166	458	393	495	361	149	56	22	16	4	7
2013	6	59	785	796	367	564	218	132	28	32	5	2
2014	2	289	298	893	610	262	303	72	32	7	3	0
2015	2	211	262	900	653	270	326	75	29	8	5	0
2016	1	64	975	558	753	356	110	139	37	24	9	2
2017	0	15	261	1,297	518	454	197	61	42	5	16	1
2018	7	28	103	431	1,043	312	110	49	15	5	1	1
2019	6	28	69	151	262	595	207	103	54	14	6	4
2020	1	9	29	89	100	124	337	41	30	14	3	1
2021	0	7	48	167	41	29	51	37	21	4	2	6
2022	1	14	46	99	93	50	33	20	28	1	3	0

Table 11. Mean annual weights-at-age (kg) calculated from lengths-at-age based on samples from commercial fisheries (including food fisheries and sentinel surveys where available) in subDiv. 3Ps since 1974.

Year(s)	Age 3	Age 4	Age 5	Age 6	Age 7	Age 8	Age 9	Age 10	Age 11	Age 12	Age 13	Age 14
1974	0.399	0.624	1.064	1.813	2.429	3.349	3.927	4.832	5.438	7.558	9.337	8.466
1975	0.543	0.827	1.281	1.75	2.355	3.182	3.509	5.381	4.971	6.417	10.185	10.185
1976	0.537	1.005	1.455	2.284	3.032	4.267	5.439	7.395	7.426	9.873	11.45	16.628
1977	0.606	0.684	1.367	1.992	2.765	3.703	4.684	5.452	6.701	6.741	9.225	11.753
1978	0.545	0.763	1.111	2.03	2.888	3.929	4.612	6.058	7.233	6.981	9.747	10.954
1979	0.422	0.668	1.056	1.692	2.694	3.776	4.125	5.942	7.65	10.423	10.032	10.987
1980	0.511	0.776	1.147	1.715	2.357	3.561	5.474	7.193	7.219	9.872	9.566	8.527
1981	0.516	0.877	1.366	1.839	2.303	3.359	4.893	6.991	7.52	10.414	8.871	12.302
1982	0.462	0.809	1.171	1.82	2.396	2.819	3.756	4.853	6.814	8.394	8.805	11.688
1983	0.583	0.853	1.472	2.019	2.525	3.099	3.523	4.952	6.486	7.968	10.613	12.076
1984	0.671	1.201	1.485	2.105	2.741	4.26	5.369	6.314	8.081	10.55	7.704	8.682
1985	0.588	0.821	1.2	1.783	2.626	3.373	5.149	5.941	6.74	7.94	11.32	7.876
1986	0.532	0.691	1.15	1.744	2.327	3.075	4.96	6.132	6.293	7.489	9.41	12.003
1987	0.472	0.701	1.251	1.707	2.27	3.248	4.299	5.523	6.867	7.072	7.73	10.514
1988	0.63	0.799	1.016	1.637	2.169	3.122	4.256	5.976	6.885	7.342	8.277	9.126
1989	0.559	0.79	1.166	1.709	2.441	3.531	4.58	6.081	6.529	7.448	7.889	8.98
1990	0.543	0.753	1.346	1.932	2.562	2.958	3.923	3.959	6.185	7.509	7.836	7.231
1991	0.435	0.7	1.135	1.877	2.608	3.234	4.382	5.15	6.894	8.143	8.065	10.071
1992	0.459	0.665	1.023	1.658	2.514	3.251	4.665	7.621	7.861	9.296	11.49	13.43
1993	0.417	0.848	1.344	1.945	2.08	2.652	3.701	4.286	7.307	6.585	7.378	7.435
1994	0.417	0.848	1.344	1.945	2.08	2.652	3.701	4.286	7.307	6.585	7.378	7.435
1995	0.497	0.681	1.966	2.21	2.499	2.434	2.513	-	-	-	-	-
1996	0.576	0.878	1.383	1.879	2.389	2.709	3.862	4.374	8.354	6.57	10.112	13.097
1997	0.519	0.984	1.153	1.417	2.285	3.233	3.903	3.863	4.585	9.272	5.847	12.044
1998	0.598	0.984	1.736	1.982	2.361	3.158	4.087	3.994	4.439	4.458	5.717	5.459
1999	0.789	0.924	1.543	2.263	2.52	2.784	3.822	5.389	4.985	5.333	6.041	7.166
2000	0.442	1.23	1.219	1.949	2.763	2.808	3.337	4.858	6.799	6.719	6.717	8.679
2001	0.722	1.063	1.478	1.964	2.579	3.379	3.347	3.538	5.472	8.75	7.591	8.118
2002	0.586	1.053	1.531	1.972	2.289	3.013	4.023	3.627	3.751	6.198	9.153	7.133
2003	0.673	0.971	1.531	2.067	2.316	2.621	3.836	4.581	4.066	5.251	7.968	10.317
2004	0.619	0.996	1.409	2.091	2.479	2.709	2.901	4.45	6.298	5.331	6.88	8.703
2005	0.681	0.967	1.381	1.832	2.438	2.87	3.165	3.37	4.944	6.296	6.136	8.697
2006	0.643	1.012	1.53	1.898	2.175	2.732	3.405	3.89	3.213	5.147	7.014	7.387
2007	0.642	1.085	1.517	1.991	2.3	2.556	3.535	4.912	5.425	4.765	6.897	8.299
2008	0.912	0.961	1.349	1.949	2.202	2.522	2.717	4.073	5.214	5.041	5.257	8.153
2009	0.722	0.952	1.446	1.933	2.385	2.506	2.423	3.257	5.567	7.026	8.189	8.303
2010	0.805	1.128	1.334	1.966	2.161	2.523	2.605	2.85	5.562	7.751	9.753	10.329
2011	0.845	1.017	1.355	1.574	2.125	2.386	2.745	2.598	2.769	2.864	4.728	7.567
2012	0.836	0.965	1.418	1.982	2.019	2.206	2.82	3.305	3.559	2.665	2.849	2.897

Year(s)	Age 3	Age 4	Age 5	Age 6	Age 7	Age 8	Age 9	Age 10	Age 11	Age 12	Age 13	Age 14
2013	0.819	1.149	1.487	1.732	2.034	2.067	2.56	2.733	2.926	3.104	2.364	2.583
2014	0.93	1.03	1.832	2.046	2.097	2.731	2.49	3.281	3.826	2.644	4.532	4.873
2015	0.766	1.144	1.532	2.067	2.416	2.727	2.991	3.116	3.997	5.79	5.072	-
2016	0.837	1.184	1.506	1.787	2.261	2.385	2.958	3.575	4.038	4.749	4.14	7.625
2017	0.481	0.852	1.338	1.816	1.932	2.361	2.528	2.396	3.937	4.07	3.654	3.158
2018	0.688	1.414	1.549	1.904	2.148	2.336	3.286	3.151	3.624	5.37	5.806	6.422
2019	0.849	1.071	1.432	1.737	2.011	2.294	2.361	3.086	2.902	3.468	7.89	4.388
2020	0.726	1.210	1.731	1.966	2.055	2.134	2.368	2.776	2.666	3.134	4.577	3.206
2021	0.616	0.915	1.302	1.748	2.043	2.409	2.286	2.171	2.591	3.654	4.32	2.672
2022	0.657	1.438	1.75	2.147	2.325	2.414	2.555	2.552	2.703	3.171	2.588	3.955

Table 12. Annual tag releases in NAFO subDiv. 3Ps and returns by fishery type 1998–2022.

Year	Low-value tag releases	High-value tag releases	**Total tag releases**	Low-value tag returns (commercial)	High-value tag returns (commercial)	**Total tag returns (commercial)**	Low-value tag returns (recreational)	High-value tag returns (recreational)	**Total tag returns** (recreational)
1998	1,955	7,942	**9,897**	317	157	**474**	1	5	**6**
1999	1,066	7,384	**8,450**	1,063	363	**1,426**	4	6	**10**
2000	160	9,643	**9,803**	1,082	198	**1,280**	5	5	**10**
2001	768	7,597	**8,365**	1,182	102	**1,284**	23	1	**24**
2002	1,213	8,726	**9,939**	1,237	95	**1,332**	32	4	**36**
2003	1,642	9,569	**11,211**	1,442	207	**1,649**	15	1	**16**
2004	380	1,443	**1,823**	885	146	**1,031**	10	1	**11**
2005	150	1,340	**1,490**	525	84	**609**	13	3	**16**
2006	0	0	**0**	194	47	**241**	16	2	**18**
2007	480	3,410	**3,890**	122	33	**155**	6	3	**9**
2008	80	315	**395**	200	40	**240**	5	0	**5**
2009	504	2,006	**2,510**	227	59	**286**	20	6	**26**
2010	205	817	**1,022**	253	77	**330**	13	2	**15**
2011	196	767	**963**	100	32	**132**	9	6	**15**
2012	471	1,869	**2,340**	159	44	**203**	7	2	**9**
2013	798	3,153	**3,951**	173	58	**231**	14	3	**17**
2014	200	790	**990**	194	65	**259**	6	5	**11**
2015	256	994	**1,250**	185	63	**248**	16	6	**22**
2016	101	401	**502**	124	55	**179**	4	3	**7**
2017	373	1,467	**1,840**	165	62	**227**	11	2	**13**
2018	76	283	**359**	52	28	**80**	6	4	**10**
2019	466	1,927	**2,393**	54	18	**72**	3	1	**4**
2020	285	1,129	**1,414**	65	28	**93**	3	3	**6**
2021	188	746	**934**	38	16	**54**	7	5	**12**
2022	397	1,667	**2,064**	19	14	**33**	4	6	**10**

Table 13. Results of sensitivity testing the 2022 recreational catch estimate (prop = proportion of total tag returns, SD = standard deviation, HR = high reward tag, LR = low reward tag).

Scenario	Rec prop	Rec prop SD	Inshore Catch (t)	Rec Catch (t)	Rec Catch SD
S0 (2022)	0.34	0.11	734.3	249.0	83.0
S1 (+1 HR)	0.37	0.12	734.3	269.4	88.2
S2 (+1 LR)	0.39	0.12	734.3	287.5	89.1
S3 (-1 HR)	0.32	0.10	734.3	234.1	76.2
S4 (-1 LR)	0.29	0.10	734.3	213.2	72.8
S5 (+1 HR, +1 LR)	0.42	0.13	734.3	305.3	95.1
S6 (-1 HR, -1 LR)	0.27	0.09	734.3	194.6	67.3
S7 (+2 HR, +2 LR)	0.49	0.14	734.3	357.3	101.5
S8 (-2 HR, -2 LR)	0.24	0.09	734.3	179.7	63.7

Table 14. Proportion of tag returns from the recreational fishery, reported inshore landings (tonnes) and estimated recreational catch (tonnes) for NAFO subDiv. 3Ps from 1998–2022 (prop = proportion, SD = standard deviation).

Year	Rec Prop	Prop SD	Inshore Landings	Estimated Rec Catch	Rec Catch SD
1998	0.012	0.005	10,725.7	125.9	49.2
1999	0.008	0.002	17,091.4	143.5	39.5
2000	0.011	0.003	12,730.6	134.4	35.0
2001	0.034	0.006	8,991.6	302.7	51.6
2002	0.047	0.007	8,140	380.2	54.9
2003	0.021	0.004	8,492.5	176.9	31.8
2004	0.019	0.004	7,691.8	142.5	32.2
2005	0.041	0.008	7,339	303.0	60.0
2006	0.120	0.022	7,186.2	860.7	161.3
2007	0.081	0.021	6,806.2	551.9	144.4
2008	0.035	0.012	6,648.4	234.5	79.0
2009	0.140	0.024	4,439.5	623.0	108.2
2010	0.074	0.015	3,934.1	289.5	58.8
2011	0.160	0.036	2,876	459.9	102.8
2012	0.069	0.019	2,642.7	182.9	49.6
2013	0.116	0.023	2,293.9	266.9	52.8
2014	0.056	0.014	2,741	153.1	38.0
2015	0.127	0.024	2,744.1	349.2	66.2
2016	0.049	0.016	2,649.1	131.1	41.7
2017	0.086	0.020	3,833.1	329.9	75.8
2018	0.161	0.044	3,763.9	605.8	165.6
2019	0.078	0.031	2,571.1	199.4	79.7
2020	0.074	0.026	1,692.1	125.5	44.7
2021	0.272	0.079	660.4	179.8	52.2
2022	0.339	0.113	734.3	249.0	83.0

Table 15. Details of annual DFO research vessel surveys of NAFO subDiv. 3Ps. Further information can be found in Rideout (2022), Wheeland et al. (2023), and references therein.

Year	Vessel	Start Date	End Date	Days	Sets	Sets with Cod	Proportion of sets with cod
1983	AN 9	23-Apr-83	8-May-83	15	164	117	0.71
1984	AN 26	10-Apr-84	17-Apr-84	7	93	59	0.63
1985	WT 26	8-Mar-85	25-Mar-85	17	109	78	0.72
1986	WT 45	6-Mar-86	23-Mar-86	17	136	88	0.65
1987	WT 55-56	13-Feb-87	22-Mar-87	37	130	95	0.73
1988	WT 68	27-Jan-88	14-Feb-88	18	146	106	0.73
1989	WT 81	1-Feb-89	16-Feb-89	15	146	90	0.62
1990	WT 91	1-Feb-90	19-Feb-90	18	108	66	0.61
1991	WT 103	2-Feb-91	20-Feb-91	18	158	104	0.66
1992	WT 118	6-Feb-92	24-Feb-92	18	137	63	0.46
1993.1	WT 133	6-Feb-93	23-Feb-93	17	136	52	0.38
1993.4	WT 135	2-Apr-93	20-Apr-93	18	130	63	0.48
1994	WT 150-151	6-Apr-94	26-Apr-94	20	166	73	0.44
1995	WT 166-167	04-Apr-95	28-Apr-95	24	161	65	0.40
1996	WT 186-187	10-Apr-96	01-May-96	22	148	105	0.71
1997	WT 202-203	02-Apr-97	23-Apr-97	22	158	104	0.66
1998	WT 219-220	10-Apr-98	05-May-98	25	177	113	0.64
1999	WT 236-237	13-Apr-99	06-May-99	23	175	128	0.73
2000	WT 313-315	08-Apr-00	11-May-00	34	171	136	0.80
2001	WT 364-365, Tel 351	07-Apr-01	29-Apr-01	23	173	134	0.77
2002	WT 418-419	05-Apr-02	27-Apr-02	21	177	117	0.66
2003	WT 476-477	05-Apr-03	02-May-03	23	176	117	0.66
2004	WT 523, WT 546, Tel 522	11-Apr-04	11-May-04	30	177	107	0.60
2005	WT 617-618, AN 656	17-Apr-05	09-May-05	22	178	134	0.75
2006	WT 688	13-Apr-06	18-Apr-06	5.1	48	43	-
2007	WT 757-759	04-Apr-07	02-May-07	29	178	135	0.76
2008	WT 824-827	10-Apr-08	23-May-08	44	169	115	0.68
2009	AN 902-904	08-Apr-09	13-May-09	35	175	137	0.78
2010	AN 930-932	08-Apr-10	08-May-10	31	177	132	0.75
2011	AN 401-403	07-Apr-11	08-May-11	32	174	131	0.75
2012	AN 415-417	31-Mar-12	26-Apr-12	27	177	137	0.77
2013	AN 430-432	26-Mar-13	23-Apr-13	29	179	133	0.74
2014	AN 445-446, Tel 130	05-Apr-14	10-May-14	36	156	105	0.67
2015	AN 450-452	11-Apr-15	10-May-15	30	173	116	0.67
2016	Tel 157,158,169	02-Apr-16	01-May-16	30	157	110	0.70
2017	AN 476-478	06-Apr-17	08-May-17	33	179	121	0.68
2018	AN 494-496	28-Apr-18	27-May-18	30	167	115	0.69
2019	AN 506-508	30-Mar-19	4-May-19	35	169	106	0.63
2020	No Survey	-	-	-	-	-	-
2021	TEL 218, 219	24-Apr-21	17-May-21	24	141	92	0.65
2022	CAB 21, 22, 23, 24	8-Apr-22	27-May-23	49	129	83	0.64
2023	No Survey	-	-	-	-	-	-

Table 16. Survey biomass estimates for cod from DFO bottom-trawl research vessel surveys in NAFO subDiv. 3Ps. NF = strata not fished. There was no survey in 2020. See Brattey et al. 2007 and Ings et al. 2023 for previous years.

Stratum	Depth (m)	sq. nm	2018	2019	2020	2021	2022	2023
314	<55	974	230	8	NF	222	465	NF
320	<55	1,320	1,444	1,580	NF	1,216	363	NF
293	56–91	159	64	23	NF	NF	81	NF
308	56–91	112	692	56	NF	1,011	1,231	NF
312	56–91	272	1,081	71	NF	93	1,520	NF
315	56–91	827	1,611	452	NF	3,216	687	NF
321	56–91	1,189	7,413	257	NF	6,066	99	NF
325	56–91	944	197	31	NF	124	337	NF
326	56–91	166	0	0	NF	21	1	NF
783	56–91	229	31	2	NF	71	67	NF
294	92–183	135	1,185	85	NF	2,050	3,056	NF
297	92–183	152	348	1,668	NF	835	4,636	NF
307	92–183	395	1,412	3,345	NF	832	1,735	NF
311	92–183	317	4,020	274	NF	1,663	471	NF
317	92–183	193	12	862	NF	0	0	NF
319	92–183	984	2,756	8,662	NF	1,157	923	NF
322	92–183	1,567	6,343	217	NF	2,055	1,384	NF
323	92–183	696	135	33	NF	42	2,015	NF
324	92–183	494	86	34	NF	350	691	NF
781	92–183	446	149	94	NF	517	139	NF
782	92–183	183	32	23	NF	37	127	NF
295	184–274	209	171	124	NF	1,063	339	NF
298	184–274	171	32	0	NF	126	245	NF
300	184–274	217	77	37	NF	64	61	NF
306	184–274	363	256	231	NF	85	0	NF
309	184–274	296	0	3,591	NF	37	44	NF
310	184–274	170	31	103	NF	0	25	NF
313	184–274	165	0	15	NF	0	0	NF
316	184–274	189	4	0	NF	0	0	NF
318	184–274	129	0	59	NF	0	0	NF
779	184–274	422	54	54	NF	8	492	NF
780	184–274	403	10	138	NF	33	528	NF
296	275–366	71	1	69	NF	39	168	NF
299	275–366	212	11	0	NF	0	17	NF
705	275–366	195	0	1	NF	5	3	NF
706	275–366	476	107	19	NF	0	0	NF
707	275–366	74	NF	47	NF	11	0	NF
715	275–366	128	NF	39	NF	0	42	NF
716	275–366	539	0	0	NF	0	190	NF

Stratum	Depth (m)	sq. nm	2018	2019	2020	2021	2022	2023
708	367–549	126	NF	13	NF	0	0	NF
711	367–549	593	1,026	135	NF	0	0	NF
712	367–549	731	0	5	NF	0	13	NF
713	367–549	851	0	31	NF	0	0	NF
714	367–549	1,074	48	0	NF	0	0	NF
Total	Offshore	-	28,905	20,173	-	18,205	12,238	-
Total	In/Offshore	-	31,607	22,491	-	23,048	22,194	-
Std	In/Offshore	-	7,972	5,939	-	5,925	3,149	-

Table 17. Survey abundance estimates for cod from DFO bottom-trawl research vessel surveys in NAFO subDiv. 3Ps. NF = strata not fished. There was no survey in 2020. See Brattey et al. 2007 and Ings et al. 2023 for previous years.

Stratum	Depth (m)	sq. nm	2018	2019	2020	2021	2022	2023
314	<55	974	1,680	22	NF	1,644	2,970	NF
320	<55	1,320	3,841	838	NF	2,651	1,253	NF
293	56–91	159	973	197	NF	NF	580	NF
308	56–91	112	1,425	169	NF	2,773	2,550	NF
312	56–91	272	1,553	206	NF	1,029	3,367	NF
315	56–91	827	2,844	861	NF	3,104	4,238	NF
321	56–91	1,189	8,289	1,276	NF	7,900	537	NF
325	56–91	944	730	487	NF	1,336	1,436	NF
326	56–91	166	0	0	NF	91	13	NF
783	56–91	229	221	44	NF	621	221	NF
294	92–183	135	2,646	1,367	NF	4,330	9,946	NF
297	92–183	152	920	5,499	NF	3,251	5,876	NF
307	92–183	395	3,152	6,466	NF	1,386	3,559	NF
311	92–183	317	5,152	2,384	NF	3,336	1,112	NF
317	92–183	193	27	5,031	NF	0	0	NF
319	92–183	984	6,071	22,102	NF	5,631	4,250	NF
322	92–183	1,567	8,969	2,867	NF	5,266	4,742	NF
323	92–183	696	394	447	NF	432	14,060	NF
324	92–183	494	731	702	NF	8,931	8,053	NF
781	92–183	446	2,491	1,242	NF	2,851	1,135	NF
782	92–183	183	793	712	NF	730	1,661	NF
295	184–274	209	1,279	1,624	NF	6,411	1,877	NF
298	184–274	171	12	12	NF	24	247	NF
300	184–274	217	95	90	NF	119	119	NF
306	184–274	363	133	316	NF	125	0	NF
309	184–274	296	0	5,366	NF	48	41	NF
310	184–274	170	35	160	NF	0	12	NF
313	184–274	165	0	20	NF	0	0	NF
316	184–274	189	15	0	NF	0	0	NF
318	184–274	129	0	27	NF	0	0	NF
779	184–274	422	581	916	NF	264	2,922	NF
780	184–274	403	249	1,285	NF	83	5,802	NF
296	275–366	71	15	587	NF	91	200	NF
299	275–366	212	15	0	NF	0	58	NF
705	275–366	195	0	13	NF	13	13	NF
706	275–366	476	64	15	NF	0	0	NF
707	275–366	74	NF	31	NF	14	0	NF
715	275–366	128	NF	23	NF	0	44	NF
716	275–366	539	0	0	NF	0	99	NF

Stratum	Depth (m)	sq. nm	2018	2019	2020	2021	2022	2023
708	367–549	126	NF	8	NF	0	0	NF
711	367–549	593	669	87	NF	0	0	NF
712	367–549	731	0	17	NF	0	29	NF
713	367–549	851	0	50	NF	0	0	NF
714	367–549	1,074	16	0	NF	0	0	NF
Total	Offshore	-	45,788	49,991	-	45,709	52,378	-
Total	In/Offshore	-	56,077	63,565	-	64,486	83,022	-
Std	In/Offshore	-	9,578	13,133	-	11,629	15,032	-

FIGURES

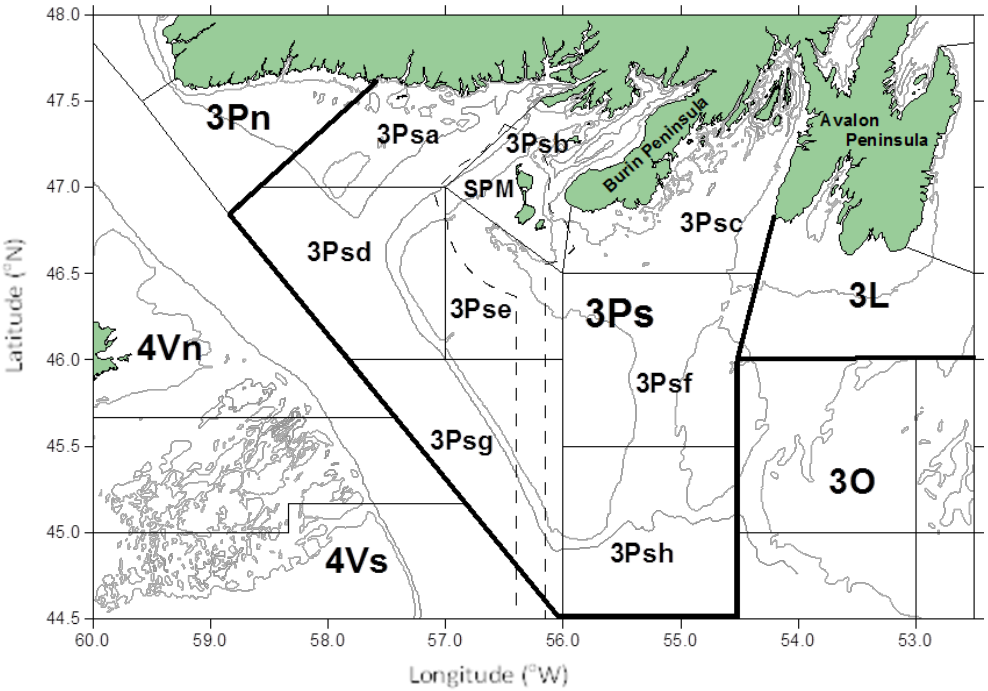

Figure 1. NAFO subDiv. 3Ps management zone showing the economic zone around the French islands of St. Pierre et Miquelon (SPM, dashed line), the 100 m and 250 m depth contours (grey lines) and the boundaries of the statistical unit areas (solid lines).

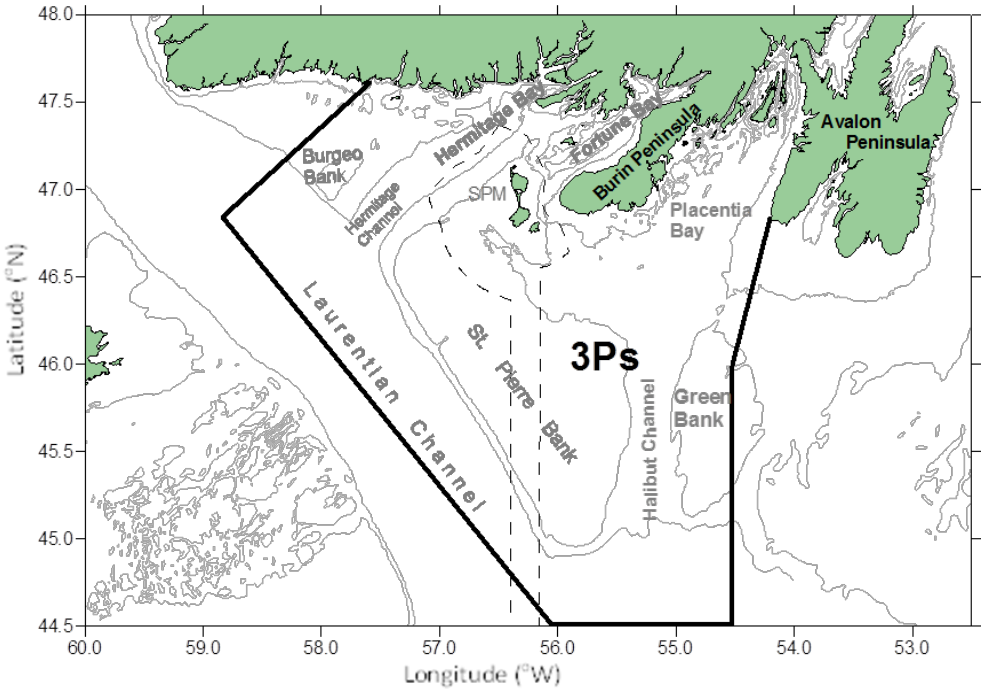

Figure 2. NAFO subDiv. 3Ps management zone showing the economic zone around the French islands of St. Pierre and Miquelon (SPM, dashed line), the 100 m and 250 m depth contours (grey lines) and the main fishing areas labelled.

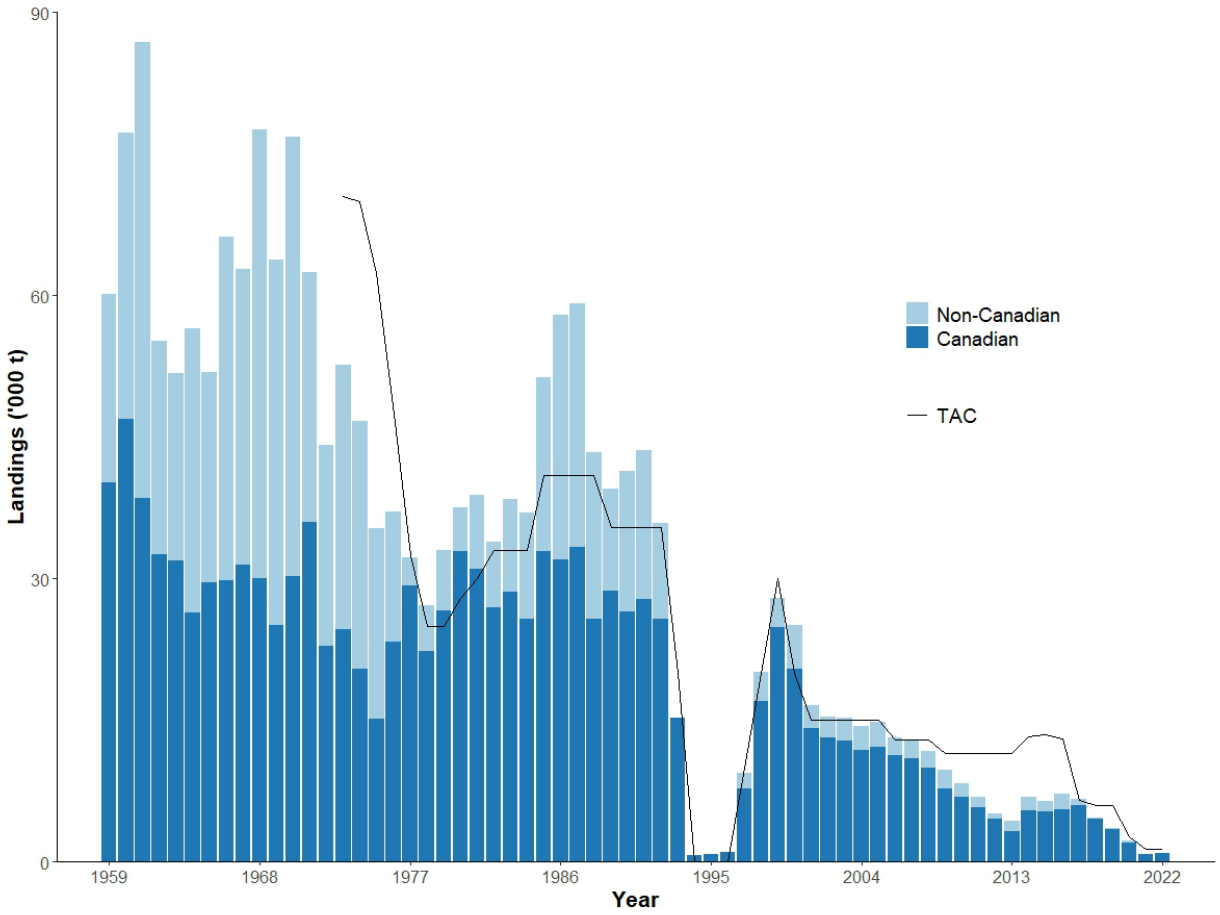

Figure 3. Reported landings of cod by Canadian and non-Canadian vessels in NAFO subDiv. 3Ps.

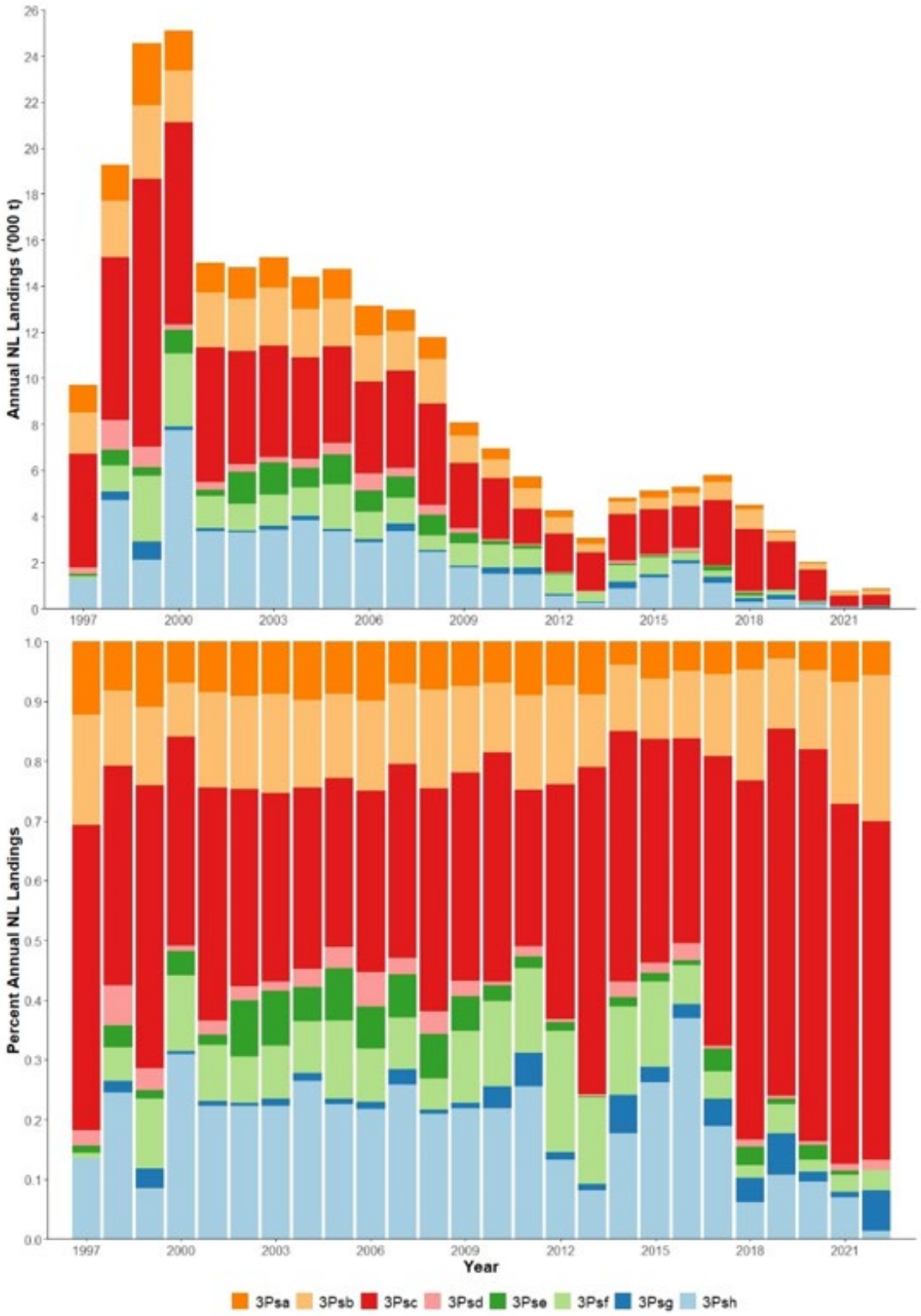

Figure 4. Breakdown of recent Canadian annual landings of 3Ps cod by statistical unit areas. Both landings (upper panel) and percent of total landings (lower panel) are presented. Unit area is not available for SPM landings. Refer to Figure 1 for locations of unit areas.

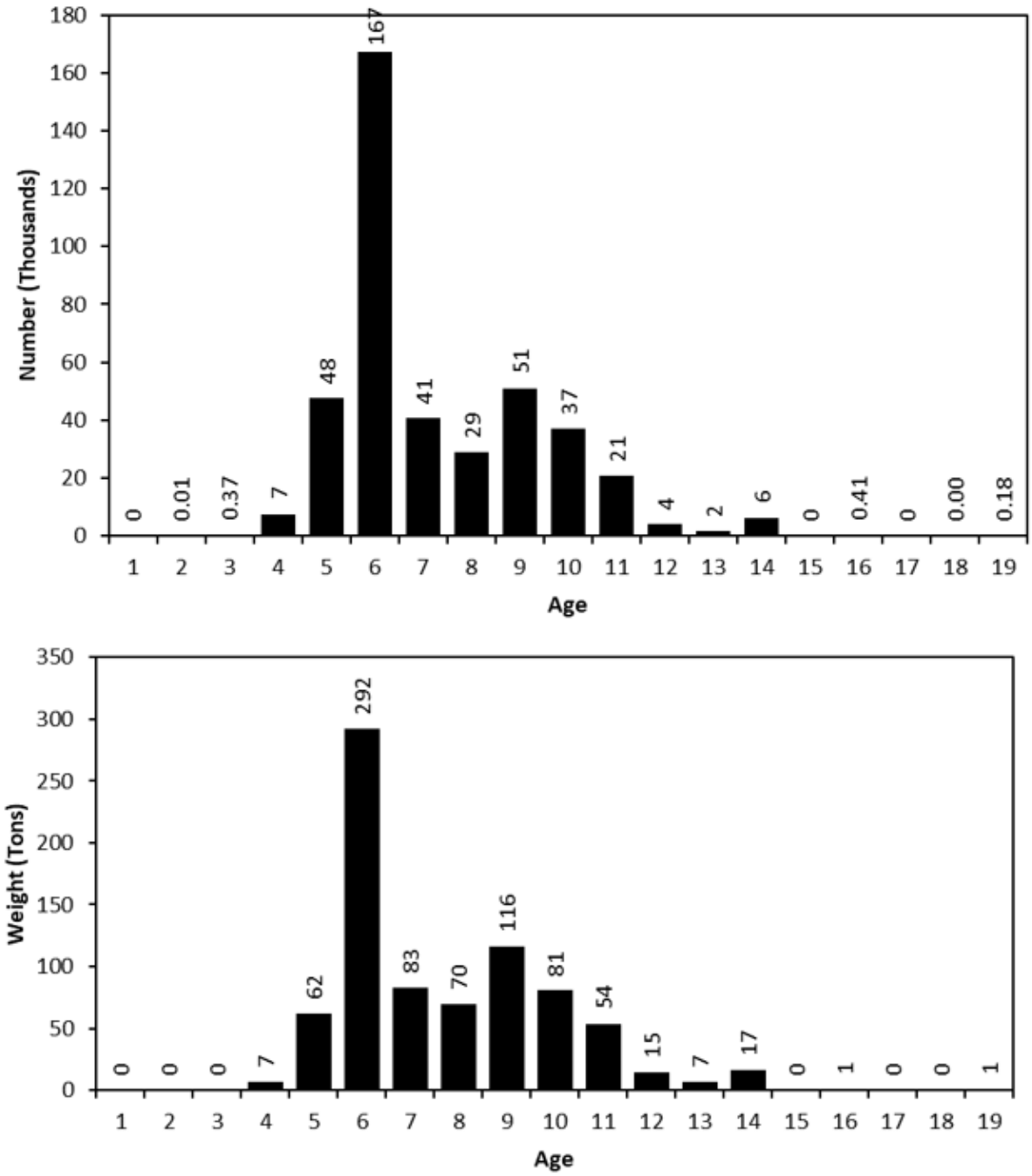

Figure 5. Catch numbers (top) and weight- (bottom) at-age from commercial fisheries and sentinel sampling in 2021.

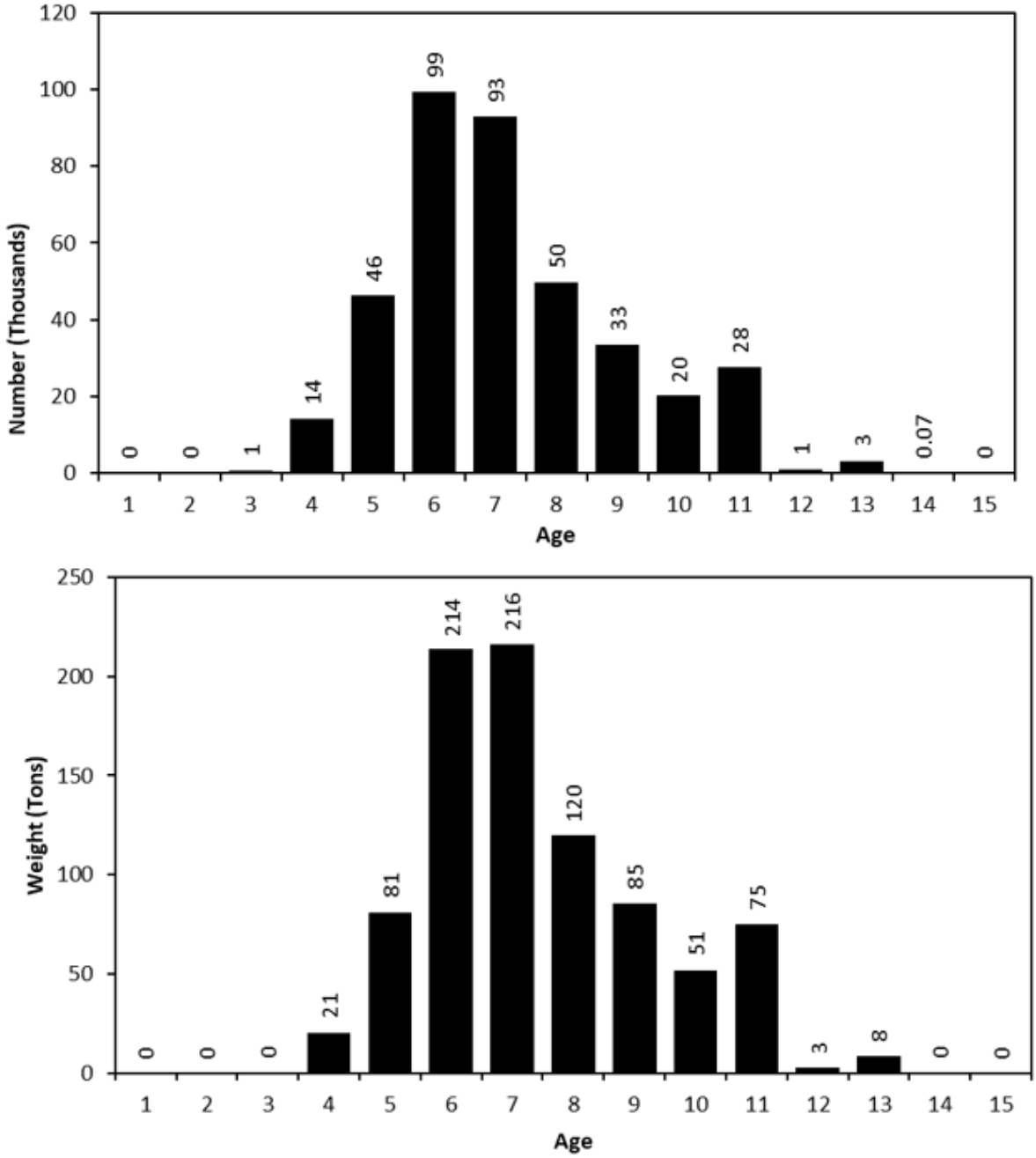

Figure 6. Catch numbers (top) and weight- (bottom) at-age from commercial fisheries and sentinel sampling in 2022.

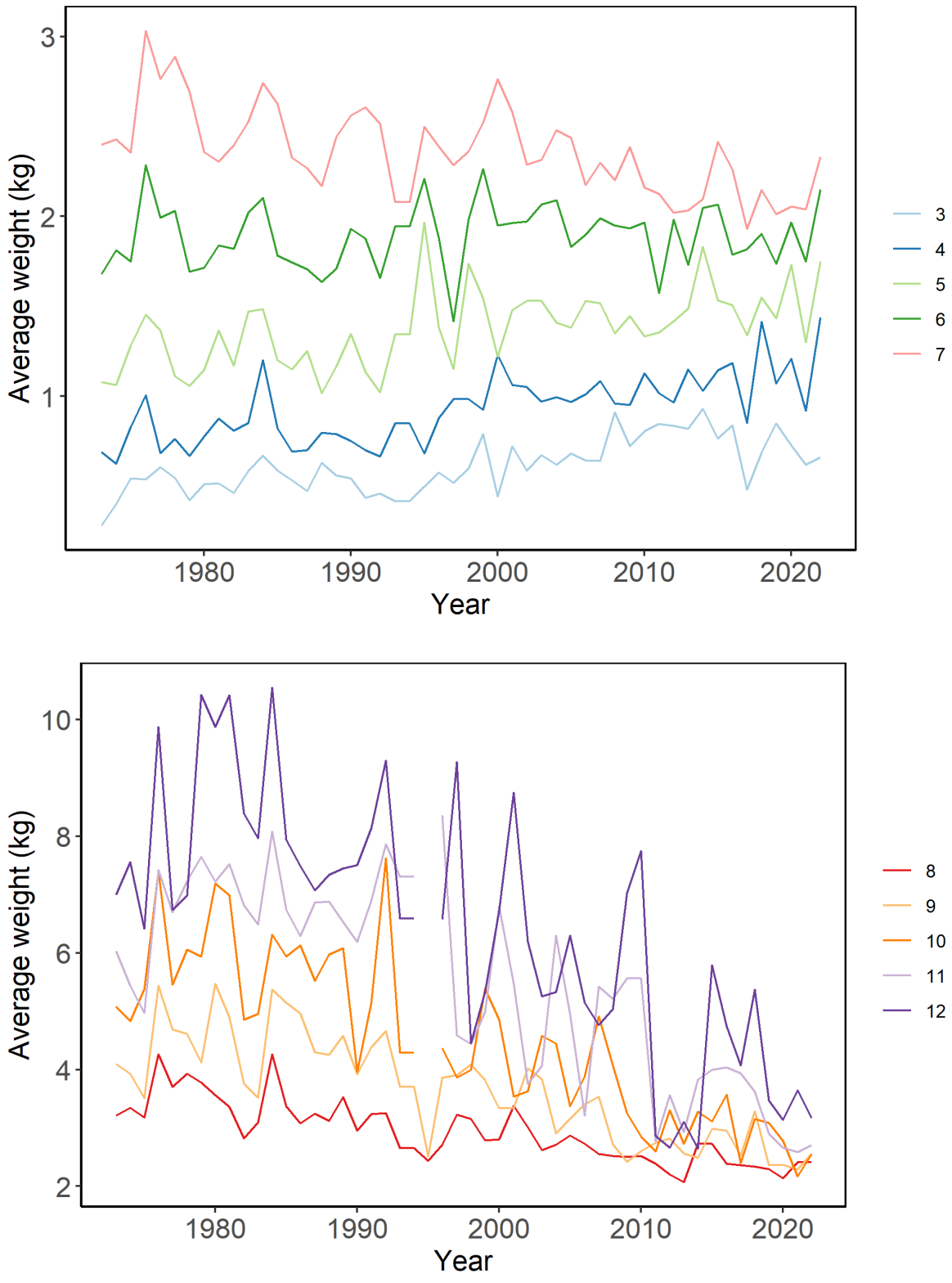

Figure 7. Mean weights-at-age calculated from mean lengths-at-age (upper panel: ages 3–7; upper panel: ages 8–12, colors show different ages) from the commercial catch of cod in subDiv. 3Ps during 1973 to 2022.

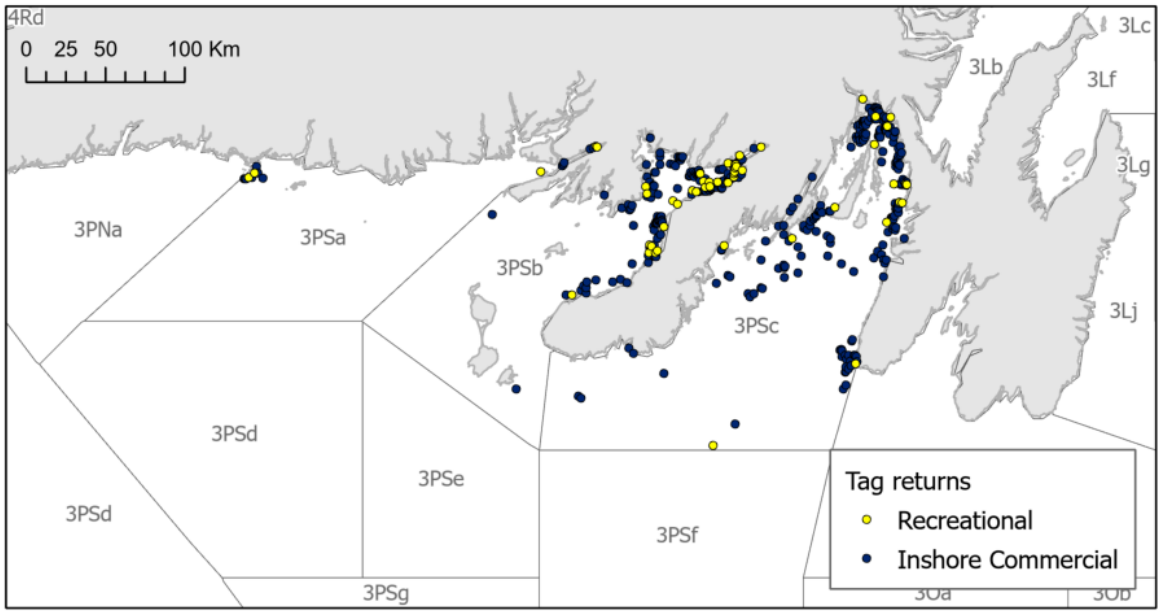

Figure 8. Spatial distribution of tag returns from the NAFO subDiv. 3Ps recreational and inshore commercial fisheries (2016–22).

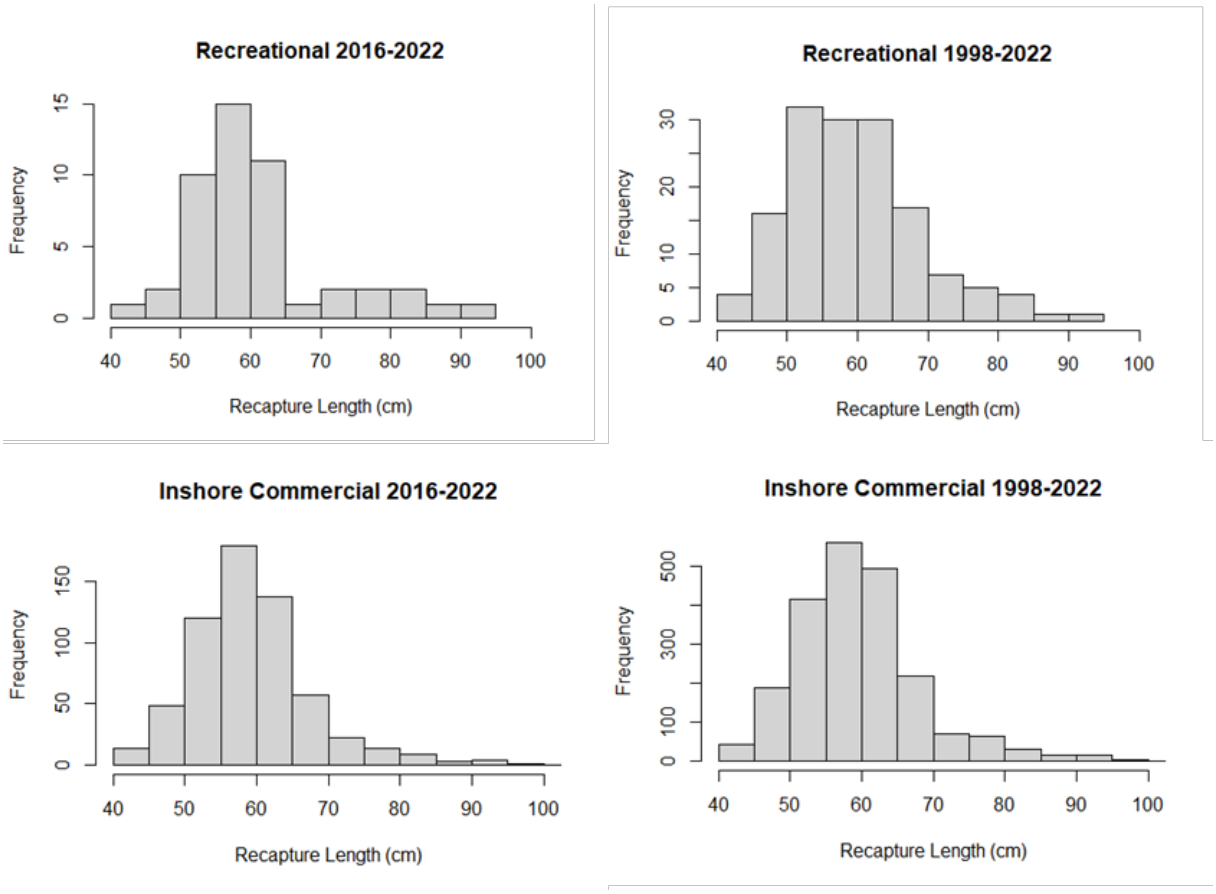

Figure 9. Recapture length (cm) of tagged Atlantic Cod in NAFO subDiv. 3Ps by recreational fishers (top) and the inshore commercial fishery (bottom) 2016–22 (left) and for 1998–2022 (right).

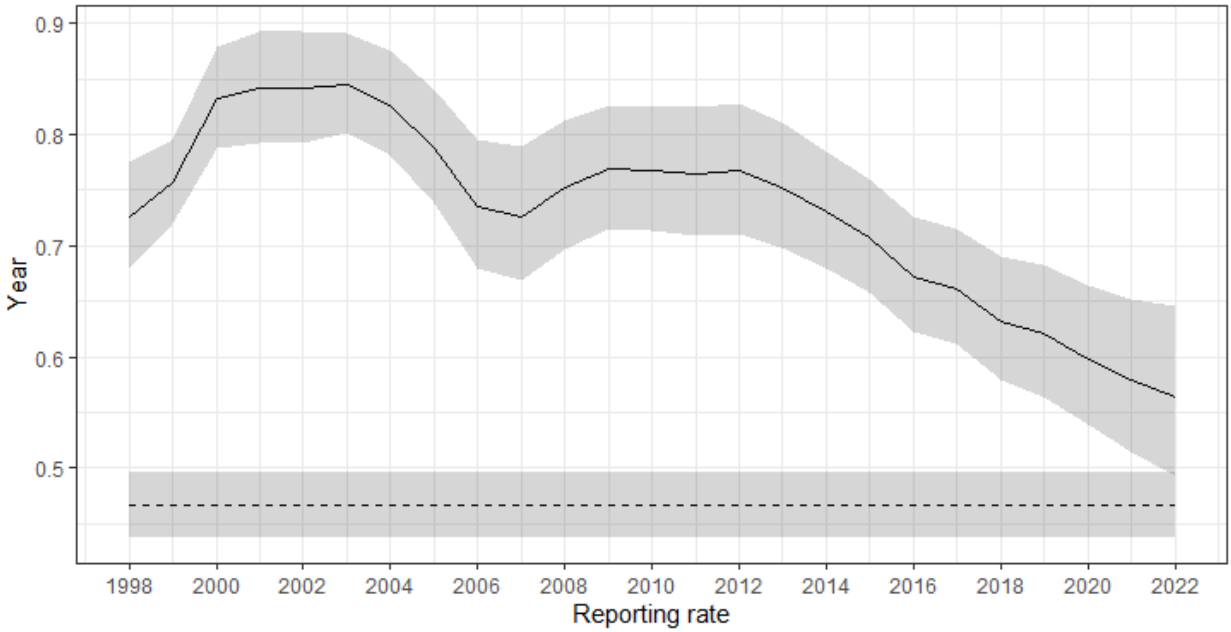

Figure 10. Estimated reporting rate for low value Atlantic Cod tags from the NAFO subDiv. 3Ps inshore commercial fishery (solid line) and the NAFO subDiv. 3Ps recreational fishery (dashed line) 1998–2022. Shaded areas show +/- 1 standard deviation.

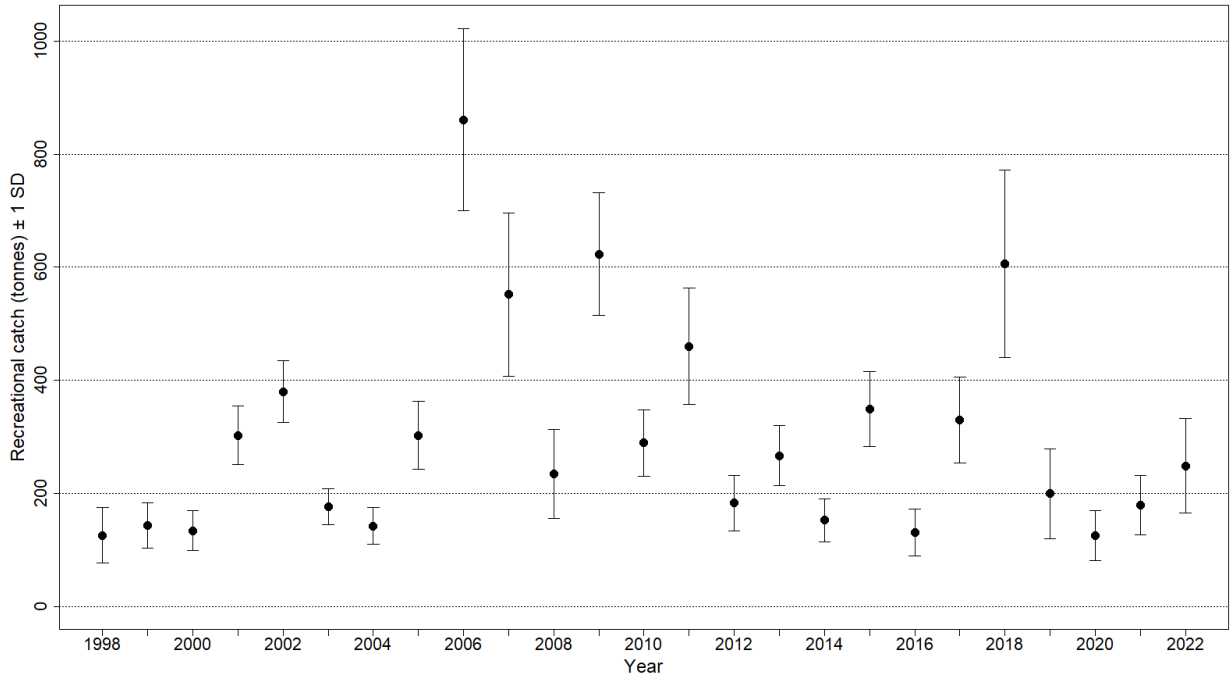

Figure 11. Estimated recreational catch for NAFO subDiv. 3Ps derived from tag return data from 1998–2022.

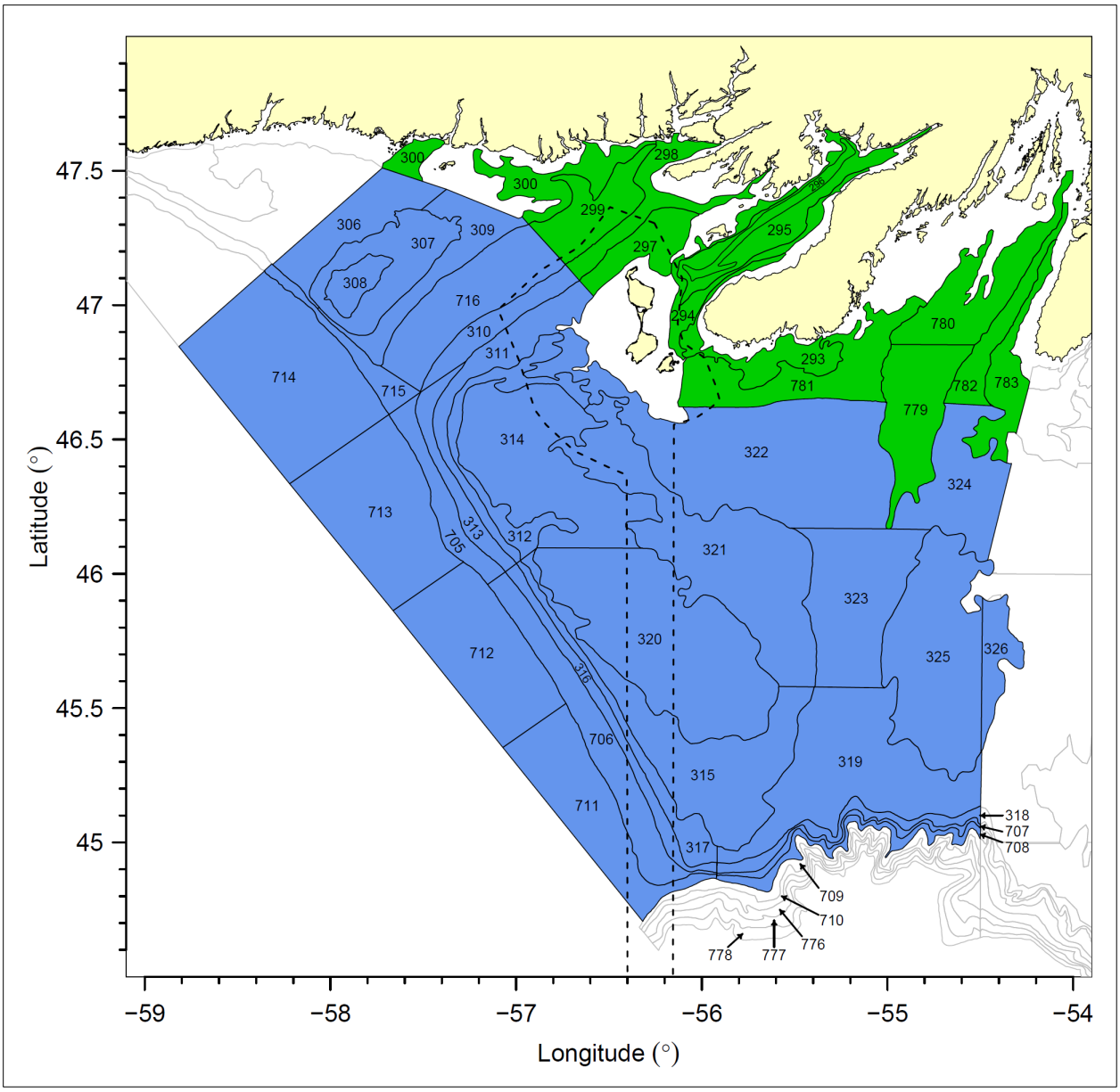

Figure 12. Stratum area boundaries and area surveyed during the DFO research vessel bottom-trawl survey of NAFO subDiv. 3Ps. Offshore strata are shaded blue. Inshore strata were added in 1994 (strata 779–783) and 1997(strata 293–300) and are shaded green. The dashed line represents the boundary of the French economic zone.

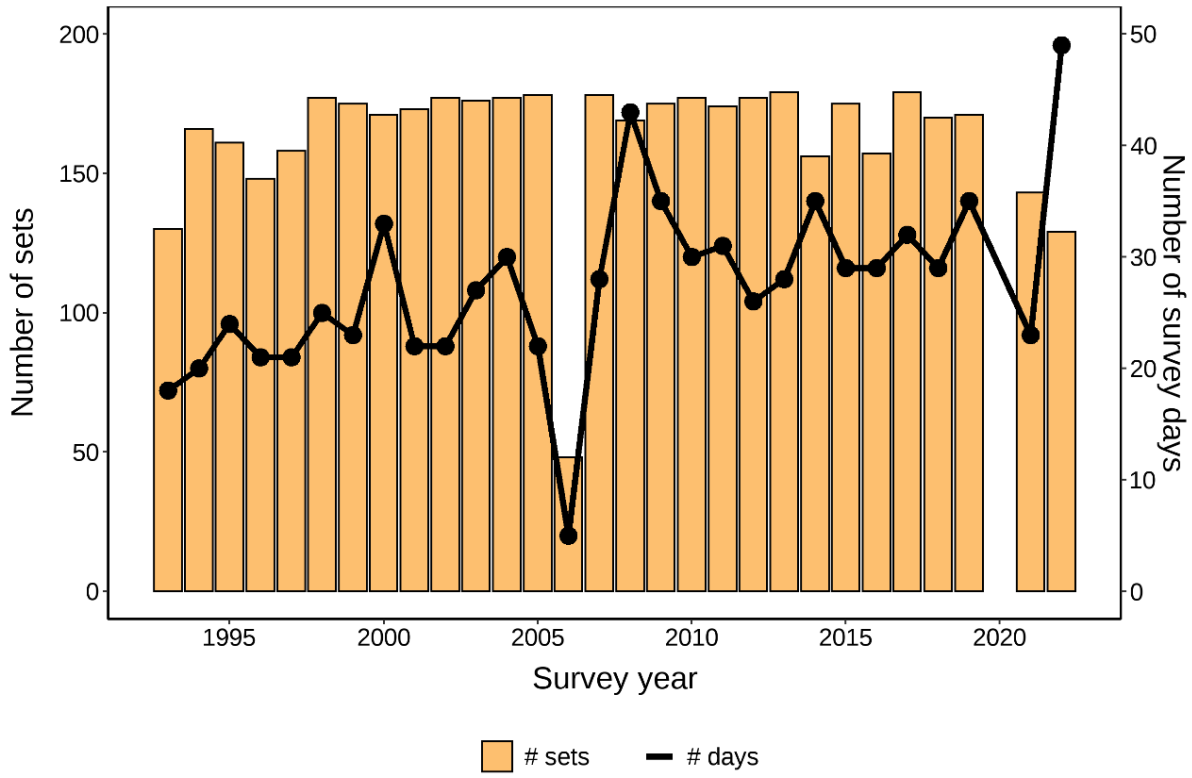

Figure 13. Number of research vessel survey sets (bars) completed during surveys of NAFO subDiv. 3Ps, and the number of days (solid black line with points) required to complete these sets. Survey coverage was expanded to present levels (i.e., covering all inshore and offshore index strata) in 1997.

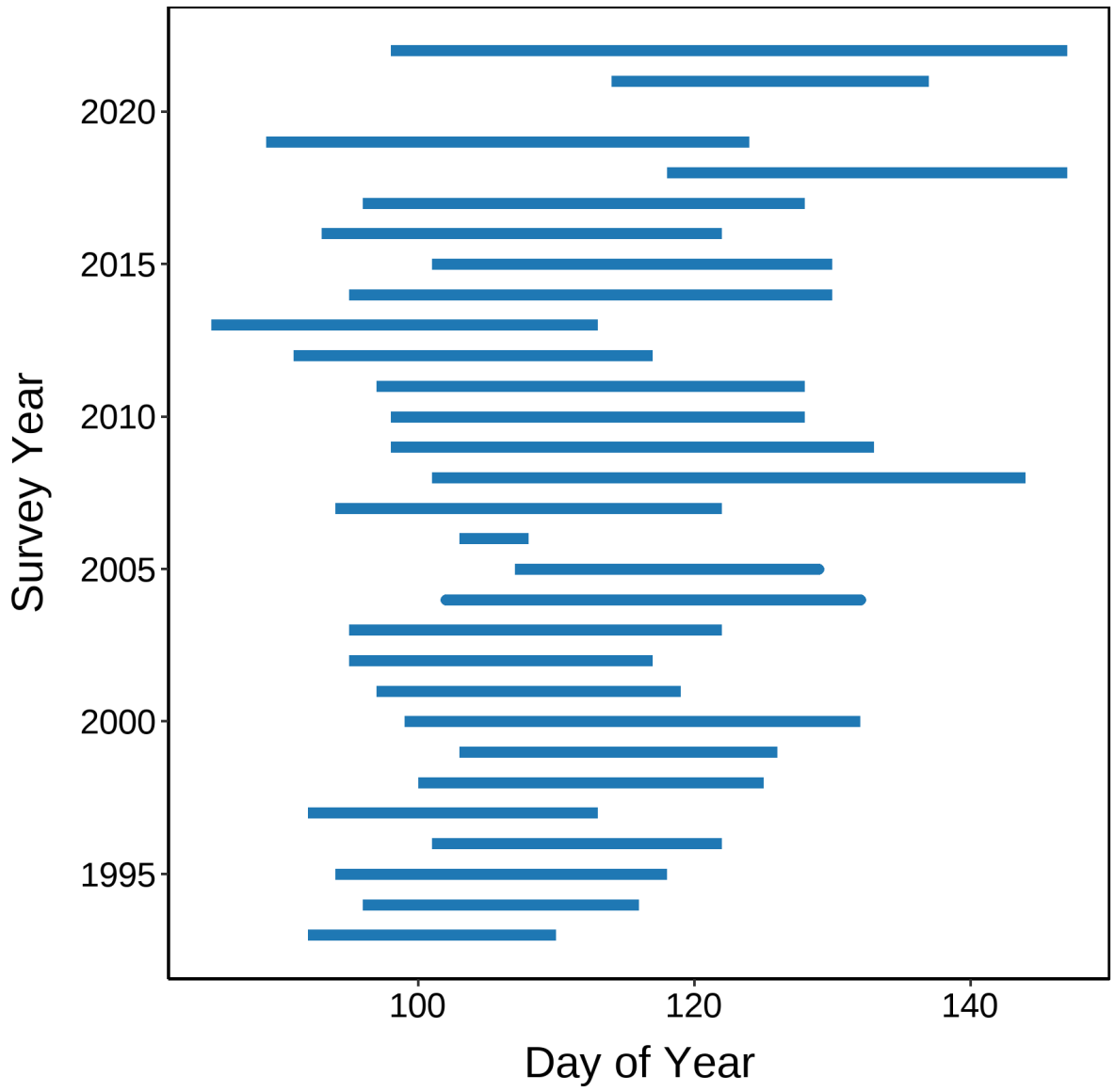

Figure 14. Timing of the survey in subDiv. 3Ps by day of the year. The survey was incomplete in 2006 and there was no survey in 2020 or 2023.

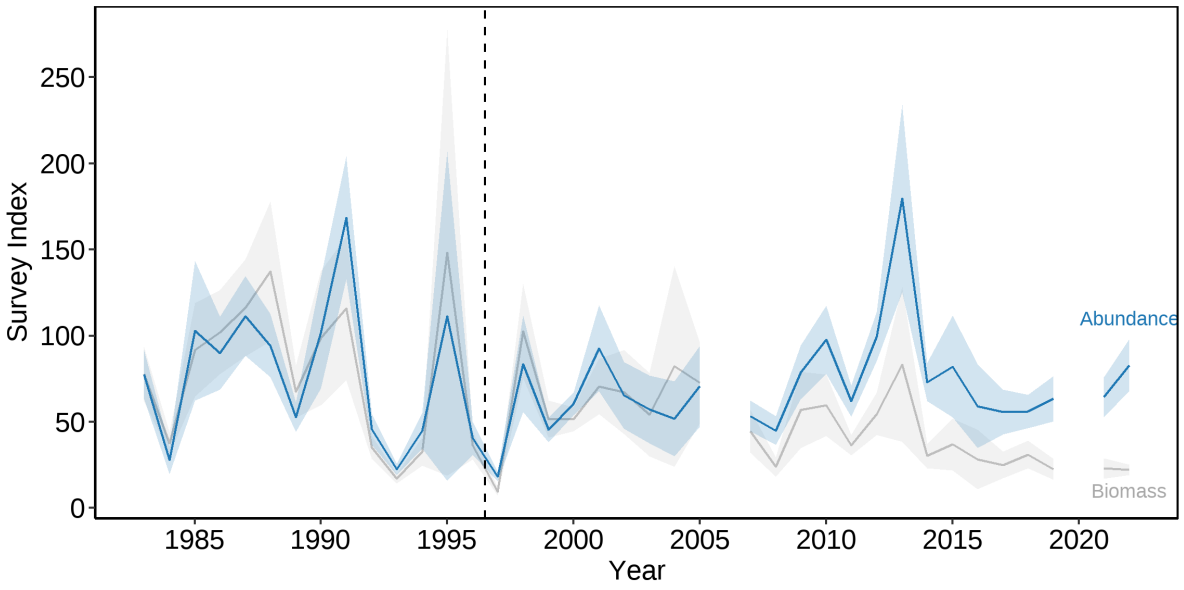

Figure 15. Campelen-equivalent survey indices of abundance (blue) and biomass (grey) from the annual 3Ps RV survey, Mean (solid line) +/- 1 Standard Error (shaded area). Surveys prior to 1994 did not cover inshore areas, from 1994–97 have varying inshore coverage, and include inshore and offshore areas since 1997. Indices are relative values and are therefore presented here without units. The survey was incomplete in 2006 and there was no survey in 2020 or 2023.

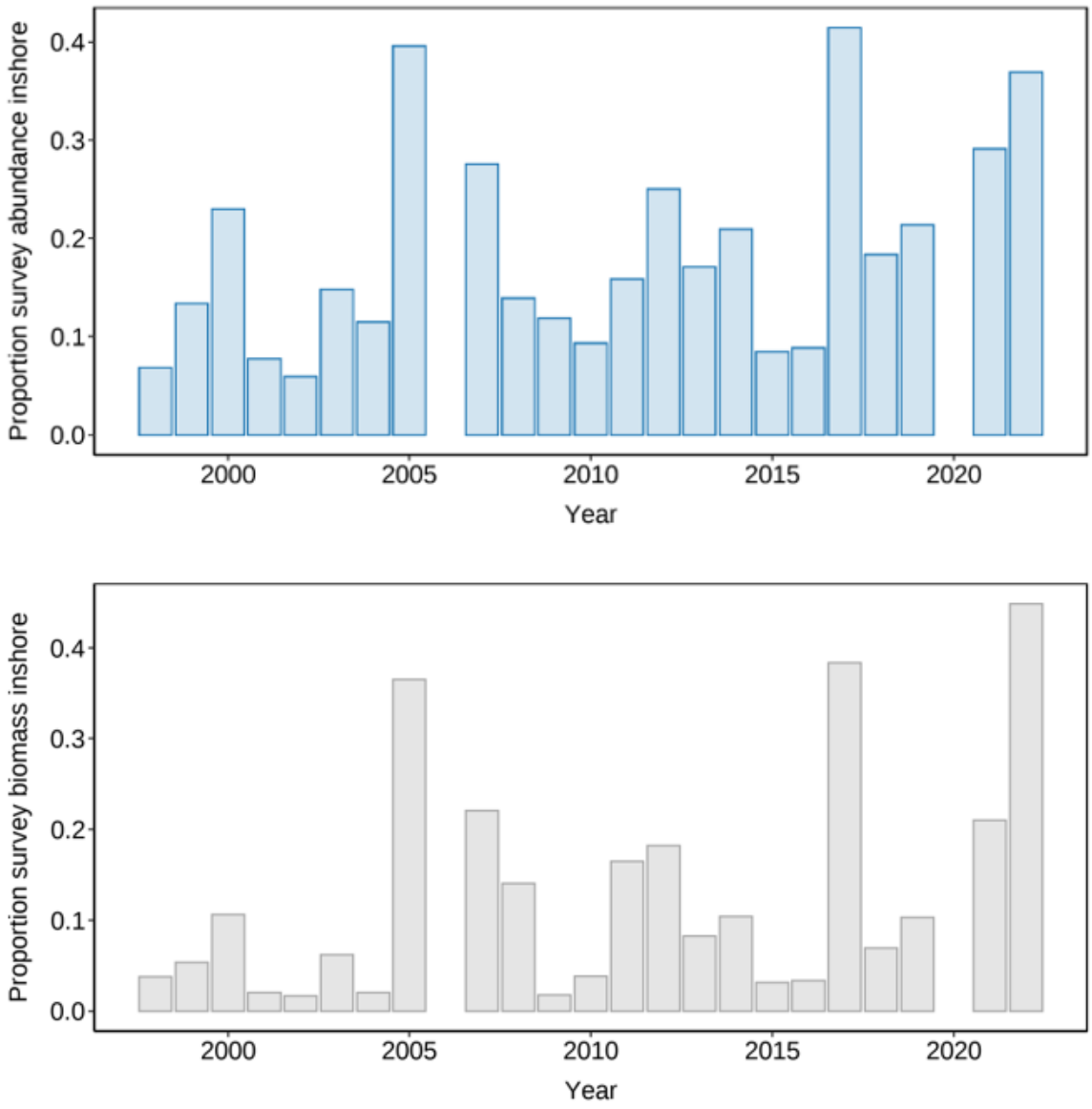

Figure 16. Proportion of survey abundance (top) and biomass (bottom) caught in the inshore strata of subDiv. 3Ps since 1998. The survey was incomplete in 2006 and there was no survey in 2020 or 2023.

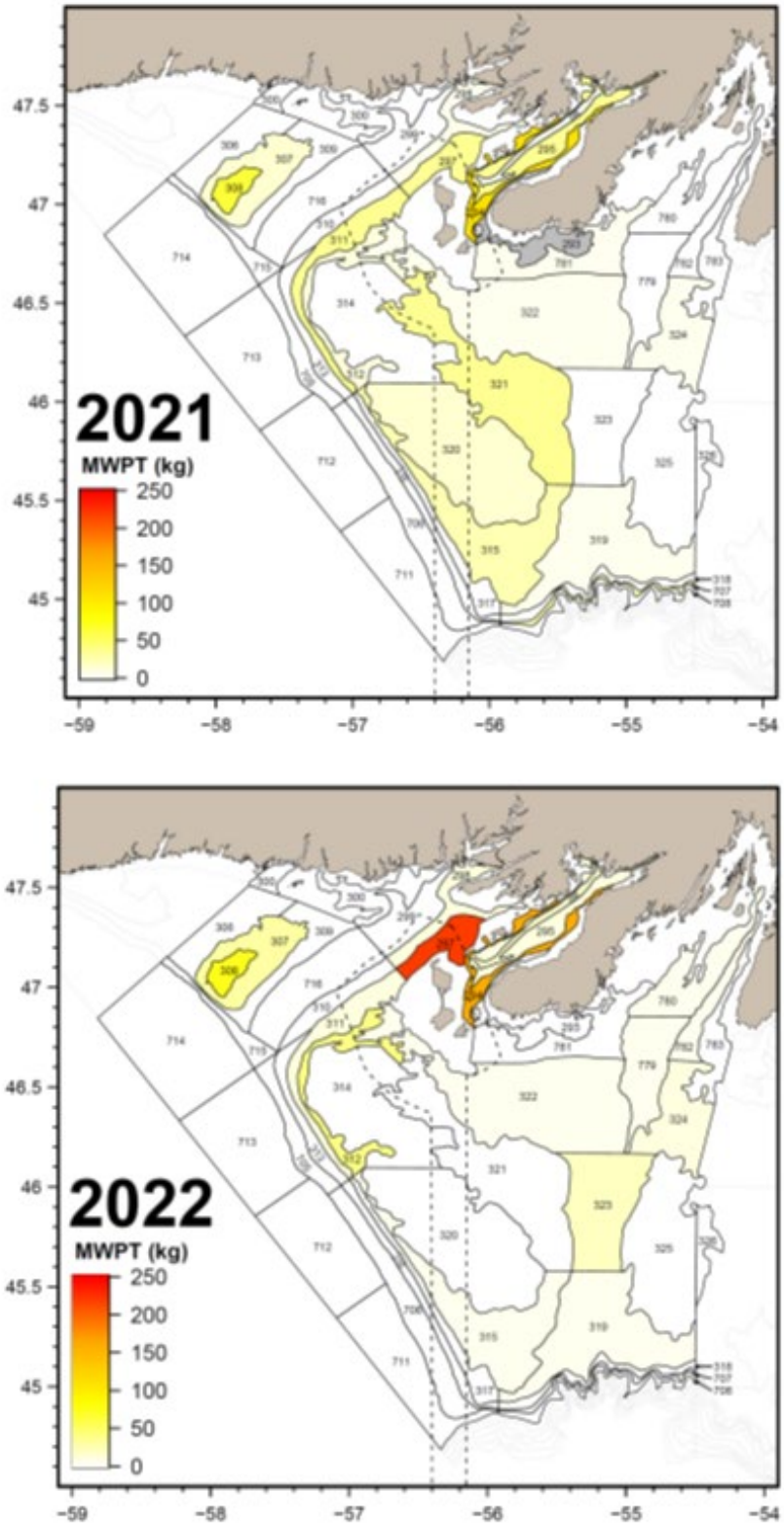

Figure 17. Distribution of survey biomass (mwpt = mean weight per tow) in 2021 (top) and 2022 (bottom) by strata. Grey shading indicates the stratum was incomplete.

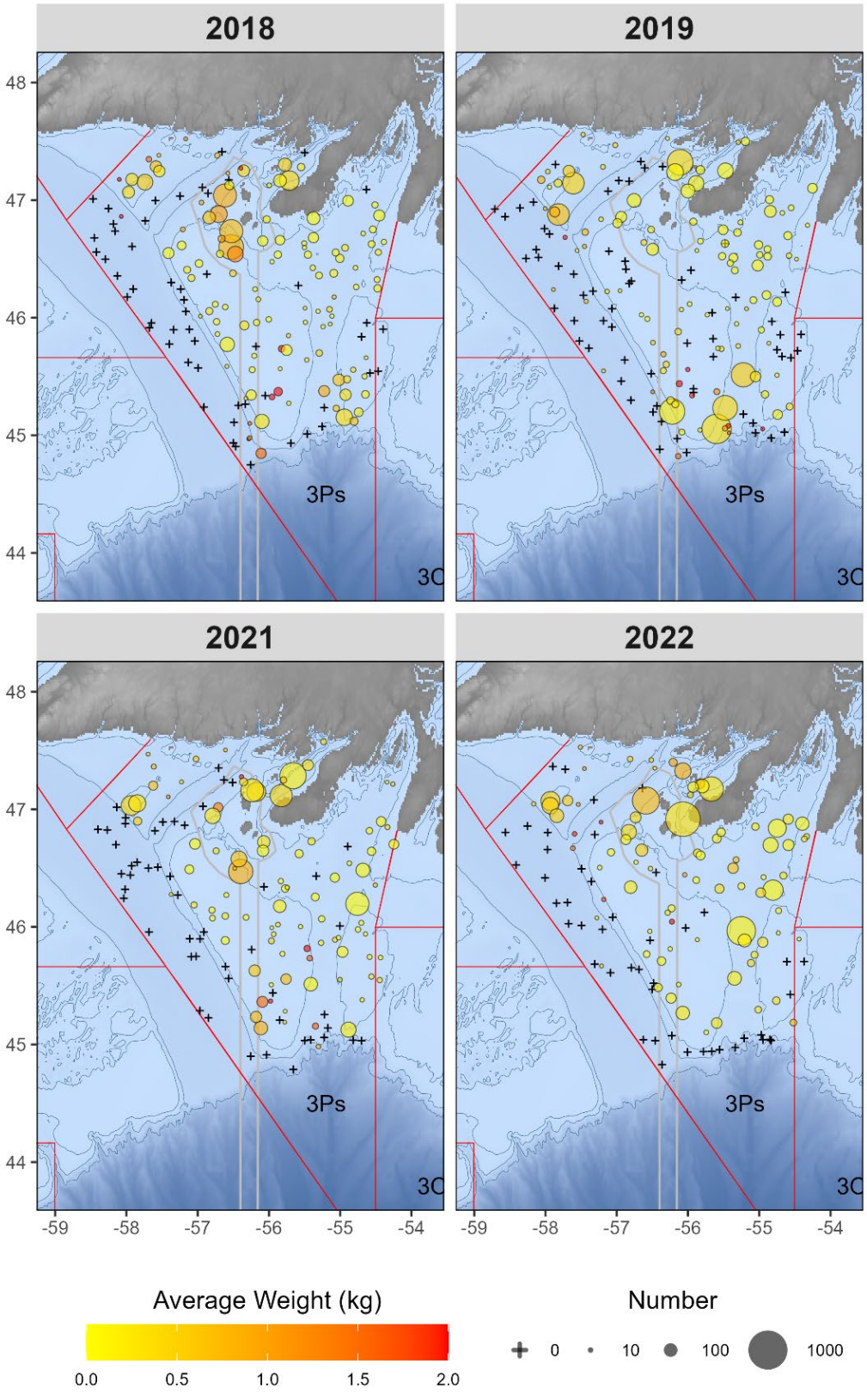

Figure 18. Number of fish (shown by bubble size) per 15 min tow from since 2018. Note there was no survey in the spring of 2020 or 2023. Color of bubbles indicates the mean size of cod within each tow.

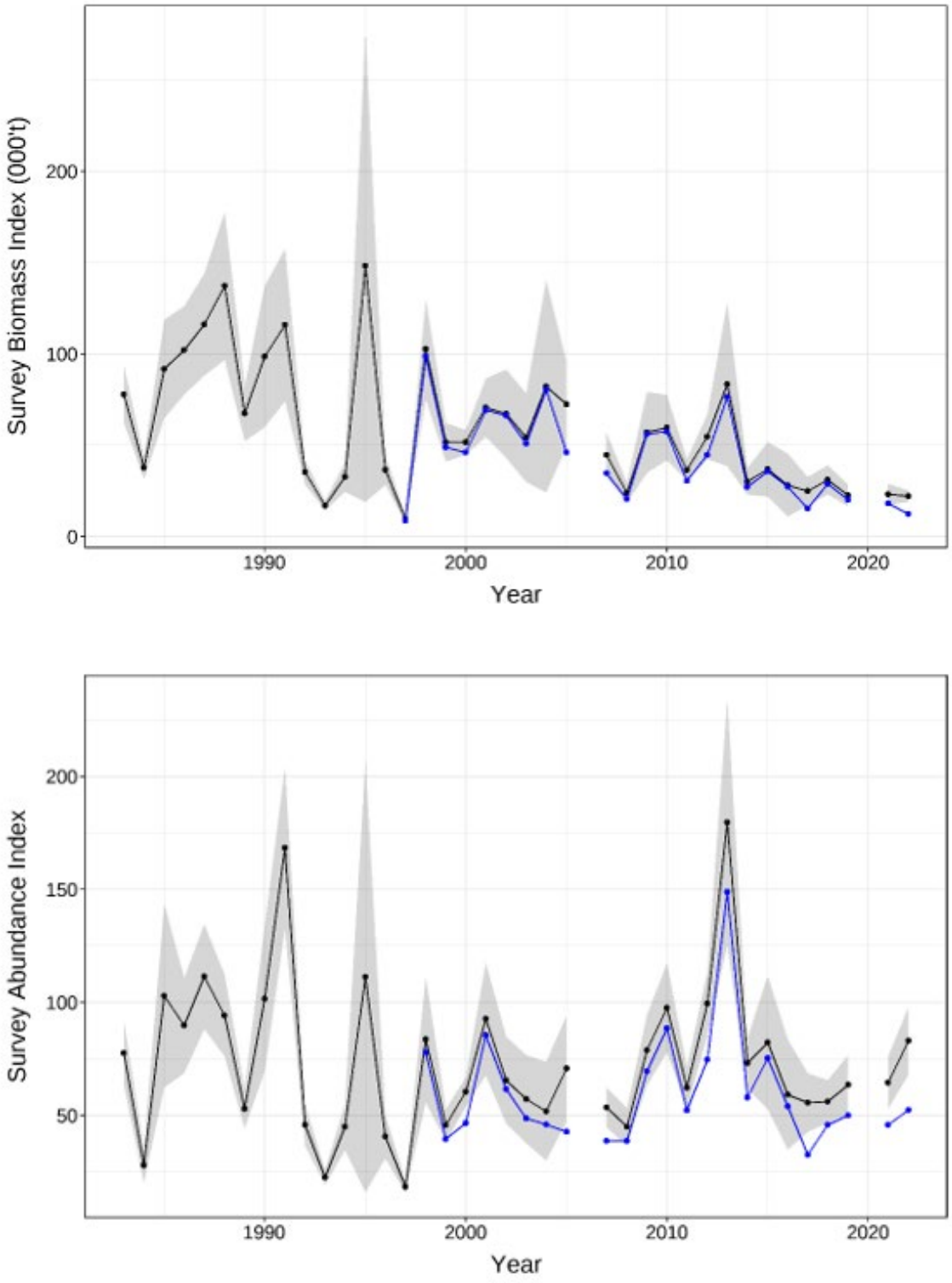

Figure 19. Comparison of biomass (upper panel) and abundance (lower panel) survey indices for cod in NAFO subDiv. 3Ps in all index strata (black; includes inshore strata added in 1997), and in offshore strata only (blue Shaded areas indicate +/- 1 standard deviation on the index for the whole area. The survey was incomplete in 2006 and there was no survey in 2020 or 2023.

Figure 20. Bubble plot of survey mean number per tow (mnpt) at age from 1997 to 2022. Bubble area is proportional to the mnpt, and colors coincide with cohorts. The survey was incomplete in 2006 and there was no survey in 2020 or 2023.

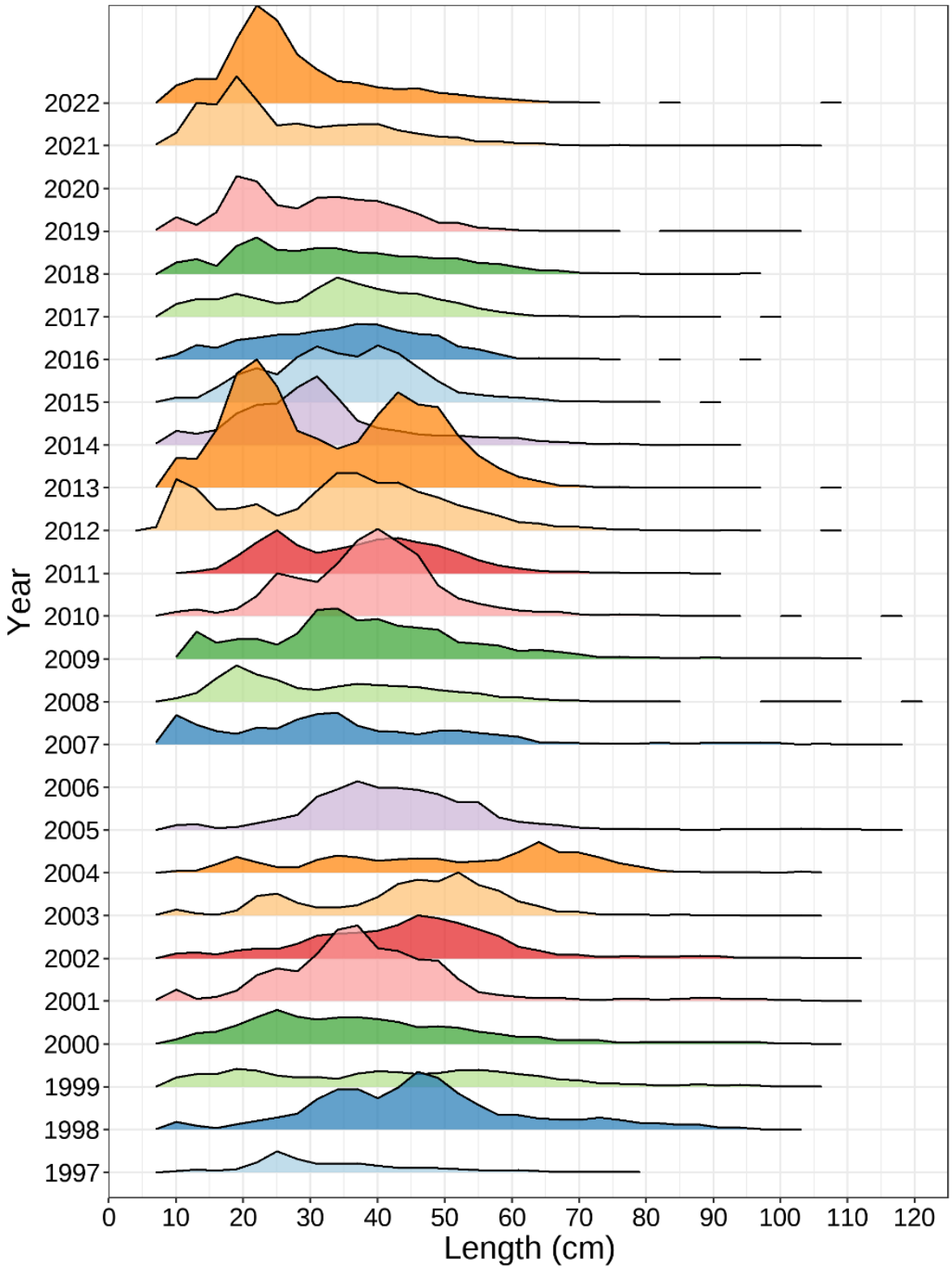

Figure 21. Length frequencies from the spring RV survey in NAFO subDiv. 3Ps from 1997 to 2022. The survey was incomplete in 2006 and there was no survey in 2020 or 2023.

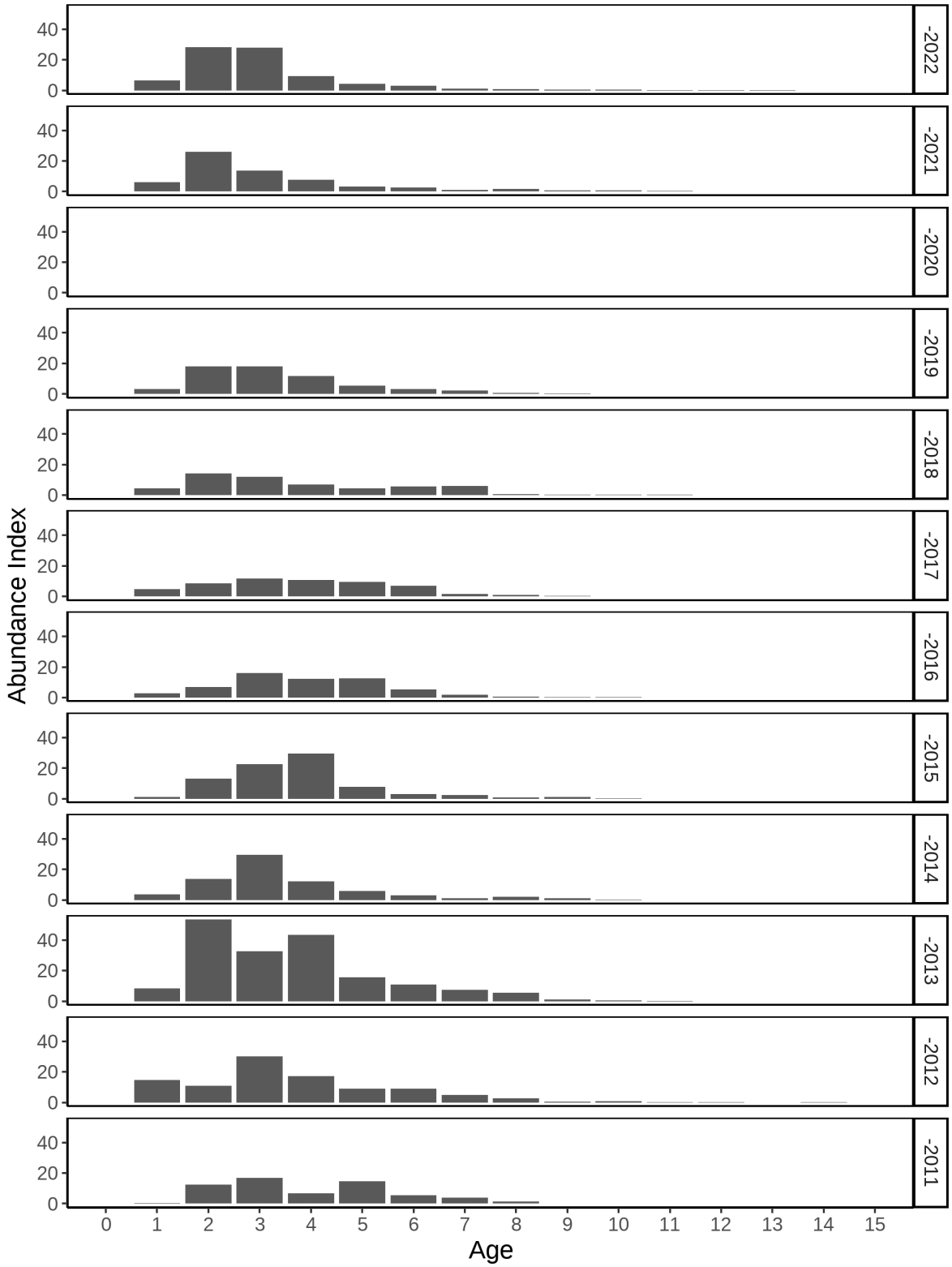

Figure 22. Survey abundance at age from 2011 to 2022. There was no survey in 2020 or 2023.

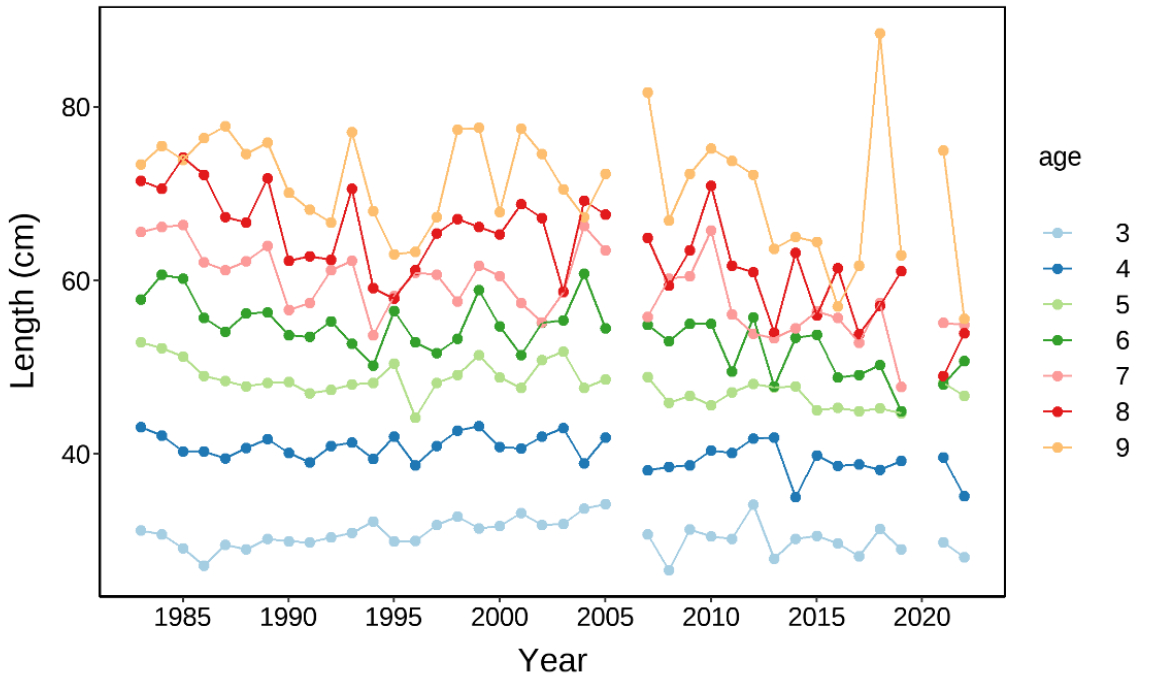

Figure 23. Mean length-at-age in the RV survey.

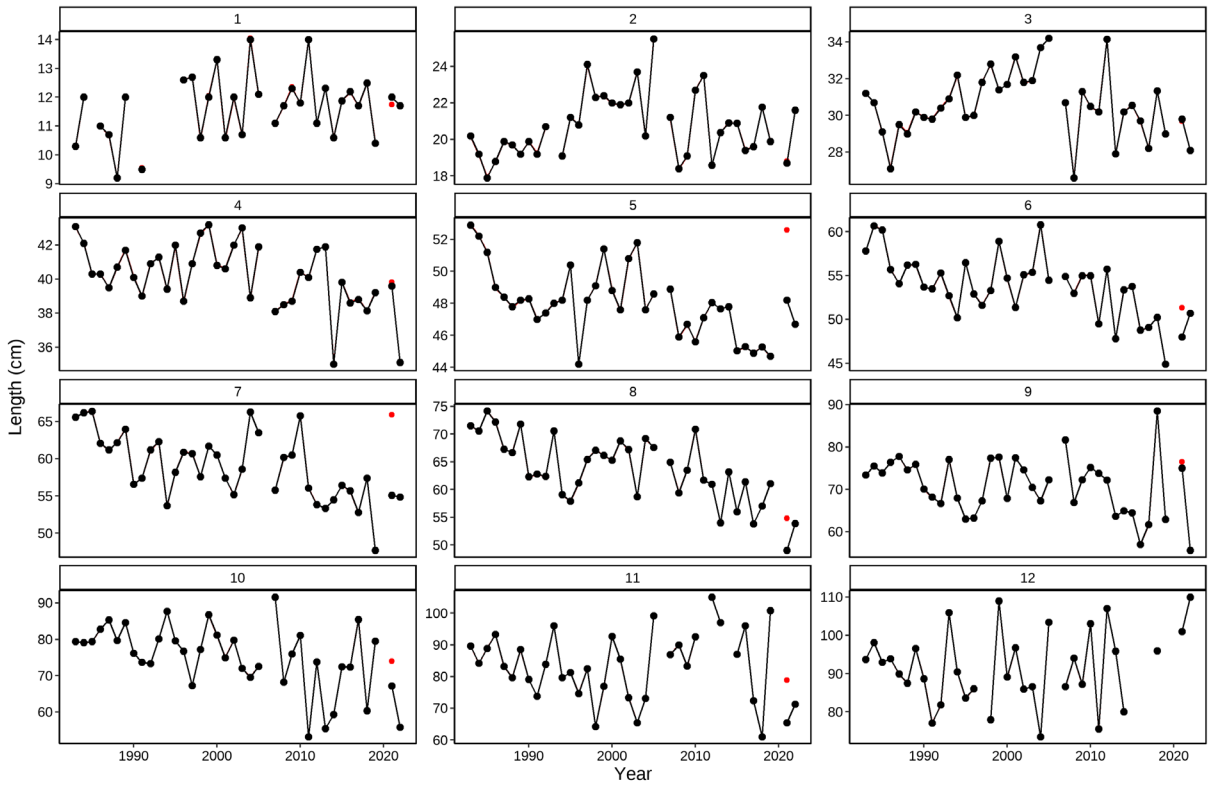

Figure 24. Comparison of length-at-age estimates from the 2021 assessment (red) and 2023 assessment. Estimates for 2021 were revised for the current meeting following the identification of an error in values used in 2021.

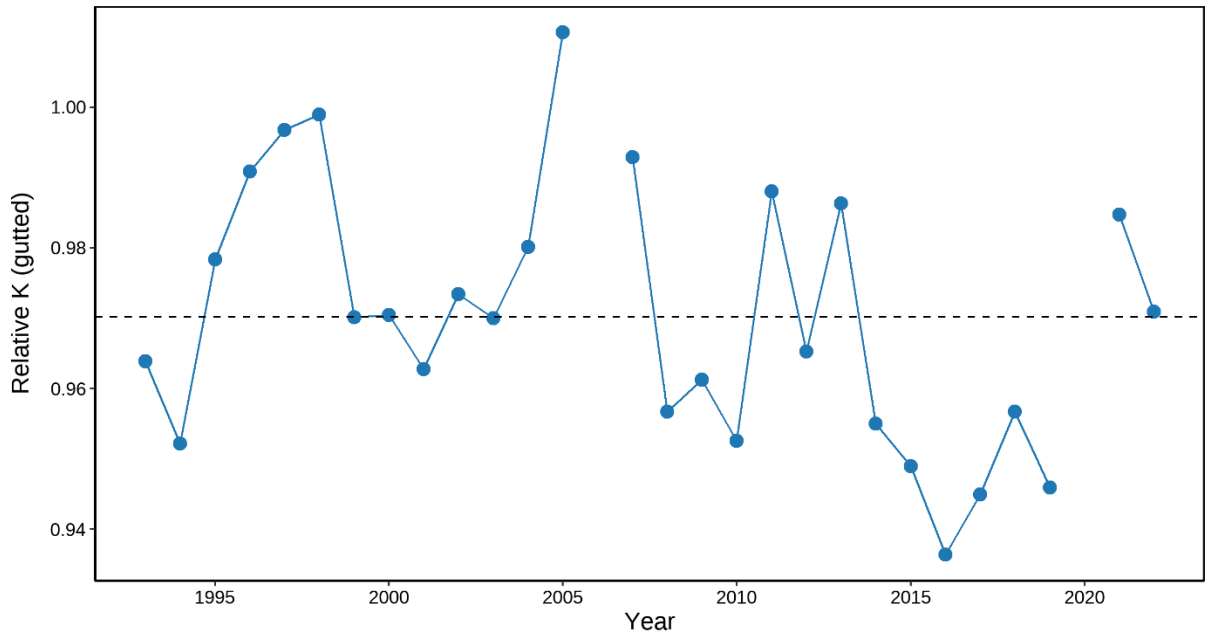

Figure 25. Relative gutted condition (relative K) calculated from RV survey data.

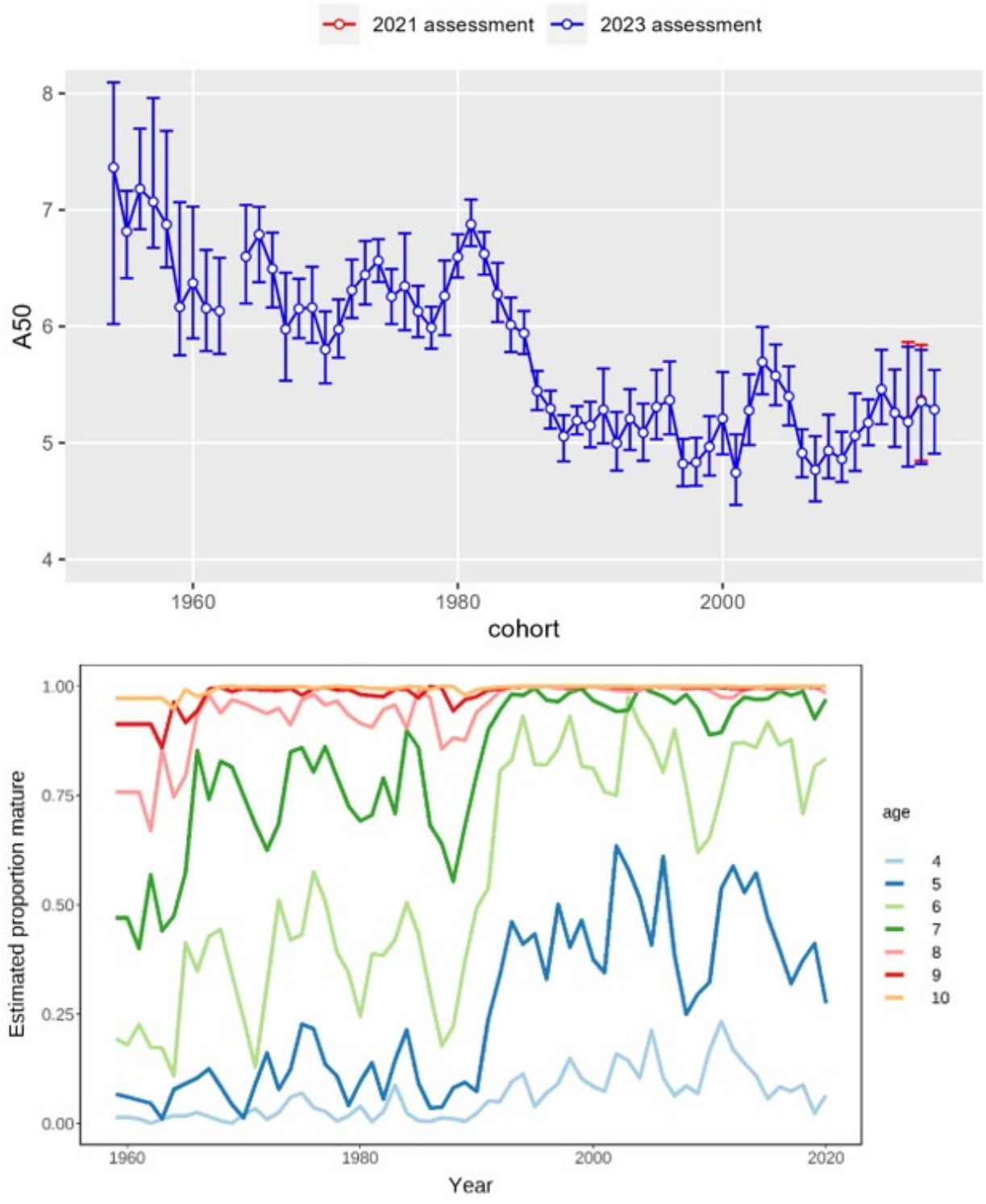

Figure 26. Estimated age at 50% mature by cohort (top; red points show estimates from the previous assessment), and proportion mature by age (bottom) for Atlantic cod in subDiv. 3Ps.

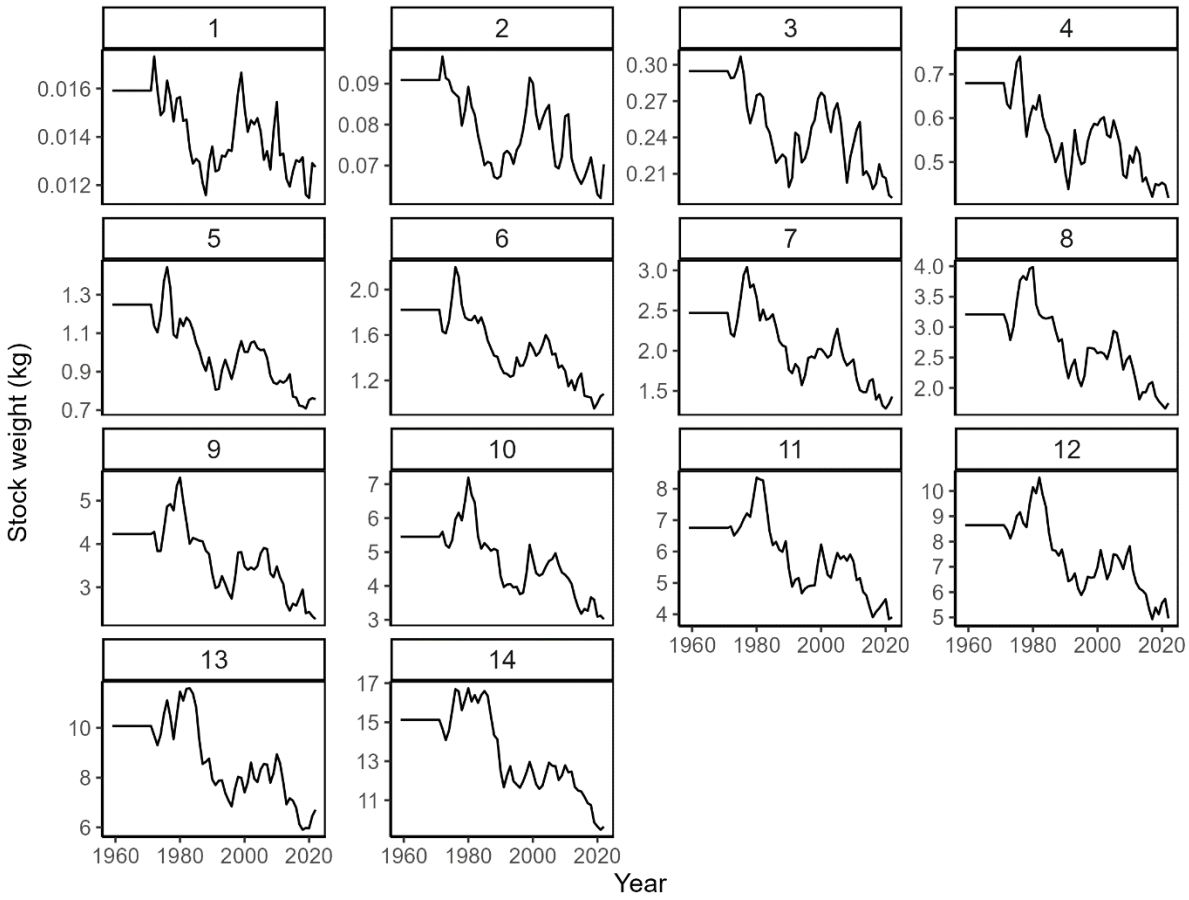

Figure 27. Stock weight-at-age modelled from RV survey data.

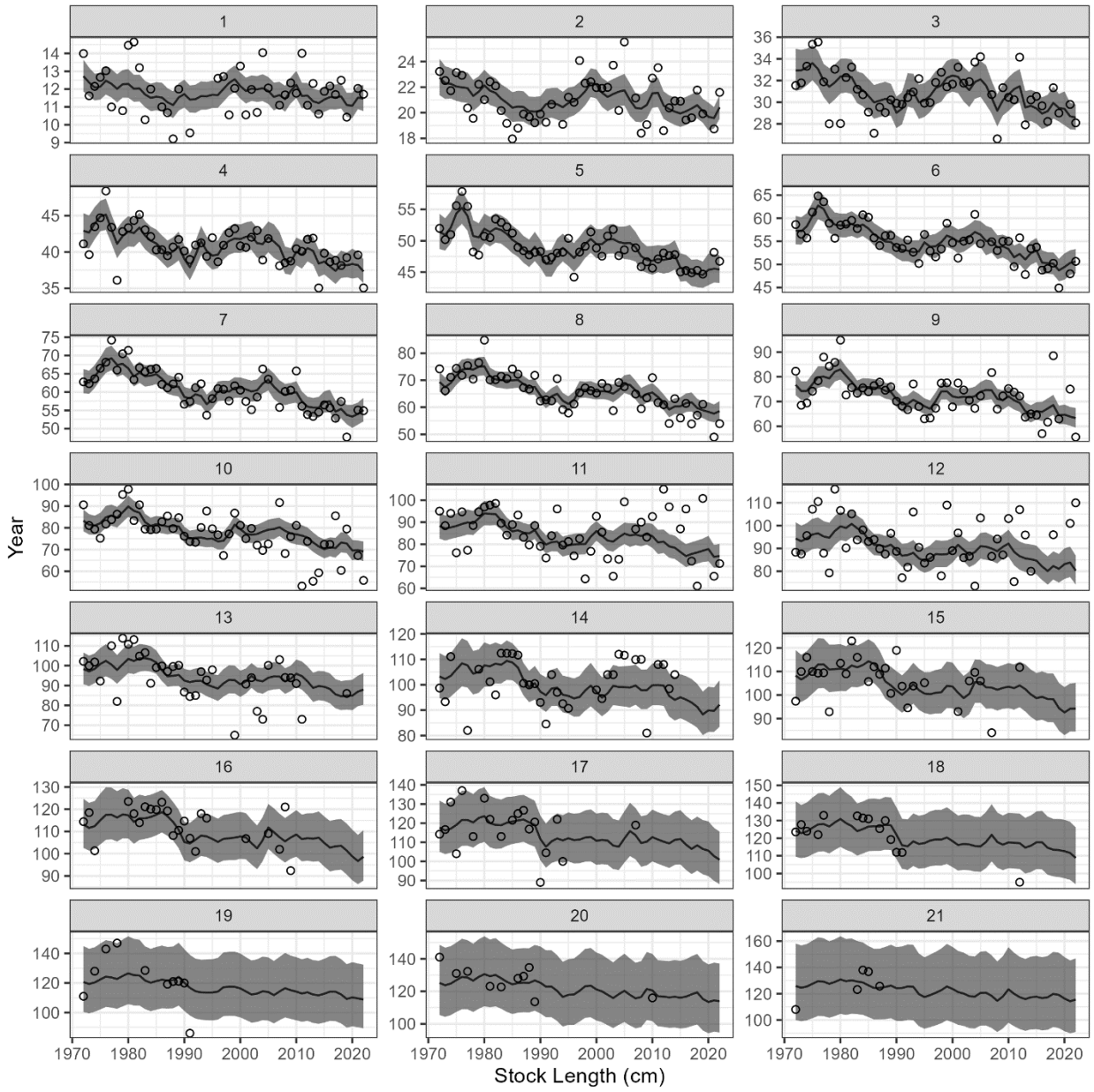

Figure 28. Observed (points) and model-predicted (lines) weight-at-age. Ages are listed at the top of each panel. Shaded regions indicate 95% confidence intervals.

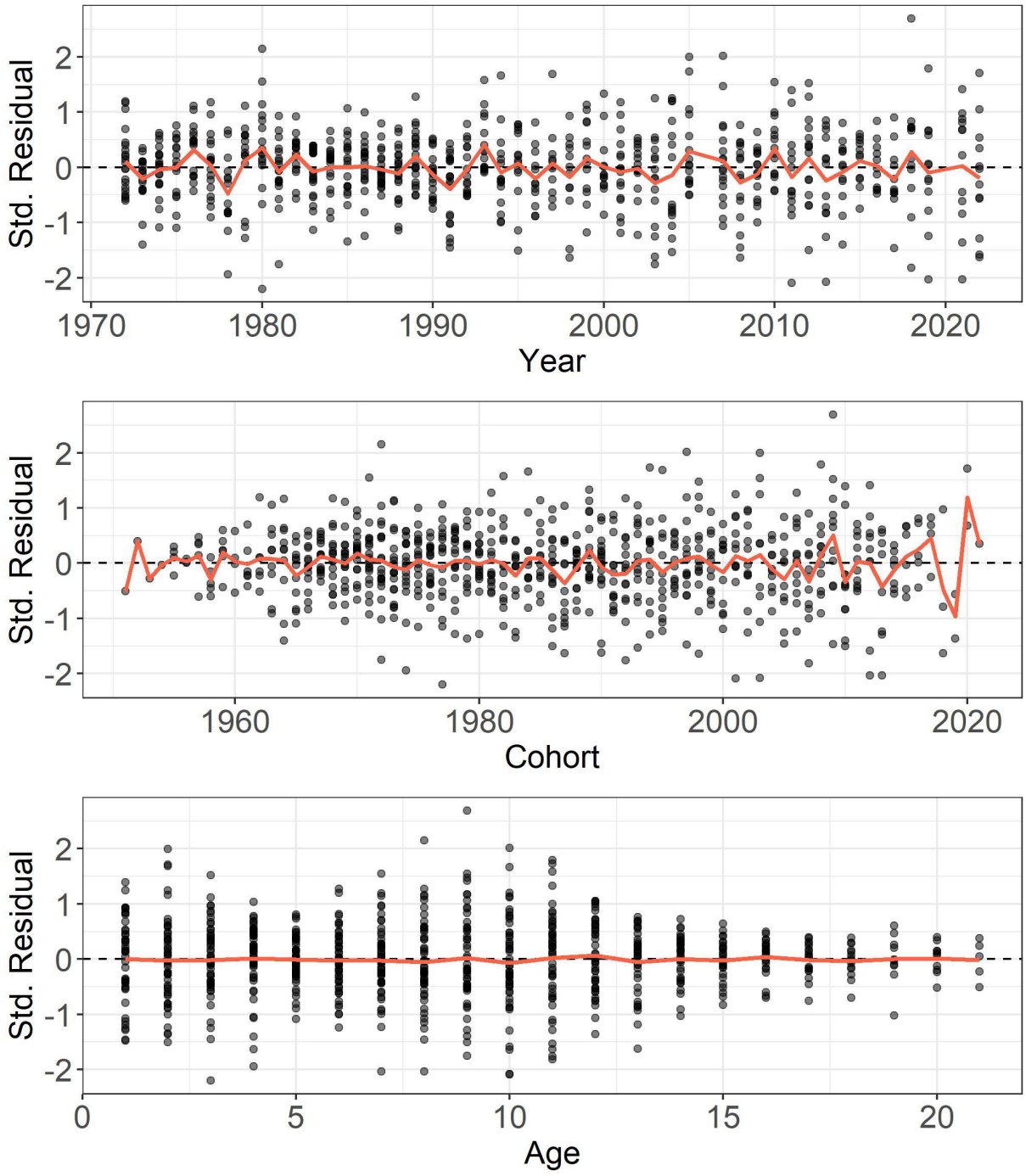

Figure 29. Standardized weight-at-age residuals versus year (top), cohort (middle), and age (bottom). Red lines indicate the average residual by year or cohort.

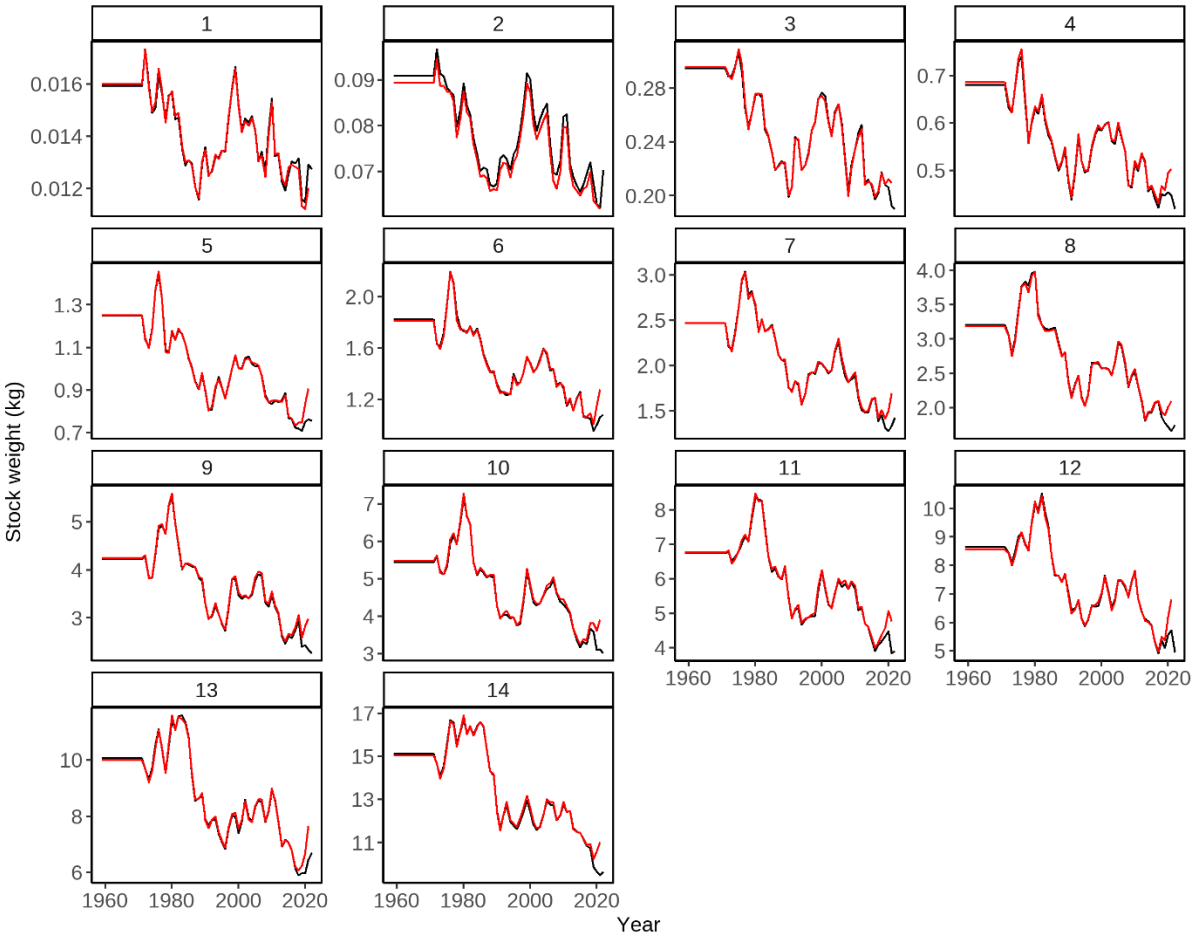

Figure 30. Comparison of stock weights from the 2021 assessment (red) and current estimates (black).