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The status of northern Gulf of St. Lawrence (3Pn, 4RS) Atlantic Cod (*Gadus morhua*) Stock in 2018

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Canada

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

Assessment of the Atlantic cod (*Gadus morhua*) stock of the northern Gulf of St. Lawrence (3Pn, 4RS) is based on data from commercial fisheries, a tagging program, an abundance index calculated from the Fisheries and Oceans Canada (DFO) research survey, abundance indices from the fixed gear sentinel fisheries program (longlines and gillnets), an abundance index from the mobile gear sentinel fisheries program and biological data. This document describes the data and methods used to assess a number of indicators including abundance, biomass, spawning biomass, natural mortality, exploitation rate and recruitment. It also includes a prediction of the stock trend until 2021.

Beginning in 2017–2018, the total allowable catch increased from 1,500 t to 3,185 t, which corresponds to an available fishing allocation of 2,769 t. Preliminary landings totalled 2,670 t in 2017–2018 and 2,515 t in 2018–2019. Catches in the recreational fishery are unknown.

In 2017 and 2018, indicators from the DFO research survey and the sentinel fisheries showed a decline in abundance ranging from 21% to 60% relative to 2016.

The virtual population analysis model indicates that the spawning stock biomass (SSB) has declined in the past two years, with a decrease of 46% in 2018 relative to 2016 reaching the lowest values in the last 20 years. This decrease in the spawning biomass is believed to be linked to high mortality, caused among other things by unaccounted fishing mortality and predation by grey seals and harp seals; however, the level of mortality is unknown.

The northern Gulf of St. Lawrence cod stock remains in the critical zone, well below the limit reference point (LRP). The estimated spawning biomass is in the critical zone, at 10% of the 2019 LRP. No significant signs of recruitment permitting short term recovery have been detected. According to the precautionary approach, harvests from all sources should be as low as possible to promote the recovery of this stock.

1. INTRODUCTION

Because of a marked decline in the northern Gulf of St. Lawrence Atlantic cod (*Gadus morhua*) population in the late 1980s and early 1990s, two moratoriums were imposed on the directed cod fishery (1994 to 1996 and 2003). Since it first reopened in 1997, the commercial fishery has been carried out exclusively by Canadian fixed gear fleets. Several management measures are in place, including total allowable catch (TAC), number and types of gear, area closures during spawning and in winter (3Ps portion), observers, dockside monitoring, minimum legal size, bycatch monitoring, and rules for the recreational fishery.

In recent years, commercial and recreational harvesting of this stock has been mainly carried out by Newfoundland and Labrador (NL) and Quebec fishers. From 2012 to 2016, the annual TAC was 1,500 t. The TAC increased to 3,185 t in 2017 and 2018, which corresponds to an available fishing allocation of 2,769 t. Preliminary landings totaled 2,670 t in 2017–2018 and 2,515 t in 2018–2019. The recreational fishery takes place from July to September, but catches for this activity are not known.

The northern Gulf cod spawning stock biomass has been in the critical zone, well below the LRP, since 1990 (Duplisea and Fréchet 2011, Brassard et al. 2018). In 2010, the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) designated the Laurentian North (3Pn, 4RS and 3Ps) cod population, which includes the 3Pn and 4RS stock, as endangered, based essentially on the extent of the decline (78–89%) in adult abundance over three generations (30 years). The Recovery Potential Assessment of the Laurentian North Designable Unit (3Pn, 4RS and 3Ps) of Atlantic cod was carried out in 2011 (DFO 2011). Concerning the northern Gulf Atlantic cod population (3Pn, 4RS), the report concluded that: 1) exploitation must be reduced to encourage stock recovery; 2) seal predation is contributing to the recent increase in cod natural mortality; 3) any decrease in natural mortality will aid in recovery; 4) it is important to maintain the fishery closure during the spawning season to facilitate successful reproduction; and 5) overfishing of local stocks must be avoided.

Since 2011, the status assessment of the 3Pn, 4RS cod stock has been performed every two years. The most recent peer review was conducted from February 21 to 22, 2019. In support of the scientific advice from this review (DFO 2019a), this research document presents the methods, data and results of the last assessment. The previous research document on this topic was produced in 2018 (Brassard et al. 2018).

1.1 BIOLOGY AND ECOSYSTEM

1.1.1 Biology

In summer, 3Pn, 4RS cod are distributed throughout the northern Gulf of St. Lawrence at depths of 50 to 200 m. In winter, the fish gather southwest (3Pn) and south (3Psa and 3Psd) of Newfoundland at depths of 300 to 500 m. Tagging studies indicate that this stock is generally isolated from neighbouring stocks. There seems to be little mixing with adjacent stocks, though some mixing occurs to the southwest (4T) and northeast (2J, 3KL) in summer, and to the southeast (3Ps) in winter (Yvelin et al. 2005).

Hypoxic conditions can affect cod metabolism (reduced physiological capacity: digestion, growth, fertility, condition). Oxygen concentrations below 70% are unfavorable (growth rate decreases, partial avoidance), and concentrations below 30% are avoided almost completely, as they are lethal to some fish (Chabot and Claireaux in Rose 2019).

The reproductive strategy of cod is based on an increase in the number of recruits produced per female with increasing age, a long breeding period, a relatively long lifespan, and a potential for homing to spawning sites. These characteristics help to maximize reproductive success despite the low probability of larval hatching coinciding with optimal feeding conditions (zooplankton productivity) (Winemiller and Rose in Rose 2019).

Breeding takes place near the beginning of the spring plankton bloom, and the temperature differences seem to explain much of the inter-stock variation in the spawning period. For northern Gulf cod, spawning takes place mainly in April and May at depths of 200 to 250 m. The main spawning area is found off Port au Port (west coast of Newfoundland). Age at 50% maturity for the northern Gulf stock was between 5 and 6 years before 1993 and has been between 4 and 5 years since then.

After spawning, the eggs and larvae are pelagic and disperse with the currents over a period of two to three months. The ideal temperature for larval survival is 7 to 14 °C (Rose 2019). The feeding period following yolk sac resorption is quite critical. Conditions during this period can significantly influence the size of a cohort. In this regard, larval growth and survival are positively correlated with plankton density, while water movement and swimming ability are also factors influencing prey capture. Lastly, the presence of predators can reduce the size of a cohort.

This larval period is followed by a pelagic juvenile phase which takes place at a greater depth than the previous phase; during this time, the larvae are about 17 mm long. Juveniles (30 to 60 mm in length) subsequently seek out demersal areas, where they appear to prefer habitats with cobble, grass beds, and sponges, based on laboratory experiments (Rose 2019).

Cod diet varies with fish size: smaller cod feed mainly on small prey (zooplankton, crustaceans), while larger cod feed on, among other things, capelin (*Mallotus villosus*), herring (*Clupea harengus*), redfish (*Sebastes spp.*), flatfish, cod, and crab. Data on the diet of cod in the northern Gulf suggest that these fish have a diversity of food sources, and do not seem to be dependent on a single prey item, though some cod populations are much more specialized (Rose 2019).

Cod are preyed on by various species depending on the size of the cod (northern shortfin squid (*Illex illecebrosus*), grey seal (*Halichorus grypus*) (Carrie et al. 2007), harp seal (*Pagophilus groenlandicus*), Atlantic halibut (*Hippoglossus hippoglossus*), Atlantic mackerel (*Scomber scombrus*) and herring). Grey seals are essentially piscivorous, and their diet is mainly focused on cod at the end of the season (Hammil et al. 2007). In NAFO (Northwest Atlantic Fisheries Organization) Subdivisions 3Pn and 4Rd, cod make up 21% of the diet of harp seals from April to October and 42% the rest of the year. These prey are usually small (3 years and under) (Hammil et al. 2014).

Predation can have a major impact on cod population status. This pressure is likely also responsible for changes in cod distribution showing a shift to deeper waters (Swain et al. 2015). A number of studies conducted in the southern Gulf of St. Lawrence (4T) are currently reporting high grey seal predation on cod (Benoît et al. 2011), which is preventing the recovery of this stock (Neuenhofff et al. 2019).

1.1.2 Ecosystem

Every year, DFO's Atlantic Zone Monitoring Program (AZMP) assesses the prevailing physical oceanographic conditions in the Gulf of St. Lawrence. The Gulf of St. Lawrence ecosystem has undergone significant changes in recent decades. Surface waters and deep waters are warming and becoming depleted in oxygen, particularly at the heads of channels. The volume of water in the cold intermediate layer (CIL) in summer has been decreasing since 2007, and the CIL

temperature index shows some inter-annual variability although an upward trend has been observed since 2000 (Galbraith et al. 2018).

Compared to the historical averages, the surface temperatures observed throughout the Gulf from May to November reflected above-average conditions in 2017 and below-average conditions in 2018. The water volume in the cold intermediate layer (CIL) in summer has been decreasing since 2015 but showed average characteristics in 2017 and 2018 in contrast with the CIL temperature index, which was slightly warmer than average (1981–2010) in 2017 and 2018. The channel-bottom temperature was warmer than average in 2017 and 2018 (Galbraith, personal communication 2019).

In recent years, the oxygen concentration in the water has decreased significantly in some areas of the Gulf of St. Lawrence, particularly at the heads of deep channels (Galbraith et al. 2018). The annual DFO survey conducted in August has shown for several years that cod are not present in the hypoxic (< 30%) waters located at the heads of channels. However, in summer, cod are not typically found at great depths in the Gulf of St. Lawrence. In 2016, the dissolved oxygen level at cod wintering sites was 45% (Galbraith et al. 2017).

Although nutrient inventories were highly variable during the 1999–2017 period in the northern Gulf of St. Lawrence, many of the strongest negative nutrient anomalies have been observed since 2010. At the same time, the satellite data show a decrease of about 5% in the annual phytoplankton biomass in the northern Gulf. However, the data collected at sea tend to indicate a recent increase in chlorophyll in the fall, particularly in the northeastern Gulf, which may point to a change in phytoplankton phenology (Blais 2018).

In the northern Gulf, zooplankton biomass has also declined significantly since 2010 with an even greater decrease since 2015. Zooplankton biomass declined by about 30% between 2010 and 2017. This marked decrease in biomass is linked to a change in size structure within the community. During the same period, the abundance of small calanoid copepods (for example, *Pseudocalanus* spp.) increased, while that of large, energy-rich calanoid copepods (for example, *Calanus finmarchicus*) decreased. The abundance of non-copepod species has also increased in recent years. These changes observed at lower trophic levels and in zooplankton species composition could affect energy transfer to higher trophic levels.

The demersal community in the northern Gulf of St. Lawrence was dominated by redfish and cod before the collapse of these stocks. At the same time, there were significant increases in several invertebrate species (shrimp, crab). In recent years, the deepwater redfish (*Sebastes mentella*) population has grown considerably. Based on the DFO research survey, several species seem to be increasing in abundance: Atlantic halibut, witch flounder (*Glyptocephalus cynoglossus*), black dogfish (*Centroscyllium fabricii*), blacksnout snailfish (*Paraliparis copei*), lumpfish (*Cyclopterus lumpus*) and thorny skate (*Amblyraja radiata*). However, the abundance index for the following species shows signs of decline: Atlantic hookear sculpin (*Artediellus* sp.), Arctic staghorn sculpin (*Gymnocanthus tricuspis*), Atlantic soft pout (*Melanostigma atlanticum*) and smooth skate (*Malacoraja senta*) (Bourdages et al. 2019).

Among northern Gulf invertebrates, over the past few years, a decrease in biomass has been noted for most shrimp species (decapods), while an increase has been noted for northern shortfin squid (warmer water species) and for some amphipod and echinoderm species.

The Canadian Northwest Atlantic grey seal population has been increasing since 1960; it consisted of more than 420,000 individuals in 2016. Grey seal numbers in the Gulf of St. Lawrence vary from season to season. In the northern Gulf, for example, their abundance in summer may be twice that in winter. According to DFO (2017), on average there are more than 2,000 grey seals in 3Pn, 4RS at different times of the year.

The harp seal population is very abundant (more than 7 million individuals in 2012). A portion of this population arrives in the Gulf of St. Lawrence in the fall and returns to the waters of the Canadian Arctic and Greenland in April and May (DFO 2014).

Seals, the main natural predator of cod, can compromise the recovery of a cod stock (Cook *et al*. 2015). Predation on cod in the northern Gulf is poorly documented, but several studies conducted in the southern Gulf of St. Lawrence (4T) report high levels of grey seal predation (Bousquet *et al*. 2014; Hammil *et al.* 2014; DFO 2019b), to the point of causing a shift in the distribution of cod to deeper waters less suitable in terms of food availability (Swain et al. 2015).

The components of the St. Lawrence ecosystem and the changes observed in it could have effects on cod, such as impacts on productivity and changes in the occurrence and intensity of interspecific interactions (predation, competition). However, the magnitude of these effects is unknown. Nevertheless, an increase in predator (grey seal and harp seal) populations or a decrease in food availability could have a negative impact on the northern Gulf cod stock.

1.2 MANAGEMENT MEASURES

Prior to 1999, the management year for 3Pn, 4RS cod followed the calendar year, namely January 1 to December 31. Since 2000, the management year for this stock has run from May 15 to May 14 of the following year. To bridge the gap between these two calendars, the 1999 management year ran from January 1, 1999 to May 14, 2000. This stock is currently managed on a two-year cycle. Since the reopening of the directed fishery, after the first moratorium, the fishing pattern has changed, and the fishery now takes place mainly from July to November.

Management measures include an annual TAC, specific gear characteristics, observer coverage, dockside weighing, minimum legal size (≥ 43 cm), a small fish protocol, by-catch provisions, regulations (periods) for the recreational fishery, and a vessel monitoring system (VMS) for large longliners. Additional management measures are described below.

1. To limit catches of 3Pn, 4RS cod, which could be mixed with the 3Ps stock in winter, the 3Ps (d) and (g) management units are closed to fishing from November 15 to May 16, while in the 3Ps (a) management unit, fishing is permitted during this period but only for residents. In addition, the whole of Subdivision 3Ps is closed from March 1 to May 16.
2. To protect fish during spawning:

- Closure of the groundfish fishery from April 1 to June 23 in part of Division 4R offshore from St. George's Bay and Port au Port Bay, a known spawning area; and
- Closure of the directed cod fishery from April 1 to June 23 (during the spawning period) in Divisions 3Pn, 4RS.

1.2.1 Coral and sponge conservation areas in the Estuary and Gulf of St. Lawrence

On December 15, 2017, DFO created 11 coral and sponge conservation areas in the Estuary and Gulf of St. Lawrence in order to protect areas with high concentrations of sponges and sea pens.

All fishing activities that use bottom-contact gear or gear that comes into contact with the sea bed, including bottom trawls, dredges, gillnets, bottom longlines, bottom seines and traps, are prohibited in these conservation areas.

1.2.2 Quebec Region

A temporary sharing of the North Shore's cod allocation between the Upper and Middle North Shore (UMNS) fleet and the Lower North Shore (LNS) fleet was established in 2017 and renewed in 2018. Thus, the respective shares of these two fleets, defined on the basis of the history of landings, stand at 85% for the LNS and 15% for the UMNS. Please note that this sharing arrangement could be revised for 2019. In addition, an individual quota (IQ) pilot project for the LNS fleet was initiated in 2017 and renewed in 2018. The LNS allocation has been split into temporary IQs assigned to eligible ground fish license holders, according to the history of landings associated with their licenses during predetermined reference periods.

1.2.3 Newfoundland and Labrador Region

The inshore fixed gear 3Pn, 4RS cod stock fishery for Newfoundland and Labrador fishers is a competitive fishery with weekly catch limits. In 2017 and 2018, each license holder was limited to a maximum cod catch of 1,361 t (eviscerated weight) or 1,633 t (round weight) per week. The fishery comprised several fishing periods from July to December, in accordance with the conservation harvesting plan established for the fleet. Most of the total allocation available to the Newfoundland and Labrador-based fleet in 2017 and 2018 (approximately 2,100 t) was landed in July (about 58%). The rest of the fleet allocation was landed during the September fishing period (about 22%), the fishing period in early November (about 3%), and the fishing period from mid-November to mid-December (about 12%).

2. METHODOLOGY

The list of fishers (Quebec and Newfoundland and Labrador) who participated in the assessment of Atlantic cod in the northern Gulf of St. Lawrence in 2017 and 2018 can be found in Appendix 1.

2.1 COMMERCIAL FISHERIES

2.1.1 Landings, fishing effort and observers

Since 1997, Newfoundland and Labrador cod fishers have been required to complete a logbook for vessels under 10.66 m (35 ft.). This logbook is an initiative of DFO Science in the Newfoundland and Labrador Region. After completing their logbooks, fishers submit them to the Science office for processing. They contain information such as fishing effort data which is used to determine catch per unit effort (CPUE). The logbook information is not captured in official DFO statistics or in the ZIFF (Zonal Interchange File Format).

Since 1999, Quebec fishers with the fleet of boats under 13.71 m (45 ft.) have been required to complete logbooks. These logbooks are used to identify the characteristics of the fishery (type of gear, number, soak time), position, dates of activity and catch weights. In Quebec, the logbooks for all fishing vessel categories also include a section on purchase slips (completed by the buyer's representative) and the weigh-out summary (during dockside weighing). In these cases, DFO's statistics sector (regional offices) captures the data and it is made available in ZIFF files.

Performance indices for the commercial fishery based on logbook data for the fixed gear fleets (gillnet and longline, Newfoundland and Labrador vessels under 10.66 m and Quebec vessels under 13.71 m) represent about 70% of annual landings in NAFO Divisions 3Pn, 4S and 4R. The mean CPUE and confidence intervals are calculated based on the raw data. Usable data from logbooks represent over 50% of the landings from these fleets. Logbook data for the fleet of vessels over 13.71 m (45 ft.) in Quebec (large longliners) are also presented. To produce the

index for large longliners, the raw data are standardized (factors: month and NAFO Division) by using a multiplicative model (Gavaris 1980).

$$\ln CPUE_{ijkl} = \ln \mu + \ln D_j + \ln M_k + \varepsilon_{ijkl}$$

where:

$CPUE_{ijkl}$ = CPUE in the first activity

ln μ = log of mean CPUE

D_j = effect of j^{th} level of the factor NAFO Division

M_k = effect of k^{th} level of the factor Month

ε_{ijkl} = log normal distribution of residuals

In Quebec and in Newfoundland and Labrador, the DFO commercial catch sampling program allows regular collection of data on cod length and otoliths (see age readings, section 2.3.1).

The data from the observer program (commercial fisheries) are used to track the rates of bycatches in the directed cod fishery. The same data are also collected in the turbot, shrimp and Atlantic halibut fisheries in order to estimate the cod bycatch in these fisheries.

2.1.2 Telephone survey

Since 1998, Fish, Food and Allied Workers (FFAW) and the Lower North Shore Fisherman's Association (LNSFA) have carried out an annual telephone survey with fixed gear fishers (random draw) who hold a directed cod license. The objective is to document various issues related to commercial cod fishing in the northern Gulf of St. Lawrence. Fishers are asked to answer a number of questions (Appendix 2) regarding their general view of the fishing season, their performance and the size and condition of the fish caught.

2.2 SURVEYS

2.2.1 Fisheries and Oceans Canada (DFO) research survey

Since 1990, DFO has conducted a multidisciplinary research survey (groundfish and shrimp) throughout the northern Gulf of St. Lawrence using a bottom trawl. This survey uses a stratified random sampling design (Figure 1). Because of a change in fishing vessel and gear type in 2004, comparative fishing was carried out to ensure continuity of the series. The fishing gear that has been used since 2004 is a Campelen 1800 shrimp trawl equipped with Rockhopper footgear (McCallum and Walsh 2002). A detailed description of the fishing and sampling protocol and the calculation methods are presented in Bourdages et al. (2018). In 2017 and 2018, 47 and 53 stations were completed in 4R, and 83 and 75 stations in 4S, respectively. Note that this sampling design does not include Subdivision 3Pn (Figure 2a). The average depth of the sites sampled is 212 m.

2.2.2 Sentinel survey (fixed and mobile gear)

The sentinel fisheries program, which has been in place in eastern Canada since 1994, is a collaborative program between DFO and fishers. The harvesting is carried out by fishers (contracts awarded through an invitation to tender) in accordance with scientific protocols developed by DFO Science. In the northern Gulf of St. Lawrence, this program has two components: the mobile gear (trawl) component and the fixed gear (gillnet and longline) component. Because of budget cuts to this program over the years, the number of activities has declined.

DFO Science is in charge of data validation, analysis and interpretation. The data from the sentinel fisheries program are available on the St. Lawrence Global Observatory website.

Mobile gear (trawl) sentinel fisheries

The trawl sentinel program is carried out by the *Association des capitaines propriétaires de la Gaspésie* (ACPG) in NAFO Division 4S and by FFAW in Subdivision 3Pn and Division 4R. This survey is conducted every July. It includes close to 230 stations distributed based on a stratified random sampling design (Figures 1 and 2a). The fishing gear used is a Star Balloon 300 trawl mounted on a Rockhopper bicycle. The trawl mesh size is 145 mm with a 40-mm mesh liner in the codend. Standard 30-minute tows are done at a speed of 2.5 knots. The 30-minute time frame is calculated from the time the winches are stopped (after the gear is deployed) to the time they are reactivated to raise the trawl.

The mobile gear sentinel fisheries cover two periods: from 1995 to 2002 depth strata equal to or greater than 20 fathoms (37 m) were used exclusively; and from 2003 onward, three strata from 10 to 20 fathoms (18 to 37 m) were added to those previously sampled. As a result, the series for these two periods cannot be directly compared or combined.

One of the purposes of this survey is to collect fish length and weight data (cod, redfish, halibut, turbot, capelin, herring) and to collect cod and Atlantic halibut otolith samples.

Fixed gear (gillnet and longline) sentinel fisheries

The fixed gear sentinel fisheries program was carried out by the LNSFA in Division 4S and by FFAW in Subdivision 3Pn and Division 4R. In 2017 and 2018, most of the activities were carried out using gillnets in six zones (Figures 2a and 2b and Appendix 3).

Since 1998, CPUEs from the fixed gear sentinel fisheries program have been used as abundance indices in cod assessments. To produce these indices, a multiplicative model is used to standardize the raw data (Gavaris 1980) (Appendices 4 and 5). This model is used to derive an index that reflects the annual cod abundance trends since 1995.

$$\text{Ln CPUE}_{ijkl} = \ln \mu + \ln A_i + \ln Z_j + \ln M_k^* + \ln L_l + \ln E_m^* + \varepsilon_{ijkl}$$

where:

CPUE_{ijkl} = CPUE in the first activity

ln μ = log of mean CPUE

A_i = effect of i^{th} level of the factor Year

Z_j = effect of j^{th} level of the factor NAFO Area

M_k = effect of k^{th} level of the factor Month

L_l = effect of l^{th} level of the factor Soak time

E_m = effect of m^{th} level of the factor Gear (* longline index only)

ε_{ijkl} = log normally distribution of residuals

Data are collected at 24 sites along the coast in 3Pn, 4R and 4S. Average gear deployment depth is 90 m for longlines (16 J-hooks and 12 circle hooks) and 80 m for gillnets.

The use of fixed gear sentinel fishery activities as an abundance index is based on the assumption that the abundance of the resource is directly proportional to the catch rate. However, the data could be biased if the gear used becomes saturated, i.e. if the gear reaches a catch level at which no further catches could be made regardless of resource abundance. In fact, the probability of catching a fish would decrease and the catch rate would no longer be

directly proportional to abundance. This fishing gear saturation aspect is examined every year for the longline sentinel fishery program (Brulotte and Fréchet 2000), and saturation has not been an issue so far.

2.3 BIOLOGICAL INDICATORS

2.3.1 Age readings

Cod otoliths are sampled in DFO research surveys, sentinel surveys, the reproductive potential project and the commercial fishery. Sampling stratification is based on NAFO divisions, time of year, fishing gear and fish size (stratification). The narrow part of the otolith is sawed in two using an IsoMet™ low-speed saw. A count of annual growth rings is done by applying a drop of alcohol and exposing the side of the otolith to light.

A collection of reference otoliths is updated regularly and shared with DFO experts (Maritimes and NL regions) and European experts to validate the accuracy of the readings. This collection is reviewed every each year to ensure that the age readings are standardized.

2.3.2 Condition

Since 1994, cod have been caught in the fixed gear sentinel fisheries from June to September along the Lower North Shore (4S) and from December to January along the west coast of Newfoundland (3Pn and 4R) in order to assess fish condition. The following measurements are taken: fork length, weight (gonads, stomach contents, liver and total), sex and maturity.

The health status of cod is assessed using two indices: Fulton's condition index (K_{som}) and the hepatosomatic index (HSI).

Fulton's index represents a time-specific condition:

$$K_{som} = 100 * \text{somatic weight (g)} / L^3 \text{ (cm)}$$

The hepatosomatic index is an indicator of lipid energy reserves:

$$HSI = \text{liver weight (g)} / \text{somatic weight (g)} * 100$$

To minimize the size effect, the cod used in the calculation of K_{som} and HSI are between 30 and 55 cm long, and the indices are presented for cod 35, 45, 55 and 65 cm in length.

2.3.3 Maturity and fecundity

Data on fish maturity are used to produce maturity ogives for determining the proportion of mature individuals at age. These data are necessary to complete estimates of the stock's spawning biomass.

From 1983 to 1990, the proportion of mature female cod at age in 3Pn, 4RS was assessed annually from the data collected during DFO missions on the MV Gadus Atlantica in the winter (January). This type of information was also gathered in May 1994 on the Gadus Atlantica and in May 1995, 1997 and 1998 on the CCGS Teleost.

Subsequently, as part of the project to estimate the reproductive potential of cod in the northern Gulf (Lambert 2008), surveys were conducted in 1998, 2001 and 2002, then annually between 2004 and 2016, as well as in 2018 (Fisheries Science Collaborative Program, or FSCP, in collaboration with FFAW). This annual survey includes a grid of 40 stations and is conducted during the spawning season (Appendix 6). The goal is to catch cod in a Star Balloon 300-type trawl mounted on a Rockhopper bicycle with 145-mm mesh and with a 40-mm mesh liner in the codend. The activities take place off the west coast of Newfoundland (St. George's Bay area).

Fish caught are counted, sexed, assessed for maturity, weighed (gonads, stomach contents, liver and total) and measured. Cod otolith (age) and gonad (egg count) samples are also collected.

Because of the type of data available, the proportions of mature females at length were determined first and the proportions of mature females at age were estimated afterward. Females were classified as immature or mature (mature females including those in maturation and in the spawning and post-spawning stages). Proportions of mature females at length weighted by catch were estimated using the following equation:

$$P = 1/ (1+e^{a+bl})$$

where P is the proportion of mature females, L is the length in cm (1-cm class) and a, b are the equation parameters. Proportions of mature females at age were estimated from the mean lengths at age obtained from age-length keys and from corresponding proportions of mature females at length according to logistic equations.

Proportions of mature females at age for the missing years (1996, 1999, 2000 and 2003) were determined by interpolation using adjacent years to calculate new maturity ogives at age per cohort and by applying the proportions of mature females at age for the missing ages and years. Given the absence of fish maturity data for the 1974–1982 period, the maturity ogive at age obtained for 1983 was used for all of those years. A running average of four consecutive surveys is used as an input in the sequential population analysis.

2.4 POPULATION ANALYSIS

2.4.1 Number at age

A program (CATCH) developed by DFO using these age and length frequency data can be used for calculations of catch at age, weight at age, and mean length at age for cod caught annually. The length-weight relationship from the corresponding year's DFO research survey is also used, as are the values for commercial landings (by month, NAFO Division and gear type).

Annual surveys (DFO research, mobile sentinel > 20 fathoms, mobile sentinel > 10 fathoms, longline sentinel, gillnet sentinel) are used to monitor cohort abundance. Coherence for each survey was checked by establishing the relation between the number at age x for one year (t) and the number at age $x+1$ for the following year ($t+1$) for the entire series.

2.4.2 Virtual population analysis

The virtual population analysis (VPA) was conducted using the ADAPT program from the NOAA Fisheries Toolbox (NFT) of the National Marine Fisheries Service (NOAA 2014a). The NFT ADAPT model for estimating a population's age structure was developed from the Gavaris model (Gavaris 1988), from which features of other ADAPT versions were incorporated. Population cohorts are estimated by backward projection, which requires an estimate of the number of surviving fish in the last year. These estimates are used to launch the application; this value is then adjusted by the model. Retrospective analyses were also undertaken to confirm the consistency of the model. In addition, bootstrap analyses were performed with 1,000 repetitions to estimate, among other things, the accuracy of population parameters for the year following the last fishing year.

VPA is based on catches at age in the commercial fishery and is adjusted based on the various abundance indices. The parameters used for application in the NFT ADAPT program are presented in Appendix 7. The formulation used for this assessment is similar to that in Fréchet et al. (2009). Natural mortality (M) values were set at 0.2 from 1974 to 1985, 0.4 from 1986 to

1996, and 0.2 from 1997 to 2003. Subsequently, the M values were estimated in blocks (2004–2008, 2009–2013 and 2014–2018) (DFO 2007) for ages 3 to 12 by a sensitivity analysis (VPA/ADAPT/NFT). Natural mortality includes all potential mortality sources that are not accounted for in catch statistics.

The VPA has therefore been used to estimate several northern Gulf of St. Lawrence cod stock status parameters, including exploitation rate, population abundance and spawning stock biomass. The recruitment rate is estimated by dividing the number of recruits at 3 years by mature biomass in the year of birth of these recruits.

1.4.3 Empirical estimates of mortality

Empirical estimates of total mortality (*Z*), relative exploitation rates (*E*) and natural mortality (*M*) were produced independently of the assessment model. This was done previously for this stock in 2004 (Benoît and Chouinard 2004). The approaches use the same inputs as the VPA (catch at age in surveys and in the commercial fishery) but involve fewer assumptions than the assessment model and can be used to validate its assumptions and results.

A modified catch-curve analysis was used to estimate the annual *Z* values (Sinclair 2001). The approach used is an extension of a typical catch-curve analysis (regression of loge[abundance] at age) whereby *Z* is estimated as the common slope from an analysis of covariance that includes several year classes treated as class variables.

The analytical model employed was:

$$\log_e A_{ij} = \beta_0 + \beta_{1y} + \beta_2 age + \varepsilon$$

where A_{ij} is the mean catch per tow in the stratified survey of age *i* in year *j*. The vector β_{1y} provides separate estimates of intercepts for each year class (treated as fixed effects). The parameter β_2 is the estimator of *Z*. Following the approach of Sinclair (2001), this analysis was repeated in successive four-year blocks to provide an estimate of average *Z* for the cohorts for the block.

The analysis was applied to the data from each fishery independent survey (DFO and sentinel fisheries). The age range included in the analysis was restricted to include those ages that seem to be fully recruited for each survey: DFO bottom trawl research survey (6 to 10 years) and sentinel bottom trawl (6 to 10 years), longline (8 to 12 years) and gillnet (9 to 13 years) surveys. Assuming that mortality is constant across year classes, departures from linearity in the catch-curve analysis suggest changing catchability at age (Ricker 1975). We visually examined the residuals of the analysis with respect to age to confirm the relevance of the age ranges for each survey.

The relative exploitation rates (*E*) comparable to the estimates of *Z* were quantified as the sum of the catches for a given age and year block, divided by the sum of the trawlable biomass in the multispecies survey for the same age and year block. The multispecies survey was chosen as the basis for the calculation because it provides the longest series covering the distribution area of the stock. Another calculation was done for the different age groups relevant to the other surveys to allow a comparison between the estimates of *Z*.

Given that:

$$Z_{ij} = F_{ij} + M_{ij} \quad \leftrightarrow \quad \exp(-M_{ij}) = \exp(-Z_{ij}) / \exp(-F_{ij}) \qquad \text{eq. 1}$$

where F_{ij} is the instantaneous fishing mortality rate, indexed for age block *i* in year block *j*, and

$$E_{ij} = q \cdot C_{ij} / b_{ij} \qquad \text{eq. 2}$$

where C_{ij} is the commercial fishery catch for age block *i* in year block *j*, *q* is the catchability for the multispecies survey, and b_{ij} is the trawlable biomass of cod for *i* and *j*, and

$$\exp(-F_{ij}) = 1-E_{ij} \quad \text{eq. 3}$$

therefore,

$$M_{ij} = -\log(\exp(-Z_{ij}) / (1- q \cdot C_{ij} / b_{ij})) \quad \text{eq. 4}$$

From this relationship, it is possible to estimate the *M* for a given year and age group, based on an estimate of *Z* and an estimated value of *q*. Since it is assumed that the *q* of the survey does not change over time, this allows different trends of *M* to be explored under different assumptions for *q*.

2.5 TAGGING

In the northern Gulf, 94,934 cod were tagged between 1995 and 2018 under the tagging program in order to estimate the exploitation rate. Of this number, in December 2018, 7,885 tags were returned by fishers, nearly 90% of which came from 3Pn, 4R and 4S. This program includes double-tagged fish in order to estimate the tag loss rate. In recent years, tagging was carried out by FFAW as part of an FSCP project (Appendix 8).

In addition to providing information on the migratory behaviour of cod in the northern Gulf (Yvelin et al. 2005; Tamdrari et al. 2012), the tagging program has been used since 2008 to estimate the stock's exploitation rate independently of VPA.

The exploitation rate is calculated using a traditional method that has been used since 2008 (Le Bris et al. 2009). Individuals between 40 and 80 cm in size were selected. Incomplete data and data for individuals recaptured outside 3Pn, 4RS were rejected. Of these numbers, the three years after the tagging year were used except for 1996, where only two years (1995 and 1996) were available. Also, an initial mortality rate (tag-induced mortality) of 22% was applied to individuals tagged from June to October, and a 3% rate was applied to individuals tagged from November to May (J. Brattey, DFO NL, pers. comm.). The exploitation rate μ in year *t* is calculated using the following equation:

$$\mu_t = \frac{\sum_k R_t}{\sum_k N_t}$$

Where R_t is the number of tags recovered in year t corrected by the rate of tag return; N_t is the number of tags available to the fishery in year *t*; and *k* is the type of tagging (i.e. single, double, high-value). The number of tags available to the fishery matches the number of tags attached in year *t*, corrected by the initial mortality caused by tagging, by the natural mortality rate (estimated by VPA) and by the tag loss rate (Le Bris et al. 2009).

2.6 PROJECTION

The NFT AGEPRO model (NOAA 2014b) was used to assess the impact of various catch levels on the exploitation rate and SSB. This model can be used to evaluate the population structure over a number of years according to different annual landings and different recruitment assumptions, based on the age structure of a population. It is also possible to incorporate the results of the VPA combined with a bootstrap analysis as an initial population.

Therefore, the NFT AGEPRO model used with VPA results made it possible to derive cod spawning stock biomass projections for 2020 and 2021. The projections were generated for two scenarios: a TAC of 300 t and a TAC of 1,500 t. The parameters used for these projections are presented in Appendix 9. It should be noted that it was necessary to incorporate a recruitment

assumption (1 year) as of 2017. However, this recruitment estimate will have no impact on short-term projections or mature biomass estimates.

3. RESULTS

3.1 COMMERCIAL AND RECREATIONAL FISHERIES

3.1.1 Landings

Landings peaked in 1983 at over 100,000 t and then steadily declined from 1984 to 1993 (Figure 3), as did the TAC. The stock collapsed and was under a moratorium from 1994 to 1996 and in 2003. Landings ranged from 1,772 to 6,470 t between 2004 and 2011 for TACs ranging from 2,000 to 7,000 t (Table 1). From 2012 to 2016, the annual TAC was 1,500 t. Beginning in 2017–2018, the TAC was increased to 3,185 t, which corresponds to an available fishing allocation of 2,769 t. Preliminary landings (December 2018) totaled 2,670 t in 2017–2018 and 2,515 t in 2018–2019.

The majority of landings are from NAFO Division 4R. Since the reopening of the fishery in 1997 at the end of the first moratorium, the directed fishery has been carried out almost exclusively with fixed gear (gillnets and longlines). In NAFO Divisions 4R and 4S, the gillnet is the most commonly used gear. In Subdivision 3Pn, only longlines are used (Tables 2 and 3).

The commercial catch data expressed in catches at age, mean weights at age and mean lengths at age are presented in Tables 4, 5 and 6. For several years now, catches in the commercial fishery have been made up mainly of 5 to 10 year-old cod.

Landings practically doubled between 2016 and 2017, particularly in Newfoundland and Labrador, following the 50% increase in TAC in 2017. The harvest in 2017–2018 was similar to that in 2018–2019. However, in Quebec, the increase was smaller owing to several factors, including changes in licensing regimes (see section 1.2), harsh weather conditions in 2017, a lower abundance of cod in late summer 2018 (according to fishers), and fishers leaving the cod fishery to take part in more lucrative fisheries (crab, lobster).

The recreational fishery takes place along the north shore of the St. Lawrence (Quebec, 4S) and on the west coast of Newfoundland (3Pn, 4R). In 2016, the recreational fishing season increased from 32 days to 46 days. In 2018, there were 39 recreational fishing days between June and September. No catch data are available for this fishery.

3.1.2 Catch per unit effort

Commercial fishery performance indices derived from logbook data for fixed gear fleets (gillnet and longline, Newfoundland and Labrador vessels under 35 ft. and Quebec vessels under 45 ft.) show an increase in CPUE from after the 2003 moratorium until 2006, and then a decrease until 2009. CPUEs increased from 2009 to 2016 (Figure 5). In 2017, the commercial longline fishery performance index remained above the series average, while the index for gillnet fishing fell to the average level. The performance index for the commercial large longline fishery (Quebec Region) has remained above the series average since 2015 (Figure 6).

3.1.3 Incidental catch

Since 2004, more than 85% of cod landings have come from the directed cod fishery. Cod bycatch landings are low (around 200 t/year) and mainly occur in the directed fisheries for Atlantic halibut and Greenland halibut (*Reinhardtius hippoglossoides*).

Cod is a bycatch that is not accounted for in the landing statistics for the northern shrimp (*Pandalus borealis*) fishery. An analysis of the at-sea observer database indicates that cod is caught in slightly more than 20% of trawl tows. These catches amount to 1 kg or less per tow, and the captured cod are small, i.e. under 30 cm (1–2 years). Overall, these catches represent less than 1% of the estimated biomass of cod in that size category (under 30 cm), according to the DFO survey (Bourdages and Marquis 2018).

3.1.4 Telephone survey

The survey results for the answers to the question about fishery performance indicate roughly the same trends as the commercial fishery CPUEs and the fixed gear sentinel fishery CPUEs from 2006 to 2015. In 2018, the survey results indicate that fishery yields decreased in NAFO Divisions 4R and 4S and increased in 3Pn (Figure 7). No significant changes in cod condition or migration profile were noted by the survey respondents.

3.2 SURVEYS

3.2.1 DFO survey

The mean number of cod and mean weight per trawl tow decreased significantly between 1991 and 1993. After the 1994–1996 moratorium, these indicators improved slightly until 1999, after which they remained generally low and stable (Figure 8 and Table 7). Low values were recorded in 2002 and high values in 2003. These variations are considered annual effects; they were also observed for other species in the DFO surveys. From 2014 to 2016, an increase was observed in these two indices, which were above the 1990–2014 series average. For 2017 and 2018, the indices decreased to near-average values.

In 2017, the abundance of cod less than 44 cm was generally comparable to the series average for 1990–2017, while in 2018, cod abundance was higher than this average. In both years, the abundance of cod over 44 cm was below the series average. For 2018, a mode at 7 cm was observed (2018 cohort), which is uncommon for this survey (Figure 9). In 2018, most cod catches occurred at depths of less than 200 m (Appendix 10). Table 8 provides the mean numbers per tow at age.

Cod distribution along the west coast of Newfoundland (4R) remained fairly constant from 1990 to 2018, while in the western Gulf, cod biomass gradually declined from 1990–1994 to 2000–2004. Beginning in 2005–2009, the spatial distribution of cod expanded in Division 4S, especially north and west of Anticosti Island. Recent cod distribution (2010–2014 and 2015–2018) is similar to that observed in the early 1990s (1990–1994) (Figure 10).

3.2.2 Mobile gear sentinel survey

There are no clear trends in the number of cod caught and their mean weight in these surveys until 2015, when these indices followed a downward trend. In 2018, the abundance index from the sentinel fishery trawl survey was the second-lowest value observed since 1995 (Figure 11 and Table 9). This low value is represented by all cod sizes (Figure 12). The numbers at age are presented in Table 10.

3.2.2 Fixed gear sentinel survey

Since 1999, annual survey coverage of the longline fisheries in NAFO Subdivision 3Pn has been used to track cod migration. Cod arrive in the Gulf through the Cabot Strait in May (day 125) and leave the Gulf gradually from mid-September (day 250) to mid-December (Figure 13).

The longline index (standardized CPUE) has fluctuated over the years. After increasing from 1995 to 2006, it began moving downward until 2010 before increasing again until 2016. The longline index decreased over the past two years and, in 2018, fell below the 1995–2016 series average. The gillnet index (standardized CPUE) shows a similar pattern, with 2017 and 2018 values near the series average (Figure 14). The gross values (CPUE) of these indices (longline and gillnet) are presented in Appendix 11.

In 2018, longline cod catches consisted mainly of 5- to 7-year-olds with a mode of 7, whereas gillnet catches consisted mainly of 6- to 9-year-olds with a mode of 8 (Table 11).

In recent years, the saturation percentages for longlines have been low enough to avoid biasing catch rates (Appendix 12).

3.3 BIOLOGICAL INDICATORS

3.3.1 Condition and maturity

Physical cod condition monitoring conducted as part of the sentinel fisheries program shows an annual cycle. The Fulton's condition index is lower in spring before spawning and then increases from summer to fall, when it peaks. In 2017 and 2018, the values obtained using Fulton's condition index (somatic K) were lower than the 1998 to 2016 average for fish 45 and 55 cm long, while the value was close to the average for fish 35 and 65 cm long (Figure 15).

In the DFO survey (August) the condition index is estimated using total mass, which is influenced by stomach fullness and gonad development. The condition index has been declining in recent years; in 2018, it was generally higher than the series average (1990–2016).

In 2017 and 2018, the HSI, which more closely follows recent fish feeding success, shows the same trends over an annual cycle (Figure 16). The observed values for these indices represent acceptable condition levels.

Length and age at 50% maturity decreased between the mid-1980s and mid-1990s. The proportion of fish that are mature at age 4 was less than 10% before 1994, but since 1995, it has ranged from 14% to 50% (Table 12). Age at 50% maturity was between 5 and 6 years in the 1980s, and is now between 4 and 5 years.

3.4 VIRTUAL POPULATION ANALYSIS

The parameters estimated by bootstrap analysis are presented in Table 13. The adjustment of the ADAPT model to five abundance indices is shown in Figure 17. Regressions between the observed and predicted values are generally positive for all ages except age 11 in the DFO survey.

The distribution of residuals from the ADAPT model for each abundance index is presented in Figure 18. Although a few annual effects are detected, particularly in 2002 and 2003, in the DFO survey, the patterns of these residuals for each index are suitable (distribution not very heterogeneous).

The estimates of natural mortality were 0.4 for 2004 to 2008, 0.5 for 2009 to 2013, and 0.7 for 2014 to 2018 (Figure 19). Possible causes for the apparent increase in natural mortality, particularly beginning in 2004, are predation by grey seals and harp seals and unaccounted fishing mortality, such as recreational fishing. However, the magnitude of these factors is unknown.

The abundance of cod, along with cod biomass (ages 3+), was very high in the late 1980s and then decreased in the early 1990s. Abundance remained low and stable until 2010, after which

it increased slightly from 2012 to 2015, only to decline again in recent years (Tables 14 to 16 and Figure 20).

The SSB has been in the critical zone, well below the LRP of 116,000 t since 1990 (Table 17 and Figure 20). The SSB estimated from the VPA decreased over the past two years to the lowest values observed in 20 years. According to the bootstrap analysis, the estimated value for 2019 is 11,774 t.

Recruitment abundance at age 3, estimated by VPA since 1990, was higher in 2014 and 2015 (2011 and 2012 cohorts). The recruitment rate increased between 1994 and 2014 before declining in subsequent years (Figures 20a, 20b).

The exploitation rate for 7- to 9-year-old cod, estimated by VPA, was high from 1997 to 2002, as well as in 2008, 2009 and 2010. The rate then fell sharply from 2011 to 2016 before increasing again in 2017 in response to an increase in landings. The estimate for 2018 was 0.18 (Figure 21 and Table 18).

In the northern Gulf, 94,934 cod were tagged between 1995 and 2018 to estimate the exploitation rate. Of this number, 7,885 tags were returned by fishers, nearly 90% of which came from 3Pn, 4R and 4S. The exploitation rate estimated from this tagging program increased from 2003 to 2007 before falling to lower levels from 2011 to 2016. It has since doubled, reaching 0.21 in 2018, which is comparable to the estimate calculated using VPA (Figure 21).

3.5 EMPIRICAL ESTIMATES OF MORTALITY

The modified catch-curve analysis showed that Z (total mortality) was high (> 1.5) in the early 1990s when the stock collapsed, and then declined to around 0.7 in 1994–1996 during the first moratorium (Figure 22). Since virtually no fishing took place during that time, this Z value reflects the natural mortality rate. Z subsequently increased to about 0.85 in 2000 and then to between 0.2 and 0.4 in 2003 during the second moratorium. In 2004, after the moratorium was lifted, the Z value increased with increasing fishing activity. From 2008 to 2011, Z estimates differed between the mobile gear surveys (DFO and bottom trawl sentinel) and the fixed inshore gear (longline and gillnet) surveys. The latter produced high estimates (Z > 1.2) comparable to values observed during the stock collapse in the early 1990s. Since surveys with fixed (inshore) gear capture larger cod and sample sites are on average closer to the coast (average depth of 85 m) than in mobile gear surveys (DFO: average depth of 210 m), these mortality estimates may represent values for older cod or for cod in coastal waters. Similar trends in Z estimates between surveys after 2012 suggest that Z decreased to around 0.7 in 2014. Since fishing allocations were very low during this period, this suggests that natural mortality, which includes unaccounted fishing mortality and predation, was high. Estimated Z has increased to about 1.0 in recent years, which coincides with the recent increase in fishing allocations.

Trends in empirical estimates of relative exploitation rates for cod aged 6 to 10 (Figure 23) generally correspond to the estimates of the exploitation rate derived by VPA (Figure 21), with high values in the early 1990s, low values in the mid-1990s and around the 2003 moratorium, and intermediate values for a period of five to six years around 2000 to 2009. Contrary to the age-aggregated results of the VPA and tagging (Figure 21), empirical estimates for cod indicate that exploitation rates for these fish may have been high in the late 2000s and at levels comparable to those estimated during the stock collapse in the early 1990s. These high values estimated from commercial catches and the multispecies survey correspond to particularly high estimates of Z obtained independently for this period from sentinel longline and gillnet surveys (Figure 22).

Empirical estimates of natural mortality suggest that rates may have been particularly high ($M \geq 1$) during the stock collapse in the early 1990s and high (generally from 0.5 to 0.8) for most years between 1994 and 2016. They were apparently low (0.2 to 0.3) during the 2003 moratorium (Figure 24). The estimated average values for cohorts in 2003 and adjacent years correspond to levels considered typical of the stock on a historical basis. Empirical estimates are higher than the VPA values in the early and late 1990s (Figure 19). In addition, empirical estimates suggest that *M* has been high since 2005, while VPA estimates suggest an upward trend; however, both show that *M* is currently high. An improvement in the way *M* is estimated in the VPA, which involves estimating the parameter directly when adjusting the model, as opposed to adjusting the model by assuming different values for *M* as is currently done in the VPA, could help close the gap. It is important to note that since catches in the recreational fishery are neither reported nor accounted for, and there is a possibility of underreporting of catches in the commercial fishery, unaccounted fishing mortality includes a portion of *M*, although its magnitude is currently unknown.

3.6 PROJECTION

The NFT AGEPRO model was used to generate SSB projections from the VPA results. For 2020 and 2021, the projections for annual harvests of 300 t and 1,500 t indicate a decrease in the SSB compared to that estimated for January 2019, with a probability of decrease of more than 75% and 85% for the two harvests, respectively (Figure 25). These estimates are greatly influenced by natural mortality estimates.

4. SOURCES OF UNCERTAINTY

The model used (VPA) requires comprehensive total catch data; however, there are no catch estimates for the recreational fishery.

Natural mortality estimates in the VPA play an important role in estimating the SSB, particularly when deriving projections. In this regard, if natural mortality is incorrectly estimated or changes over the coming years, the projections will be inaccurate. Moreover, it was not possible to estimate seal predation.

The tagging project was carried out only in NAFO Division 4R. According to the DFO survey, cod abundance is similar between 4S and 4R even though 4S is twice as large as 4R. In addition, landings are significantly higher in 4R than in 4S, so this could bias the exploitation rate estimated by the tagging method.

5. CONCLUSION

This assessment indicates that the Atlantic cod stock of the northern Gulf of St. Lawrence remains in the critical zone according to the precautionary approach and well below the estimated LRP of 116,000 t. The 2019 estimate is only 10% of the LRP. According to the precautionary approach, harvests from all sources should be as low as possible to promote spawning biomass recovery.

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8. TABLES

Table 1. Historical monthly catch statistics (t) for the period 1964-2018 (NK = unknown).

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug	Sept.	Oct.	Nov.	Dec.	NK	TOTAL	TAC
1964	1 104	24 423	15 761	6 058	3 106	10 350	12 527	5 853	2 153	1 385	863	651	-	84 234	-
1965	792	12 506	21 171	3 698	2 216	5 267	10 422	5 945	3 636	1 359	927	990	-	68 929	-
1966	1 965	22 817	8 929	2 516	1 638	8 371	7 482	4 744	2 490	1 146	1 779	1 208	-	65 085	-
1967	7 872	7 028	14 792	8 447	2 017	7 525	12 664	5 232	7 154	3 315	1 356	1 909	1	79 312	-
1968	725	7 980	22 799	9 061	3 087	10 717	17 216	9 400	4 914	1 781	1 172	819	-	89 671	-
1969	875	4 654	9 675	4 220	5 192	10 958	12 103	8 639	7 866	3 557	2 035	1 366	-	71 140	-
1970	1 637	25 487	18 115	27 995	4 803	6 020	8 974	3 897	2 130	3 170	1 936	1 301	-	105 465	-
1971	845	44 590	7 580	5 250	2 338	5 839	8 420	3 039	2 374	1 616	1 004	915	-	83 810	-
1972	1 494	14 961	5 337	7 400	7 334	4 594	6 818	3 296	2 365	1 406	994	212	2 026	58 237	-
1973	16 472	10 556	7 586	4 826	3 235	5 860	5 125	4 145	2 365	1 459	1 016	567	2 593	65 805	-
1974	12 995	10 753	5 959	5 665	6 231	5 021	6 235	5 396	2 214	1 331	1 009	479	3 148	66 436	-
1975	8 232	19 486	2 702	2 616	5 316	5 122	5 042	4 488	2 767	1 267	819	704	1 672	60 233	-
1976	15 637	15 204	3 610	3 437	7 071	6 930	6 978	4 310	3 348	2 286	1 537	578	6 055	76 981	-
1977	11 143	8 603	3 790	11 312	10 057	7 368	8 133	5 780	3 361	1 751	1 814	454	-	73 566	55 000
1978	20 754	6 307	5 161	3 156	6 717	9 796	13 255	7 000	2 836	1 979	1 309	236	-	78 506	55 000
1979	15 543	4 273	6 475	6 647	8 517	12 890	12 085	8 660	2 971	2 449	1 816	451	-	82 777	75 000
1980	5 280	8 965	9 925	8 087	7 147	14 096	23 158	10 719	5 687	2 773	1 311	431	-	97 579	75 000
1981	9 156	15 368	3 170	3 763	12 835	17 257	16 344	10 343	5 676	2 550	1 172	277	-	97 911	75 000
1982	2 289	11 671	10 122	5 544	12 723	16 826	22 492	9 136	8 412	4 463	1 229	32	-	104 939	93 300
1983	4 152	10 213	11 335	6 251	21 049	18 341	16 228	8 173	5 698	3 956	530	154	-	106 080	100 000
1984	5 002	11 079	9 494	4 260	15 205	13 349	22 300	10 962	5 238	4 644	1 113	997	-	103 643	100 000
1985	2 436	16 749	7 306	3 516	7 139	12 693	13 725	11 026	7 713	3 038	962	1 986	-	88 289	100 000
1986	2 508	18 550	10 011	4 227	11 871	7 903	12 418	5 763	4 181	2 737	803	974	870	82 816	92 100
1987	8 657	7 701	4 938	3 294	6 627	8 323	9 222	7 501	5 293	2 871	1 027	1 093	-	66 547	80 300
1988	1 440	2 786	4 313	2 671	9 955	5 072	7 848	6 056	3 243	1 782	1 178	1 608	-	47 952	73 900
1989	6 211	7 434	2 038	892	4 771	6 480	6 354	4 773	2 071	2 185	767	199	-	44 176	76 540
1990	4 864	2 561	1 114	334	5 937	8 027	4 658	3 055	2 003	1 514	1 959	464	-	36 488	58 000
1991	1 384	2 129	2 811	2 249	3 472	4 464	5 385	2 926	3 206	2 054	1 797	158	-	32 034	35 000
1992	3 656	1 966	234	1 386	4 117	1 705	3 269	3 546	2 241	1 957	1 840	1 297	-	27 213	35 000
1993[a]	8	46	1 206	1 293	1 391	4 397	3 862	2 226	1 123	1 016	1 168	715	-	18 452	18 000

1994	14	48	41	4	28	11	15	100	207	28	7	35	-	537	0
1995	0	0	0	0	10	7	25	97	25	21	0	0	-	185	0
1996	0	0	0	0	5	10	149	55	40	33	23	2	-	317	0
1997	0	1	0	2	356	255	1 189	963	801	1 050	148	27	-	4 792	6 000
1998	3	0	0	1	27	245	897	1 062	418	552	22	0	-	3 229	3 000
	May	June	July	Aug	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	-	TOTAL	TAC
1999/2000[b]	92	863	1 985	1 463	989	1 058	395	39	1	51	132	50	11	7 135	7 500
2000/2001	523	907	1 251	1 533	1 087	775	398	82	86	72	49	32	40	6 834	7 000
2001/2002[c]	405	486	1 858	1 292	1 288	905	313	125	1	167	6	10	43	7 150	7 000
2002/2003[d]	130	55	2 507	1 488	854	858	404	7	0	0	0	0	4	6 341	7 000
2003/2004	1	14	117	131	48	31	39	5	0	0	0	13	7	406	0
2004/2005	21	25	1 875	217	537	356	207	1	0	0	0	14	10	3 264	3 500
2005/2006	34	72	2 409	596	848	476	22	3	0	0	0	24	7	4 491	5 000
2006/2007[e]	12	105	3 285	580	656	298	669	17	1	0	0	15	3	5 715	6 000
2007/2008	19	132	3 711	398	1 175	578	447	5	0	0	1	7	4	6 476	7 000
2008/2009[f]	36	118	2 952	888	1 273	575	301	2	0	0	1	3	8	6 224	7 000
2009/2010	5	173	1 693	661	699	719	687	51	1	0	2	2	1	4 695	7 000
2010/2011	6	53	1 362	836	569	533	186	1	0	0	0	13	8	3 567	4 000
2011/2012	7	51	998	168	312	16	193	9	0	0	0	12	6	1 772	2 000
2012/2013	10	41	672	104	293	24	137	3	0	0	0	21	5	1 311	1 500
2013/2014	6	20	697	93	220	10	148	3	0	0	0	7	5	1 208	1 500
2014/2015	6	16	644	92	331	39	100	23	0	0	0	3	12	1 266	1 500
2015/2016	8	19	730	139	186	19	137	13	0	0	0	10	3	1 264	1 500
2016/2017	6	25	840	139	153	35	154	7	0	0	0	23	4	1 387	1 500
2017/2018[g]	7	26	908	705	638	24	206	129	0	0	0	11	9	2 663	3 185
2018/2019[g]	9	15	860	762	326	228	241	2	-	-	-	-	-	2 444	3 185

[a] Established in August 1993, the initial TAC was 35,000 t
[b] TAC from 1999/01/01 to 2000/05/14
[c] Includes 253 t. from recreationnal fishery
[d] Includes 34 t. from recreationnal fishery
[e] Includes 75,3 t. from recreationnal fishery
[f] Includes 67 t. from recreationnal fishery
[g] Preliminary statistics

*Table 2a. Nominal landings (t) (*preliminary) for NAFO Subdivision 3Pn by gear category (DV=dory vessels, T=traps, GN=gillnets, HL=handlines, LL=Longline, IN=misc. inshore, DS=Danish seines, PT=pair trawl, OT=otter trawl).*

Year	NAFO 3Pn											
	DV	T	GN	HL	LL	IN	DS	PT	OT	Total Fixed	Total mobil	Total
1964	558	-	-	-	3416	4875	-	178	6105	8849	6283	15132
1965	113	-	-	-	2702	4815	-	142	8963	7630	9105	16735
1966	16	-	-	-	2499	2854	-	559	7696	5369	8255	13624
1967	-	-	-	-	657	3463	27	33	16248	4120	16308	20428
1968	33	-	-	-	85	5031	12	306	6442	5149	6760	11909
1969	-	-	444	270	3630	39	10	24	500	4383	534	4917
1970	-	46	643	675	3378	-	5	62	396	4742	463	5205
1971	-	-	364	217	5574	134	-	52	1503	6289	1555	7844
1972	17	10	181	98	5593	20	545	176	3717	5919	4438	10357
1973	1405	-	175	110	5431	97	174	356	3552	7218	4082	11300
1974	128	-	297	52	2460	915	58	1507	8596	3852	10161	14013
1975	-	-	61	152	2418	12	6	-	3584	2643	3590	6233
1976	-	9	163	225	4467	636	163	-	2802	5500	2965	8465
1977	-	37	73	163	5679	-	119	-	1494	5952	1613	7565
1978	-	7	34	103	5323	-	17	-	1318	5467	1335	6802
1979	-	25	40	116	7338	-	181	-	3216	7519	3397	10916
1980	-	-	13	83	6443	-	18	-	2242	6539	2260	8799
1981	-	4	3	72	7560	-	28	-	7463	7639	7491	15130
1982	-	1	8	87	7670	-	12	-	7707	7766	7719	15485
1983	-	1	46	97	6789	-	20	8	9146	6933	9174	16107
1984	-	2	129	45	7089	-	499	-	8177	7265	8676	15941
1985	-	4	35	24	5619	-	186	-	8581	5682	8767	14449
1986	-	-	6	46	5728	-	16	-	16415	5780	16431	22211
1987	-	-	23	11	6589	-	25	-	11709	6623	11734	18357
1988	-	-	12	3	3331	-	-	-	5712	3346	5712	9058
1989	-	-	146	8	1722	-	1	-	5244	1876	5245	7121
1990	-	-	230	23	853	-	19	-	4242	1106	4261	5367
1991	-	-	280	22	1217	-	76	-	5333	1519	5409	6928
1992	-	-	184	35	1156	-	33	-	6428	1375	6461	7836
1993	-	-	153	57	1388	-	-	-	1597	1598	1597	3195
1994	-	-	3	81	6	32	-	-	73	122	73	195
1995	-	0	13	0	22	-	0	-	0	35	0	35

Year	NAFO 3Pn											
	DV	T	GN	HL	LL	IN	DS	PT	OT	Total Fixed	Total mobil	Total
1996	-	-	14	-	58	-	-	-	1	71	1	72
1997	-	-	5	20	1969	-	-	-	12	1994	12	2006
1998	-	-	2	15	859	-	-	-	0	876	0	876
1999	-	-	2	49	1110	-	2	-	2	1161	4	1165
2000	-	-	3	33	1442	-	0	-	0	1478	0	1478
2001	-	-	2	21	1715	-	-	-	1	1738	1	1739
2002	-	-	0	40	1657	-	-	-	15	1698	15	1713
2003	-	-	1	-	85	-	-	-	1	85	1	86
2004	-	-	2	10	762	-	-	-	0	774	0	774
2005	-	-	1	4	871	-	-	-	0	876	0	876
2006	-	1	1	5	1198	-	-	-	3	1205	3	1208
2007	-	-	3	4	1074	-	-	-	0	1081	0	1081
2008	-	-	3	3	1125	-	-	-	0	1131	0	1131
2009	-	-	6	6	1345	-	-	-	0	1357	0	1357
2010	-	-	2	6	697	-	-	-	0	705	0	705
2011	-	1	7	6	302	-	-	-	0	316	0	316
2012	-	-	10	2	176	-	0	-	0	187	0	187
2013	-	-	1	2	182	-	0	-	-	185	0	185
2014	-	-	3	1	149	-	-	-	0	153	0	153
2015	-	-	1	0	153	-	-	-	0	155	0	155
2016	-	-	0	2	172	-	-	-	-	174	0	174
2017	-	-	1	3	340	-	-	-	0	344	0	344
2018	-	-	1	5	142	-	-	-	0	149	0	149

*Table 2b. Nominal landings (t) (*preliminary) for NAFO Subdivision 4R 3Pn, 4RS by gear category (DV=dory vessels, T=traps, GN=gillnets, HL=handlines, LL=Longline, IN=misc. inshore, DS=Danish seines, PT=pair trawl, OT=otter trawl).*

	NAFO 4R											
Year	DV	T	GN	HL	LL	IN	DS	PT	OT	Total Fixed	Total mobil	Total
1964	-	-	-	-	123	18789	185	-	39863	18912	40048	58960
1965	-	-	-	-	152	16766	145	-	26776	16918	26921	43839
1966	-	-	-	-	201	15532	53	38	28384	15733	28475	44208
1967	-	-	-	-	207	21015	47		28672	21222	28719	49941
1968	-	-	289	-	1138	26130	60	508	41916	27557	42484	70041
1969	-	3943	10905	1622	4405	2646	198	5	32908	23521	33111	56632
1970	184	2340	4319	1673	5489	1962	239	225	74715	15967	75179	91146
1971	-	3786	3718	1295	3076	436	247	-	53804	12311	54051	66362
1972	-	1606	2835	1107	1115	2851	16	24	28029	9514	28069	37583
1973	-	2007	3154	1007	2564	3050	120	84	31108	11782	31312	43094
1974	-	1789	5182	1714	1358	666	223	-	28514	10709	28737	39446
1975	-	2032	6462	1413	978	490	221	-	29973	11375	30194	41569
1976	-	1572	7671	1445	527	4238	155	-	40422	15453	40577	56030
1977	-	2414	7866	1591	1429	147	147	-	39793	13447	39940	53387
1978	-	4103	13235	1749	2462	-	233	-	35158	21549	35391	56940
1979	-	3071	11479	3138	5031	-	311	-	32738	22719	33049	55768
1980	-	8354	11607	2380	7768	-	467	-	34107	30109	34574	64683
1981	-	5408	5796	2096	8936	327	384	-	38231	22563	38615	61178
1982	-	7473	9465	2126	7208	-	337	-	38878	26272	39215	65487
1983	-	3415	11849	5047	6614	-	473	-	38347	26925	38820	65745
1984	-	2899	6625	2815	7311	-	-	-	43643	19650	43643	63293
1985	-	3315	4474	2178	7275	-	321	-	36881	17242	37202	54444
1986	-	2938	5540	1000	4645	-	695	-	28999	14123	29694	43817
1987	-	1290	4949	746	4646	-	950	-	21180	11631	22130	33761
1988	-	1323	5110	803	2645	-	833	-	18959	9881	19792	29673
1989	-	736	4078	632	1610	-	772	-	19168	7056	19940	26996
1990	-	387	1797	863	1929	-	773	-	17874	4976	18647	23623
1991	-	2308	2532	1187	2275	-	606	-	10626	8302	11232	19534
1992	-	1471	1555	1142	1686	-	521	-	9022	5854	9543	15397
1993	-	2458	1739	846	566	-	190	-	7695	5609	7885	13494
1994	-	-	13	148	69	-	9	-	46	230	55	285
1995	-	-	14	1	15	-	4	-	0	30	5	35

Year	NAFO 4R											
	DV	T	GN	HL	LL	IN	DS	PT	OT	Total Fixed	Total mobil	Total
1996	-	4	30	0	33	0	11		1	67	13	80
1997	-	57	233	245	1685	27	8	-	43	2247	51	2298
1998	-	2	131	247	1295	-	30	-	1	1675	31	1707
1999	-	0	2801	890	1150	1	32	-	7	4841	40	4881
2000	-	26	2230	515	1428	7	36	-	24	4206	60	4265
2001	-	8	1683	716	1780	35	64	-	23	4221	87	4309
2002	-	-	1939	582	1365	5	29	-	17	3891	46	3937
2003	-	-	80	1	95	-	25	-	9	177	34	210
2004	-	0	956	288	564	-	44	-	28	1808	72	1881
2005	-	1	1674	218	977	-	50	-	32	2871	82	2953
2006	-	0	1971	174	1412	-	38	-	76	3558	113	3672
2007	-	-	2638	130	1746	-	31	-	0	4513	31	4544
2008	-	0	2285	204	1657	-	25	-	1	4147	26	4173
2009	-	1	1417	166	1129	-	23	-	1	2714	24	2738
2010	-	0	1268	244	648	-	13	-	2	2161	15	2176
2011	-	0	681	74	152	-	12	-	5	906	17	923
2012	-	-	558	67	101	-	4	-	1	727	5	732
2013	-	1	464	123	171	-	2	-	0	759	3	761
2014	-	0	571	123	84	-	3	-	2	778	5	783
2015	-	-	571	42	89	-	4	-	-	702	4	706
2016	-	1	613	58	120	-	5	-	2	791	8	799
2017	-	-	1489	163	205	-	6	-	3	1857	9	1866
2018	-	0	1465	50	301	-	6	-	2	1816	8	1824

*Table 2c. Nominal landings (t) (*preliminary) for NAFO Subdivision 4S by gear category (DV=dory vessels, T=traps, GN=gillnets, HL=handlines, LL=Longline, IN=misc. inshore, DS=Danish seines, PT=pair trawl, OT=otter trawl).*

	NAFO 4S											
Year	**DV**	**T**	**GN**	**HL**	**LL**	**IN**	**DS**	**PT**	**OT**	**Total Fixed**	**Total mobil**	**Total**
1964	-	-	-	-	486	6 166	-	-	3 490	6 652	3 490	10 142
1965	-	3 950	24	-	320	-	1	-	4 060	4 294	4 061	8 355
1966	-	1 656	973	-	441	798	-	-	3 385	3 868	3 385	7 253
1967	-	2 470	1 618	710	305	-	-	-	3 840	5 103	3 840	8 943
1968	-	3 070	1 127	623	333	-	-	-	2 568	5 153	2 568	7 721
1969	-	2 312	1 960	607	262	-	-	-	4 450	5 141	4 450	9 591
1970	21	1 789	846	771	251	-	-	-	5 436	3 678	5 436	9 114
1971	-	2 410	963	503	565	-	-	1	5 162	4 441	5 163	9 604
1972	-	2 040	1 418	511	511	-	-	-	5 817	4 480	5 817	10 297
1973	-	885	1 774	470	402	2 248	-	-	5 632	5 779	5 632	11 411
1974	-	200	2 326	402	976	2 064	-	-	7 009	5 968	7 009	12 977
1975	-	579	2 072	2 337	136	1 425	-	-	5 882	6 549	5 882	12 431
1976	-	992	2 900	353	46	1 385	-	-	6 810	5 676	6 810	12 486
1977	-	861	4 089	303	36	-	2	-	7 323	5 289	7 325	12 614
1978	-	2 178	3 626	194	28	-	2	-	8 736	6 026	8 738	14 764
1979	-	1 043	6 578	467	148	-	-	-	7 857	8 236	7 857	16 093
1980	-	-	1 376	-	1 796	11 658	-	-	9 267	14 830	9 267	24 097
1981	-	3	364	-	2 678	12 554	-	51	5 953	15 599	6 004	21 603
1982	-	13	27	-	3 688	11 629	3	340	8 267	15 357	8 610	23 967
1983	-	-	622	2	3 890	11 245	174	-	8 295	15 759	8 469	24 228
1984	8	675	8 923	961	4 301	-	1 694	-	7 847	14 868	9 541	24 409
1985	-	1 211	6 182	891	4 307	-	11	-	6 794	12 591	6 805	19 396
1986	-	52	4 269	383	2 672	-	161	-	9 251	7 376	9 412	16 788
1987	-	10	3 065	219	2 189	-	46	-	8 900	5 483	8 946	14 429
1988	-	-	3 782	42	1 232	-	16	-	4 149	5 056	4 165	9 221
1989	-	3	3 207	377	1 394	-	9	-	5 069	4 981	5 078	10 059
1990	-	1	1 824	159	675	-	12	-	4 825	2 659	4 837	7 496
1991	-	48	1 467	480	682	-	-	-	2 893	2 677	2 893	5 570
1992	-	25	1 142	78	345	-	-	-	2 391	1 590	2 391	3 981
1993	-	-	609	138	172	-	-	-	845	919	845	1 764
1994	-	-	7	-	23	19	-	-	9	49	9	58
1995	-	-	20	-	6	88	0	-	1	113	1	114

Year	NAFO 4S											
	DV	**T**	**GN**	**HL**	**LL**	**IN**	**DS**	**PT**	**OT**	**Total Fixed**	**Total mobil**	**Total**
1996	-	0	150	-	7	6			1	163	1	165
1997	-	-	300	-	51	132	-	-	5	483	5	488
1998	-	-	496	-	26	121	0	-	4	643	4	647
1999	-	-	598	29	84	130	1	-	2	841	3	844
2000	-	-	813	9	211	23	-	-	0	1 056	0	1 056
2001	-	5	335	128	226	207	-	-	1	901	1	902
2002	-	5	733	12	103	23	1	-	2	875	3	878
2003	-	0	81	-	11	-	-	-	1	92	1	93
2004	-	-	525	11	71	-	-	-	0	607	0	607
2005	-	5	613	8	26	-	0	-	3	652	3	655
2006	-	-	712	9	46	-	-	-	5	767	5	772
2007	-	-	789	21	48	-	-	-	0	858	0	858
2008	-	-	739	8	106	-	-	-	0	854	0	854
2009	-	1	429	35	140	-	-	-	0	605	0	605
2010	-	0	439	13	218	-	-	-	1	670	1	671
2011	-	-	316	4	217	-	-	-	0	537	0	537
2012	-	-	252	5	126	-	-	-	1	383	1	384
2013	-	0	206	6	61	-	-	-	2	273	2	275
2014	-	-	210	5	110	-	-	-	0	325	0	325
2015	-	-	300	5	100	-	-	-	1	405	1	406
2016	-	0	253	4	141	-	-	-	1	398	1	400
2017	-	-	256	5	199	-	-	-	0	460	0	460
2018	-	-	352	1	135	0	-	-	2	488	2	490

*Table 2d. Nominal landings (t) (*preliminary) for NAFO Subdivision 3Pn, 4RS by gear category (DV=dory vessels, T=traps, GN=gillnets, HL=handlines, LL=Longline, IN=misc. inshore, DS=Danish seines, PT=pair trawl, OT=otter trawl).*

	NAFO 3Pn, 4RS											
Year	DV	T	GN	HL	LL	IN	DS	PT	OT	Total Fixed	Total mobil	Total
1964	558	-	-	-	4025	29830	185	178	49458	34413	49821	84234
1965	113	3950	24	-	3174	21581	146	142	39799	28842	40087	68929
1966	16	1656	973	-	3141	19184	53	597	39465	24970	40115	65085
1967	-	2470	1618	710	1169	24478	74	33	48760	30445	48867	79312
1968	33	3070	1416	623	1556	31161	72	814	50926	37859	51812	89671
1969	-	6255	13309	2499	8297	2685	208	29	37858	33045	38095	71140
1970	205	4175	5808	3119	9118	1962	244	287	80547	24387	81078	105465
1971	-	6196	5045	2015	9215	570	247	53	60469	23041	60769	83810
1972	17	3656	4434	1716	7219	2871	561	200	37563	19913	38324	58237
1973	1405	2892	5103	1587	8397	5395	294	440	40292	24779	41026	65805
1974	128	1989	7805	2168	4794	3645	281	1507	44119	20529	45907	66436
1975	-	2611	8595	3902	3532	1927	227	-	39439	20567	39666	60233
1976	-	2573	10734	2023	5040	6259	318	-	50034	26629	50352	76981
1977	-	3312	12028	2057	7144	147	268	-	48610	24688	48878	73566
1978	-	6288	16895	2046	7813	-	252	-	45212	33042	45464	78506
1979	-	4139	18097	3721	12517	-	492	-	43811	38474	44303	82777
1980	-	8354	12996	2463	16007	11658	485	-	45616	51478	46101	97579
1981	-	5415	6163	2168	19174	12881	412	51	51647	45801	52110	97911
1982	-	7487	9500	2213	18566	11629	352	340	54852	49395	55544	104939
1983	-	3416	12517	5146	17293	11245	667	8	55788	49617	56463	106080
1984	8	3576	15677	3821	18701	-	2193	-	59667	41783	61860	103643
1985	-	4530	10691	3093	17201	-	518	-	52256	35515	52774	88289
1986	-	2990	9815	1429	13045	-	872	-	54665	27279	55537	82816
1987	-	1300	8037	976	13424	-	1021	-	41789	23737	42810	66547
1988	-	1323	8904	848	7208	-	849	-	28820	18283	29669	47952
1989	-	739	7431	1017	4726	-	782	-	29481	13913	30263	44176
1990	-	388	3851	1045	3457	0	804	-	26941	8741	27745	36486
1991	-	2356	4279	1689	4174	-	682	-	18852	12498	19534	32032
1992	-	1496	2881	1255	3187	-	554	-	17841	8819	18395	27214
1993	-	2458	2501	1041	2126	-	190	-	10137	8126	10327	18453
1994	-	0	23	229	98	51	9	-	128	401	137	538
1995	-	0	47	1	43	88	4	-	1	178	6	184

Year	NAFO 3Pn, 4RS											
	DV	T	GN	HL	LL	IN	DS	PT	OT	Total Fixed	Total mobil	Total
1996	-	4	193	0	98	6	11	-	4	301	15	317
1997	-	57	538	265	3 705	159	8		60	4 724	68	4 792
1998	-	2	629	262	2180	121	30	-	5	3194	35	3229
1999	-	0	3401	968	2344	-	35	-	11	6843	46	6891
2000	-	26	3046	557	3081	-	36	-	24	6740	60	6800
2001	-	13	2020	864	3721	-	64	-	25	6861	89	6950
2002	-	5	2672	634	3125	-	30	-	34	6464	64	6527
2003	-	1	161	1	191	-	25	-	10	354	35	389
2004	-	0	1483	309	1397	-	44	-	29	3189	73	3262
2005	-	6	2288	230	1874	-	50	-	35	4398	85	4483
2006	-	1	2685	188	2656	-	38	-	84	5530	121	5652
2007	-		3430	154	2868	-	31	-	0	6452	31	6483
2008	-	0	3027	215	2889	-	25	-	2	6131	27	6158
2009	-	2	1852	207	2615	-	23	-	2	4676	25	4700
2010	-	0	1710	263	1563	-	13	-	3	3536	16	3552
2011	-	1	1004	84	671	-	12	-	5	1759	17	1776
2012	-	0	820	74	403	-	4	-	2	1297	6	1303
2013	-	1	670	131	415	-	2	-	2	1217	5	1222
2014	-	0	785	129	342	-	3	-	2	1256	5	1262
2015	-	0	872	48	342	-	4	-	1	1262	4	1267
2016	-	1	866	64	433	-	5	-	3	1364	9	1373
2017	-	0	1746	171	744	-	6	-	3	2661	10	2671
2018	-	0	1819	55	579	-	6	-	4	2453	10	2463

Table 3a. 2018 cod landing (t) statistics (preliminary) in NAFO Subdivision 3Pn.

Newfoundland

	NAFO 3Pn												
Gear	**Jan.**	**Feb.**	**Mar.**	**Apr.**	**May**	**June**	**July**	**Aug.**	**Sept.**	**Oct.**	**Nov.**	**Dec.**	**Total**
Otter trawl	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Danish seines	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Gillnets	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	1,1	0,0	0,0	1,1
Longlines	0,0	0,0	0,0	8,5	14,1	6,5	6,5	1,5	7,8	69,2	28,3	0,0	142,4
Handlines	0,0	0,0	0,0	0,0	0,0	0,0	1,1	0,3	1,3	2,4	0,0	0,0	5,1
Traps	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Total	0,0	0,0	0,0	8,5	14,1	6,5	7,7	1,8	9,1	72,8	28,3	0,0	148,6

Maritimes

	NAFO 3Pn												
Gear	**Jan.**	**Feb.**	**Mar.**	**Apr.**	**May**	**June**	**July**	**Aug.**	**Sept.**	**Oct.**	**Nov.**	**Dec.**	**Total**
Otter trawl	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Danish seines	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Longlines	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Quebec

	NAFO 3Pn												
Gear	**Jan.**	**Feb.**	**Mar.**	**Apr.**	**May**	**June**	**July**	**Aug.**	**Sept.**	**Oct.**	**Nov.**	**Dec.**	**Total**
Otter trawl	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Longlines	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	**0,0**	**0,0**	**0,0**	**8,5**	**14,1**	**6,5**	**7,7**	**1,8**	**9,1**	**72,8**	**28,3**	**0,0**	**148,6**

Table 3b. 2018 cod landing (t) statistics (preliminary) in NAFO Subdivision 4R.

Newfoundland

	NAFO 4R												
Gear	**Jan.**	**Feb.**	**Mar.**	**Apr.**	**May**	**June**	**July**	**Aug.**	**Sept.**	**Oct.**	**Nov.**	**Dec.**	**Total**
Otter trawl	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Danish seines	0,0	0,0	0,0	0,0	0,0	0,0	0,5	3,6	1,4	0,9	0,0	0,0	6,4
Gillnets	0,0	0,0	0,0	0,0	0,0	0,0	583,8	543,0	193,7	111,7	23,9	0,0	1456,2
Longlines	0,0	0,0	0,0	1,3	0,6	0,6	20,7	14,6	24,1	35,3	188,1	0,0	285,2
Handlines	0,0	0,0	0,0	0,0	0,0	0,0	12,8	12,6	16,2	6,9	0,3	0,0	48,8
Traps	0,0	0,0	0,0	0,0	0,0	0,0	0,1	0,0	0,0	0,0	0,0	0,0	0,1
Total	0,0	0,0	0,0	1,3	0,6	0,7	617,8	573,9	235,4	154,8	212,3	0,0	1796,7

Maritimes

	NAFO 4R												
Gear	**Jan.**	**Feb.**	**Mar.**	**Apr.**	**May**	**June**	**July**	**Aug.**	**Sept.**	**Oct.**	**Nov.**	**Dec.**	**Total**
Otter trawl	0,0	0,0	0,0	0,0	0,0	0,0	0,4	0,0	0,0	0,0	0,0	1,4	1,7
Danish seines	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Longlines	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Total	0,0	0,0	0,0	0,0	0,0	0,0	0,4	0,0	0,0	0,0	0,0	1,4	1,7

Quebec

	NAFO 4R												
Gear	**Jan.**	**Feb.**	**Mar.**	**Apr.**	**May**	**June**	**July**	**Aug.**	**Sept.**	**Oct.**	**Nov.**	**Dec.**	**Total**
Otter trawl	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Gillnets	0,0	0,0	0,0	0,0	0,0	0,0	4,7	4,5	0,0	0,0	0,0	0,0	9,2
Longlines	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,4	15,6	0,0	0,0	0,0	16,0
Handlines	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,1	0,6	0,0	0,0	0,0	0,7
Total	0,0	0,0	0,0	0,0	0,0	0,0	4,7	5,0	16,2	0,0	0,0	0,0	25,9
TOTAL	**0,0**	**0,0**	**0,0**	**1,3**	**0,6**	**0,7**	**622,9**	**578,9**	**251,6**	**154,8**	**212,3**	**1,4**	**1824,4**

Table 3c. 2018 cod landing (t) statistics (preliminary) in NAFO Subdivision 4S.

Newfoundland

	NAFO 4S												
Gear	**Jan.**	**Feb.**	**Mar.**	**Apr.**	**May**	**June**	**July**	**Aug.**	**Sept.**	**Oct.**	**Nov.**	**Dec.**	**Total**
Otter trawl	0,0	0,0	0,0	0,0	0,0	0,0	0,2	0,0	0,0	0,0	0,0	0,0	0,2
Gillnets	0,0	0,0	0,0	0,0	0,0	0,0	1,2	0,1	0,0	0,0	0,0	0,0	1,3
Longlines	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,1	0,0	0,0	0,0	0,0	0,1
Handlines	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Total	0,0	0,0	0,0	0,0	0,0	0,0	1,4	0,1	0,0	0,0	0,0	0,0	1,5

Maritimes

	NAFO 4S												
Gear	**Jan.**	**Feb.**	**Mar.**	**Apr.**	**May**	**June**	**July**	**Aug.**	**Sept.**	**Oct.**	**Nov.**	**Dec.**	**Total**
Otter trawl	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,2	0,2
Danish seines	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Gillnets	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Longlines	0,0	0,0	0,0	0,0	0,0	0,0	0,0	1,6	0,0	0,0	0,0	0,0	1,6
Total	0,0	0,0	0,0	0,0	0,0	0,0	0,0	1,6	0,0	0,0	0,0	0,2	1,9

Quebec

	NAFO 4S												
Gear	**Jan.**	**Feb.**	**Mar.**	**Apr.**	**May**	**June**	**July**	**Aug.**	**Sept.**	**Oct.**	**Nov.**	**Dec.**	**Total**
Otter trawl	0,0	0,0	0,0	0,0	0,0	0,0	0,9	0,0	0,0	0,4	0,4	0,0	1,7
Danish seines	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Gillnets	0,0	0,0	0,0	0,1	0,3	0,1	193,0	138,6	18,9	0,0	0,0	0,0	351,1
Longlines	0,0	0,0	0,0	1,4	2,9	7,7	34,7	40,8	46,1	0,1	0,0	0,0	133,7
Handlines	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,5	0,0	0,0	0,0	0,5
Traps	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Total	0,0	0,0	0,0	1,5	3,2	7,8	228,6	179,4	65,5	0,5	0,4	0,0	487,0
TOTAL	**0,0**	**0,0**	**0,0**	**1,5**	**3,2**	**7,8**	**230,0**	**181,2**	**65,5**	**0,5**	**0,4**	**0,2**	**490,4**

Table 3d. 2018 cod landing (t) statistics (preliminary) in NAFO Subdivision 3Pn, 4RS.

Newfoundland

	NAFO 3Pn, 4RS												
Gear	**Jan.**	**Feb.**	**Mar.**	**Apr.**	**May**	**June**	**July**	**Aug.**	**Sept.**	**Oct.**	**Nov.**	**Dec.**	**Total**
Otter trawl	0,0	0,0	0,0	0,0	0,0	0,0	0,2	0,0	0,0	0,0	0,0	0,0	0,2
Danish seines	0,0	0,0	0,0	0,0	0,0	0,0	0,5	3,6	1,4	0,9	0,0	0,0	6,4
Gillnets	0,0	0,0	0,0	0,0	0,0	0,0	585,0	543,1	193,7	112,8	23,9	0,0	1458,6
Longlines	0,0	0,0	0,0	9,7	14,7	7,1	27,2	16,2	31,9	104,5	216,4	0,0	427,7
Handlines	0,0	0,0	0,0	0,0	0,0	0,0	13,9	12,9	17,5	9,4	0,3	0,0	53,9
Traps	0,0	0,0	0,0	0,0	0,0	0,0	0,1	0,0	0,0	0,0	0,0	0,0	0,1
Total	0,0	0,0	0,0	9,7	14,7	7,2	626,8	575,8	244,5	227,6	240,6	0,0	1946,8

Maritimes

	NAFO 3Pn, 4RS												
Gear	**Jan.**	**Feb.**	**Mar.**	**Apr.**	**May**	**June**	**July**	**Aug.**	**Sept.**	**Oct.**	**Nov.**	**Dec.**	**Total**
Otter trawl	0,0	0,0	0,0	0,0	0,0	0,0	0,4	0,0	0,0	0,0	0,0	1,6	2,0
Danish seines	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Gillnets	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Longlines	0,0	0,0	0,0	0,0	0,0	0,0	0,0	1,6	0,0	0,0	0,0	0,0	1,6
Total	0,0	0,0	0,0	0,0	0,0	0,0	0,4	1,7	0,0	0,0	0,0	1,6	3,7

Quebec

	NAFO 3Pn, 4RS												
Gear	**Jan.**	**Feb.**	**Mar.**	**Apr.**	**May**	**June**	**July**	**Aug.**	**Sept.**	**Oct.**	**Nov.**	**Dec.**	**Total**
Otter trawl	0,0	0,0	0,0	0,0	0,0	0,0	0,9	0,0	0,0	0,4	0,4	0,0	1,7
Danish seines	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Gillnets	0,0	0,0	0,0	0,1	0,3	0,1	197,7	143,1	18,9	0,0	0,0	0,0	360,3
Longlines	0,0	0,0	0,0	1,4	2,9	7,7	34,7	41,2	61,7	0,1	0,0	0,0	149,7
Handlines	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,1	1,1	0,0	0,0	0,0	1,2
Traps	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Total	0,0	0,0	0,0	1,5	3,2	7,8	233,3	184,4	81,7	0,5	0,4	0,0	513,0
TOTAL	**0,0**	**0,0**	**0,0**	**11,2**	**17,9**	**15,0**	**860,5**	**761,9**	**326,2**	**228,1**	**241,0**	**1,6**	**2463,5**

Table 4. Commercial Fisheries, catch-at-age ('000).

Age	3	4	5	6	7	8	9	10	11	12	13 +
1974	741	4069	9607	13498	5303	6658	2794	1509	413	173	272
1975	35	4313	7707	5091	7185	2930	2757	1719	740	316	431
1976	217	5210	12535	6323	4244	5750	1991	2561	993	395	393
1977	14	2672	10124	12756	7943	2628	3274	1098	894	394	607
1978	61	2678	10794	17616	9292	2163	1064	1261	538	441	595
1979	70	3404	13995	12871	12592	4822	1429	721	543	300	439
1980	605	3390	17515	20196	11624	7064	1531	483	289	324	361
1981	316	6689	8999	20054	13971	4730	2154	939	294	172	609
1982	229	3231	18782	12747	13768	8673	3372	2109	618	145	278
1983	840	4901	15255	18451	10206	6002	3061	1161	817	211	410
1984	47	2947	7733	13493	20246	7394	5688	2095	821	406	371
1985	175	2518	15909	13820	10688	9818	3179	2317	828	200	165
1986	215	2415	8534	15635	11847	6024	6189	2284	1748	461	327
1987	15	1194	8426	12310	11864	7210	3650	1843	1470	575	651
1988	117	1274	6037	11452	6078	5145	1515	656	826	277	314
1989	99	1750	5072	7637	8365	3800	2431	971	436	329	342
1990	225	2748	6608	4636	5860	4173	1806	896	362	121	194
1991	267	4218	7809	6242	3283	2690	2232	594	449	104	158
1992	739	4081	8822	5877	2860	1409	903	686	207	73	109
1993	167	1788	3605	5677	2841	897	368	243	128	29	89
1994	2	33	113	68	70	29	15	5	2	3	3
1995	0	10	24	44	25	23	6	2	0	0	0
1996	1	16	53	49	40	22	17	6	1	0	1
1997	37	371	485	809	509	447	217	187	27	8	4
1998	0	34	473	596	473	217	122	130	40	18	5
1999	0	83	286	1134	480	756	345	168	112	55	7
2000	1	71	479	728	1257	368	394	162	38	13	11
2001	3	191	307	694	706	1020	315	176	34	18	33
2002	0	53	244	702	819	784	599	139	50	11	19
2003	0	8	21	52	61	43	15	16	11	1	1
2004	0	4	109	283	363	326	209	88	74	7	13
2005	0	9	64	281	628	407	288	130	128	49	24
2006	0	70	193	523	613	898	345	157	111	52	33
2007	2	54	222	467	454	629	525	217	108	43	70
2008	1	171	266	543	627	414	449	187	97	33	35
2009	3	116	593	629	431	302	226	88	50	20	23
2010	0	87	248	519	403	281	193	71	26	21	2
2011	2	32	176	254	298	134	60	33	14	5	6
2012	1	4	30	110	206	185	65	35	15	12	2
2013	0	10	37	119	173	131	95	23	10	1	2
2014	1	21	36	82	98	144	109	58	14	4	3
2015	0	18	48	99	84	147	99	30	15	2	2
2016	1	15	68	123	137	56	81	42	28	9	4
2017	0	8	36	176	298	208	123	58	91	27	24
2018	0	13	49	120	243	217	100	49	23	18	14

Table 5. Commercial Fisheries, mean weight at age January 1 (kg).

Age	3	4	5	6	7	8	9	10	11	12	13
1974	0.46	0.64	0.99	1.31	1.67	1.98	2.51	2.89	4.46	5.59	5.57
1975	0.40	0.72	1.00	1.52	1.89	2.34	2.61	3.08	4.16	4.50	4.30
1976	0.44	0.76	1.13	1.68	2.15	2.60	2.90	3.12	3.91	4.83	6.90
1977	0.46	0.65	1.02	1.48	2.02	2.52	2.77	3.17	3.35	4.23	4.13
1978	0.57	0.75	0.96	1.44	1.98	2.63	3.22	3.32	3.22	3.86	5.12
1979	0.35	0.65	0.94	1.42	1.87	2.59	3.40	3.84	3.96	5.23	5.38
1980	0.51	0.62	0.93	1.43	1.91	2.41	3.41	4.15	4.41	3.87	5.42
1981	0.57	0.79	0.98	1.33	1.85	2.49	3.34	4.55	6.04	7.43	5.93
1982	0.45	0.85	1.11	1.44	1.77	2.12	2.66	3.13	3.88	5.70	6.02
1983	0.38	0.93	1.30	1.60	1.90	2.18	2.45	3.47	4.52	4.37	6.66
1984	0.42	0.79	1.03	1.45	1.77	2.03	2.30	2.71	3.48	3.75	4.70
1985	0.63	0.79	0.98	1.22	1.62	1.93	2.15	2.32	2.60	3.71	4.60
1986	0.64	0.73	0.98	1.19	1.47	1.92	2.22	2.46	2.62	3.07	3.19
1987	0.45	0.60	0.77	1.01	1.31	1.58	2.09	2.65	2.73	3.05	3.28
1988	0.51	0.73	0.88	1.20	1.49	1.81	2.27	2.74	2.92	3.05	3.90
1989	0.40	0.69	0.94	1.12	1.42	1.67	2.02	2.33	2.84	3.11	3.98
1990	0.59	0.75	0.93	1.18	1.39	1.64	1.86	2.16	2.67	3.91	4.13
1991	0.42	0.59	0.81	1.08	1.36	1.60	1.94	2.05	2.54	3.10	4.69
1992	0.42	0.65	0.85	1.05	1.40	1.63	1.91	2.17	2.52	2.68	3.11
1993	0.49	0.63	0.83	1.11	1.38	1.86	2.14	2.73	3.15	5.07	5.39
1994	0.89	0.84	1.25	1.52	1.69	2.14	2.68	3.10	3.07	3.64	4.92
1995	0.49	0.70	0.94	1.31	1.56	1.76	2.15	2.36	2.50	2.78	3.71
1996	0.50	0.75	1.05	1.32	1.69	2.10	2.67	3.10	4.26	4.05	6.79
1997	0.69	0.82	1.07	1.43	1.64	1.97	2.21	2.44	3.20	3.28	5.14
1998	0.56	0.83	1.14	1.36	1.64	1.87	1.81	2.50	2.94	3.06	5.82
1999	0.56	0.92	1.20	1.65	1.97	2.26	2.39	2.85	3.53	3.89	5.10
2000	0.56	0.79	1.22	1.59	2.01	2.24	2.53	2.60	2.92	5.69	3.98
2001	0.56	0.79	1.13	1.50	1.80	2.42	2.57	3.24	3.92	4.04	4.32
2002	0.37	0.73	1.24	1.53	1.80	2.02	2.42	2.60	3.07	3.77	3.64
2003	0.08	0.44	0.60	1.04	1.32	1.59	1.87	1.95	2.49	2.49	3.39
2004	0.58	0.88	1.30	1.66	2.15	2.30	2.71	2.76	3.41	4.33	3.68
2005	0.34	0.95	1.38	1.60	1.86	2.32	2.59	3.29	2.96	4.10	5.04
2006	0.33	0.62	1.12	1.41	1.75	1.96	2.31	2.79	2.97	3.24	3.41
2007	0.59	0.85	1.35	1.85	2.03	2.44	2.56	3.29	3.61	4.17	3.80
2008	0.44	0.85	1.22	1.80	2.17	2.40	2.66	2.85	3.69	4.07	5.66
2009	0.50	0.86	1.16	1.53	2.00	2.59	2.63	3.44	3.83	5.08	5.45
2010	0.52	0.88	1.17	1.55	1.95	2.46	2.61	3.02	3.30	4.20	5.42
2011	0.64	0.81	1.04	1.32	1.89	2.32	2.81	2.96	3.11	3.85	4.32
2012	0.54	0.65	1.12	1.44	1.72	2.18	2.48	2.85	3.55	2.94	4.87
2013	0.59	0.80	1.20	1.59	1.88	2.10	2.71	3.20	3.86	4.50	5.27
2014	0.48	0.76	1.03	1.52	1.97	2.30	2.63	3.14	3.89	5.38	6.42
2015	0.68	0.93	1.36	1.94	2.05	2.51	2.64	3.25	3.77	5.23	4.35
2016	0.52	0.87	1.37	1.91	2.43	2.77	2.86	3.52	3.59	4.42	5.98
2017	0.42	0.82	1.16	1.83	2.24	2.64	3.11	3.69	3.44	3.71	4.63
2018	0.45	0.84	1.16	1.75	2.40	3.22	4.12	4.66	4.75	5.54	6.38

Table 6. Commercial Fisheries, lengths at age (cm).

Age	3	4	5	6	7	8	9	10	11	12	13
1974	36.78	41.06	47.59	52.40	56.69	59.95	64.72	67.16	78.00	84.78	83.13
1975	35.17	42.76	47.91	54.96	59.15	63.23	65.57	68.98	76.55	78.01	76.17
1976	36.11	43.64	49.82	56.85	61.83	65.85	68.24	69.83	75.00	80.20	90.65
1977	37.00	41.35	48.08	54.45	60.53	65.14	67.22	70.09	71.23	76.82	76.70
1978	39.24	43.30	47.21	53.91	60.03	66.13	70.50	70.97	69.68	74.89	81.29
1979	33.25	41.14	46.62	53.67	58.85	65.27	71.65	74.13	75.19	81.82	83.78
1980	38.17	40.67	46.49	53.79	59.20	63.91	71.62	76.39	77.99	74.40	84.17
1981	39.26	44.01	47.47	52.49	58.30	63.96	69.95	77.75	86.78	93.17	86.79
1982	36.49	44.94	49.50	53.95	57.79	61.32	65.82	69.06	74.47	85.27	87.26
1983	33.44	46.37	52.06	55.96	59.08	61.48	63.81	70.99	77.97	76.01	88.68
1984	35.88	44.05	48.23	54.20	57.91	60.42	62.75	65.90	71.57	73.09	77.64
1985	40.65	44.06	47.40	51.03	56.04	59.36	61.28	62.88	64.79	72.74	77.76
1986	41.36	42.93	47.33	50.58	54.10	59.02	61.94	64.00	65.17	68.41	69.37
1987	36.65	40.18	43.83	47.80	52.21	55.24	60.53	65.25	65.82	68.30	69.55
1988	37.97	42.83	45.69	50.65	54.35	58.01	62.09	66.01	67.42	68.23	73.75
1989	41.40	42.98	47.14	50.05	53.85	56.81	60.30	63.44	66.70	69.17	73.81
1990	40.77	43.94	46.79	50.14	53.24	56.04	58.39	62.54	63.44	72.89	77.38
1991	36.50	40.68	45.10	49.52	53.23	56.31	59.77	60.25	64.27	68.23	78.30
1992	36.27	41.85	45.75	48.87	53.52	56.01	58.83	61.23	63.95	64.55	67.90
1993	38.08	41.29	45.05	49.40	52.78	57.90	59.86	64.80	67.54	79.10	81.15
1994	45.44	45.84	51.84	55.20	57.14	61.20	65.52	68.87	69.49	73.26	81.48
1995	37.90	42.31	46.70	52.09	55.22	57.60	61.42	63.09	63.39	66.80	73.48
1996	38.42	43.76	48.71	52.47	56.60	60.49	65.56	67.71	76.71	76.45	89.93
1997	41.84	44.72	48.75	53.72	56.17	59.41	61.52	63.51	69.10	69.27	82.43
1998	39.39	45.45	50.61	53.63	57.09	59.50	58.52	64.01	68.43	68.55	85.70
1999	39.39	46.73	51.06	56.73	60.21	63.00	64.10	67.44	72.25	75.08	82.75
2000	40.00	44.62	51.25	55.85	60.39	62.49	64.86	65.37	67.71	84.36	74.06
2001	40.00	44.44	49.95	54.86	58.30	64.07	64.98	70.54	74.47	75.12	77.11
2002	34.00	42.40	50.58	54.15	57.18	59.35	62.78	64.37	67.93	71.46	71.41
2003	36.37	40.15	47.62	51.69	55.08	58.20	58.64	63.67	64.03	70.19	83.36
2004	40.00	45.50	51.43	55.46	60.05	61.37	64.28	64.45	68.71	74.55	71.46
2005	36.79	46.54	52.10	54.90	57.37	61.51	63.57	68.40	66.14	73.11	76.82
2006	36.79	41.32	49.58	53.25	57.03	59.30	62.30	66.25	66.79	69.29	70.04
2007	40.74	45.69	52.81	58.17	59.91	63.68	64.51	70.04	72.02	75.12	73.15
2008	37.00	45.40	50.83	57.54	60.87	62.71	65.09	66.20	71.70	73.72	83.44
2009	38.59	45.66	50.01	54.78	59.42	64.40	64.35	70.35	72.34	79.09	81.94
2010	37.79	46.03	50.24	54.94	59.16	63.52	64.18	67.45	69.83	75.50	82.69
2011	41.77	44.80	48.52	52.19	58.56	62.20	65.70	66.96	68.79	73.93	75.33
2012	40.00	42.27	50.40	54.57	57.63	62.05	64.91	66.93	72.51	67.40	79.01
2013	40.89	44.71	50.60	55.56	58.45	60.23	65.49	69.07	73.80	77.13	82.35
2014	38.10	44.05	48.61	54.89	59.67	62.78	65.61	69.56	73.93	83.16	88.32
2015	43.00	47.25	53.23	59.71	60.75	64.65	65.73	69.68	74.14	83.08	77.88
2016	39.48	46.50	53.61	59.86	64.68	67.35	68.03	72.60	72.87	77.76	84.98
2017	37.00	45.56	51.31	59.34	63.48	67.18	70.45	74.24	72.74	74.92	79.88
2018	37.00	44.81	49.62	56.40	62.15	67.78	73.00	75.93	76.45	80.68	85.90

Table 7a. DFO Survey, NAFO Division 4R, average weight of cod caught per tow per stratum.

	NAFO 4S / Strata																				
Year	**803**	**804**	**805**	**806**	**807**	**808**	**814**	**815**	**816**	**817**	**818**	**819**	**827**	**828**	**829**	**830**	**831**	**832**	**833**	**839**	**841**
1990	1.0	0.0	0.0	0.0	0.0	0.0	11.5	0.5	12.2	80.3	3.1	7.2	1.9	42.1	129.4	45.0	114.5	97.5	94.6	4.0	0.2
1991	1.8	0.0	0.0	0.5	1.0	0.4	63.4	5.4	14.2	273.5	160.6	96.6	17.6	39.1	46.9	15.9	538.5	306.8	28.9	31.1	0.6
1992	0.0	0.0	0.0	0.0	0.0	0.0	11.2	8.7	2.3	0.9	3.5	24.5	0.4	9.4	6.3	51.2	122.5	41.6	0.4	0.1	0.0
1993	0.0	0.0	0.0	1.2	0.3	0.0	0.4	0.0	11.9	7.5	0.3	0.0	2.0	1.4	1.3	1.3	35.6	12.5	3.3	2.7	0.3
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.7	7.8	3.8	27.2	1.9	29.3	14.8	5.4	0.5	20.5	24.7	1.0	3.7	5.2
1995	0.0	1.2	0.0	0.0	0.0	0.0	0.2	0.7	4.0	0.5	2.5	2.3	8.6	0.0	0.4	17.6	5.9	6.1	0.5	0.0	0.0
1996	0.0	0.0	0.0	0.0	1.4	0.0	3.2	1.0	22.0	74.5	15.3	10.1	14.0	6.2	4.6	15.9	3.3	19.7	0.0	0.7	0.0
1997	0.0	0.0	0.0	0.0	0.8	0.0	33.6	1.7	7.5	3.3	9.4	2.2	8.3	0.3	2.7	0.5	2.2	3.1	8.3	2.8	0.1
1998	0.0	0.0	0.0	0.0	1.3	0.0	0.0	0.0	8.2	1.0	3.0	26.3	27.8	0.0	7.6	2.0	5.4	2.3	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	2.6	0.7	6.1	0.1	0.9	4.0	23.9	18.5	20.6	0.1	24.0	8.0	3.5	4.1	14.1	3.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	28.5	8.5	0.2	1.0	205.0	2.4	17.9	0.0	0.0	29.2	12.4	1.6	8.2	0.0	2.9
2001	0.0	0.0	0.0	0.0	0.0	0.0	2.7	0.0	0.5	0.7	13.7	0.5	7.9	0.0	0.5	0.7	4.5	1.5	0.4	0.0	0.0
2002	0.0	0.0	0.0	0.0	0.0	0.0	7.1	0.0	1.2	1.5	18.2	0.0	14.6	0.0	4.2	3.0	0.2	1.3	1.7	0.0	2.9
2003	0.0	0.0	0.0	0.7	0.0	0.0	5.5	8.8	20.8	7.4	83.9	15.5	1.2	0.0	0.1	5.5	1.2	2.2	62.7	11.1	10.2
2004	0.0	0.0	0.6	0.0	0.0	0.0	47.3	2.0	0.9	1.5	44.2	0.3	36.2	5.7	0.5	4.7	12.4	4.3	12.8	11.6	2.2
2005	0.0	0.0	0.0	0.0	0.1	0.0	0.0	5.6	0.0	1.3	0.2	19.8	16.1	2.1	13.9	8.6	7.6	5.7	5.5	4.7	3.5
2006	0.0	0.0	0.0	3.4	0.0	0.0	0.6	0.3	5.0	0.0	16.5	1.7	44.7	7.9	8.4	94.6	4.4	8.4	18.3	6.6	5.0
2007	0.0	0.0	0.0	0.0	0.0	0.0	33.1	2.8	0.1	1.5	21.8	19.1	25.5	2.9	18.6	11.1	7.9	9.3	6.9	3.6	6.9
2008	0.2	0.0	0.0	0.4	0.0	0.0	46.4	1.8	35.0	0.0	6.6	0.9	88.9	9.3	69.2	55.8	49.0	74.7	6.8	54.6	13.1
2009	0.0	0.0	0.0	0.0	0.0	0.0	7.8	0.3	0.0	4.9	76.6	1.7	6.9	19.3	4.9	7.5	19.8	6.3	20.7	6.5	3.5
2010	0.0	0.2	0.0	0.0	0.9	0.0	54.5	16.3	6.7	3.5	11.1	5.4	27.0	80.5	12.2	9.2	2.4	13.4	14.7	16.1	2.9
2011	0.0	0.0	0.0	0.0	0.4	0.1	0.4	20.5	49.4	46.3	14.0	2.5	38.4	12.5	12.0	17.4	15.7	39.7	23.1	14.7	3.8
2012	0.1	0.0	0.0	0.0	0.0	0.0	3.8	0.1	21.9	15.1	9.0	1.2	21.4	79.0	26.2	24.7	16.0	15.0	19.7	9.7	9.8
2013	0.0	0.0	0.0	2.1	0.7	0.1	5.1	0.0	0.4	14.3	33.4	1.2	110.1	9.5	11.2	24.1	71.1	9.2	17.8	20.4	11.0
2014	0.0	0.4	0.0	1.1	3.7	9.4	13.5	8.6	19.6	15.1	21.6	2.1	4.3	2.7	88.8	54.5	67.4	50.3	20.2	10.9	12.0
2015	0.1	1.3	1.7	3.7	0.0	0.1	4.6	6.4	54.0	27.4	35.2	29.4	69.2	136.2	142.9	42.0	110.5	45.7	2.0	38.3	21.1
2016	0.0	1.3	0.1	0.7	0.3	0.2	17.3	3.7	2.9	35.8	88.1	0.7	20.1	149.1	88.6	42.0	398.0	107.4	21.8	22.5	12.3
2017	0.1	0.0	0.0	0.0	0.1	0.1	0.0	0.2	10.3	22.2	21.2	0.2	31.6	42.0	17.6	18.0	129.8	44.1	3.1	2.5	2.2
2018	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.5	1.5	10.4	6.3	3.1	18.9	3.1	18.6	20.6	27.0	177.4	12.2	2.8	3.1

Table 7b. DFO Survey, NAFO Division 4S, average weight of cod caught per tow per stratum.

	4S / Strate																				
Year	**803**	**804**	**805**	**806**	**807**	**808**	**814**	**815**	**816**	**817**	**818**	**819**	**827**	**828**	**829**	**830**	**831**	**832**	**833**	**839**	**841**
1990	1.0	0.0	0.0	0.0	0.0	0.0	11.5	0.5	12.2	80.3	3.1	7.2	1.9	42.1	129.4	45.0	114.5	97.5	94.6	4.0	0.2
1991	1.8	0.0	0.0	0.5	1.0	0.4	63.4	5.4	14.2	273.5	160.6	96.6	17.6	39.1	46.9	15.9	538.5	306.8	28.9	31.1	0.6
1992	0.0	0.0	0.0	0.0	0.0	0.0	11.2	8.7	2.3	0.9	3.5	24.5	0.4	9.4	6.3	51.2	122.5	41.6	0.4	0.1	0.0
1993	0.0	0.0	0.0	1.2	0.3	0.0	0.4	0.0	11.9	7.5	0.3	0.0	2.0	1.4	1.3	1.3	35.6	12.5	3.3	2.7	0.3
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.7	7.8	3.8	27.2	1.9	29.3	14.8	5.4	0.5	20.5	24.7	1.0	3.7	5.2
1995	0.0	1.2	0.0	0.0	0.0	0.0	0.2	0.7	4.0	0.5	2.5	2.3	8.6	0.0	0.4	17.6	5.9	6.1	0.5	0.0	0.0
1996	0.0	0.0	0.0	0.0	1.4	0.0	3.2	1.0	22.0	74.5	15.3	10.1	14.0	6.2	4.6	15.9	3.3	19.7	0.0	0.7	0.0
1997	0.0	0.0	0.0	0.0	0.8	0.0	33.6	1.7	7.5	3.3	9.4	2.2	8.3	0.3	2.7	0.5	2.2	3.1	8.3	2.8	0.1
1998	0.0	0.0	0.0	0.0	1.3	0.0	0.0	0.0	8.2	1.0	3.0	26.3	27.8	0.0	7.6	2.0	5.4	2.3	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	2.6	0.7	6.1	0.1	0.9	4.0	23.9	18.5	20.6	0.1	24.0	8.0	3.5	4.1	14.1	3.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	28.5	8.5	0.2	1.0	205.0	2.4	17.9	0.0	0.0	29.2	12.4	1.6	8.2	0.0	2.9
2001	0.0	0.0	0.0	0.0	0.0	0.0	2.7	0.0	0.5	0.7	13.7	0.5	7.9	0.0	0.5	0.7	4.5	1.5	0.4	0.0	0.0
2002	0.0	0.0	0.0	0.0	0.0	0.0	7.1	0.0	1.2	1.5	18.2	0.0	14.6	0.0	4.2	3.0	0.2	1.3	1.7	0.0	2.9
2003	0.0	0.0	0.0	0.7	0.0	0.0	5.5	8.8	20.8	7.4	83.9	15.5	1.2	0.0	0.1	5.5	1.2	2.2	62.7	11.1	10.2
2004	0.0	0.0	0.6	0.0	0.0	0.0	47.3	2.0	0.9	1.5	44.2	0.3	36.2	5.7	0.5	4.7	12.4	4.3	12.8	11.6	2.2
2005	0.0	0.0	0.0	0.0	0.1	0.0	0.0	5.6	0.0	1.3	0.2	19.8	16.1	2.1	13.9	8.6	7.6	5.7	5.5	4.7	3.5
2006	0.0	0.0	0.0	3.4	0.0	0.0	0.6	0.3	5.0	0.0	16.5	1.7	44.7	7.9	8.4	94.6	4.4	8.4	18.3	6.6	5.0
2007	0.0	0.0	0.0	0.0	0.0	0.0	33.1	2.8	0.1	1.5	21.8	19.1	25.5	2.9	18.6	11.1	7.9	9.3	6.9	3.6	6.9
2008	0.2	0.0	0.0	0.4	0.0	0.0	46.4	1.8	35.0	0.0	6.6	0.9	88.9	9.3	69.2	55.8	49.0	74.7	6.8	54.6	13.1
2009	0.0	0.0	0.0	0.0	0.0	0.0	7.8	0.3	0.0	4.9	76.6	1.7	6.9	19.3	4.9	7.5	19.8	6.3	20.7	6.5	3.5
2010	0.0	0.2	0.0	0.0	0.9	0.0	54.5	16.3	6.7	3.5	11.1	5.4	27.0	80.5	12.2	9.2	2.4	13.4	14.7	16.1	2.9
2011	0.0	0.0	0.0	0.0	0.4	0.1	0.4	20.5	49.4	46.3	14.0	2.5	38.4	12.5	12.0	17.4	15.7	39.7	23.1	14.7	3.8
2012	0.1	0.0	0.0	0.0	0.0	0.0	3.8	0.1	21.9	15.1	9.0	1.2	21.4	79.0	26.2	24.7	16.0	15.0	19.7	9.7	9.8
2013	0.0	0.0	0.0	2.1	0.7	0.1	5.1	0.0	0.4	14.3	33.4	1.2	110.1	9.5	11.2	24.1	71.1	9.2	17.8	20.4	11.0
2014	0.0	0.4	0.0	1.1	3.7	9.4	13.5	8.6	19.6	15.1	21.6	2.1	4.3	2.7	88.8	54.5	67.4	50.3	20.2	10.9	12.0
2015	0.1	1.3	1.7	3.7	0.0	0.1	4.6	6.4	54.0	27.4	35.2	29.4	69.2	136.2	142.9	42.0	110.5	45.7	2.0	38.3	21.1
2016	0.0	1.3	0.1	0.7	0.3	0.2	17.3	3.7	2.9	35.8	88.1	0.7	20.1	149.1	88.6	42.0	398.0	107.4	21.8	22.5	12.3
2017	0.1	0.0	0.0	0.0	0.1	0.1	0.0	0.2	10.3	22.2	21.2	0.2	31.6	42.0	17.6	18.0	129.8	44.1	3.1	2.5	2.2
2018	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.5	1.5	10.4	6.3	3.1	18.9	3.1	18.6	20.6	27.0	177.4	12.2	2.8	3.1

Table 7c. DFO Survey, NAFO Divisions 4RS, average weight per tow and average number per set.

Year	**Average weight / tow with multiplicative model**	**Average weight / tow without multiplicative model**	**Average number / tow with multiplicative model**
1990	43.8	39.5	87.2
1991	76.0	73.5	145.3
1992	21.8	22.7	39.8
1993	5.3	5.3	11.3
1994	14.5	14.6	38.2
1995	12.1	12.3	16.3
1996	13.8	13.0	23.2
1997	21.2	22.6	28.8
1998	25.4	25.3	32.0
1999	27.1	28.6	42.4
2000	26.6	25.4	47.6
2001	19.1	23.6	30.4
2002	9.4	10.7	12.9
2003	53.5	32.1	86.4
2004	22.3	27.3	29.4
2005	18.7	19.1	24.1
2006	25.4	25.4	45.6
2007	16.0	16.1	30.0
2008	27.6	27.6	65.1
2009	17.0	17.2	34.6
2010	20.1	17.2	34.1
2011	21.0	21.2	37.6
2012	23.2	23.2	46.5
2013	15.8	15.4	50.0
2014	39.8	39.8	87.4
2015	34.5	34.5	76.4
2016	54.2	54.3	78.2
2017	20.5	20.6	41.3
2018	25.2	25.2	61.2

Table 8. DFO Survey, average numbers at age.

Age	1	2	3	4	5	6	7	8	9	10	11	12	13
1990	3.96	7.07	30.58	18.90	8.24	2.83	2.73	2.53	0.53	0.16	0.05	0.02	0.04
1991	22.68	12.04	40.72	67.20	30.56	13.07	3.50	1.99	2.09	0.48	0.32	0.07	0.08
1992	7.25	7.35	10.45	14.92	12.81	4.57	1.42	0.67	0.50	0.21	0.09	0.07	0.03
1993	0.00	2.61	2.49	1.85	1.94	1.63	0.29	0.15	0.03	0.02	0.00	0.02	0.00
1994	5.67	6.55	12.38	4.76	2.23	2.35	1.69	0.63	0.12	0.02	0.02	0.02	0.00
1995	0.00	1.83	1.50	5.13	3.51	1.96	0.87	0.86	0.14	0.10	0.03	0.00	0.00
1996	0.14	3.05	9.14	3.40	3.96	1.96	0.89	0.28	0.23	0.04	0.00	0.01	0.00
1997	0.66	4.29	4.47	9.48	3.01	4.24	1.99	0.95	0.43	0.29	0.02	0.00	0.00
1998	0.53	2.31	7.62	7.58	7.34	3.15	2.36	0.70	0.47	0.15	0.00	0.00	0.00
1999	0.98	8.37	12.27	9.41	3.86	4.31	1.02	0.87	0.28	0.08	0.14	0.03	0.02
2000	7.89	5.49	13.73	9.17	4.87	2.02	2.42	0.61	0.47	0.13	0.06	0.07	0.01
2001	1.72	4.90	9.45	4.46	3.44	2.65	1.32	1.72	0.23	0.45	0.06	0.07	0.02
2002	0.00	2.10	2.49	4.30	1.54	1.13	0.62	0.50	0.18	0.10	0.01	0.00	0.00
2003	0.67	17.10	20.26	15.58	9.88	5.32	3.40	1.41	0.70	0.77	0.14	0.07	0.00
2004	0.82	6.16	5.64	6.08	3.80	4.00	2.12	1.25	0.89	0.33	0.21	0.02	0.01
2005	3.09	2.89	3.64	4.16	3.56	2.50	2.33	0.78	0.56	0.29	0.19	0.07	0.00
2006	5.32	14.28	7.82	6.58	4.18	3.21	1.80	1.23	0.61	0.23	0.23	0.05	0.00
2007	4.53	4.99	7.92	6.01	2.78	1.56	0.93	0.60	0.42	0.14	0.08	0.04	0.01
2008	1.84	24.73	12.68	15.62	5.63	2.69	1.04	0.51	0.19	0.11	0.01	0.02	0.02
2009	0.44	10.93	6.66	6.61	5.53	2.38	1.39	0.43	0.06	0.11	0.00	0.01	0.01
2010	3.39	1.73	8.50	8.58	6.13	2.95	0.86	0.31	0.18	0.02	0.01	0.00	0.01
2011	1.54	10.17	6.67	6.72	5.67	3.54	2.16	0.67	0.26	0.06	0.03	0.00	0.01
2012	6.82	8.94	10.78	6.42	5.42	5.00	1.61	0.81	0.34	0.17	0.02	0.08	0.00
2013	7.10	17.79	12.49	6.33	1.95	1.37	1.05	0.48	0.18	0.07	0.00	0.02	0.00
2014	2.94	29.28	25.29	16.03	6.34	3.61	2.18	0.86	0.61	0.27	0.03	0.00	0.00
2015	10.09	17.75	19.37	15.54	8.31	2.74	1.07	0.69	0.39	0.16	0.05	0.02	0.01
2016	2.27	9.33	21.78	18.62	13.89	7.23	2.72	1.11	0.91	0.27	0.19	0.19	0.15
2017	4.69	6.39	5.74	10.28	6.54	4.13	2.37	0.63	0.31	0.14	0.09	0.02	0.00
2018	3.02	21.64	14.63	8.25	5.57	3.74	2.44	0.40	0.14	0.03	0.03	0.01	0.00

Table 9. Mobile gear sentinel surveys, average weight (kg) of cod per tow per unit area and per stratum.

	NAFO 3Pn / strata				NAFO 4R / strata												
Year	302	303	304	305	101	102	103	801	802	809	810	811	812	813	820	821	822
1995	37.8	9.1	0.0	0.1	-	-	-	0.6	0.0	0.0	0.0	9.8	1.7	67.3	38.7	74.8	28.7
1996	31.6	8.7	0.3	0.0	-	-	-	1.6	0.0	0.0	0.0	5.0	8.3	19.1	30.8	175.1	71.5
1997	69.6	3.9	0.4	0.0	-	-	-	0.4	0.0	0.0	0.0	5.6	1.3	34.6	80.9	79.5	177.5
1998	45.4	3.7	0.3	0.0	-	-	-	0.4	0.0	0.2	0.8	8.5	6.2	26.8	46.3	69.0	56.6
1999	10.3	2.1	0.5	0.0	-	-	-	0.0	0.0	0.8	0.0	4.7	3.1	12.7	137.7	129.7	37.1
2000	17.3	0.8	0.4	0.0	-	-	-	0.4	0.0	0.0	0.3	0.1	1.5	16.6	23.8	56.4	77.2
2001	121.2	5.1	0.0	0.1	-	-	-	0.0	0.0	0.2	0.0	9.2	3.7	82.5	21.8	76.2	53.4
2002	191.3	10.2	0.0	0.0	-	-	-	2.2	0.0	0.1	0.0	9.9	18.1	14.2	33.0	27.3	29.5
2003	28.0	5.1	0.0	0.0	38.3	580.7	11.0	0.7	0.0	2.1	0.5	7.8	1.8	28.8	32.7	36.5	96.8
2004	26.4	9.4	0.8	0.1	37.3	240.4	174.6	0.0	0.1	0.0	1.1	6.8	3.7	35.4	54.1	28.6	114.8
2005	26.5	14.9	0.0	0.0	37.2	117.0	144.9	0.0	0.4	0.0	0.6	34.6	8.1	5.9	87.1	194.3	86.4
2006	20.9	3.7	0.0	0.0	61.2	126.9	1.5	0.9	0.0	0.5	0.0	46.0	13.0	7.8	34.3	83.3	64.5
2007	11.6	16.1	0.1	0.0	54.6	336.1	15.6	1.2	0.0	0.1	0.0	7.7	9.4	31.7	55.2	34.6	51.3
2008	1.6	0.0	0.0	0.0	23.4	612.6	839.4	2.0	0.0	0.4	0.0	2.0	3.6	17.2	4.2	27.5	24.0
2009	1.5	1.6	0.2	0.0	23.9	62.7	1.5	2.9	0.0	0.0	0.0	2.3	3.4	87.4	18.9	10.5	55.9
2010	1.2	0.1	0.0	0.0	53.5	12.6	359.1	0.3	0.0	0.0	0.0	4.6	3.6	37.5	25.1	9.8	30.5
2011	0.2	0.0	0.0	0.0	0.0	11.7	462.8	0.0	0.0	0.0	0.0	6.9	2.6	1.5	22.1	38.1	28.0
2012	2.4	0.1	0.0	0.0	35.3	6.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	1.8	9.2	9.6	12.3
2013	2.5	1.8	0.0	0.0	0.6	21.7	24.9	0.3	0.0	0.9	0.0	1.1	0.3	7.2	2.1	0.6	1.3
2014	1.3	0.1	0.0	0.0	18.2	26.0	9.6	4.2	0.1	0.5	0.0	1.9	26.4	22.0	4.5	15.9	19.5
2015	2.4	0.0	0.0	0.0	676.7	1.6	46.2	3.8	0.0	0.1	0.0	1.9	8.5	4.9	23.8	4.6	14.4
2016	1.7	0.2	0.0	0.0	12.2	39.0	-	0.7	0.0	0.0	0.2	5.4	8.3	7.7	11.0	11.5	13.2
2017	2.3	1.8	0.0	0.0	2.6	34.7	0.7	0.0	0.0	0.0	0.0	0.4	0.8	1.8	17.3	7.1	33.7
2018	3.7	1.0	0.0	0.0	7.5	3.5	34.6	0.0	0.5	0.1	0.0	0.3	0.9	2.0	1.0	1.0	30.1

Table 9 (continued). Mobile gear sentinel surveys, average weight (kg) of cod per tow per unit area and per stratum.

	NAFO 4R / strata							NAFO 4S / strata									
Year	**823**	**824**	**835**	**836**	**837**	**838**	**840**	**803**	**804**	**805**	**806**	**807**	**808**	**814**	**815**	**816**	**817**
1995	164.6	41.1	48.8	32.8	18.2	30.6	0.4	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.5	5.4	13.6
1996	128.9	126.4	69.9	39.4	18.5	9.0	2.6	0.1	0.0	0.0	-	0.2	0.4	8.5	39.1	10.6	5.9
1997	259.4	169.5	81.9	124.4	93.7	61.2	0.0	0.0	0.0	0.0	0.0	0.7	0.0	0.0	0.7	0.9	0.3
1998	288.1	592.5	64.4	107.7	219.6	43.3	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.6	1.1	0.0
1999	39.8	77.2	77.8	147.0	27.2	11.0	15.2	0.0	0.0	0.0	0.0	1.2	0.0	4.3	2.1	4.2	0.0
2000	74.8	44.0	114.5	195.8	295.7	179.5	7.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	6.7	0.0
2001	149.6	241.4	105.4	66.1	516.8	58.3	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.9	0.2	0.4
2002	55.5	66.3	79.2	147.3	192.2	98.6	0.0	0.0	0.0	0.0	0.0	0.3	0.0	1.0	0.0	0.0	0.3
2003	1240.9	108.8	190.2	57.1	107.9	18.1	4.8	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.5	5.8	0.6
2004	316.0	281.5	89.1	121.3	543.5	9.7	7.3	0.0	0.2	-	0.3	0.0	0.0	0.5	0.7	1.1	0.7
2005	63.3	107.9	59.3	72.1	187.6	213.7	4.9	0.1	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0
2006	83.6	8.5	139.1	176.2	278.7	328.1	12.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.1	0.1
2007	31.0	53.1	56.7	38.9	129.3	3.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.5	0.5	33.8	0.2
2008	69.3	36.3	11.1	71.9	196.7	12.8	0.1	0.0	0.0	0.0	0.0	0.0	0.2	0.3	4.2	0.4	0.0
2009	46.5	45.8	21.8	65.4	460.7	77.6	0.0	0.0	0.0	0.0	0.2	0.4	0.0	1.6	0.3	1.2	0.3
2010	18.0	4.1	12.6	22.3	141.0	74.2	7.4	0.0	0.0	0.1	0.3	0.0	0.5	9.5	0.5	7.7	0.3
2011	153.3	99.6	13.2	73.0	1079.2	22.8	7.3	0.0	0.0	0.1	0.0	0.0	0.0	53.2	0.2	0.1	3.2
2012	4.6	18.3	6.8	18.1	88.4	26.5	0.5	0.0	0.0	0.0	0.5	0.0	0.0	1.0	0.9	0.1	0.9
2013	16.9	3.4	0.7	137.3	135.8	198.0	200.6	0.0	0.2	0.1	0.0	0.8	0.0	4.8	6.3	2.2	0.5
2014	34.9	49.0	19.4	51.7	633.7	61.8	3.1	0.2	0.4	0.1	1.2	1.3	0.5	5.8	6.7	7.1	0.3
2015	86.1	71.0	35.8	74.7	511.0	146.1	4.5	0.0	0.0	0.1	1.5	0.0	0.0	4.0	3.1	5.9	3.3
2016	30.9	32.4	19.3	77.3	58.6	26.1	0.0	0.0	0.9	0.4	0.4	0.0	0.0	3.6	8.1	15.1	6.1
2017	5.8	86.1	16.0	34.4	53.4	101.8	12.0	0.0	0.1	0.6	0.0	0.2	0.0	0.7	1.9	1.8	26.9
2018	10.7	17.0	4.5	23.7	119.5	2.3	24.7	0.0	0.0	0.0	0.0	0.0	0.0	0.8	2.4	0.2	1.2

Table 9 (continued). Mobile gear sentinel surveys, average weight (kg) of cod per tow per unit area and per stratum.

Year	NAFO 4S / strata											Mean weight / set
	818	**819**	**827**	**828**	**829**	**830**	**831**	**832**	**833**	**839**	**841**	
1995	0.3	1.0	1.3	3.0	1.8	8.0	6.9	12.1	0.0	-	-	**13.0**
1996	3.0	0.9	0.0	0.0	28.8	-	13.1	15.6	0.0	0.0	5.6	**16.9**
1997	0.0	0.7	11.7	-	7.3	22.2	-	4.2	3.2	0.8	1.7	**25.4**
1998	0.2	12.0	0.3	3.3	23.2	30.0	3.8	8.9	0.7	1.0	0.6	**26.3**
1999	0.5	0.0	5.4	2.4	44.0	32.2	8.0	5.6	5.0	2.3	0.0	**16.9**
2000	0.5	0.0	0.6	34.5	12.1	4.3	0.0	5.8	0.0	0.0	1.7	**29.7**
2001	1.5	0.0	0.0	0.0	6.3	0.0	8.4	3.9	0.3	0.0	2.4	**33.1**
2002	3.0	3.0		0.5	25.0	4.1	0.0	1.8	0.0	0.5	1.2	**22.7**
2003	3.3	30.5	2.4	0.0	0.0	6.1	0.0	1.8	0.0	0.3	2.8	**30.6**
2004	3.1	0.3	0.0	0.5	9.8	1.8	5.9	4.8	0.0	0.0	0.0	**37.5**
2005	2.4	-	2.0	3.7	24.5	11.4	12.0	3.8	0.0	2.2	4.3	**28.7**
2006	0.7	0.7	0.5	3.9	13.9	3.1	13.6	3.3	5.4	1.6	6.4	**35.3**
2007	0.2	0.7	7.4	-	0.7	3.8	119.8	14.0	2.7	2.7	11.7	**20.3**
2008	0.7	0.3	1.0	-	3.6	12.2	18.3	19.0	1.1	0.8	1.0	**25.1**
2009	8.6	0.0	5.0	3.3	-	22.5	6.0	23.3	0.0	1.7	1.7	**26.6**
2010	1.8	0.0	4.1	-	22.2	8.9	-	30.9	4.3	10.4	2.2	**17.0**
2011	5.1	-	0.0	3.9	0.0	51.1	27.7	6.2	0.0	13.7	1.0	**40.9**
2012	5.0	0.6	6.7	0.0	0.2	8.4	-	10.7	4.2	3.7	-	**6.5**
2013	4.3	3.7	17.6	3.0	4.3	11.4	26.4	23.6	5.3	1.5	4.2	**19.2**
2014	3.3	5.7	27.1	-	2.4	38.6	9.8	37.5	2.9	8.1	-	**29.5**
2015	17.0	4.2	30.7	5.1	35.1	9.7	9.7	46.2	4.1	17.2	1.3	**37.6**
2016	5.0	12.1	27.1	-	54.7	10.8	33.9	105.1	7.9	185.5	0.9	**24.5**
2017	10.8	0.0	4.2	23.5	40.3	13.2	14.0	26.5	42.1	2.1	0.5	**13.6**
2018	3.8	1.2	1.5	56.9	1.9	13.5	0.0	113.9	4.0	10.9	0.4	**12.5**

Table 10. Mobile gear sentinel surveys, average numbers at age.

Age	1	2	3	4	5	6	7	8	9	10	11	12	13
1995	1.078	2.010	2.273	4.677	3.101	1.861	1.303	1.143	0.230	0.055	0.024	0.008	0.000
1996	0.118	1.692	7.259	6.180	4.951	2.392	1.216	0.819	0.644	0.145	0.025	0.011	0.000
1997	0.000	2.924	6.145	13.872	4.956	4.423	1.715	0.687	0.512	0.164	0.044	0.003	0.000
1998	0.038	2.059	8.547	6.780	7.260	3.062	2.971	0.970	0.663	0.253	0.157	0.039	0.000
1999	0.093	2.043	5.091	5.832	3.415	2.943	1.089	0.935	0.190	0.085	0.047	0.013	0.000
2000	0.359	1.220	7.433	10.218	5.743	3.892	3.485	0.800	0.792	0.281	0.047	0.012	0.007
2001	1.207	5.632	11.254	9.884	5.021	3.111	1.809	1.373	0.480	0.320	0.099	0.044	0.010
2002	0.023	0.600	3.035	8.159	4.663	3.783	2.055	1.655	0.880	0.264	0.074	0.005	0.007
2003	0.051	1.104	4.227	7.383	6.368	3.220	2.400	1.171	0.944	0.728	0.268	0.054	0.023
2004	0.016	0.709	3.620	6.718	5.831	5.489	3.401	2.218	1.352	0.664	0.488	0.127	0.025
2005	0.025	1.865	4.837	6.209	4.895	3.321	2.650	1.066	0.707	0.388	0.159	0.163	0.013
2006	0.962	3.672	4.644	7.686	5.155	3.851	2.423	2.382	1.075	0.531	0.149	0.116	0.094
2007	9.826	2.724	7.722	6.301	2.871	1.667	1.080	0.664	0.560	0.345	0.224	0.093	0.043
2008	0.023	4.637	5.882	10.553	4.089	3.034	1.707	1.168	0.813	0.359	0.107	0.065	0.031
2009	0.056	4.158	6.508	10.432	10.428	2.237	1.694	0.940	0.291	0.163	0.018	0.009	0.006
2010	0.037	0.395	6.087	6.337	5.382	2.512	0.858	0.562	0.166	0.065	0.021	0.000	0.000
2011	0.073	1.317	3.315	12.867	8.555	9.565	3.745	2.031	1.032	0.303	0.176	0.035	0.003
2012	0.908	0.619	1.134	1.145	1.560	1.321	0.926	0.328	0.183	0.036	0.016	0.002	0.000
2013	2.368	6.081	5.508	6.050	3.065	2.190	1.848	0.995	0.497	0.165	0.104	0.097	0.000
2014	0.325	7.063	11.675	10.518	6.560	4.384	1.721	1.237	0.642	0.134	0.130	0.065	0.012
2015	0.431	9.501	22.538	17.732	7.026	3.403	1.584	0.999	0.404	0.290	0.029	0.020	0.005
2016	0.202	4.501	7.586	9.636	7.818	4.356	1.311	0.610	0.427	0.080	0.082	0.012	0.003
2017	0.162	3.755	5.100	5.252	4.053	2.809	1.512	0.496	0.239	0.095	0.069	0.018	0.004
2018	0.322	2.342	3.631	2.452	2.348	1.984	1.777	0.497	0.179	0.128	0.082	0.018	0.020

Table 11a. Longline sentinel surveys, numbers at age.

Age	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1994	3	62	408	794	352	298	73	53	8	2	5	1	-	-	-	-
1995	41	712	4822	5532	8102	10707	10346	3076	710	206	158	108	20	26	3	5
1996	42	1458	5126	8606	9975	11882	7101	6178	1501	207	57	49	36	-	-	-
1997	105	902	3991	4662	8831	5850	4144	3042	2058	324	104	32	-*	14	-	-
1998	35	2540	7087	13038	12387	9393	4552	3369	1539	664	193	72	19	-	-	-
1999	25	1804	10052	7727	13937	6264	7572	2084	1357	762	353	74	30	-	-	-
2000	167	2124	13016	19204	18587	19666	6187	3439	610	202	233	77	13	-	-	-
2001	328	1122	12498	19947	19561	16901	17335	5517	2240	813	311	112	34	-	-	-
2002	5	1071	8214	13357	17461	13936	8969	8876	1843	982	150	94		-	-	-
2003	-	253	3460	10274	12596	11737	6128	4062	4286	820	338	80	45	-	-	-
2004	-	316	2188	10263	19406	16276	11338	6298	2811	3330	397	189	117	14	-	-
2005	-	294	2932	6668	7949	17481	9143	7766	3437	1945	1168	263	58	23	-	3
2006	-	561	4582	10228	15548	14816	13372	8719	4969	2696	1099	396	163	35	-	-
2007	-	372	4719	7941	10922	9574	8147	5366	3481	1145	870	395	159	35	5	-
2008	-	203	6056	9046	10308	9054	4369	3425	1823	547	516	129	51	8	-	-
2009	-	678	3829	10221	8803	6967	3960	2273	606	262	57	36	13	24	-	-
2010	-	142	5307	9389	10739	5860	1839	1257	440	121	13	-	-	-	-	-
2011	-	562	2989	11871	9963	10124	3472	1511	559	88	-	28	-	-	-	-
2012	-	747	2098	6458	9832	8305	5987	1795	708	181	37	10	-	-	-	-
2013	-	106	3041	6130	7253	7645	6001	3086	1003	369	174	32	-	-	-	-
2014	-	168	1220	4954	6009	6025	5304	3541	984	423	53	-	58	14	-	-
2015	-	153	4089	4881	6796	5028	3122	3040	1198	849	251	-	-	-	-	-
2016	-	43	2317	9099	8521	6515	3552	2674	1750	945	385	97	74	-	-	-
2017	-	13	1076	4346	7066	5947	2729	1443	416	279	127	35	17	4	4	-
2018	-	-	579	2785	4145	4404	1716	624	210	265	70	28	10	5	-	5

Table 11b. Longline sentinel surveys, numbers at age (%).

Age	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1994	0.00	0.03	0.20	0.39	0.17	0.14	0.04	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1995	0.00	0.02	0.11	0.12	0.18	0.24	0.23	0.07	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1996	0.00	0.03	0.10	0.16	0.19	0.23	0.14	0.12	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1997	0.00	0.03	0.12	0.14	0.26	0.17	0.12	0.09	0.06	0.01	0.00	0.00	0.00	0.00	0.00	0.00
1998	0.00	0.05	0.13	0.24	0.23	0.17	0.08	0.06	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00
1999	0.00	0.03	0.19	0.15	0.27	0.12	0.15	0.04	0.03	0.01	0.01	0.00	0.00	0.00	0.00	0.00
2000	0.00	0.03	0.16	0.23	0.22	0.24	0.07	0.04	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2001	0.00	0.01	0.13	0.21	0.20	0.17	0.18	0.06	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00
2002	0.00	0.01	0.11	0.18	0.23	0.19	0.12	0.12	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00
2003	0.00	0.00	0.06	0.19	0.23	0.22	0.11	0.08	0.08	0.02	0.01	0.00	0.00	0.00	0.00	0.00
2004	0.00	0.00	0.03	0.14	0.27	0.22	0.16	0.09	0.04	0.05	0.01	0.00	0.00	0.00	0.00	0.00
2005	0.00	0.00	0.05	0.11	0.13	0.30	0.15	0.13	0.06	0.03	0.02	0.00	0.00	0.00	0.00	0.00
2006	0.00	0.01	0.06	0.13	0.20	0.19	0.17	0.11	0.06	0.03	0.01	0.01	0.00	0.00	0.00	0.00
2007	0.00	0.01	0.09	0.15	0.21	0.18	0.15	0.10	0.07	0.02	0.02	0.01	0.00	0.00	0.00	0.00
2008	0.00	0.00	0.13	0.20	0.23	0.20	0.10	0.08	0.04	0.01	0.01	0.00	0.00	0.00	0.00	0.00
2009	0.00	0.02	0.10	0.27	0.23	0.18	0.10	0.06	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00
2010	0.00	0.00	0.15	0.27	0.31	0.17	0.05	0.04	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2011	0.00	0.01	0.07	0.29	0.24	0.25	0.08	0.04	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2012	0.00	0.02	0.06	0.18	0.27	0.23	0.17	0.05	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00
2013	0.00	0.00	0.09	0.18	0.21	0.22	0.17	0.09	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00
2014	0.00	0.01	0.04	0.17	0.21	0.21	0.18	0.12	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00
2015	0.00	0.01	0.14	0.17	0.23	0.17	0.11	0.10	0.04	0.03	0.01	0.00	0.00	0.00	0.00	0.00
2016	0.00	0.00	0.06	0.25	0.24	0.18	0.10	0.07	0.05	0.03	0.01	0.00	0.00	0.00	0.00	0.00
2017	0.00	0.00	0.05	0.18	0.30	0.25	0.12	0.06	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00
2018	0.00	0.00	0.04	0.19	0.28	0.30	0.12	0.04	0.01	0.02	0.00	0.00	0.00	0.00	0.00	0.00

Table 11c. Longline sentinel surveys, Catch rates at age (number / standardized effort).

Age	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1994	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1995	0.87	15.08	102.15	117.19	171.64	226.82	219.17	65.16	15.04	4.36	3.35	2.29	0.42	0.55	0.06	0.11
1996	0.79	27.51	96.72	162.38	188.21	224.19	133.98	116.57	28.32	3.91	1.08	0.92	0.68	0.00	0.00	0.00
1997	2.53	21.74	96.18	112.34	212.81	140.97	99.86	73.31	49.59	7.81	2.51	0.77	0.00	0.34	0.00	0.00
1998	1.13	81.92	228.57	420.50	399.50	302.94	146.81	108.66	49.64	21.42	6.22	2.32	0.61	0.00	0.00	0.00
1999	1.04	75.40	420.11	322.94	582.48	261.80	316.46	87.10	56.71	31.85	14.75	3.09	1.25	0.00	0.00	0.00
2000	5.08	64.67	396.28	584.68	565.89	598.74	188.37	104.70	18.57	6.15	7.09	2.34	0.40	0.00	0.00	0.00
2001	9.99	34.18	380.77	607.71	595.95	514.91	528.13	168.08	68.24	24.77	9.47	3.41	1.04	0.00	0.00	0.00
2002	0.13	28.89	221.54	360.24	470.93	375.86	241.90	239.39	49.71	26.48	4.05	2.54	0.00	0.00	0.00	0.00
2003	0.00	9.39	128.48	381.50	467.73	435.83	227.55	150.83	159.15	30.45	12.55	2.97	1.67	0.00	0.00	0.00
2004	0.00	15.42	106.75	500.70	946.76	794.05	553.14	307.26	137.14	162.46	19.37	9.22	5.71	0.68	0.00	0.00
2005	0.00	14.36	143.24	325.76	388.34	854.02	446.67	379.40	167.91	95.02	57.06	12.85	2.83	1.12	0.00	0.15
2006	0.00	27.82	227.21	507.18	770.99	734.69	663.09	432.35	246.40	133.69	54.50	19.64	8.08	1.74	0.00	0.00
2007	0.00	21.28	269.97	454.30	624.84	547.72	466.09	306.99	199.15	65.50	49.77	22.60	9.10	2.00	0.29	0.00
2008	0.00	10.35	308.91	461.43	525.81	461.84	222.86	174.71	92.99	27.90	26.32	6.58	2.60	0.41	0.00	0.00
2009	0.00	40.89	230.93	616.44	530.92	420.19	238.83	137.09	36.55	15.80	3.44	2.17	0.78	1.45	0.00	0.00
2010	0.00	8.82	329.57	583.06	666.90	363.91	114.20	78.06	27.32	7.51	0.81	0.00	0.00	0.00	0.00	0.00
2011	0.00	39.29	208.94	829.82	696.45	707.70	242.70	105.62	39.08	6.15	0.00	1.96	0.00	0.00	0.00	0.00
2012	0.00	71.20	199.93	615.52	937.06	791.53	570.62	171.04	67.45	17.29	3.50	0.95	0.00	0.00	0.00	0.00
2013	0.00	11.20	319.93	645.01	763.18	804.41	631.44	324.65	105.52	38.87	18.26	3.40	0.00	0.00	0.00	0.00
2014	0.00	15.98	116.08	471.18	571.60	573.13	504.55	336.78	93.56	40.24	5.05	0.00	5.56	1.31	0.00	0.00
2015	0.00	14.45	386.71	461.59	642.72	475.46	295.23	287.51	113.29	80.33	23.69	0.00	0.00	0.00	0.00	0.00
2016	0.00	4.79	258.44	1015.03	950.57	726.76	396.21	298.24	195.17	105.41	42.97	10.87	8.20	0.00	0.00	0.00
2017	0.00	1.44	121.96	492.50	800.80	673.92	309.23	163.48	47.14	31.62	14.37	3.91	1.98	0.47	0.47	0.00
2018	0.00	0.00	65.99	317.60	472.78	502.22	195.74	71.20	23.91	30.19	8.03	3.17	1.09	0.54	0.00	0.54

Table 11d. Longline sentinel surveys, lengths at age (cm).

Age	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1994	29.38	37.86	43.96	50.76	54.66	56.70	59.20	60.47	68.87	64.00	74.41	85.00	-	-	-	-
1995	26.86	34.75	42.60	48.12	53.20	56.33	59.25	64.51	69.21	76.99	74.11	77.74	91.06	86.78	88.00	89.05
1996	28.79	38.85	45.16	51.55	55.19	60.63	63.69	66.21	70.58	84.04	76.79	86.20	80.06	-	-	-
1997	30.90	37.72	45.01	49.76	55.02	57.52	63.07	63.87	66.79	67.55	62.01	80.86	-	88.80	-	-
1998	25.00	36.30	43.22	49.99	53.97	58.01	60.21	63.64	65.76	73.32	75.85	78.25	79.00	-	-	-
1999	31.00	38.64	45.12	49.65	54.47	57.78	59.44	63.17	63.46	66.25	75.17	80.29	90.06	-	-	-
2000	30.31	37.27	44.83	50.49	54.17	58.52	61.73	63.11	68.34	72.44	77.70	68.40	70.00	-	-	-
2001	30.22	36.51	43.41	49.86	54.51	57.18	61.62	63.87	65.83	65.37	69.16	87.41	74.41	-	-	-
2002	28.00	36.41	42.37	48.45	53.54	56.40	59.95	64.15	68.70	72.43	75.06	76.83	-	-	-	-
2003	-	36.52	43.49	49.35	54.13	57.54	61.49	63.05	65.84	73.45	72.53	83.21	77.65	-	-	-
2004	-	37.10	43.68	49.74	53.25	58.33	61.86	64.36	66.40	69.24	76.13	69.84	74.41	88.00	-	-
2005	-	38.29	44.85	50.58	54.83	56.52	60.83	64.95	67.49	67.87	73.96	72.95	80.36	85.89	-	94.00
2006	-	38.04	43.65	50.32	54.08	57.93	60.60	63.33	66.90	68.93	73.32	76.70	76.62	82.27	-	-
2007	-	36.01	43.33	50.59	54.97	57.54	60.54	63.49	68.16	74.74	75.15	73.81	79.56	79.94	100.24	-
2008	-	36.76	43.67	49.38	53.60	57.46	61.52	63.05	66.27	71.25	70.27	71.53	83.73	87.26	-	-
2009	-	36.30	42.86	47.84	52.69	57.61	60.10	62.47	67.57	72.56	74.32	78.39	76.00	95.52	-	-
2010	-	38.20	43.64	47.32	51.45	54.56	59.07	62.47	63.47	68.24	73.00	-	-	-	-	-
2011	-	37.80	43.66	48.56	51.29	54.32	59.52	59.63	70.06	65.83	-	73.00	-	-	-	-
2012	-	38.45	43.76	47.70	52.35	55.39	57.87	61.33	66.72	71.39	74.62	76.00	-	-	-	-
2013	-	36.92	44.71	49.49	53.46	56.32	56.04	63.26	66.95	69.84	71.43	70.00	-	-	-	-
2014	-	37.07	43.03	47.45	51.94	55.56	59.49	61.02	67.04	71.41	71.88	-	81.62	82.00	-	-
2015	-	37.46	45.99	50.57	54.62	57.02	60.38	61.57	65.37	67.65	75.15	-	-	-	-	-
2016	-	38.91	46.66	51.28	55.25	59.37	62.50	64.47	66.73	70.14	76.76	87.51	66.99	-	-	-
2017	-	37.00	45.71	48.89	53.91	58.29	63.98	63.18	68.84	68.59	74.80	82.91	79.33	100.00	100.00	-
2018	-	-	42.68	47.85	51.97	57.05	61.26	62.90	67.79	70.29	82.33	65.12	89.49	85.00	-	94.00

Table 11e. Longline sentinel surveys, weights at age (kg).

Age	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1994	0.23	0.52	0.78	1.22	1.54	1.71	1.94	2.12	3.13	2.39	4.67	5.59	-	-	-	-
1995	0.18	0.38	0.71	1.03	1.41	1.69	1.97	2.62	3.28	4.44	4.01	4.74	7.18	6.14	6.32	6.60
1996	0.21	0.53	0.84	1.25	1.54	2.08	2.43	2.74	3.39	5.53	4.13	6.00	4.64	-	-	-
1997	0.28	0.51	0.85	1.14	1.54	1.77	2.38	2.50	2.84	3.02	2.40	4.78	-	6.31	-	-
1998	0.14	0.43	0.73	1.13	1.43	1.78	2.03	2.40	2.67	3.62	4.10	4.39	4.32	-	-	-
1999	0.26	0.51	0.81	1.08	1.43	1.72	1.88	2.30	2.33	2.69	3.76	4.55	6.37	-	-	-
2000	0.24	0.45	0.80	1.15	1.43	1.83	2.16	2.36	2.96	3.66	4.41	2.98	3.06	-	-	-
2001	0.25	0.44	0.73	1.09	1.42	1.64	2.04	2.31	2.50	2.40	2.88	5.43	3.55	-	-	-
2002	0.19	0.44	0.72	1.08	1.48	1.76	2.13	2.65	3.28	3.81	4.35	4.82	-	-	-	-
2003	-	0.45	0.76	1.13	1.51	1.82	2.26	2.48	2.82	3.95	3.77	5.69	4.52	-	-	-
2004	-	0.46	0.77	1.16	1.44	1.91	2.30	2.62	2.91	3.27	4.38	3.31	4.05	6.51	-	-
2005	-	0.50	0.84	1.21	1.58	1.74	2.21	2.73	3.14	3.15	4.07	3.93	5.13	6.31	-	8.30
2006	-	0.47	0.74	1.14	1.43	1.77	2.06	2.40	2.84	3.16	3.80	4.31	4.21	5.13	-	-
2007	-	0.40	0.72	1.17	1.51	1.76	2.06	2.42	3.03	4.03	4.07	3.88	4.80	4.74	9.54	-
2008	-	0.43	0.75	1.10	1.43	1.78	2.23	2.39	2.86	3.54	3.47	3.52	5.67	6.37	-	-
2009	-	0.42	0.71	0.99	1.35	1.80	2.06	2.35	2.98	3.73	3.94	4.59	4.10	8.40	-	-
2010	-	0.48	0.75	0.95	1.25	1.51	1.95	2.33	2.41	2.94	3.57	-	-	-	-	-
2011	-	0.48	0.74	1.04	1.23	1.48	1.99	1.98	3.31	2.60	-	3.57	-	-	-	-
2012	-	0.49	0.73	0.96	1.29	1.54	1.77	2.10	2.86	3.33	3.71	3.92	-	-	-	-
2013	-	0.44	0.81	1.11	1.43	1.69	1.65	2.43	2.84	3.33	3.40	3.15	-	-	-	-
2014	-	0.44	0.71	0.96	1.28	1.60	1.98	2.16	2.86	3.41	3.36	-	5.39	5.03	-	-
2015	-	0.46	0.86	1.15	1.52	1.71	2.08	2.22	2.64	2.96	4.15	-	-	-	-	-
2016	-	0.50	0.89	1.19	1.51	1.90	2.24	2.46	2.78	3.21	4.27	6.01	2.64	-	-	-
2017	-	0.42	0.82	1.00	1.37	1.76	2.32	2.33	2.89	2.94	3.72	4.98	4.50	8.50	8.50	-
2018	-	-	0.71	1.04	1.36	1.85	2.38	2.64	3.23	3.77	5.89	2.84	7.27	6.13	-	8.42

Table 11f. Longline sentinel surveys, total numbers at age, effort, catch and catch per unit effort (CPUE).

Year	Total	Effort	Capture	CPUE
1994	2059	-	-	-
1995	44574	4720	71066	15.06
1996	52218	5300	96426	18.19
1997	34059	4150	65578	15.80
1998	54888	3101	88842	28.65
1999	52041	2393	85046	35.54
2000	83525	3285	136546	41.57
2001	96719	3282	160687	48.96
2002	74958	3708	130858	35.29
2003	54079	2693	105677	39.24
2004	72943	2050	136703	66.69
2005	59130	2047	122924	60.05
2006	77184	2017	142227	70.53
2007	53131	1748	100440	57.46
2008	45535	1960	75463	38.49
2009	37729	1658	55377	33.40
2010	35107	1610	45497	28.25
2011	41167	1431	53710	37.55
2012	36158	1049	50742	48.36
2013	34841	950	51569	54.26
2014	28754	1051	42915	40.82
2015	29408	1057	47857	45.26
2016	35972	896	60335	67.30
2017	23501	882	39758	45.06
2018	14845	877	23875	27.23

Table 11g. Gillnet sentinel surveys, numbers at age.

Age	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1995	7	82	585	1765	5407	8729	10614	2653	716	104	122	98	17	5	4	6
1996	3	156	1298	19590	38993	35306	22594	16257	4911	195	42	48	39	-	-	-
1997	3	138	1901	6299	23046	17150	12442	8878	5145	737	216	29	-	11	-	-
1998	-	1504	6450	32715	21488	25843	12707	7773	6904	1820	700	54	116	-	-	98
1999	-	123	1052	6520	22375	14816	19043	5775	2971	1634	669	102	21	-	-	-
2000	18	105	1541	15221	35346	49826	18546	13028	3723	1349	821	734	130	-	-	-
2001	0	14	765	4582	10723	13862	20905	7715	3129	665	616	56	20	-	-	-
2002	-	29	469	4907	19084	17590	15598	14302	2901	1694	171	260	-	-	-	-
2003	-	44	401	5354	15105	20342	11406	7123	8487	1265	616	44	47	-	-	-
2004	-	50	201	2660	18655	27204	22857	8457	3673	3526	261	296	364	-	-	-
2005	-	6	520	3976	8701	30211	24737	16737	7043	3082	1712	629	55	4	-	2
2006	-	25	475	5912	17674	25550	25152	16236	9631	4922	1863	582	215	38	-	-
2007	-	10	238	4915	14824	16591	17022	12313	8708	2307	1870	908	320	56	14	-
2008	-	17	403	5490	17821	20599	11586	10219	5222	1615	1332	448	109	35	-	-
2009	-	11	316	4410	11288	15298	9642	6005	1624	684	117	73	21	33	-	-
2010	-	-	509	2170	18577	12664	7622	2848	2063	332	145	74	-	-	-	-
2011	-	8	461	5256	17157	37445	16081	8268	3903	112	-	-	-	-	-	-
2012	-	-	148	4394	19903	25881	22907	10197	2894	368	417	-	-	-	-	-
2013	-	-	510	2526	13400	14232	12275	10206	1200	1108	41	35	-	-	-	-
2014	-	101	152	2395	9854	11940	16132	12592	4259	1304	330	67	52	-	-	-
2015	-	42	1633	7977	22236	24311	22202	14608	6823	4961	258	256	49	-	-	-
2016	-	19	140	5989	25380	30786	9574	8307	4032	1667	1240	111	-	-	-	-
2017	-	3	86	1786	7900	13106	11141	3039	2038	1734	330	130	52-	24	-	-
2018	-	6	239	1558	8069	11744	11998	7259	4014	696	887	73	38	-	-	-

Table 11h. Gillnet sentinel surveys, numbers at age (%).

Age	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1995	0.00	0.00	0.02	0.06	0.17	0.28	0.34	0.09	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1996	0.00	0.00	0.01	0.14	0.28	0.25	0.16	0.12	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1997	0.00	0.00	0.03	0.08	0.30	0.23	0.16	0.12	0.07	0.01	0.00	0.00	0.00	0.00	0.00	0.00
1998	0.00	0.01	0.05	0.28	0.18	0.22	0.11	0.07	0.06	0.02	0.01	0.00	0.00	0.00	0.00	0.00
1999	0.00	0.00	0.01	0.09	0.30	0.20	0.25	0.08	0.04	0.02	0.01	0.00	0.00	0.00	0.00	0.00
2000	0.00	0.00	0.01	0.11	0.25	0.35	0.13	0.09	0.03	0.01	0.01	0.01	0.00	0.00	0.00	0.00
2001	0.00	0.00	0.01	0.07	0.17	0.22	0.33	0.12	0.05	0.01	0.01	0.00	0.00	0.00	0.00	0.00
2002	0.00	0.00	0.01	0.06	0.25	0.23	0.20	0.19	0.04	0.02	0.00	0.00	0.00	0.00	0.00	0.00
2003	0.00	0.00	0.01	0.08	0.22	0.29	0.16	0.10	0.12	0.02	0.01	0.00	0.00	0.00	0.00	0.00
2004	0.00	0.00	0.00	0.03	0.21	0.31	0.26	0.10	0.04	0.04	0.00	0.00	0.00	0.00	0.00	0.00
2005	0.00	0.00	0.01	0.04	0.09	0.31	0.25	0.17	0.07	0.03	0.02	0.01	0.00	0.00	0.00	0.00
2006	0.00	0.00	0.00	0.05	0.16	0.24	0.23	0.15	0.09	0.05	0.02	0.01	0.00	0.00	0.00	0.00
2007	0.00	0.00	0.00	0.06	0.19	0.21	0.21	0.15	0.11	0.03	0.02	0.01	0.00	0.00	0.00	0.00
2008	0.00	0.00	0.01	0.07	0.24	0.28	0.15	0.14	0.07	0.02	0.02	0.01	0.00	0.00	0.00	0.00
2009	0.00	0.00	0.01	0.09	0.23	0.31	0.19	0.12	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00
2010	0.00	0.00	0.01	0.05	0.40	0.27	0.16	0.06	0.04	0.01	0.00	0.00	0.00	0.00	0.00	0.00
2011	0.00	0.00	0.01	0.06	0.19	0.42	0.18	0.09	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2012	0.00	0.00	0.00	0.05	0.23	0.30	0.26	0.12	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2013	0.00	0.00	0.01	0.05	0.24	0.26	0.22	0.18	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00
2014	0.00	0.00	0.00	0.04	0.17	0.20	0.27	0.21	0.07	0.02	0.01	0.00	0.00	0.00	0.00	0.00
2015	0.00	0.00	0.02	0.08	0.21	0.23	0.21	0.14	0.06	0.05	0.00	0.00	0.00	0.00	0.00	0.00
2016	0.00	0.00	0.00	0.07	0.29	0.35	0.11	0.10	0.05	0.02	0.01	0.00	0.00	0.00	0.00	0.00
2017	0.00	0.00	0.00	0.04	0.19	0.32	0.27	0.07	0.05	0.04	0.01	0.00	0.00	0.00	0.00	0.00
2018	0.00	0.00	0.01	0.03	0.17	0.25	0.26	0.16	0.09	0.01	0.02	0.00	0.00	0.00	0.00	0.00

Table 11i. Gillnet sentinel surveys, catch rates at age.

Age	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1995	0.22	2.60	18.51	55.86	171.11	276.25	335.90	83.96	22.66	3.29	3.86	3.10	0.54	0.16	0.13	0.19
1996	0.03	1.72	14.35	216.55	431.04	390.28	249.76	179.71	54.29	2.16	0.46	0.53	0.43	0.00	0.00	0.00
1997	0.04	1.71	23.49	77.85	284.82	211.95	153.77	109.72	63.59	9.11	2.67	0.36	0.00	0.14	0.00	0.00
1998	0.00	13.56	58.15	294.92	193.71	232.97	114.55	70.07	62.24	16.41	6.31	0.49	1.05	0.00	0.00	0.88
1999	0.00	1.39	11.86	73.52	252.29	167.06	214.72	65.12	33.50	18.42	7.54	1.15	0.24	0.00	0.00	0.00
2000	0.14	0.79	11.58	114.37	265.59	374.39	139.35	97.89	27.97	10.14	6.17	5.52	0.98	0.00	0.00	0.00
2001	0.00	0.12	6.74	40.36	94.45	122.10	184.13	67.95	27.56	5.86	5.43	0.49	0.18	0.00	0.00	0.00
2002	0.00	0.28	4.53	47.41	184.39	169.95	150.71	138.19	28.03	16.37	1.65	2.51	0.00	0.00	0.00	0.00
2003	0.00	1.14	10.36	138.36	390.36	525.70	294.77	184.08	219.33	32.69	15.92	1.14	1.21	0.00	0.00	0.00
2004	0.00	1.09	4.38	58.01	406.84	593.28	498.47	184.43	80.10	76.90	5.69	6.46	7.94	0.00	0.00	0.00
2005	0.00	0.11	9.26	70.81	154.95	538.01	440.53	298.06	125.42	54.89	30.49	11.20	0.98	0.07	0.00	0.04
2006	0.00	0.57	10.77	133.99	400.55	579.05	570.03	367.96	218.27	111.55	42.22	13.19	4.87	0.86	0.00	0.00
2007	0.00	0.23	5.49	113.40	342.04	382.81	392.75	284.10	200.92	53.23	43.15	20.95	7.38	1.29	0.32	0.00
2008	0.00	0.40	9.49	129.33	419.82	485.26	272.94	240.73	123.02	38.05	31.38	10.55	2.57	0.82	0.00	0.00
2009	0.00	0.26	7.58	105.82	270.87	367.10	231.37	144.10	38.97	16.41	2.81	1.75	0.50	0.79	0.00	0.00
2010	0.00	0.00	13.36	56.96	487.59	332.39	200.06	74.75	54.15	8.71	3.81	1.94	0.00	0.00	0.00	0.00
2011	0.00	0.24	13.87	158.15	516.23	1126.67	483.86	248.77	117.44	3.37	0.00	0.00	0.00	0.00	0.00	0.00
2012	0.00	0.00	4.56	134.97	611.36	794.99	703.63	313.22	88.90	11.31	12.80	0.00	0.00	0.00	0.00	0.00
2013	0.00	0.00	16.66	82.46	437.47	464.63	400.73	333.20	39.18	36.18	1.33	1.15	0.00	0.00	0.00	0.00
2014	0.00	2.71	4.08	64.43	265.08	321.20	433.96	338.74	114.57	35.07	8.88	1.80	1.39	0.00	0.00	0.00
2015	0.00	1.51	58.62	286.44	798.39	872.90	797.20	524.51	244.97	178.13	9.28	9.20	1.77	0.00	0.00	0.00
2016	0.00	0.68	5.02	215.26	912.24	1106.55	344.10	298.57	144.90	59.93	44.58	4.00	0.00	0.00	0.00	0.00
2017	0.00	0.10	3.05	63.07	278.93	462.75	393.37	107.29	71.95	61.24	11.65	4.60	1.82	0.83	0.00	0.00
2018	0.00	0.21	8.56	55.91	289.63	421.57	430.68	260.57	144.10	24.97	31.85	2.61	1.37	0.00	0.00	0.00

Table 11j. Gillnet sentinel surveys, lengths at age (cm).

Age	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1995	27.51	34.28	43.16	51.18	55.16	57.63	59.41	64.21	67.19	80.77	72.77	74.85	88.26	90.24	88.00	86.222
1996	25.60	36.59	43.93	53.05	56.59	58.34	60.83	62.23	62.03	81.50	78.92	85.99	80.67	-	-	-
1997	32.53	40.49	47.97	53.52	57.24	58.74	61.36	61.68	63.61	63.56	60.91	81.29	-	88.08	-	-
1998	-	35.94	41.41	50.58	54.63	58.67	60.81	64.33	65.18	74.42	71.12	78.35	79.00	-	-	85
1999	-	36.56	45.02	54.27	57.19	60.55	62.28	63.71	63.62	70.91	74.47	72.86	88.98	-	-	-
2000	29.71	36.78	46.83	53.79	56.76	60.22	62.19	62.46	66.12	64.86	71.19	64.69	70.00	-	-	-
2001	-	35.89	45.19	53.40	58.16	60.40	63.07	65.00	64.44	67.06	67.27	88.23	70.00	-	-	-
2002	-	37.76	46.69	52.69	57.08	58.97	60.99	63.52	66.71	68.74	77.04	66.35	-	-	-	-
2003	-	35.35	45.48	54.35	57.88	59.53	62.52	62.40	63.77	68.80	69.02	89.00	77.30	-	-	-
2004	-	37.05	42.88	52.19	56.27	59.79	61.98	64.35	66.99	66.77	83.88	69.09	71.96	-	-	-
2005	-	34.80	45.29	51.92	56.38	58.71	61.10	63.23	63.55	66.11	71.49	68.38	80.33	85.12	-	94
2006	-	38.46	46.50	54.47	57.75	60.22	61.81	63.52	65.17	66.40	70.34	72.82	75.49	82.86	-	-
2007	-	36.17	45.78	56.35	59.41	61.16	62.96	64.46	67.08	73.58	72.97	71.05	78.51	80.01	97.33	-
2008	-	37.15	46.29	54.05	57.63	59.83	63.62	63.15	65.97	69.62	69.34	68.30	85.78	89.69	-	-
2009	-	36.80	47.22	53.31	56.26	60.18	60.89	62.86	66.67	70.19	73.58	79.40	76.00	96.33	-	-
2010	-	-	47.56	54.33	56.72	57.96	62.97	63.69	63.62	69.35	74.46	77.40	-	-	-	-
2011	-	40.00	47.28	53.76	56.09	57.48	59.96	62.05	63.81	77.06	-	-	-	-	-	-
2012	-	-	40.95	56.40	57.05	58.95	60.76	61.84	67.47	78.53	70.67	-	-	-	-	-
2013	-	-	49.57	56.62	58.76	59.13	60.80	63.76	67.77	65.78	79.42	79.00	-	-	-	-
2014	-	39.47	46.48	55.57	59.25	60.50	61.51	64.05	67.07	68.74	80.07	76.84	76.45	-	-	-
2015	-	37.75	53.62	56.12	59.75	61.43	62.40	64.20	64.45	67.71	84.11	80.93	85.00	-	-	-
2016	-	37.92	46.00	57.91	60.44	62.78	65.81	65.64	66.99	69.97	67.33	90.21	-	-	-	-
2017	-	37.00	42.32	58.25	59.81	62.53	64.28	67.67	70.97	68.95	82.33	74.52	88.26	85.00	-	-
2018	-	39.33	48.87	52.91	58.81	60.11	64.04	66.15	64.07	73.73	70.35	93.56	86.42	-	-	.

Table 11k. Gillnet sentinel surveys, Weights at age (kg).

Age	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1995	0.19	0.37	0.74	1.24	1.56	1.78	1.96	2.54	3.00	5.12	3.82	4.20	6.48	6.92	6.32	6.66
1996	0.15	0.44	0.77	1.35	1.64	1.81	2.06	2.22	2.27	5.04	4.54	5.91	4.75	-	-	-
1997	0.32	0.62	1.02	1.41	1.72	1.86	2.14	2.18	2.41	2.43	2.17	4.86	-	6.16	-	-
1998	-	0.42	0.65	1.16	1.47	1.82	2.07	2.51	2.59	3.78	3.38	4.33	4.32	-	-	5.38
1999	-	0.44	0.81	1.41	1.64	1.96	2.13	2.33	2.29	3.16	3.68	3.39	6.14	-	-	-
2000	0.22	0.43	0.91	1.39	1.63	1.97	2.19	2.23	2.66	2.58	3.39	2.49	3.06	-	-	-
2001	-	0.42	0.82	1.33	1.70	1.90	2.15	2.37	2.31	2.55	2.66	5.58	2.85	-	-	-
2002	-	0.49	0.97	1.39	1.78	1.99	2.20	2.54	2.97	3.26	4.65	2.91	-	-	-	-
2003	-	0.41	0.89	1.50	1.83	1.99	2.33	2.35	2.50	3.23	3.21	6.75	4.45	-	-	-
2004	-	0.46	0.74	1.33	1.68	2.02	2.28	2.58	2.95	2.91	5.79	3.16	3.65	-	-	-
2005	-	0.38	0.86	1.31	1.69	1.93	2.20	2.49	2.57	2.87	3.68	3.19	5.13	6.13	-	8.30
2006	-	0.49	0.89	1.44	1.73	1.97	2.15	2.36	2.58	2.77	3.32	3.69	4.03	5.25	-	-
2007	-	0.41	0.85	1.62	1.90	2.09	2.29	2.48	2.84	3.83	3.73	3.44	4.63	4.76	8.63	-
2008	-	0.45	0.91	1.44	1.76	2.00	2.42	2.37	2.79	3.26	3.34	3.02	6.15	6.99	-	-
2009	-	0.43	0.94	1.38	1.64	2.02	2.13	2.38	2.84	3.37	3.81	4.77	4.10	8.62	-	-
2010	-	-	0.97	1.46	1.66	1.78	2.32	2.45	2.42	3.15	3.86	4.53	-	-	-	-
2011	-	0.55	0.97	1.42	1.61	1.74	1.99	2.25	2.43	4.41	-	-	-	-	-	-
2012	-	-	0.59	1.60	1.65	1.83	2.03	2.14	2.82	4.42	3.19	-	-	-	-	-
2013	-	-	1.12	1.67	1.87	1.93	2.09	2.44	3.03	2.83	4.90	4.59	-	-	-	-
2014	-	0.54	0.88	1.55	1.88	2.03	2.14	2.41	2.88	3.03	4.84	4.19	4.28	-	-	-
2015	-	0.46	1.40	1.58	1.92	2.08	2.23	2.42	2.46	2.90	5.61	4.87	5.53	-	-	-
2016	-	0.46	0.83	1.71	1.94	2.19	2.55	2.60	2.74	3.07	2.82	6.54	-	-	-	-
2017	-	0.42	0.64	1.69	1.84	2.11	2.32	2.77	3.16	3.03	4.81	3.64	5.84	5.19	-	-
2018	-	0.54	1.10	1.40	1.96	2.12	2.65	3.01	2.75	4.36	3.68	8.49	6.47	-	-	-

Table 11l. Gillnet sentinel surveys, total numbers at age, effort, catch and catch per unit effort (CPUE).

Year	Total	Effort	Catch	CPUE
1995	30914	3160	57210	18.11
1996	139432	9046	251247	27.77
1997	75995	8091	144425	17.85
1998	118172	11093	255026	22.99
1999	75101	8869	185249	20.89
2000	140388	13309	310878	23.36
2001	63052	11353	153284	13.50
2002	77005	10350	182517	17.63
2003	70234	3870	165454	42.76
2004	88204	4585	207039	45.15
2005	97415	5615	236486	42.11
2006	108275	4412	255338	57.87
2007	80096	4334	192087	44.32
2008	74896	4245	169919	40.03
2009	49522	4167	108880	26.13
2010	47004	3810	96322	25.28
2011	88691	3324	177301	53.35
2012	87110	3256	186909	57.41
2013	55534	3063	120241	39.25
2014	59176	3717	136699	36.77
2015	105357	2785	240563	86.38
2016	87245	2782	202752	72.88
2017	41370	2832	97745	34.51
2018	46580	2786	115526	41.47

Table 12. Proportion mature at age.

Age	3	4	5	6	7	8	9	10	11	12	13
1984	0.00	0.02	0.34	0.91	0.97	0.99	1.00	1.00	1.00	1.00	1.00
1985	0.00	0.02	0.22	0.80	0.97	0.98	0.99	1.00	1.00	1.00	1.00
1986	0.00	0.06	0.38	0.70	0.90	0.96	0.99	1.00	1.00	1.00	1.00
1987	0.00	0.05	0.24	0.74	0.93	0.98	1.00	1.00	1.00	1.00	1.00
1988	0.00	0.02	0.13	0.58	0.83	0.95	0.98	0.99	1.00	1.00	1.00
1989	0.00	0.04	0.31	0.72	0.92	0.96	0.99	1.00	1.00	1.00	1.00
1990	0.00	0.04	0.18	0.47	0.69	0.85	0.96	0.98	1.00	1.00	1.00
1991	0.00	0.03	0.25	0.73	0.94	0.97	0.99	1.00	1.00	1.00	1.00
1992	0.01	0.10	0.34	0.59	0.86	0.93	0.97	0.99	1.00	1.00	1.00
1993	0.00	0.04	0.54	0.91	0.99	1.00	1.00	1.00	1.00	1.00	1.00
1994	0.02	0.10	0.32	0.70	0.89	0.95	0.99	0.99	1.00	1.00	1.00
1995	0.07	0.49	0.88	0.98	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1996	0.13	0.39	0.77	0.92	0.98	0.99	1.00	1.00	1.00	1.00	1.00
1997	0.24	0.56	0.82	0.92	0.96	0.98	0.98	0.99	1.00	1.00	1.00
1998	0.04	0.26	0.75	0.93	0.99	1.00	1.00	1.00	1.00	1.00	1.00
1999	0.03	0.41	0.77	0.98	1.00	1.00	1.00	1.00	1.00	1.00	1.00
2000	0.02	0.20	0.67	0.89	0.99	1.00	1.00	1.00	1.00	1.00	1.00
2001	0.03	0.23	0.70	0.94	0.98	1.00	1.00	1.00	1.00	1.00	1.00
2002	0.04	0.20	0.60	0.83	0.96	0.98	1.00	1.00	1.00	1.00	0.99
2003	0.07	0.30	0.66	0.89	0.96	0.99	0.99	1.00	1.00	1.00	1.00
2004	0.05	0.27	0.75	0.92	0.98	1.00	1.00	1.00	1.00	1.00	1.00
2005	0.03	0.20	0.63	0.96	0.99	1.00	1.00	1.00	1.00	1.00	1.00
2006	0.04	0.21	0.64	0.87	0.98	0.99	1.00	1.00	1.00	1.00	1.00
2007	0.03	0.17	0.64	0.89	0.97	0.98	1.00	1.00	1.00	1.00	1.00
2008	0.02	0.14	0.49	0.88	0.97	0.99	1.00	1.00	1.00	1.00	1.00
2009	0.10	0.40	0.78	0.95	0.99	1.00	1.00	1.00	1.00	1.00	1.00
2010	0.02	0.15	0.41	0.86	0.95	0.99	1.00	1.00	1.00	1.00	1.00
2011	0.22	0.45	0.72	0.85	0.94	0.97	0.99	0.99	1.00	1.00	1.00
2012	0.07	0.24	0.70	0.90	0.94	1.00	0.99	1.00	1.00	1.00	1.00
2013	0.02	0.18	0.34	0.81	0.95	0.98	0.99	1.00	1.00	1.00	1.00
2014	0.04	0.24	0.69	0.90	0.98	0.99	0.99	1.00	1.00	1.00	1.00
2015	0.10	0.41	0.75	0.92	0.99	0.99	0.98	1.00	1.00	1.00	1.00
2016	0.17	0.27	0.59	0.82	0.94	0.94	0.97	0.95	1.00	1.00	1.00
2017	-	-	-	-	-	-	-	-	-	-	-
2018	0.03	0.16	0.47	0.93	0.97	1.00	1.00	1.00	1.00	1.00	1.00

Table 13. Parameter estimates based on NFT ADAPT sequential population analysis.

	Age	Parameter	Estimate	Standard Error	Bias	Corrected
Effectifs ('000)	2	2019	45921	93849	26468	19453
	3	2019	25200	18986	4329	20871
	4	2019	9956	4148	541	9415
	5	2019	4333	1183	137	4196
	6	2019	2921	593	46	2875
	7	2019	2518	451	55	2463
	8	2019	1562	258	23	1540
	9	2019	333	68	8	325
	10	2019	142	30	2	140
	11	2019	37	10	1	36
	12	2019	25	8	0	25
	13+	2019	33	n/a	n/a	n/a
Mature biomass t		[2018]	10699	899	395	10501
Natural mortality	[3-12]	M[1986-96]	0.50	n/a	n/a	n/a
		M[1997-03]	0.2	n/a	n/a	n/a
		M[2004-08]	0.40	n/a	n/a	n/a
		M[2009-13]	0.50	n/a	n/a	n/a
		M[2014-18]	0.7	n/a	n/a	n/a
DFO Survey	1	q ID#[1]	0.0000657	0.0000129	0.0000015	0.0000628
	2	q ID#[2]	0.0003079	0.0000390	0.0000039	0.0003001
	3	q ID#[3]	0.0006102	0.0000719	0.0000058	0.0005986
	4	q ID#[4]	0.0008102	0.0000749	0.0000004	0.0008095
	5	q ID#[5]	0.0007495	0.0000580	0.0000028	0.0007439
	6	q ID#[6]	0.0007619	0.0000676	0.0000016	0.0007588
	7	q ID#[7]	0.0007024	0.0000691	-0.0000007	0.0007037
	8	q ID#[8]	0.0006792	0.0000587	0.0000045	0.0006702
	9	q ID#[9]	0.0006686	0.0000800	0.0000032	0.0006623
	10	q ID#[10]	0.0007165	0.0000973	0.0000068	0.0007029
	11	q ID#[11]	0.0009640	0.0002388	0.0000245	0.0009151
Sentinel mobile over 20 fathoms (1995-2002)	2	q ID#[13]	0.0001540	0.0000432	0.0000065	0.0001409
	3	q ID#[14]	0.0005974	0.0001249	0.0000125	0.0005724
	4	q ID#[15]	0.0010593	0.0001445	0.0000101	0.0010390
	5	q ID#[16]	0.0009523	0.0000802	0.0000020	0.0009484
	6	q ID#[17]	0.0009732	0.0000965	0.0000069	0.0009595
	7	q ID#[18]	0.0009598	0.0000675	-0.0000028	0.0009654
	8	q ID#[19]	0.0010117	0.0000703	0.0000021	0.0010080
	9	q ID#[20]	0.0011441	0.0001744	0.0000124	0.0011190
	10	q ID#[21]	0.0011749	0.0002672	0.0000234	0.0011280
	11	q ID#[22]	0.0012500	0.0003402	0.0000427	0.0011650

	Age	Parameter	Estimate	Standard Error	Bias	Corrected
Sentinel mobile over 10 fathoms (2003+)	1	q ID#[23]	0.0000037	0.0000016	0.0000003	0.0000031
	2	q ID#[24]	0.0000812	0.0000175	0.0000020	0.0000772
	3	q ID#[25]	0.0003103	0.0000482	0.0000048	0.0003006
	4	q ID#[26]	0.0006511	0.0000969	0.0000061	0.0006389
	5	q ID#[27]	0.0007360	0.0000759	0.0000023	0.0007314
	6	q ID#[28]	0.0008038	0.0001084	0.0000093	0.0007852
	7	q ID#[29]	0.0008547	0.0000824	0.0000008	0.0008530
	8	q ID#[30]	0.0009552	0.0001474	0.0000104	0.0009345
	9	q ID#[31]	0.0010973	0.0001590	0.0000081	0.0010810
	10	q ID#[32]	0.0011071	0.0002063	0.0000132	0.0010810
	11	q ID#[33]	0.0013360	0.0003443	0.0000499	0.0012360
Sentinel longlines	3	q ID#[34]	0.0014375	0.0003395	0.0000450	0.0013480
	4	q ID#[35]	0.0212058	0.0024723	0.0001327	0.0209400
	5	q ID#[36]	0.0709918	0.0062977	0.0002625	0.0704700
	6	q ID#[37]	0.1473740	0.0117872	0.0001046	0.1472000
	7	q ID#[38]	0.2386120	0.0180057	0.0001647	0.2383000
	8	q ID#[39]	0.2936000	0.0224527	0.0011660	0.2913000
	9	q ID#[40]	0.3806490	0.0334007	0.0014830	0.3777000
	10	q ID#[41]	0.3879770	0.0423237	0.0024720	0.3830000
	11	q ID#[42]	0.4423030	0.0804419	0.0074580	0.4274000
	12	q ID#[43]	0.7267020	0.2886890	0.0691500	0.5884000
	13+	q ID#[44]	0.6311960	0.2238560	0.0332600	0.5647000
Sentinel gilnets	4	q ID#[45]	0.0011019	0.0001817	0.0000204	0.0010610
	5	q ID#[46]	0.0167025	0.0018803	0.0001410	0.0164200
	6	q ID#[47]	0.0900874	0.0099753	0.0000651	0.0899600
	7	q ID#[48]	0.2051020	0.0256370	0.0013610	0.2024000
	8	q ID#[49]	0.3158890	0.0386572	0.0014280	0.3130000
	9	q ID#[50]	0.4058690	0.0521729	0.0048400	0.3962000
	10	q ID#[51]	0.4539590	0.0634280	0.0055660	0.4428000
	11	q ID#[52]	0.3607690	0.0627957	0.0018820	0.3570000
	12	q ID#[53]	0.5882250	0.2164390	0.0327600	0.5227000
	13+	q ID#[54]	0.4675610	0.1878030	0.0305700	0.4064000

Table 14. Population numbers at age ('000).

Age	1	2	3	4	5	6	7	8	9	10	11	12	13+	3+
1974	171149	167037	105496	54976	36936	48001	19040	20102	9158	4151	1520	637	652	300669
1975	236025	140111	136745	85703	41340	21610	27181	10827	10488	4991	2047	874	783	342589
1976	262945	193221	114702	111925	66275	26911	13117	15800	6233	6110	2546	1013	692	365324
1977	201647	215260	158180	93714	86934	42982	16349	6933	7786	3317	2713	1196	1362	421466
1978	319023	165078	176222	129494	74314	62051	23743	6299	3323	3447	1732	1419	1336	483380
1979	210104	261168	135141	144223	103603	51121	34988	11122	3218	1767	1692	935	904	488714
1980	221137	172002	213805	110581	115006	72214	30290	17365	4796	1358	801	899	607	567722
1981	296812	181034	140809	174502	87476	78386	40991	14393	7898	2554	679	397	892	548977
1982	250044	242985	148203	114999	136832	63506	46160	21037	7542	4532	1250	293	356	544710
1983	367877	204698	198919	121132	91236	95109	40527	25437	9466	3163	1827	472	698	587986
1984	288060	301162	167576	162103	94750	60964	61267	24011	15431	5005	1549	766	487	593909
1985	214357	235820	246546	137157	130057	70600	37781	32008	13025	7540	2224	537	330	677805
1986	280761	175483	193054	201697	110021	92145	45369	21337	17397	7807	4094	1080	600	694601
1987	262573	170273	106425	116927	120475	60182	43957	18534	8381	5894	3007	1176	933	485891
1988	226768	159242	103265	64538	70000	66602	27130	17671	5831	2357	2183	732	603	360912
1989	94337	137528	96576	62543	38164	37826	31658	11834	6825	2388	933	704	503	289954
1990	50520	57212	83407	58500	36588	19268	17127	12860	4309	2310	721	241	257	235588
1991	38817	30639	34698	50415	33369	17152	8166	5973	4651	1262	729	169	172	156756
1992	50733	23541	18582	20840	27343	14306	5709	2492	1616	1162	324	114	122	92610
1993	30937	30768	14277	10702	9531	9926	4276	1341	475	315	202	46	91	51182
1994	48737	18762	18660	8531	5126	3073	1847	535	164	28	19	29	19	38031
1995	23400	29558	11379	11317	5149	3022	1812	1066	302	88	13	10	5	34163
1996	16119	14191	17926	6901	6856	3104	1799	1080	629	179	52	8	24	38558
1997	11685	9776	8607	10871	4173	4118	1845	1060	638	369	104	31	12	31828
1998	14221	9566	8003	7013	8566	2980	2643	1054	469	328	135	61	17	31269
1999	22174	11642	7831	6552	5711	6586	1903	1739	667	274	152	75	9	31499

Age	1	2	3	4	5	6	7	8	9	10	11	12	13+	3+
2000	19930	18153	9531	6411	5289	4418	4372	1127	748	239	75	26	18	32254
2001	18101	16315	14861	7802	5185	3898	2961	2451	593	261	52	28	43	38135
2002	20023	14818	13357	12164	6215	3968	2567	1790	1094	205	58	13	17	41448
2003	21698	16392	12131	10934	9911	4868	2617	1367	765	363	45	4	4	43009
2004	26946	17763	13419	9931	8945	8096	3939	2087	1081	613	283	27	34	48455
2005	48178	18061	11906	8994	6654	5907	5197	2346	1136	556	340	130	45	43211
2006	56832	32291	12105	7980	6022	4408	3732	2975	1244	530	268	126	65	39455
2007	89256	38092	21643	8113	5292	3880	2532	2007	1275	557	229	91	100	45719
2008	60254	59824	25531	14506	5395	3367	2223	1331	841	437	201	68	54	53954
2009	53475	40385	40097	17112	9585	3400	1819	987	560	210	144	58	55	74027
2010	77508	32431	24493	24318	10290	5358	1583	776	370	171	62	50	2	67473
2011	91194	47006	19668	14854	14682	6050	2852	654	259	82	50	18	22	59191
2012	164512	55307	28508	11928	8985	8770	3474	1501	295	112	25	20	2	63620
2013	144905	99771	33542	17289	7231	5426	5234	1949	769	129	41	4	4	71618
2014	99438	87880	60508	20342	10479	4358	3200	3042	1082	394	61	17	9	103492
2015	72548	49374	43636	30045	10087	5179	2107	1521	1411	462	156	21	21	94646
2016	82718	36023	24516	21667	14907	4976	2503	989	655	633	209	67	30	71152
2017	104024	41072	17886	12173	10749	7356	2386	1149	452	270	285	85	56	52847
2018	94164	51651	20394	8881	6039	5313	3531	981	429	142	95	81	40	45926
2019	87561	46756	25647	10126	4401	2965	2556	1587	341	146	38	32	42	47881

Table 15. Mature population at age ('000).

Age	2	3	4	5	6	7	8	9	10	11	12	13	3+
1974	0	1055	3299	18099	38881	17707	19097	8975	4151	1520	637	652	300669
1975	0	1367	5142	20257	17504	25278	10286	10278	4991	2047	874	783	342589
1976	0	1147	6716	32475	21798	12199	15010	6108	6110	2546	1013	692	365324
1977	0	1582	5623	42598	34815	15205	6586	7630	3317	2713	1196	1362	421466
1978	0	1762	7770	36414	50261	22081	5984	3257	3447	1732	1419	1336	483380
1979	0	1351	8653	50765	41408	32539	10566	3154	1767	1692	935	904	488714
1980	0	2138	6635	56353	58493	28170	16497	4700	1358	801	899	607	567722
1981	0	1408	10470	42863	63493	38122	13673	7740	2554	679	397	892	548977
1982	0	1482	6900	67048	51440	42929	19985	7391	4532	1250	293	356	544710
1983	0	1989	7268	44706	77038	37690	24165	9277	3163	1827	472	698	587986
1984	9	176	3628	32404	55235	59149	23762	15379	5001	1549	766	487	593909
1985	7	179	3037	36487	60052	36474	31523	12968	7521	2224	537	330	677805
1986	18	242	6748	34605	73893	42762	20872	17269	7783	4089	1080	600	694601
1987	21	195	4357	35611	47346	41280	18159	8332	5879	3004	1176	933	485891
1988	58	288	2378	17003	46960	24565	17159	5779	2347	2180	732	603	360912
1989	64	354	2519	10142	25992	28297	11438	6754	2380	931	704	503	289954
1990	31	326	2053	7875	12120	14418	12069	4230	2292	720	241	257	235588
1991	16	115	1591	7281	10758	6904	5583	4550	1252	728	169	172	156756
1992	15	82	1065	7403	9008	4869	2311	1577	1152	323	114	122	92610
1993	17	54	562	3135	6710	3720	1256	465	312	202	46	91	51182
1994	11	143	591	1871	2255	1700	513	162	28	19	29	19	38031
1995	87	296	2077	2695	2406	1693	1031	300	88	13	10	5	34163
1996	132	1015	1773	4324	2729	1734	1062	628	179	52	8	24	38558
1997	339	1006	4195	2919	3630	1764	1037	634	368	104	31	12	31828
1998	336	968	2987	6899	2798	2593	1045	467	327	135	61	17	31269
1999	397	858	2651	4431	6183	1867	1723	663	273	152	75	9	31499

Age	2	3	4	5	6	7	8	9	10	11	12	13	3+
2000	510	790	2293	3976	4117	4297	1119	744	238	75	26	18	32254
2001	62	445	2148	3746	3655	2929	2444	592	261	52	28	43	38135
2002	86	412	3161	4265	3614	2523	1776	1092	205	58	13	17	41448
2003	142	497	2557	6549	4320	2547	1354	761	362	45	4	4	43009
2004	171	644	2475	6075	7233	3829	2067	1076	612	283	27	34	48455
2005	161	571	2178	4406	5300	5060	2324	1130	556	340	130	45	43211
2006	231	575	1948	4044	4004	3647	2959	1238	530	268	126	65	39455
2007	160	802	1713	3525	3521	2478	1991	1272	556	229	91	100	45719
2008	216	759	2590	3244	3024	2167	1317	839	436	201	68	54	53954
2009	416	1865	3899	6123	3046	1776	977	558	210	144	58	55	74027
2010	336	1018	5192	5984	4782	1533	767	369	171	62	50	2	67473
2011	1606	1773	4223	8822	5341	2741	645	258	82	50	18	22	59191
2012	1931	2903	3717	5872	7783	3316	1483	293	112	25	20	2	63620
2013	2869	2767	4435	3918	4637	4943	1917	763	128	41	4	4	71618
2014	2547	5359	5692	6402	3775	3047	2992	1072	393	61	17	9	103492
2015	470	2515	8055	6241	4581	2033	1503	1397	461	156	21	21	94646
2016	656	2019	5935	8838	4308	2415	963	645	624	209	67	30	71152
2017	821	1610	3287	6772	6547	2314	1126	447	267	285	85	56	52847
2018	1033	1835	2398	3805	4729	3425	961	425	141	95	81	40	45926
2019	935	2308	2734	2773	2639	2479	1555	338	145	38	32	42	47881

Table 16. Biomass (t) at age.

Age	1	2	3	4	5	6	7	8	9	10	11	12	13+	3+
1974	4621	8853	17407	20946	27665	58417	32235	45752	30505	19161	9070	2844	3924	272855
1975	6373	7426	22563	32653	30964	26299	46017	24642	34936	23038	12214	3902	4713	264654
1976	7100	10241	18926	42643	49640	32751	22207	35961	20762	28204	15192	4522	4165	281048
1977	5444	11409	26100	35705	65114	52309	27679	15780	25935	15311	16188	5339	8198	296868
1978	8614	8749	29077	49337	55661	75516	40197	14337	11069	15911	10335	6334	8041	316523
1979	10925	11491	17433	51920	80085	63288	60424	25881	10819	6271	5320	4516	4278	337449
1980	5971	9288	35064	37487	84069	83263	51372	40808	14733	6802	3835	4751	2921	371473
1981	2374	10681	28303	77653	64907	98766	67881	30945	28109	13508	6769	1301	7594	428824
1982	6751	19196	26973	47725	104540	75318	74595	38329	16268	12200	4286	1420	2053	420850
1983	26119	15148	43165	56084	86036	124878	66707	45278	20371	11124	7434	3317	5601	479543
1984	7778	26502	25639	44254	50881	58525	92697	42427	32760	11421	4404	3036	2395	392548
1985	5788	17687	43392	69676	105606	90792	63774	61391	28603	17169	7502	1907	1439	507498
1986	7581	5791	19305	72006	85156	103110	70095	44808	45511	26778	15782	5530	4217	493872
1987	2101	8343	15006	42912	79754	66140	66375	38532	23936	18937	11273	5587	3948	376797
1988	5442	10032	15180	18651	36960	71198	39094	32497	13540	6354	7186	3017	2844	253710
1989	660	9764	18736	24955	31447	45769	50526	21088	15022	6739	3084	2701	1782	229831
1990	1364	3719	13095	21704	25209	19307	21409	19316	8471	4994	2163	1060	1538	140446
1991	582	1716	5239	18401	21156	16449	10559	8517	7293	2947	1607	696	398	94580
1992	1370	1389	2657	7794	17308	12046	6731	3454	2775	2283	871	308	444	57616
1993	835	1723	1999	3617	5719	8308	4776	1758	793	490	441	96	307	29719
1994	1316	732	3060	2465	2450	2357	1932	659	285	54	45	161	70	14202
1995	512	2864	2182	5687	3504	3056	1809	1538	421	246	12	23	18	21343
1996	622	1141	3730	2780	4994	2897	2220	1579	1113	380	153	20	85	21007
1997	248	882	1961	4884	3146	4196	2253	1568	1056	768	258	101	42	21073
1998	519	721	1786	3185	6935	3259	3298	1596	789	531	348	176	60	22624
1999	1102	1185	1708	3184	4336	7543	2729	2657	1245	541	341	245	32	25714

Age	1	2	3	4	5	6	7	8	9	10	11	12	13+	3+
2000	785	1739	2374	2848	4127	4572	6149	2014	1287	538	206	69	71	25924
2001	210	1439	2611	3660	3760	4077	3854	4016	1216	504	181	103	152	25421
2002	469	799	2541	4384	4694	4204	3391	2990	2112	555	190	54	60	25913
2003	933	1234	2175	4529	7190	5323	3794	2213	1472	782	135	16	14	28865
2004	633	1437	2784	4035	6984	8502	5445	3643	2062	1316	683	94	114	36984
2005	573	1167	2248	3947	4962	6351	6921	3899	2151	1263	850	367	191	34126
2006	1966	1841	2250	3546	4408	4707	5003	4997	2307	953	683	319	230	31014
2007	2972	3089	4062	3251	3930	4033	3435	3312	2760	1205	592	325	576	29995
2008	1217	4864	4807	5676	3446	3372	2975	2148	1697	1003	421	296	275	30707
2009	1973	2892	7879	6491	6329	3070	2137	1578	1038	476	374	127	154	32389
2010	2209	2656	4987	9944	6633	4985	1817	1156	723	450	145	168	8	33663
2011	2034	3798	3379	6014	9919	5751	3181	892	497	180	171	52	60	33835
2012	3011	3766	5836	3984	5742	7763	4111	2077	541	259	60	69	7	34209
2013	3594	7084	6024	7064	4277	4821	5512	2559	1239	393	113	13	13	39099
2014	2277	6239	12725	8009	7547	4178	3794	4494	1943	794	184	55	31	49961
2015	1386	3619	8553	12718	6992	5605	2842	2445	2597	1092	328	52	73	46844
2016	1729	2583	4786	8762	10342	4905	3571	1732	1292	1389	533	199	170	40094
2017	1987	2690	3239	4106	5683	6216	2578	1848	892	553	846	282	223	28934
2018	1394	2939	3288	2704	2670	3165	2732	1070	772	220	186	327	168	20074
2019	1602	3025	4596	3531	2442	2398	2795	2354	653	282	95	110	194	22282

Table 17. Mature biomass (t) at age.

Age	1	2	3	4	5	6	7	8	9	10	11	12	13+	Total
1974	0	0	174	1257	13556	47318	29978	43465	29895	19161	9070	2844	3924	200641
1975	0	0	226	1959	15172	21302	42796	23410	34237	23038	12214	3902	4713	182970
1976	0	0	189	2559	24324	26528	20653	34163	20347	28204	15192	4522	4165	180845
1977	0	0	261	2142	31906	42370	25741	14991	25416	15311	16188	5339	8198	187864
1978	0	0	291	2960	27274	61168	37383	13620	10848	15911	10335	6334	8041	194165
1979	0	0	174	3115	39242	51263	56195	24587	10603	6271	5320	4516	4278	205563
1980	0	0	351	2249	41194	67443	47776	38767	14439	6802	3835	4751	2921	230528
1981	0	0	283	4659	31805	80001	63129	29398	27547	13508	6769	1301	7594	265994
1982	0	0	270	2863	51224	61008	69373	36413	15943	12200	4286	1420	2053	257054
1983	0	0	432	3365	42157	101151	62038	43014	19963	11124	7434	3317	5601	299597
1984	0	1	27	991	17401	53026	89492	41987	32650	11413	4404	3036	2395	256822
1985	0	0	31	1543	29628	77226	61568	60461	28478	17126	7501	1907	1439	286910
1986	0	1	24	2409	26784	82686	66067	43832	45175	26696	15763	5528	4217	319184
1987	0	1	27	1599	23575	52033	62333	37752	23797	18890	11262	5586	3947	240802
1988	0	4	42	687	8978	50201	35398	31555	13419	6328	7175	3016	2843	159646
1989	0	5	69	1005	8357	31450	45163	20382	14866	6715	3078	2700	1781	135571
1990	0	2	51	762	5426	12144	18023	18128	8316	4955	2159	1059	1537	72563
1991	0	1	17	581	4616	10317	8926	7962	7135	2924	1604	696	397	45176
1992	0	1	12	398	4686	7584	5740	3203	2707	2264	869	308	444	28216
1993	0	1	8	190	1881	5616	4155	1646	776	485	440	96	307	15600
1994	0	0	24	171	894	1729	1778	632	282	54	45	161	70	5841
1995	0	8	57	1044	1834	2433	1689	1487	418	245	12	23	18	9269
1996	1	11	211	714	3150	2547	2140	1552	1111	379	153	20	85	12073
1997	1	31	229	1885	2201	3699	2154	1534	1050	765	258	101	42	13949
1998	1	25	216	1356	5586	3060	3235	1582	785	530	348	176	60	16960
1999	3	40	187	1288	3364	7081	2678	2633	1238	539	341	244	32	19669

Age	1	2	3	4	5	6	7	8	9	10	11	12	13+	Total
2000	1	49	197	1018	3102	4261	6044	1999	1281	536	206	69	71	18833
2001	0	5	78	1008	2717	3823	3813	4003	1214	503	181	103	152	17600
2002	0	5	78	1139	3221	3829	3332	2966	2107	554	190	54	60	17537
2003	1	11	89	1059	4752	4724	3692	2192	1465	781	135	16	14	18932
2004	1	14	134	1006	4743	7595	5293	3607	2052	1314	682	94	113	26648
2005	1	10	108	956	3285	5698	6739	3863	2140	1262	849	366	191	25468
2006	2	13	107	865	2960	4276	4889	4970	2296	953	683	319	229	22562
2007	1	13	151	686	2618	3660	3362	3285	2753	1204	592	325	575	19224
2008	0	18	143	1013	2072	3029	2900	2126	1692	1002	421	296	275	14987
2009	0	30	366	1479	4043	2750	2086	1562	1035	475	373	127	154	14481
2010	0	27	207	2123	3858	4449	1760	1143	721	449	145	168	8	15058
2011	23	130	305	1710	5960	5077	3057	880	494	179	170	52	60	18098
2012	34	131	594	1241	3753	6889	3924	2051	537	258	60	69	7	19551
2013	41	204	497	1812	2317	4120	5205	2518	1229	391	113	13	13	18472
2014	26	181	1127	2241	4611	3619	3613	4419	1925	791	183	55	31	22822
2015	0	34	493	3410	4326	4958	2742	2416	2571	1089	328	52	73	22493
2016	1	47	394	2400	6132	4247	3445	1686	1271	1370	532	199	170	21893
2017	0	54	292	1109	3580	5532	2501	1811	884	548	846	282	223	17660
2018	0	59	296	730	1682	2817	2650	1049	765	218	186	327	168	10947
2019	0	61	414	953	1539	2135	2712	2307	647	279	95	110	194	11444

Table 18. Fishing mortality at age, natural mortality (M), fishing mortality at ages 7 to 9 (F 7-9) and exploitation rate (Expl. %).

Age	3	4	5	6	7	8	9	10	11	12	13+	F 7-9	M	Expl.
1974	0.01	0.09	0.34	0.37	0.36	0.45	0.41	0.51	0.35	0.35	0.35	0.41	0.2	0.31
1975	0.00	0.06	0.23	0.30	0.34	0.35	0.34	0.47	0.50	0.50	0.50	0.34	0.2	0.27
1976	0.00	0.05	0.23	0.30	0.44	0.51	0.43	0.61	0.56	0.56	0.56	0.46	0.2	0.34
1977	0.00	0.03	0.14	0.39	0.75	0.54	0.61	0.45	0.45	0.45	0.45	0.63	0.2	0.43
1978	0.00	0.02	0.17	0.37	0.56	0.47	0.43	0.51	0.42	0.42	0.42	0.49	0.2	0.35
1979	0.00	0.03	0.16	0.32	0.50	0.64	0.66	0.59	0.43	0.43	0.43	0.60	0.2	0.41
1980	0.00	0.03	0.18	0.37	0.54	0.59	0.43	0.49	0.50	0.50	0.50	0.52	0.2	0.37
1981	0.00	0.04	0.12	0.33	0.47	0.45	0.36	0.51	0.64	0.64	0.64	0.42	0.2	0.31
1982	0.00	0.03	0.16	0.25	0.40	0.60	0.67	0.71	0.77	0.77	0.77	0.55	0.2	0.39
1983	0.00	0.05	0.20	0.24	0.32	0.30	0.44	0.51	0.67	0.67	0.67	0.35	0.2	0.27
1984	0.00	0.02	0.09	0.28	0.45	0.41	0.52	0.61	0.86	0.86	0.86	0.46	0.2	0.34
1985	0.00	0.02	0.14	0.24	0.37	0.41	0.31	0.41	0.52	0.52	0.52	0.36	0.2	0.28
1986	0.00	0.02	0.10	0.24	0.40	0.43	0.58	0.45	0.75	0.75	0.75	0.47	0.5	0.30
1987	0.00	0.01	0.09	0.30	0.41	0.66	0.77	0.49	0.91	0.91	0.91	0.61	0.5	0.37
1988	0.00	0.03	0.12	0.24	0.33	0.45	0.39	0.43	0.63	0.63	0.63	0.39	0.5	0.26
1989	0.00	0.04	0.18	0.29	0.40	0.51	0.58	0.70	0.85	0.85	0.85	0.50	0.5	0.32
1990	0.00	0.06	0.26	0.36	0.55	0.52	0.73	0.65	0.95	0.95	0.95	0.60	0.5	0.36
1991	0.01	0.11	0.35	0.60	0.69	0.81	0.89	0.86	1.35	1.35	1.35	0.79	0.5	0.45
1992	0.05	0.28	0.51	0.71	0.95	1.16	1.13	1.25	1.46	1.46	1.46	1.08	0.5	0.54
1993	0.02	0.24	0.63	1.18	1.58	1.60	2.33	2.29	1.44	1.44	1.44	1.84	0.5	0.71
1994	0.00	0.00	0.03	0.03	0.05	0.07	0.12	0.25	0.14	0.14	0.14	0.08	0.5	0.06
1995	0.00	0.00	0.01	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.03	0.02	0.5	0.02
1996	0.00	0.00	0.01	0.02	0.03	0.03	0.03	0.04	0.02	0.02	0.02	0.03	0.5	0.02
1997	0.00	0.04	0.14	0.24	0.36	0.62	0.47	0.80	0.34	0.34	0.34	0.48	0.2	0.35
1998	0.00	0.01	0.06	0.25	0.22	0.26	0.34	0.57	0.39	0.39	0.39	0.27	0.2	0.22
1999	0.00	0.01	0.06	0.21	0.32	0.64	0.83	1.09	1.58	1.58	1.58	0.60	0.2	0.41
2000	0.00	0.01	0.11	0.20	0.38	0.44	0.85	1.32	0.80	0.80	0.80	0.56	0.2	0.39
2001	0.00	0.03	0.07	0.22	0.30	0.61	0.86	1.30	1.21	1.21	1.21	0.59	0.2	0.41
2002	0.00	0.00	0.04	0.22	0.43	0.65	0.90	1.32	2.46	2.46	2.46	0.66	0.2	0.44
2003	0.00	0.00	0.00	0.01	0.03	0.04	0.02	0.05	0.31	0.31	0.31	0.03	0.2	0.02
2004	0.00	0.00	0.01	0.04	0.12	0.21	0.26	0.19	0.38	0.38	0.38	0.20	0.4	0.15
2005	0.00	0.00	0.01	0.06	0.16	0.23	0.36	0.33	0.60	0.60	0.60	0.25	0.4	0.18
2006	0.00	0.01	0.04	0.15	0.22	0.45	0.40	0.44	0.68	0.68	0.68	0.36	0.4	0.25
2007	0.00	0.01	0.05	0.16	0.24	0.47	0.67	0.62	0.81	0.81	0.81	0.46	0.4	0.31
2008	0.00	0.01	0.06	0.22	0.41	0.46	0.99	0.71	0.85	0.85	0.85	0.62	0.4	0.39
2009	0.00	0.01	0.08	0.26	0.35	0.48	0.69	0.73	0.56	0.56	0.56	0.51	0.5	0.32
2010	0.00	0.00	0.03	0.13	0.38	0.60	1.01	0.72	0.73	0.73	0.73	0.66	0.5	0.39
2011	0.00	0.00	0.02	0.05	0.14	0.30	0.34	0.69	0.43	0.43	0.43	0.26	0.5	0.18
2012	0.00	0.00	0.00	0.02	0.08	0.17	0.32	0.50	1.30	1.30	1.30	0.19	0.5	0.14
2013	0.00	0.00	0.01	0.03	0.04	0.09	0.17	0.25	0.36	0.36	0.36	0.10	0.5	0.08
2014	0.00	0.00	0.00	0.03	0.04	0.07	0.15	0.23	0.37	0.37	0.37	0.09	0.7	0.06
2015	0.00	0.00	0.01	0.03	0.06	0.14	0.10	0.09	0.14	0.14	0.14	0.10	0.7	0.07
2016	0.00	0.00	0.01	0.03	0.08	0.08	0.19	0.10	0.20	0.20	0.20	0.12	0.7	0.08
2017	0.00	0.00	0.00	0.03	0.19	0.28	0.46	0.35	0.56	0.56	0.56	0.31	0.7	0.20
2018	0.00	0.00	0.01	0.03	0.10	0.36	0.38	0.62	0.40	0.36	0.36	0.28	0.7	0.18

9. FIGURES

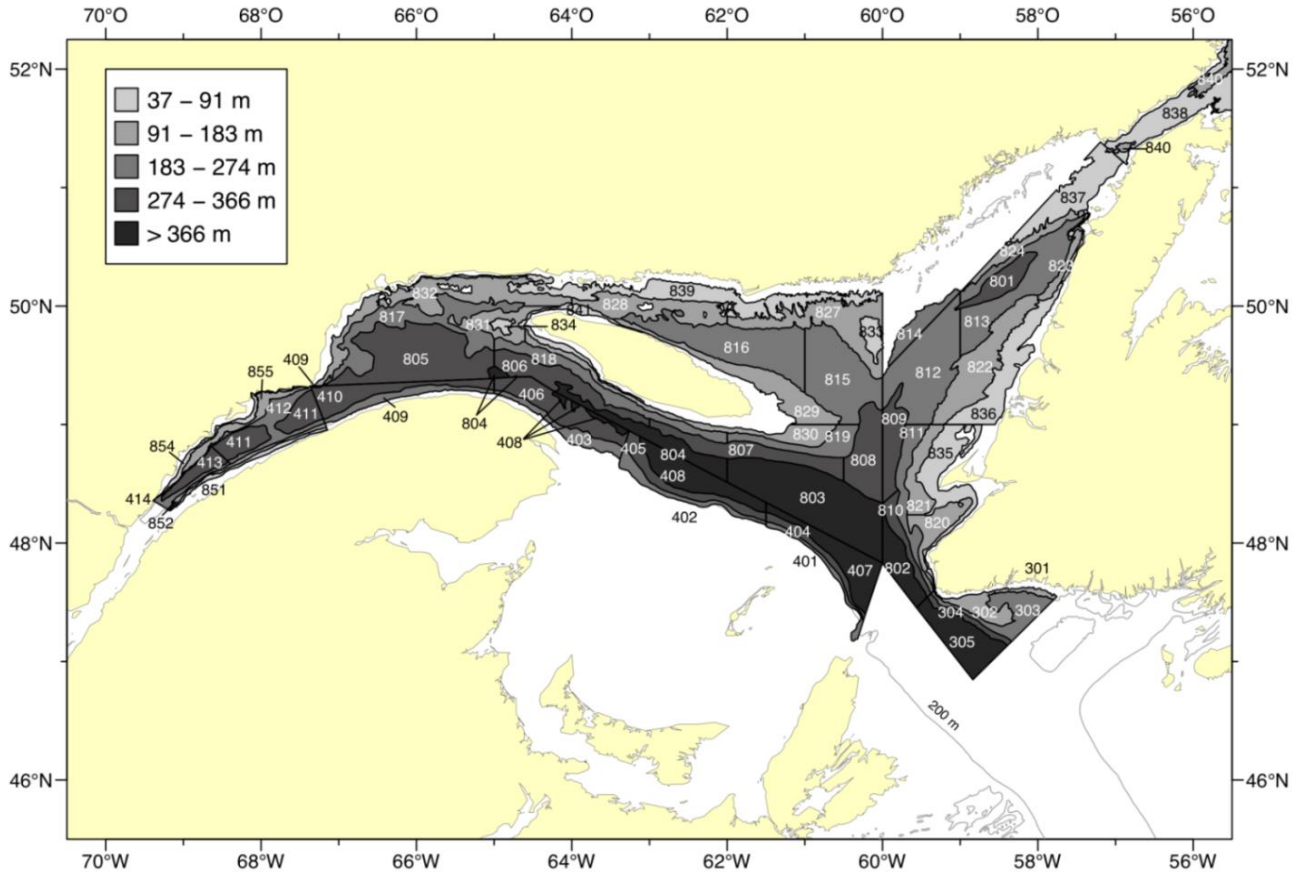


Figure 1. Stratification scheme used for multispecies research surveys (non-illustrated 10-20 fathom strata) and mobile gear sentinel surveys.

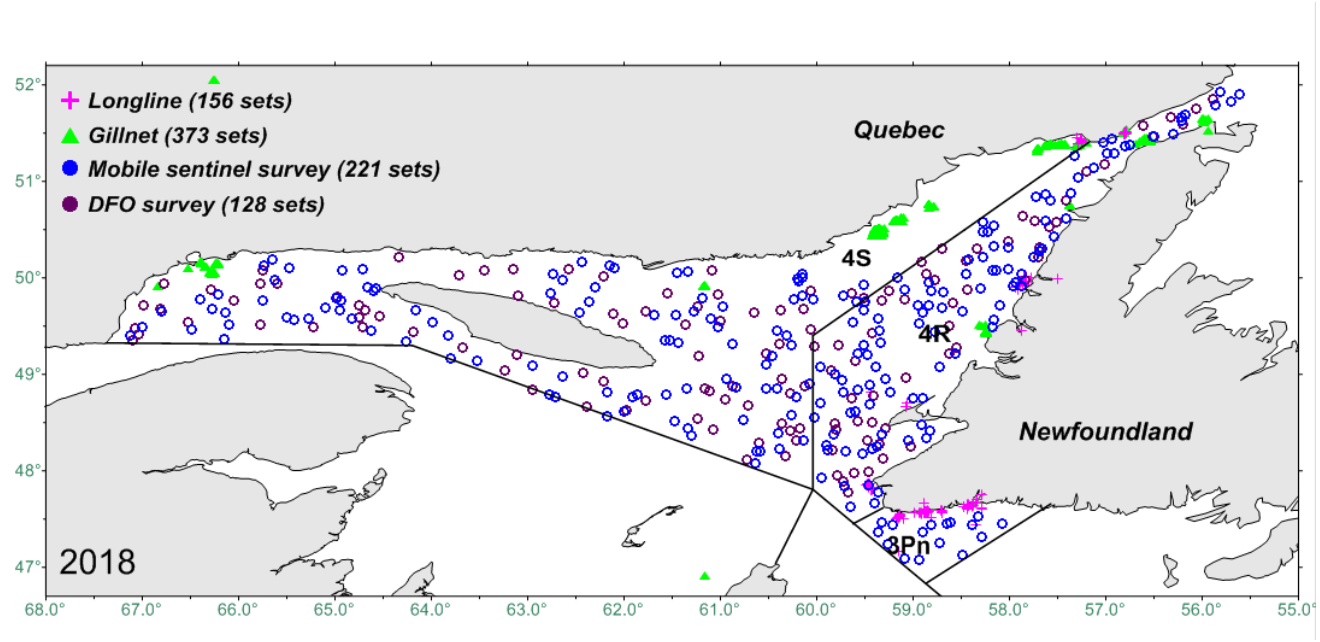


Figure 2a. Spatial distribution of sampling effort for cod abundance indices (NAFO 3Pn, 4RS) in 2018.

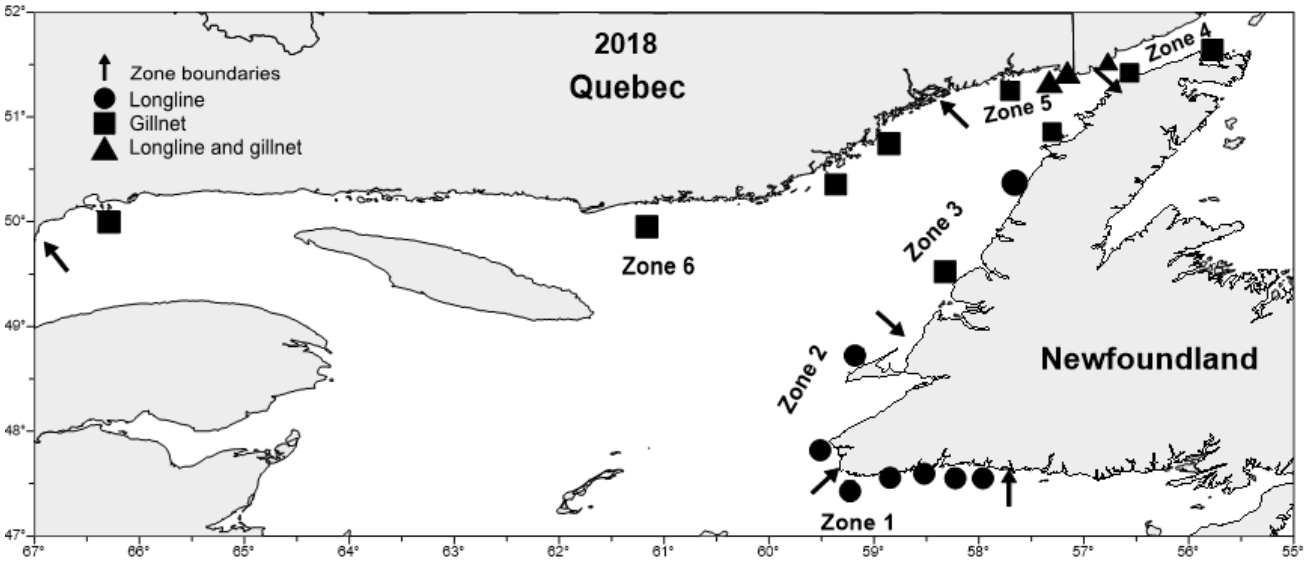


Figure 2b. Spatial distribution of sampling effort for fixed gear sentinel survey indices in 2018.

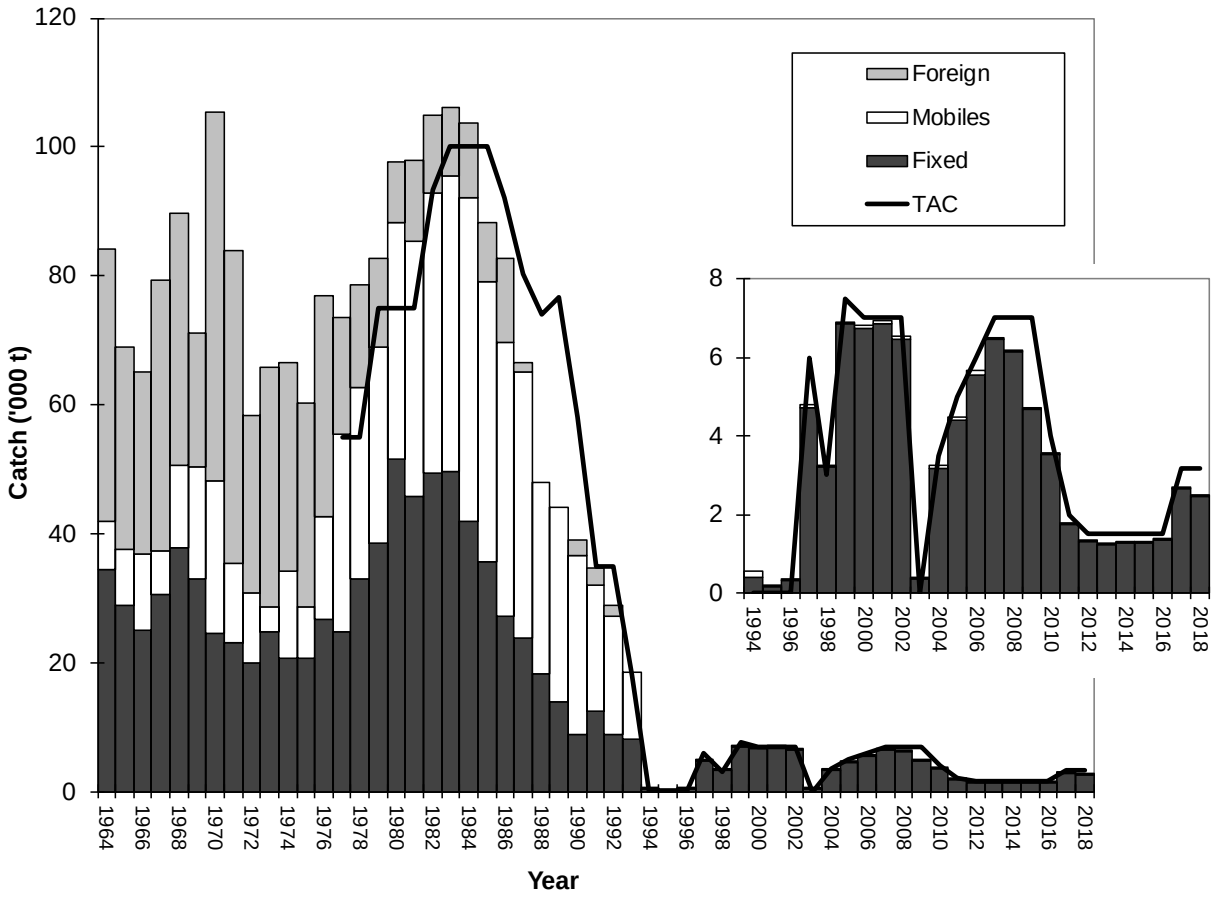


Figure 3. Annual landings and total allowable catch (TAC) by management year (1999: TAC from 1999/01/01 to 2000/05/14; 2000 and+: TAC from May 15 to May 14 of the following year).

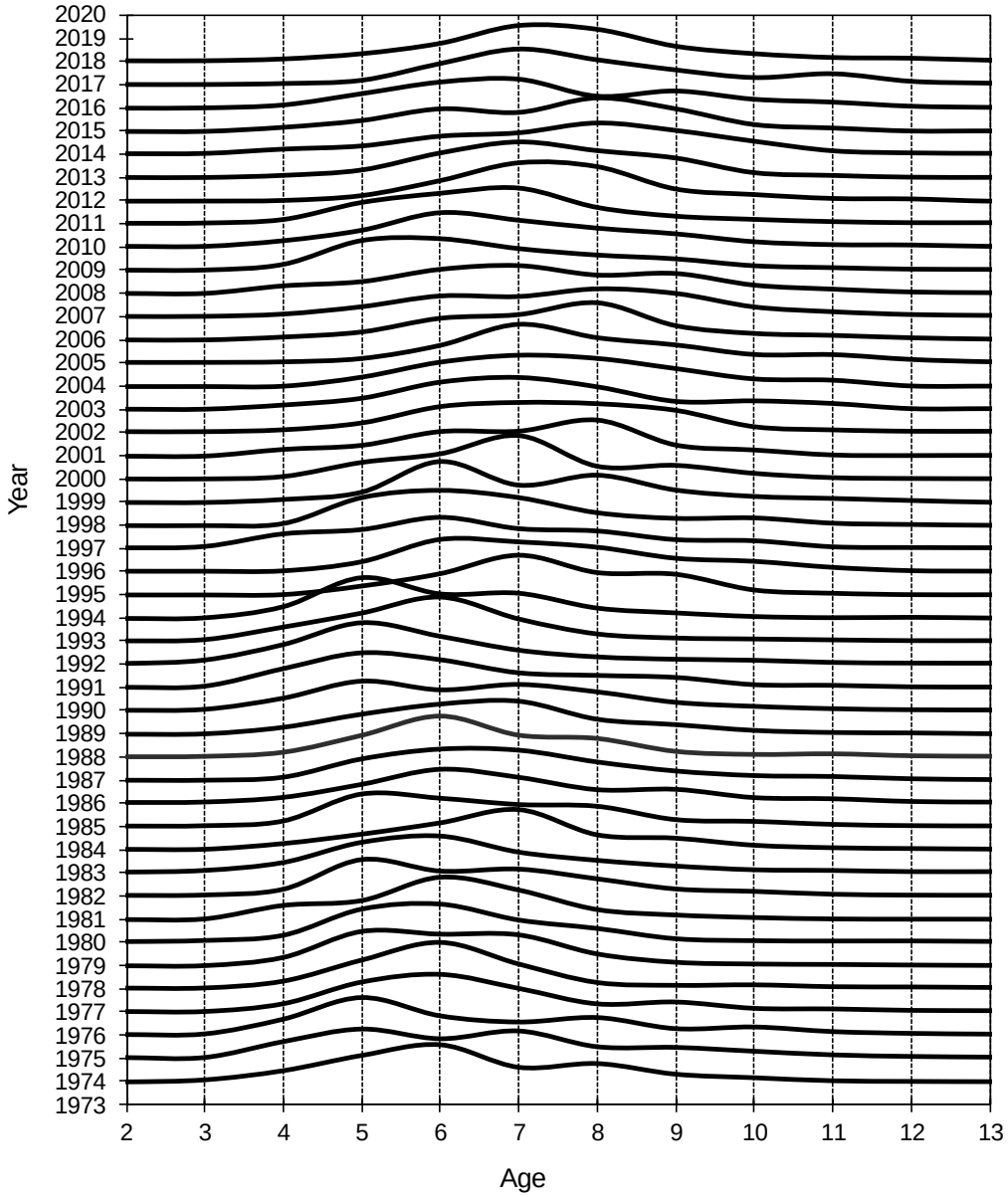


Figure 4. Catch-at-age (%) of cod in the commercial fishery.

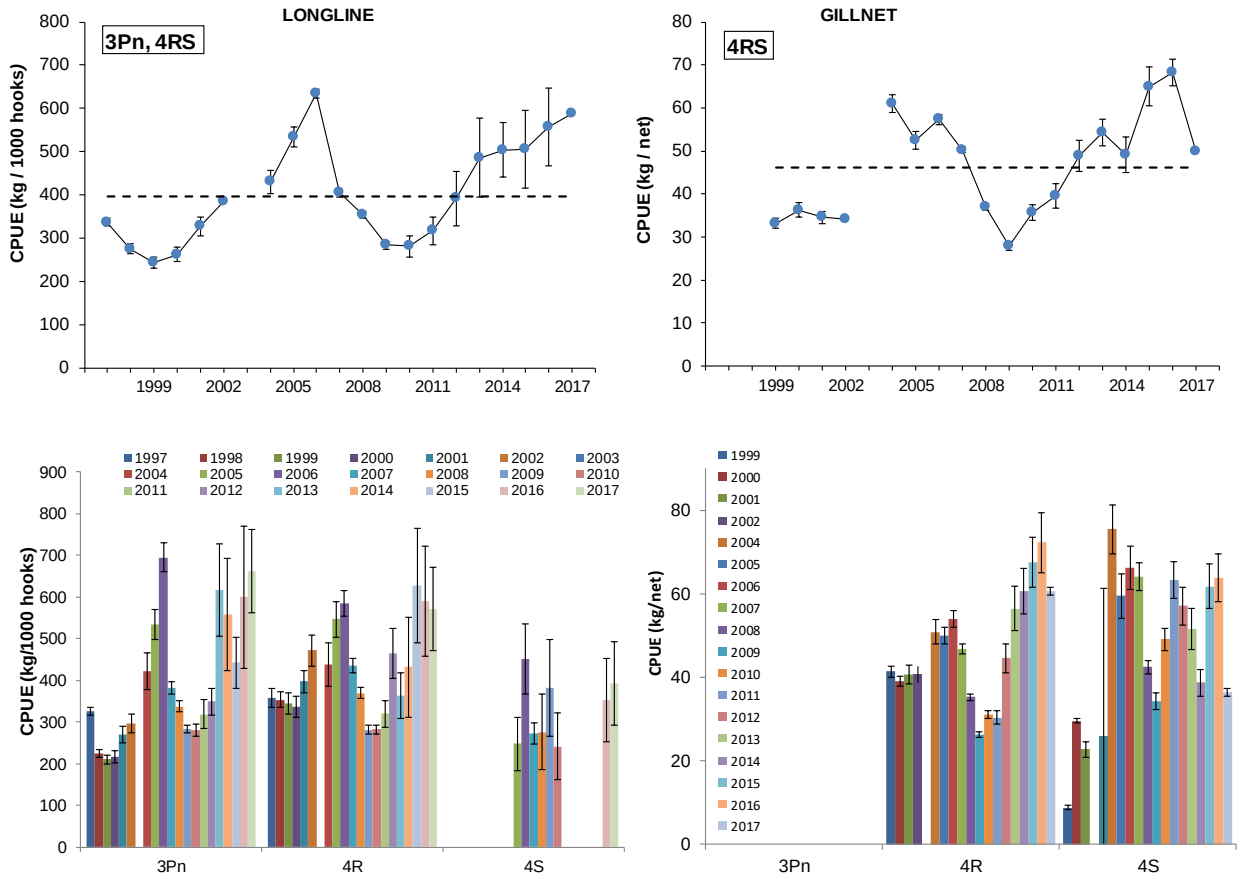


Figure 5. Commercial fishery logbooks for Quebec vessels (< 45 feet) and Newfoundland vessels (< 35 feet) from 1997 to 2018. Catch per unit effort ± 95% CI. The solid line represents the series average (1997-2016). Note that data for the 2018-2019 season were not available for this assessment.

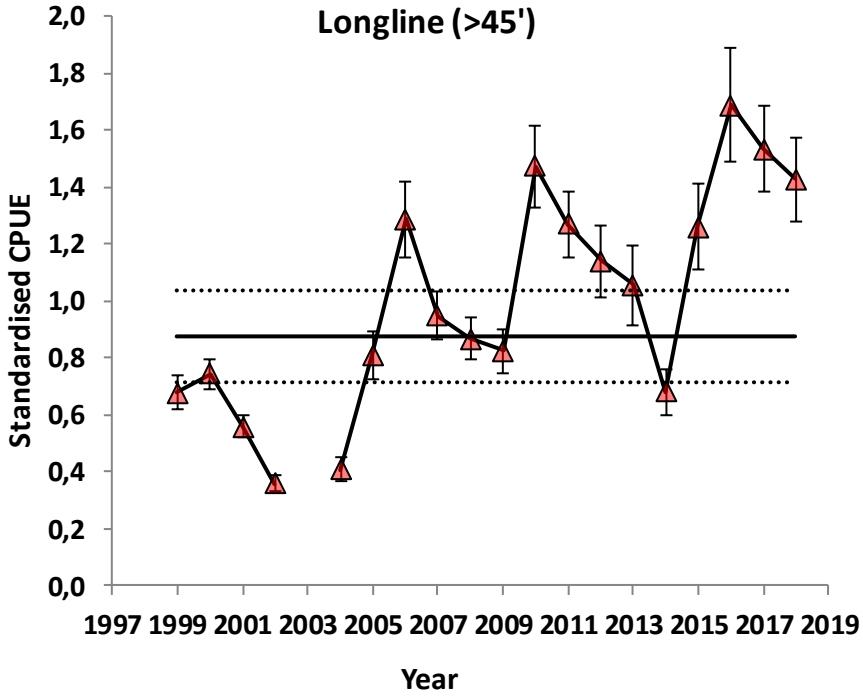


Figure 6. Quebec commercial longline fishery logbook data. Standardized catch per unit effort (CPUE) (average ± 95% CI). The dotted line represents the series average (1999-2016).

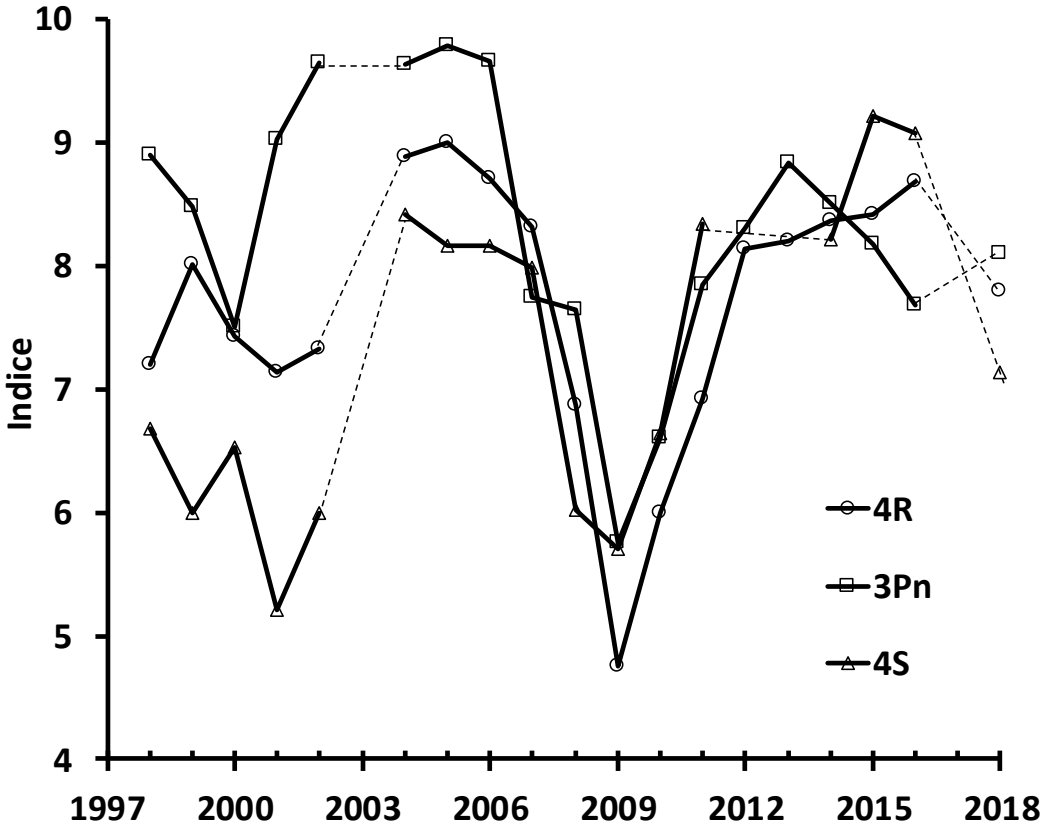
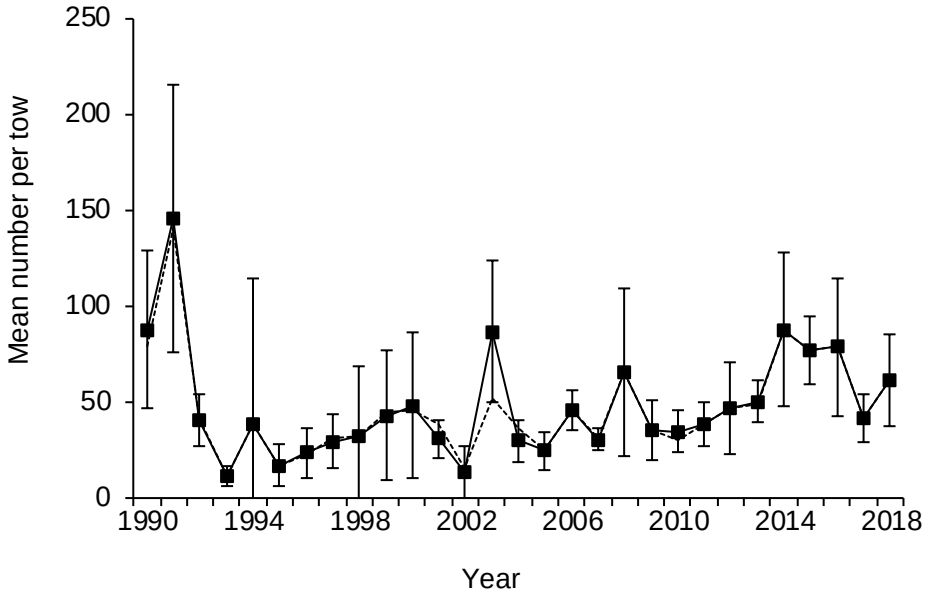


Figure 7. Fishery performance index by NAFO Division from the industry telephone survey of fixed gear fishers (dotted lines = years with no survey).

A)



B)

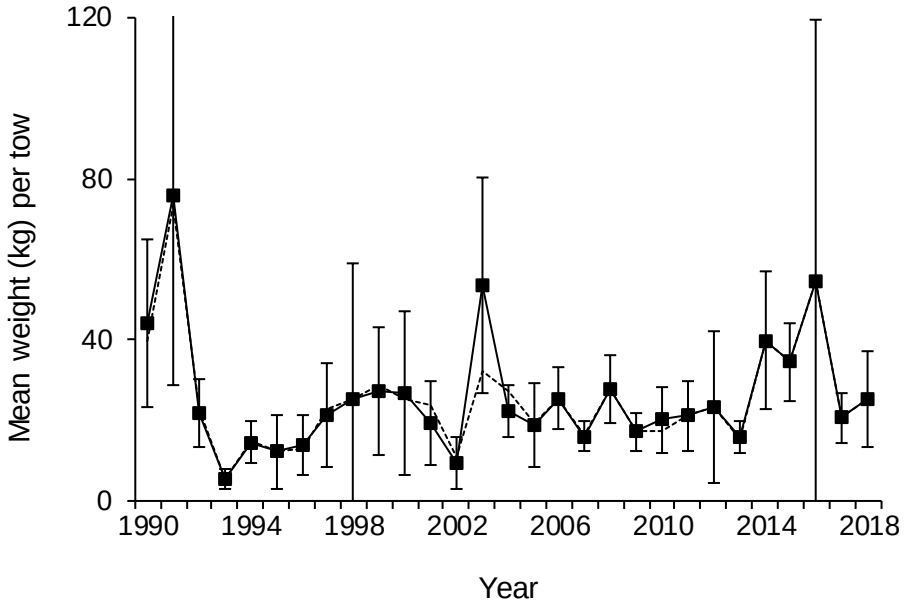


Figure 8. Mean numbers (A) and mean weights (B) per tow observed during the DFO survey. Data corrected by a multiplicative model to consider strata not sampled (solid line) and data without correction (dotted line). Error bars indicate 95% confidence intervals.

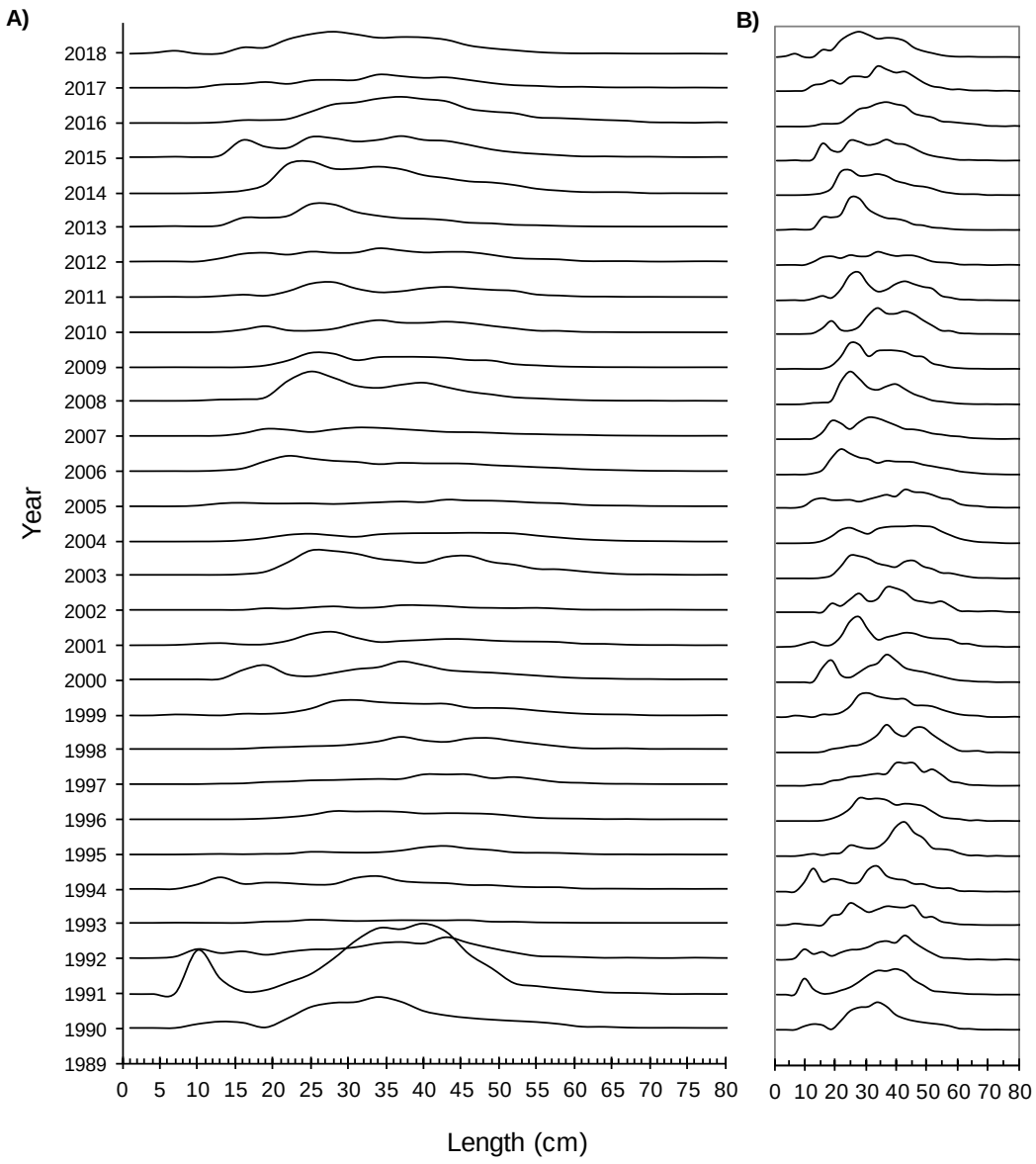


Figure 9. Length frequency distributions during DFO research surveys. (Numbers (A), percentage (B)).

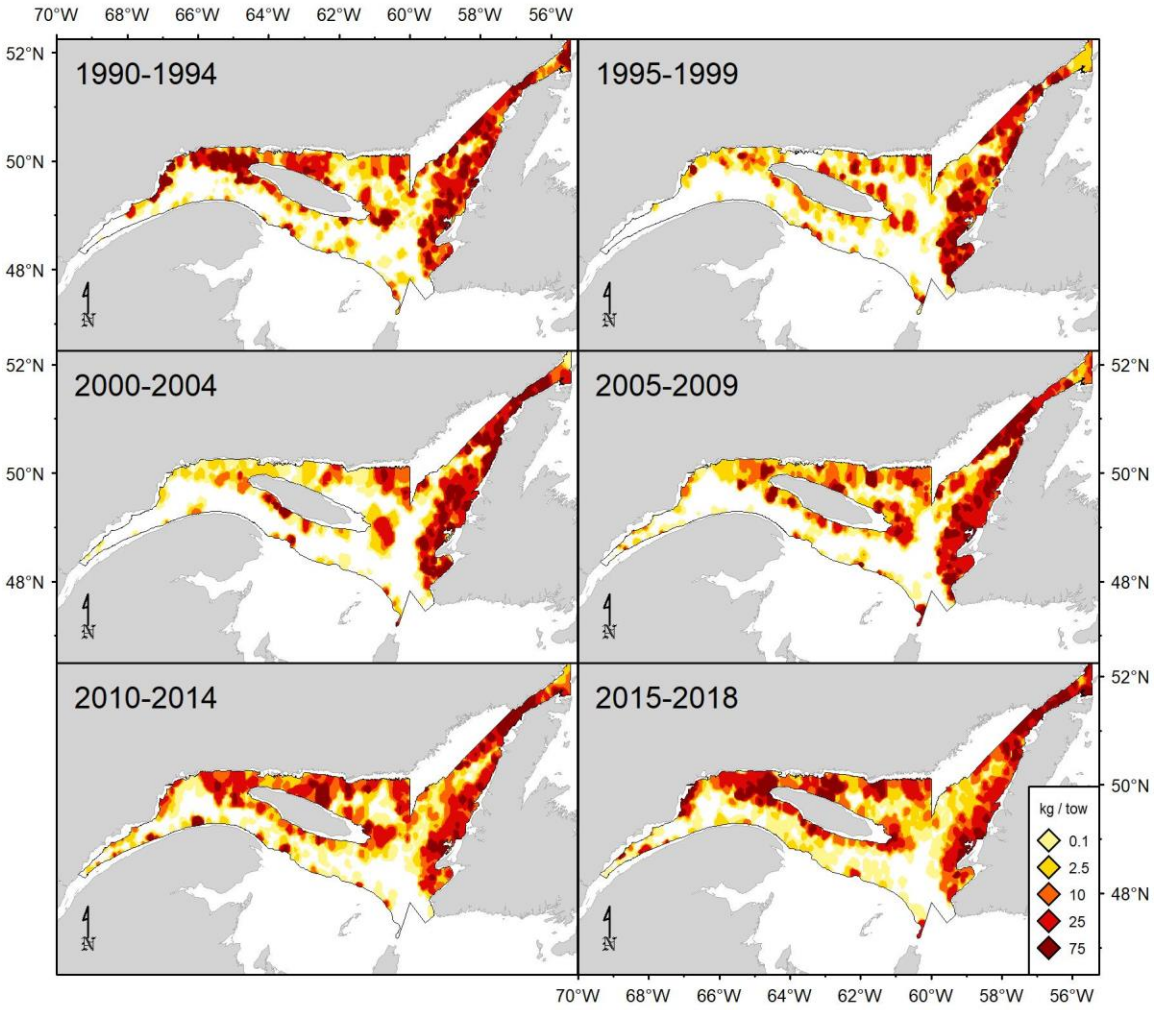


Figure 10. Distribution of cod catch rates (kg/15-minute tow) in the (August) DFO survey in NAFO Divisions 4RS.

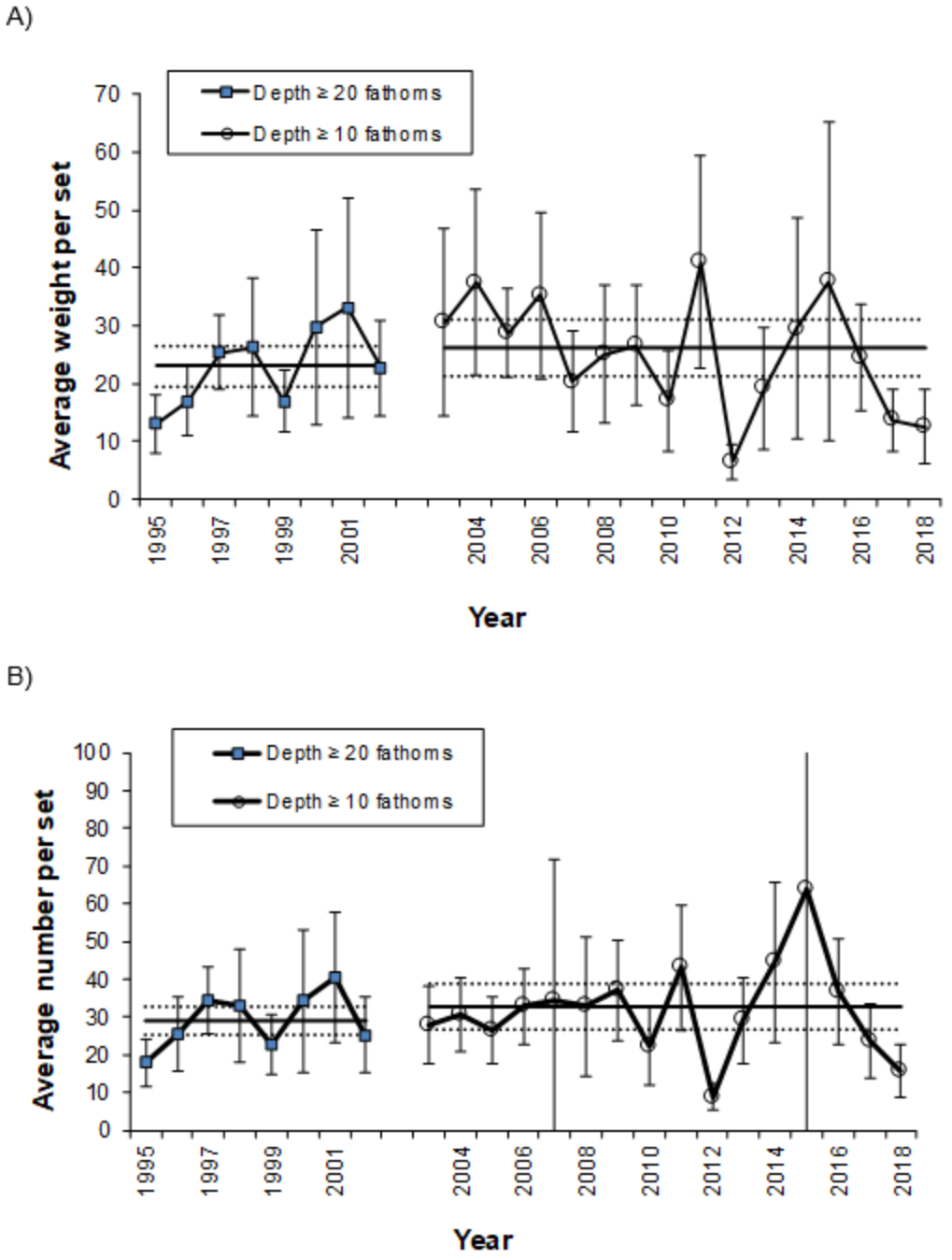


Figure 11. Mean weights (A) and mean numbers (B) per tow during the July mobile gear sentinel survey. The dashed line represents the average of each series (1995-2002 and 2003-2016).

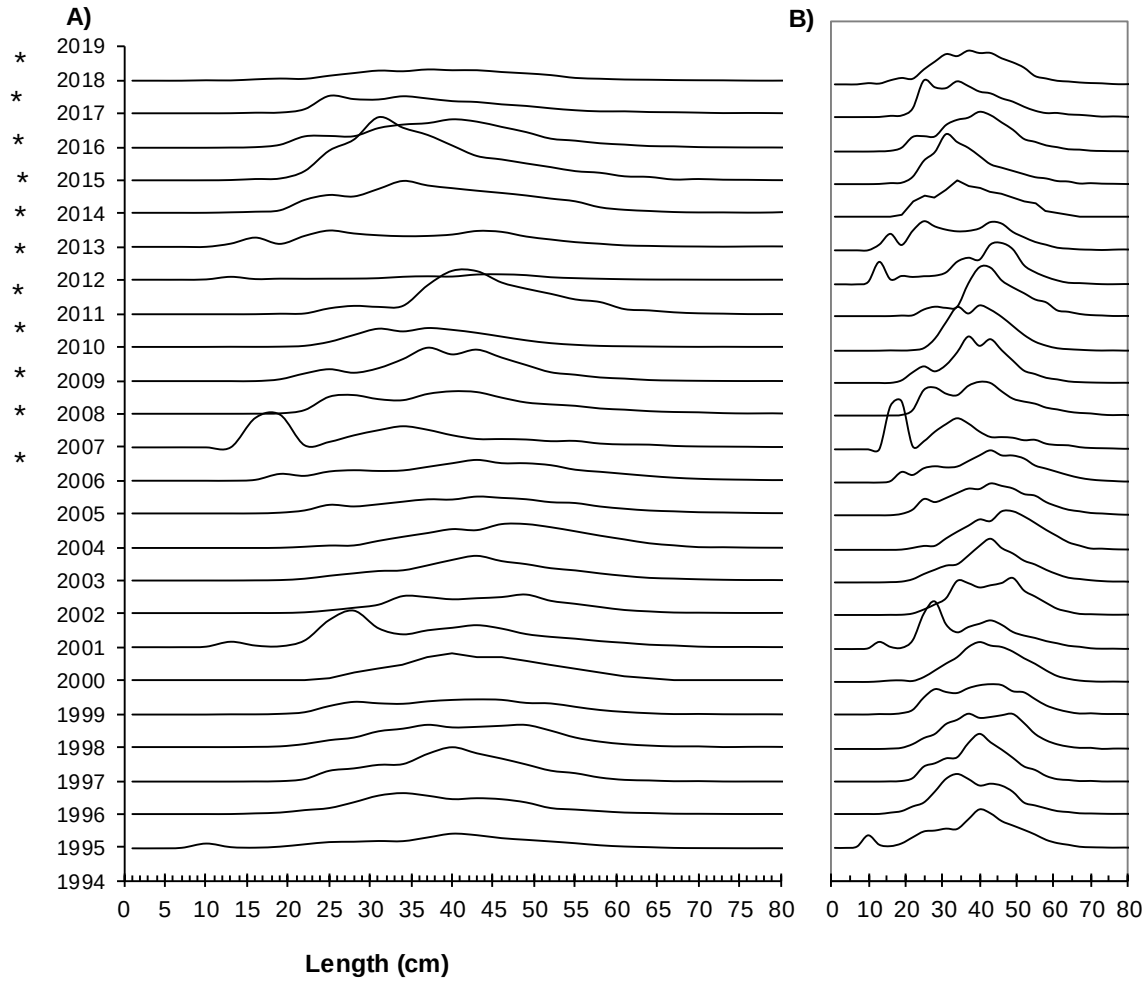


Figure 12. Length frequencies distribution in number (A) and in percentage (B) during the July mobile gear sentinel survey. (Includes 10-20 fathom strata).*

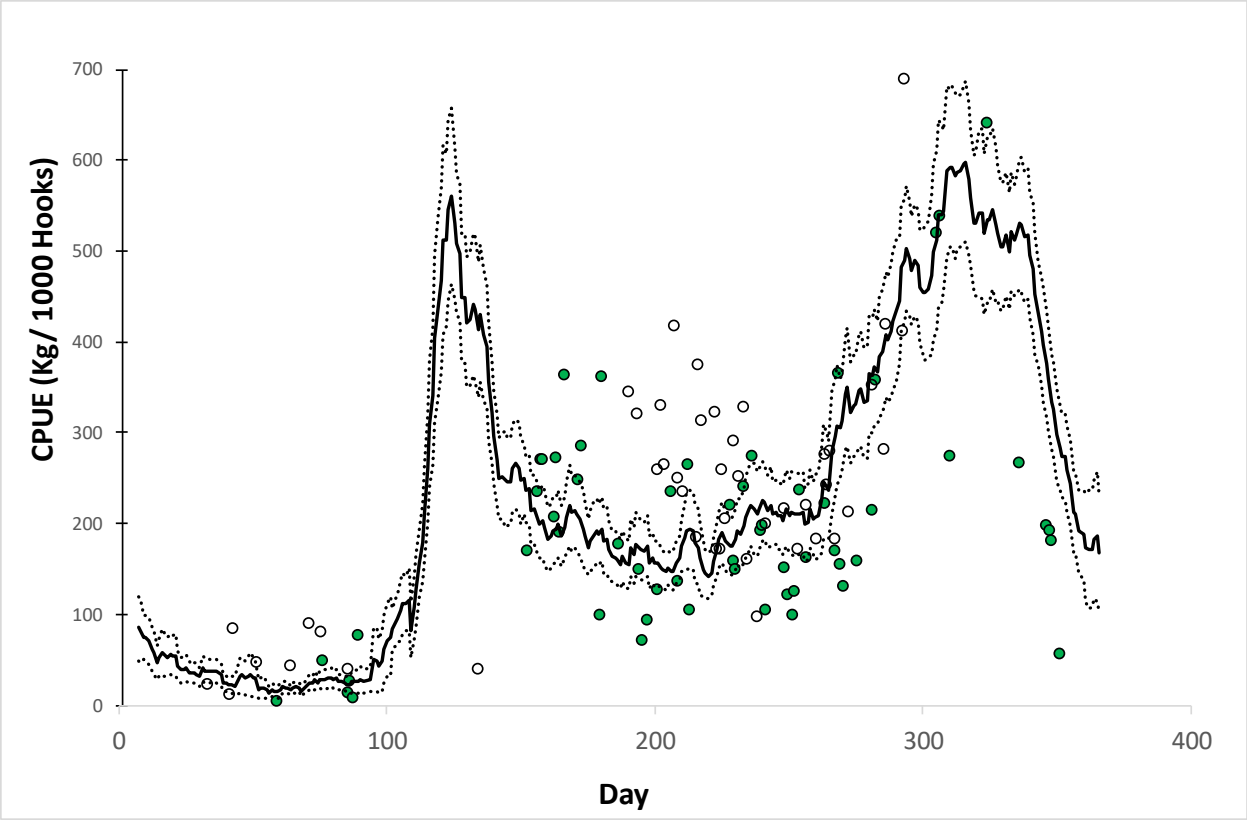


Figure 13. Average daily longline CPUE (kg / 1000 hooks) for the sentinel survey program in zone 1 (3Pn). Solid points represent 2018 and empty points represent 2017 data; the solid line is a 7-day running average of the daily averages for the 1995-2013 series; and the dotted lines ± ½ standard deviation around this average.

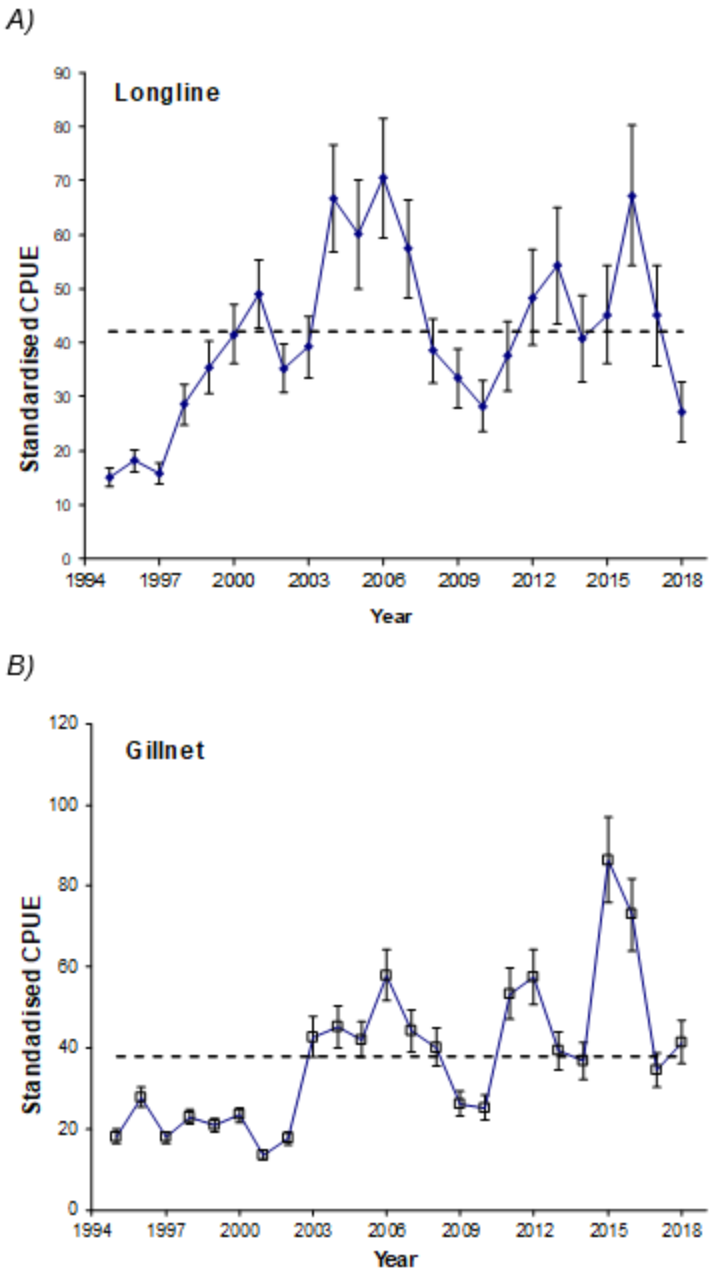


Figure 14. Standardized catch per unit effort (CPUE) (average ± 95% CI) in the sentinel survey program A) Longline B) Gillnet. The solid line represents the 1995-2016 series average.

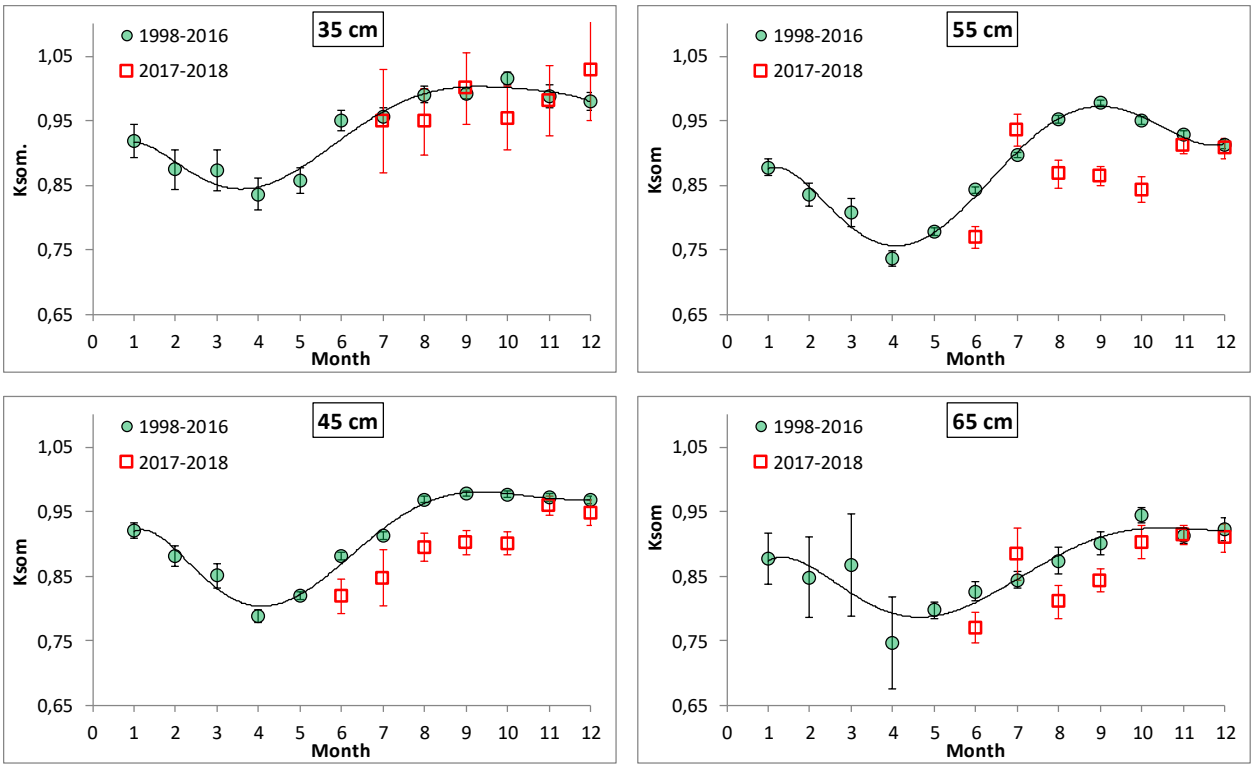


Figure 15. Seasonal changes in condition of cod sampled in the 2017 and 2018 (square) fixed gear sentinel survey program. Monthly average ± 95% CI of Fulton's somatic index (K som). The solid line represents the 1998–2016 series monthly average.

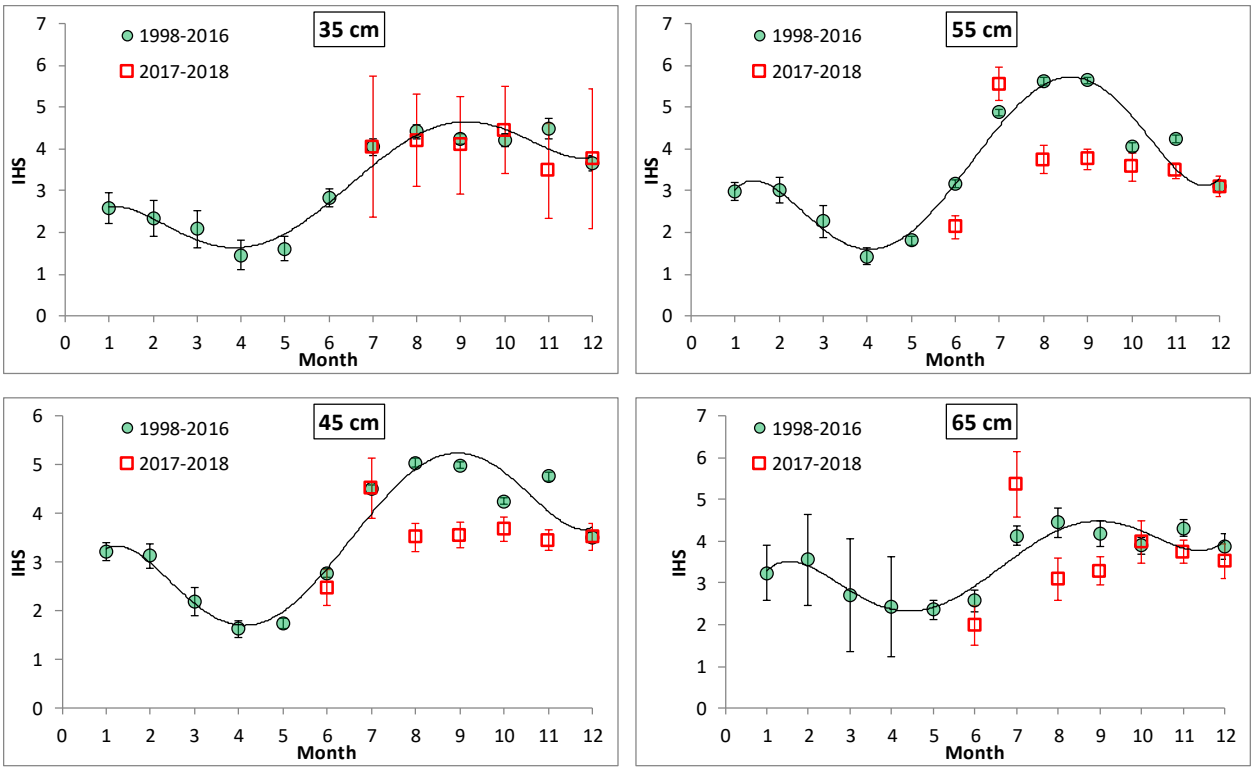


Figure 16. Seasonal changes in condition of cod sampled in the 2017 and 2018 (square) fixed gear sentinel survey program. Monthly average ± 95% CI of hepato-somatic index (HSI). The solid line represents the 1998–2016 series monthly average.

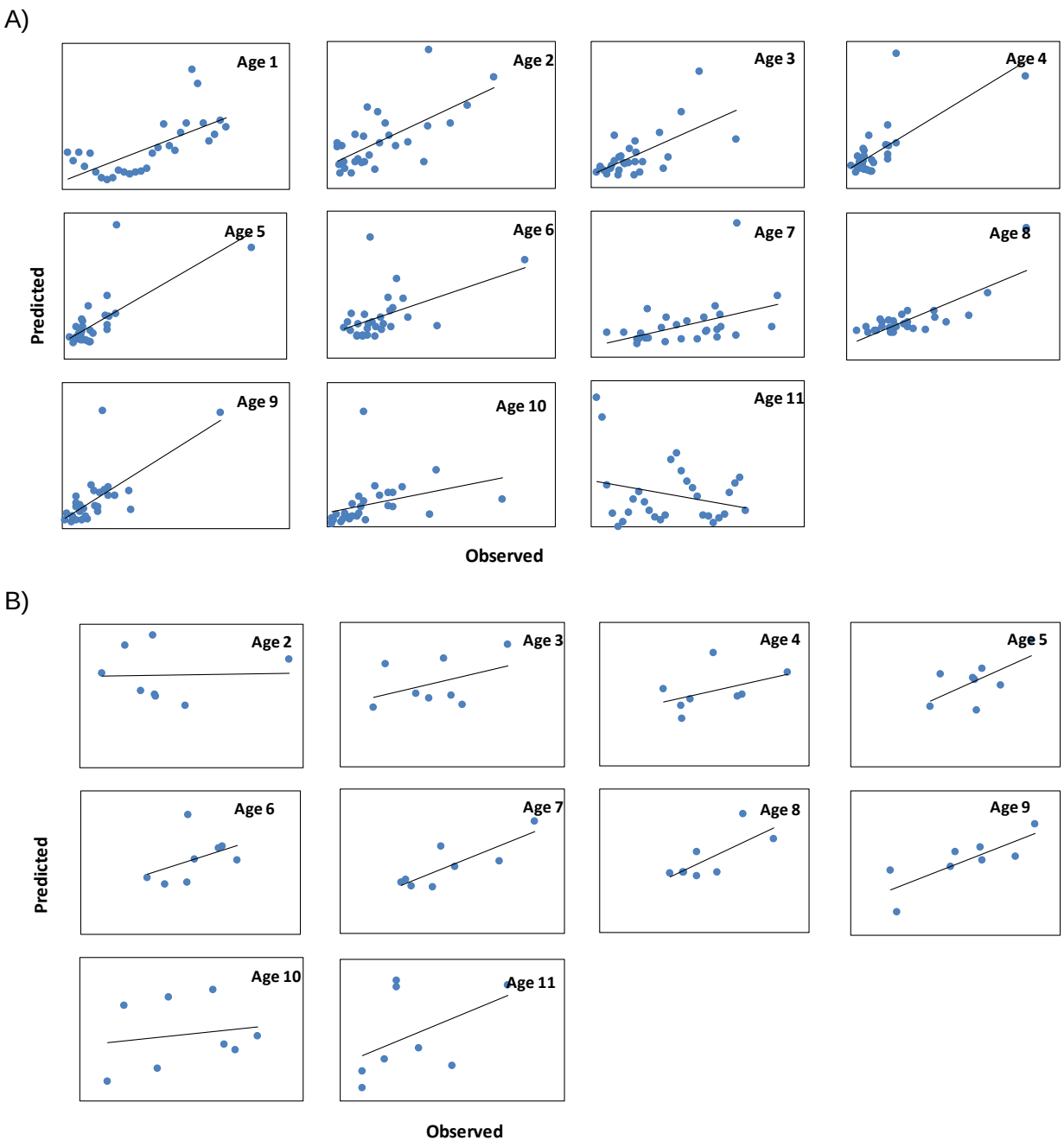
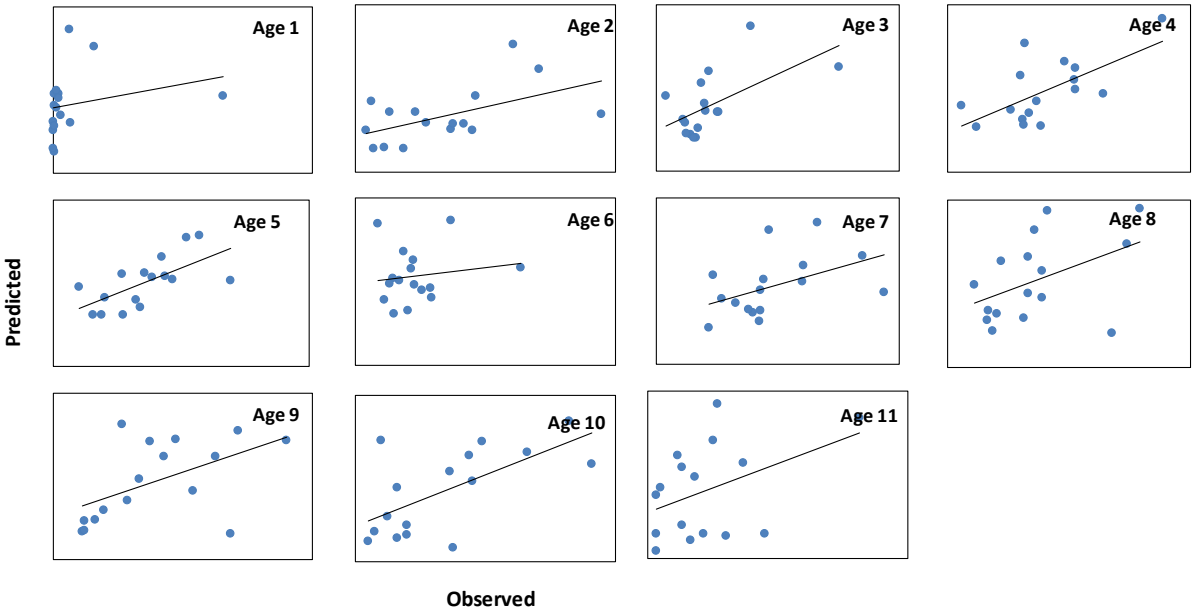


Figure 17. ADAPT adjustment between observed and predicted values at age. A) DFO Survey, B) Mobile gear sentinel survey > 20 fathoms, C) Mobile gear sentinel survey > 10 fathoms, D) Longline sentinel survey, E) Gillnet sentinel survey.

C)



D)

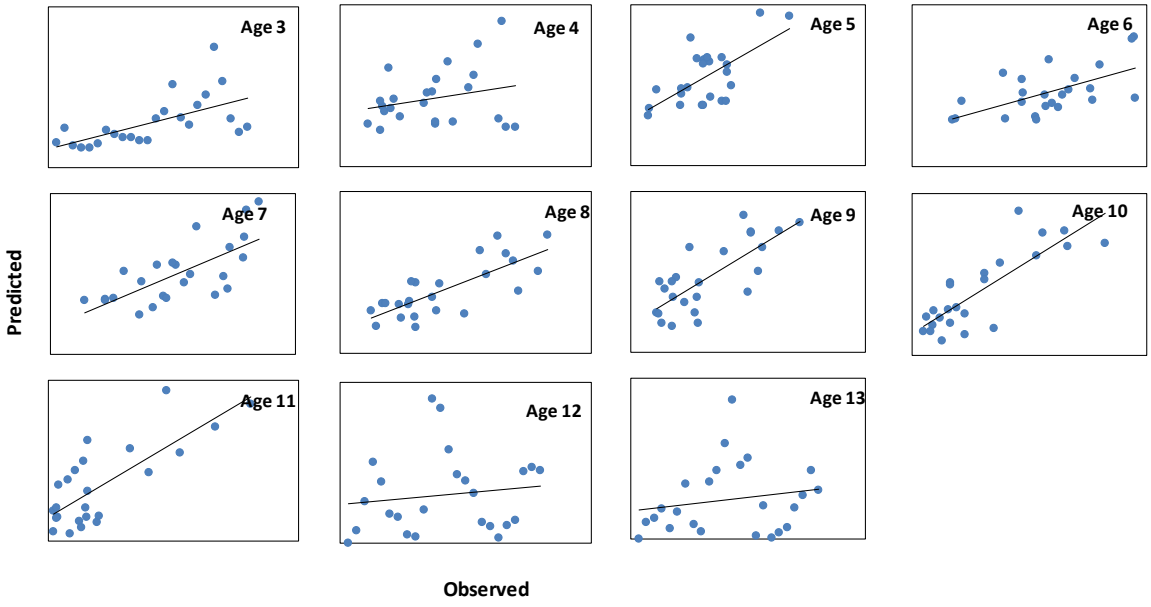


Figure 17 (continued). ADAPT adjustment between observed and predicted values at age. A) DFO Survey, B) Mobile gear sentinel survey > 20 fathoms, C) Mobile gear sentinel survey > 10 fathoms, D) Longline sentinel survey, E) Gillnet sentinel survey.

E)

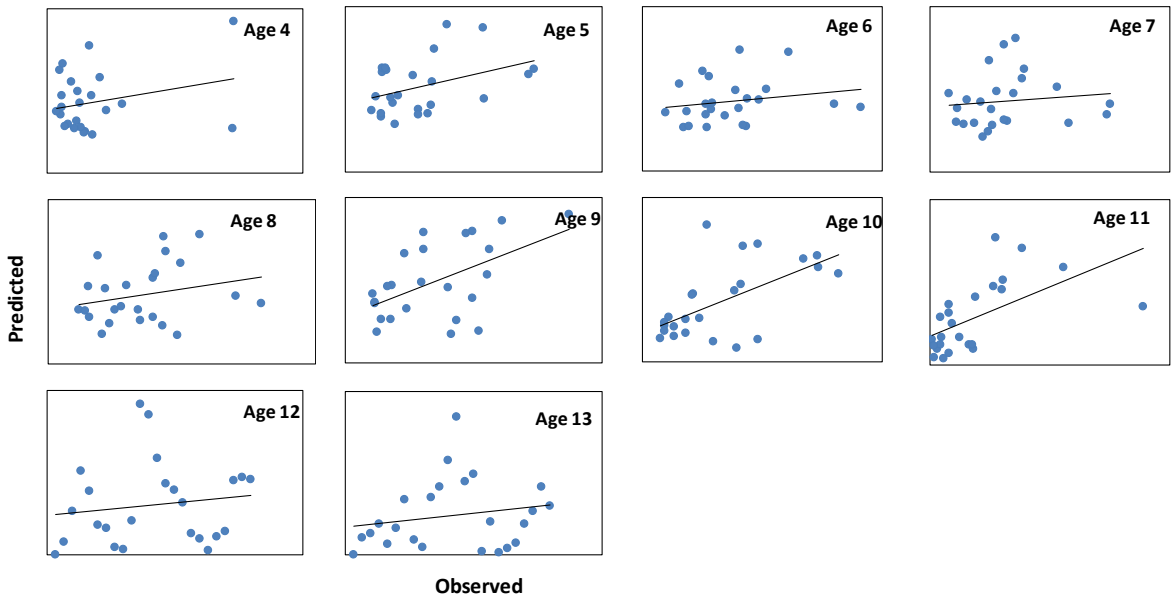


Figure 17 (continued). ADAPT adjustment between observed and predicted values at age. A) DFO Survey, B) Mobile gear sentinel survey > 20 fathoms, C) Mobile gear sentinel survey > 10 fathoms, D) Longline sentinel survey, E) Gillnet sentinel survey.

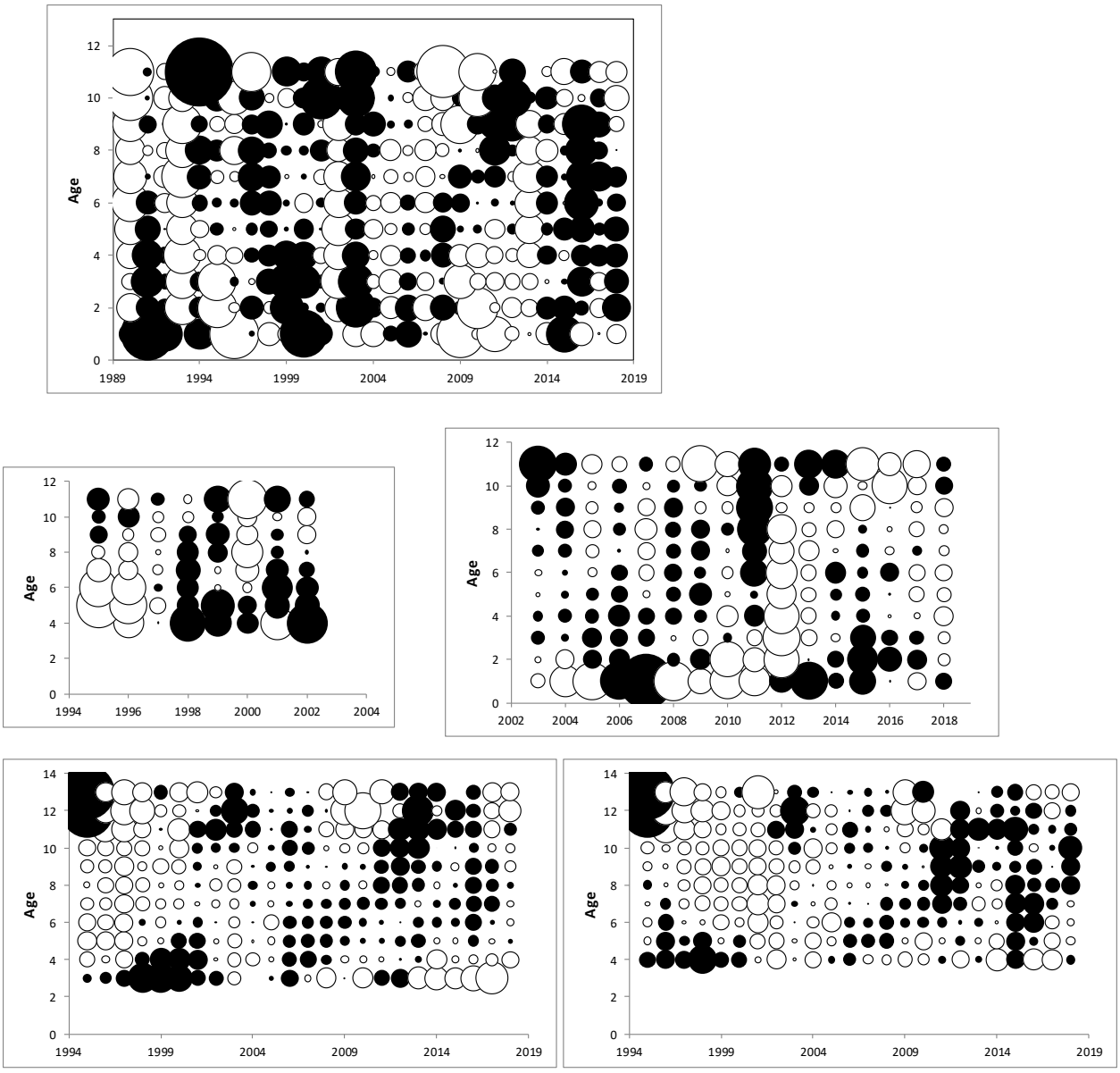


Figure 18. Distribution of residuals from the ADAPT model (Dark circle = positive, white= negative). A = DFO Survey, B = Mobile gear sentinel survey > 20 f., C = Mobile gear sentinel survey > 10 f., D = Longline sentinel survey, E) Gillnet sentinel survey.

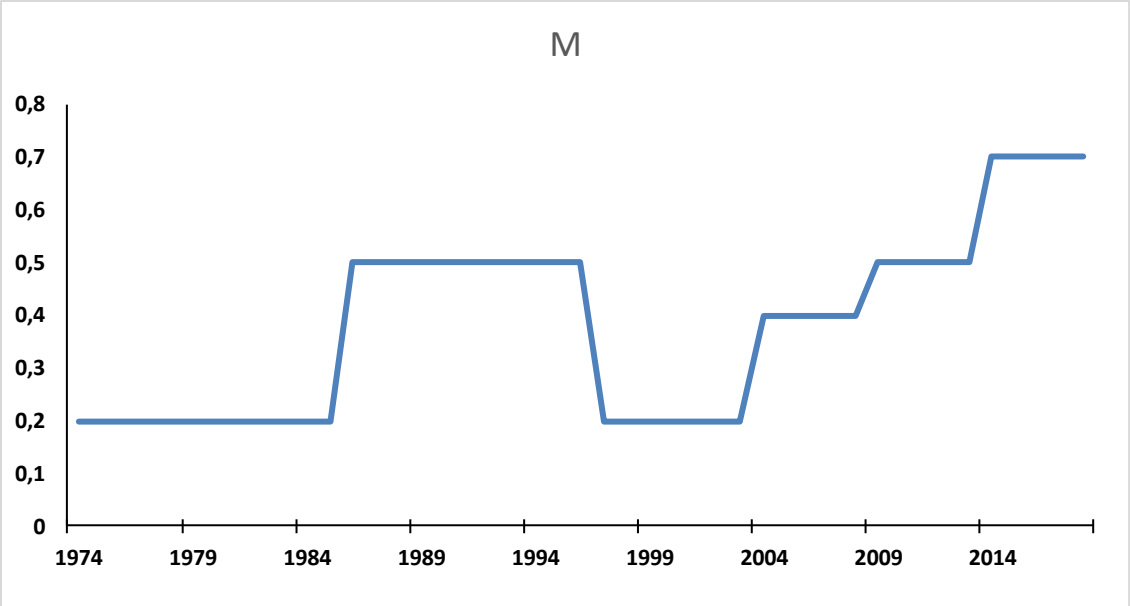
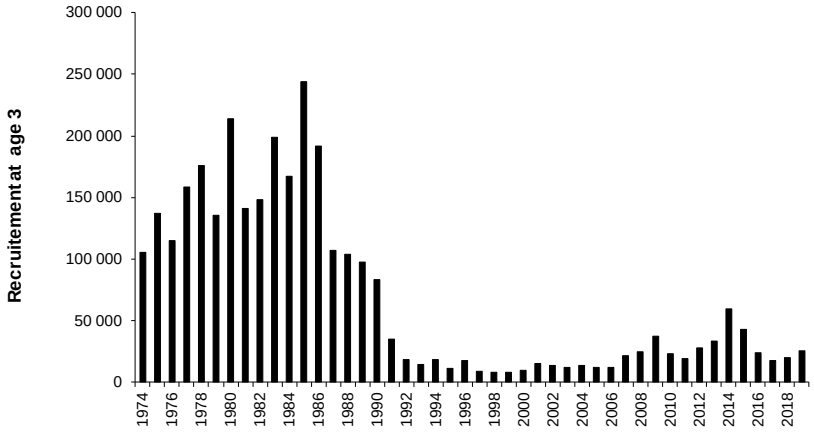
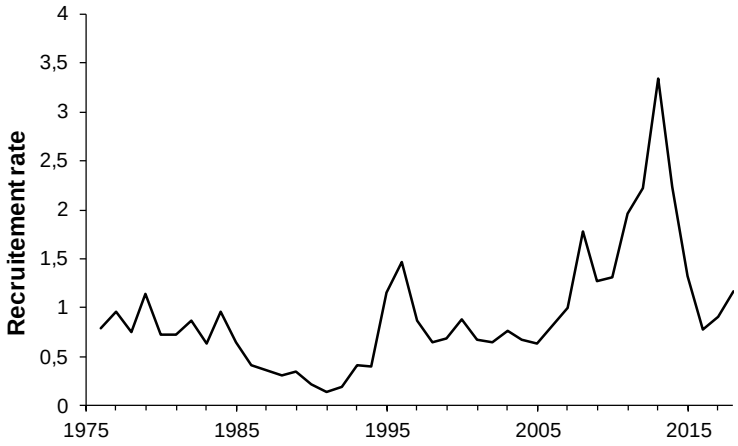


Figure 19. Natural mortality set values from 1974 to 2003 and estimated values from 2004 to 2018.

A)



B)



C)

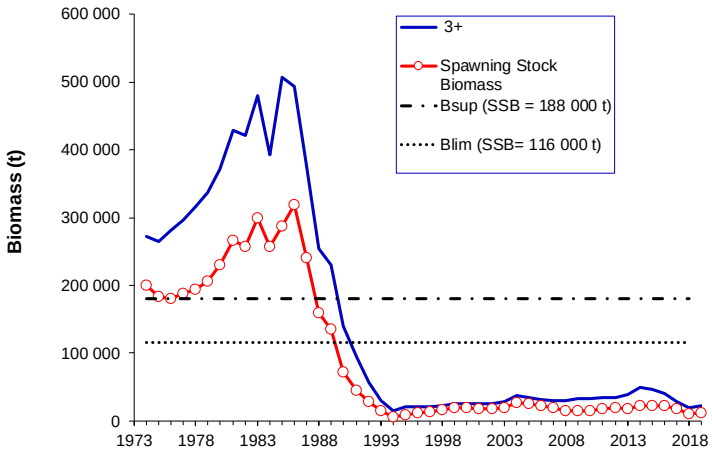


Figure 20. Main assessment findings A = Recruitment, B = Recruitment rate and C = Biomass.

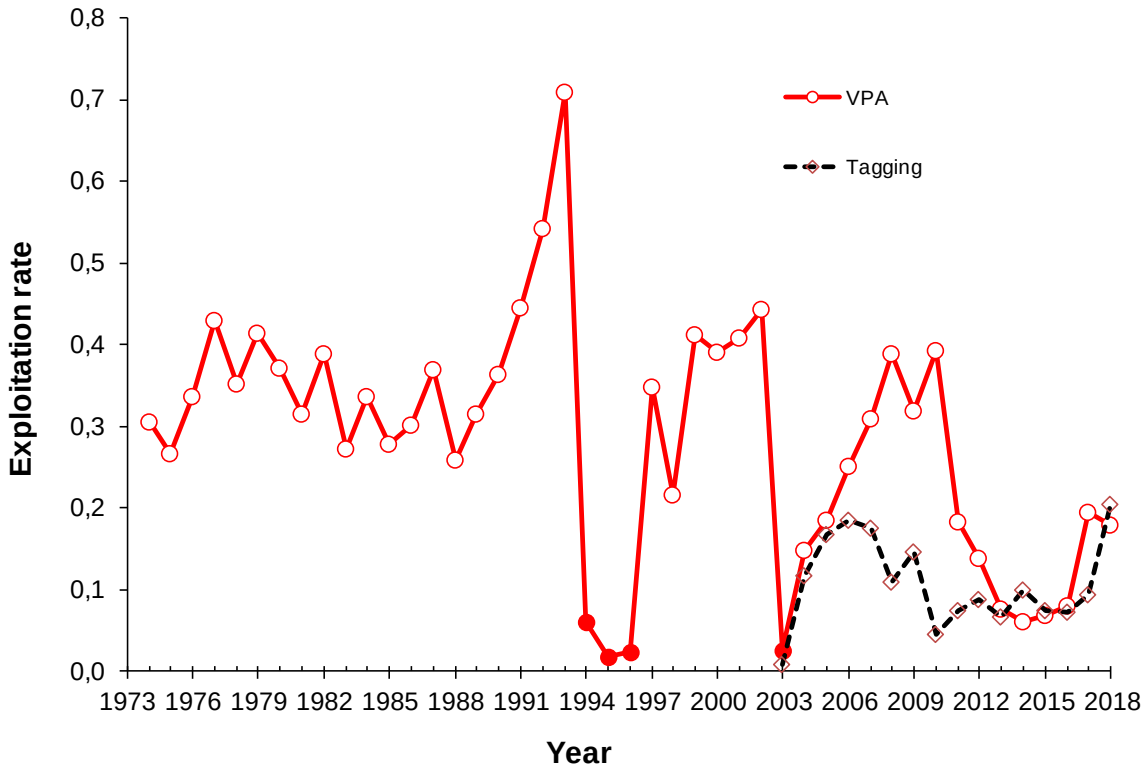


Figure 21. Exploitation rates estimated from tagging data and sequential population analysis (VPA).

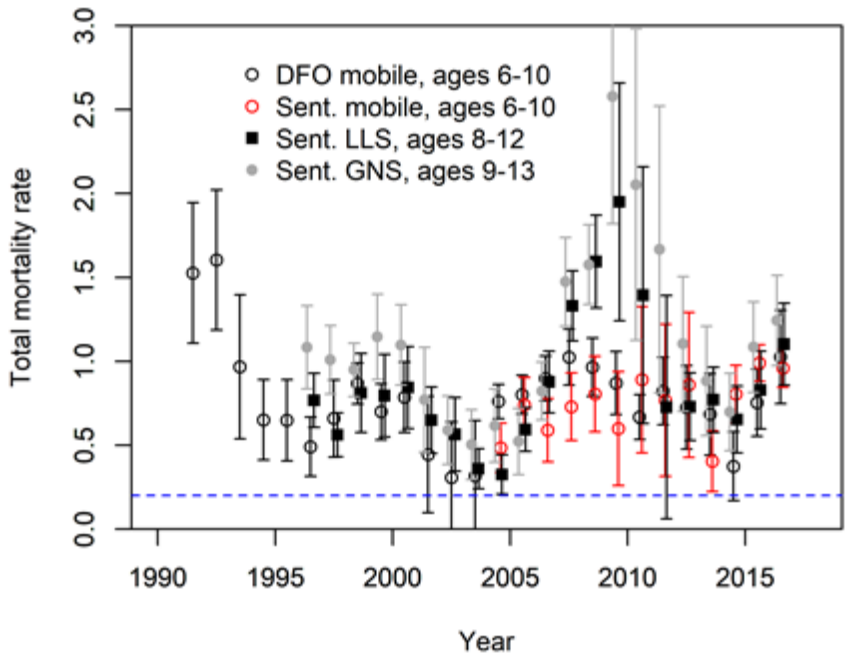


Figure 22. Estimates of total mortality rate (Z) using the modified catch curve analysis applied to each of the four scientific surveys (differentiated by the symbols in the figure): DFO (mobile) survey and Sentinel mobile, longline and gillnet surveys. The ages included in the analysis differed from one survey to another and are shown in the legend. The blue dotted line indicates a total mortality rate of 0.2, representing the assumed natural background natural mortality rate for the stock.

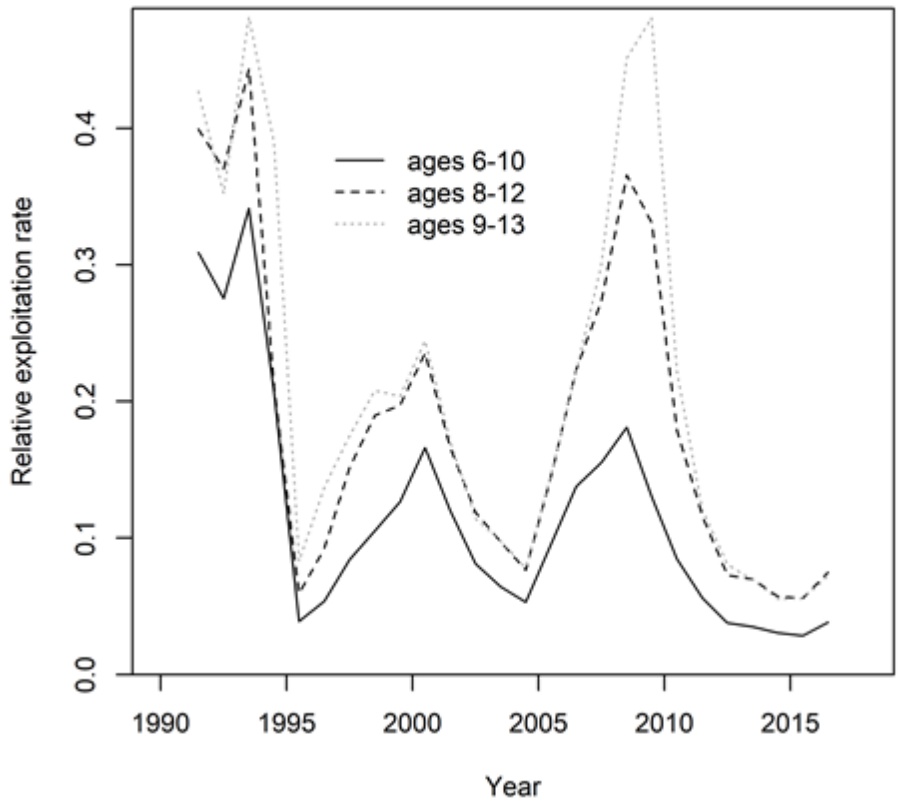


Figure 23. Empirical estimates of relative exploitation rates for three cod age blocks derived from catches at age in the multispecies survey and the commercial fishery.

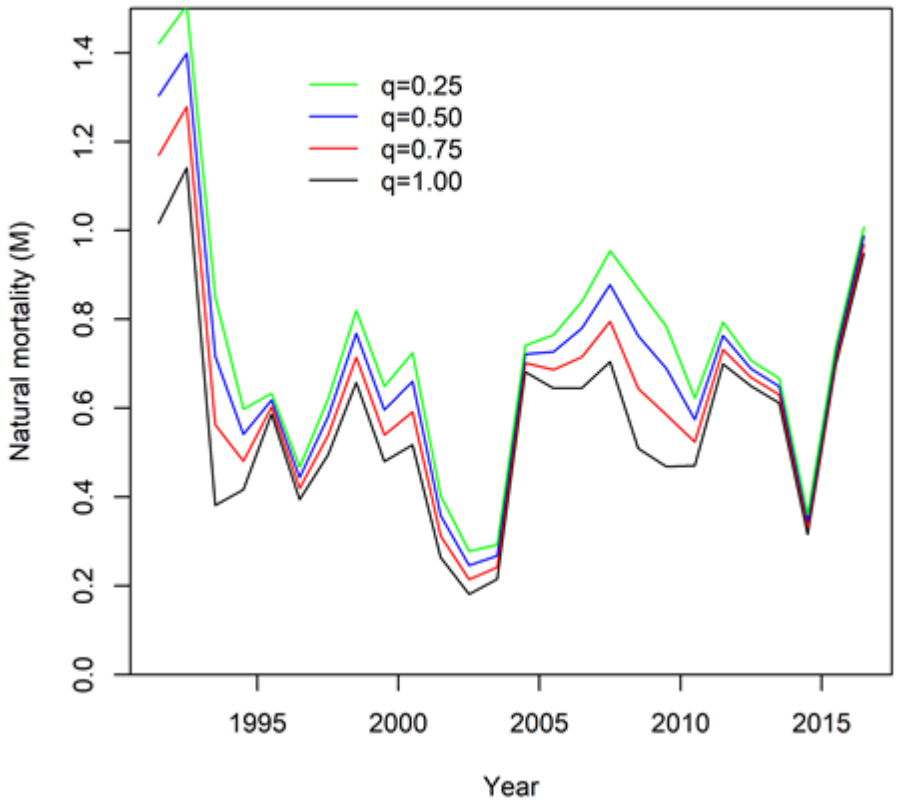
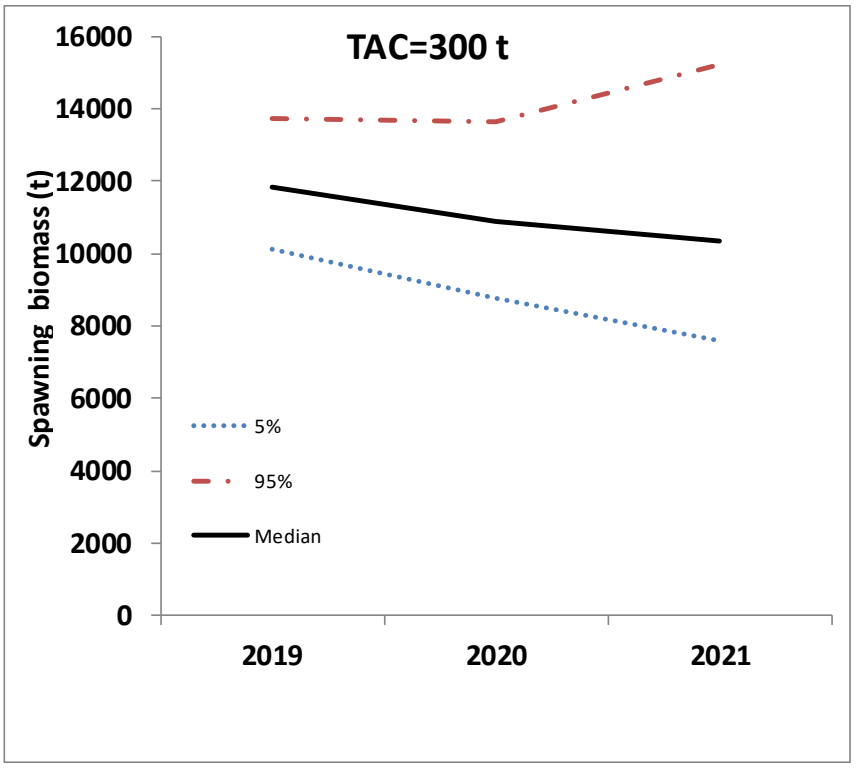


Figure 24. Empirical estimates of natural mortality (M) derived from catches at age in the multispecies survey and in the commercial fishery based on different assumption on survey catchability, q, following eq. 4.



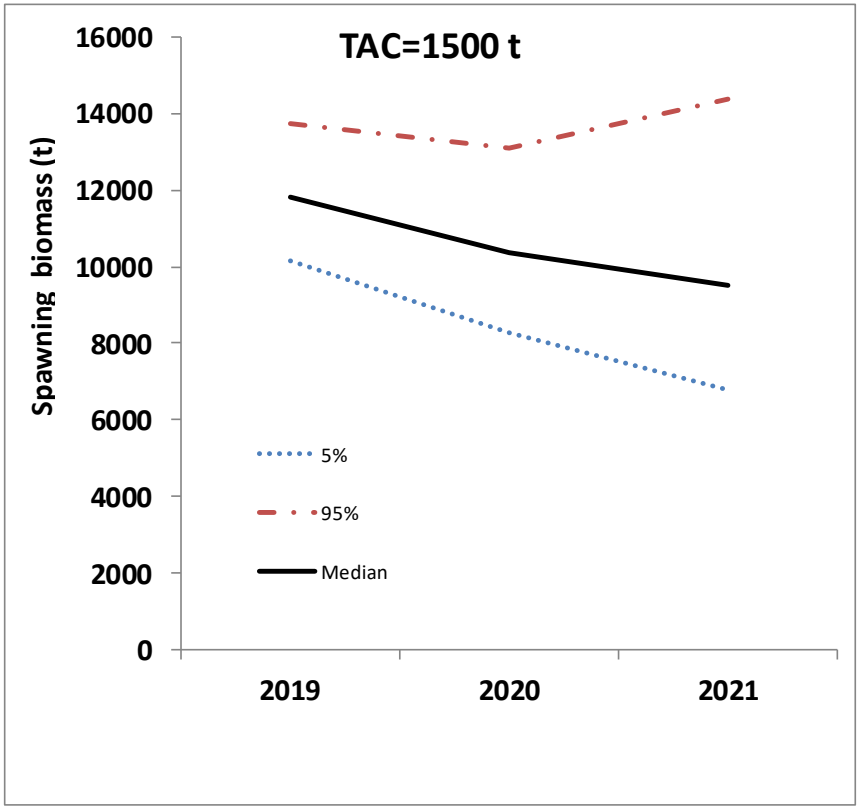


Figure 25. Projection analysis for annual harvest of 300 t and 1500 t.

10. APPENDICES

Appendix 1. List of collaborators for the assessment of Atlantic cod in the northern Gulf of St. Lawrence in 2017 and 2018.

Fisheries and Oceans Canada

Claude Brassard, Johanne Gauthier, Philippe Schwab, Jean-François Lussier, Hugo Bourdages, Sylvie St-Pierre, Jérôme Gagnon, Hugues Benoît, Caroline Senay, Jordan Ouellette-Plante, Marie-Julie Roux, Denis Bernier, Sylvain Hurtubise, Mona Rochette, Renée Morneau, André Chevrier, Yvon Dufresne, Marie-Claude Marquis, Jerry Lavers, Pierre-Marc Scallon-Chouinard, Claude Nozères, Éric Parent, Mathieu Desgagnés, Geneviève Parent, Chantal Méthot, Marilyn Thorne, Tanya Hansen, Geneviève Côté, Camille Lavoie, Lisa Treau de Coeli, Stéphanie Côté, Laurie Isabel, Mariane Daneau-Lamoureux, Maria Angelica Martinez Silva, Laélien Bassi, Camille Aubé, Sarah Brown-Vuillemin

Fish Food & Allied Workers

Myra Swyers, Jason Spingle, Monty Way, Gerald MacDonald, Brent Hedderson, Loomis Way, Scott Smith, Trevor Chaulk

Lower North Shore Fishermen's Association:

Paul Nadeau, Frank Collier, Tara Bobbitt

Association des Capitaines Propriétaires de la Gaspésie:

Jean-Pierre Couillard, Marcel Denis, Carole Vézina

Biorex

France Henry, Gabrielle Chapados

Fishers

Québec mobile gear

Captain	Crew	Locality
Jean-Pierre Élement	Rémy Élément, Martin Élément	Sept-Îles
Clément Samuel, Normand Samuel	Michel Campion	Rivière-au-Renard
Marcel Roy	Pierre Fortin, Yan Cotton, Réal Vallée, Jocelyn Bond	Rivière-au-Renard / Cloridorme

Québec fixed gear

Captain	Crew	Locality
Keith Anderson	Rodney Jones	Harrington Harbour
Marty Etheridge	Garry Etheridge	Bradore Bay
Ian Anderson	Daren Anderson	Chevery
Dennis Keats	Donald Keats	St. Paul's River
Norman Keats	Edward Keats	St. Paul's River
Jean-Yves Mercier	André Mercier	Port-Cartier
Irené Marcoux	Francis Marcoux	Tête-à-la-Baleine
Victor Monger	Jerry Mansbridge, Marius Marcoux	Tête-à-la-Baleine

Newfoundland mobile gear

Captain	Crew	Locality
Darryl Way (CRP 2018)	Martin Way Roland Way Wade Coles Gale Pilgrim Owen Way	Port Aux Choix
Leonard Warren	Ephriam Smith Curtis Dredge Jamie Warren Jonathan Warren	Cook's harbour
Murray Lavers	Philip Ryan Barry Ryan Thomas Lavers Kenneth Spence	Port Saunders
Dan Genge Jr.	Kevin Genge Hank Poole Gregory Genge	Flower's Cove

Newfoundland fixed gear

Captain	Crew	Locality
Peter Francis	Selena Francis	Lapoile
Wilfred Munden	Harry Munden Albert Munden	Rose Blanche
Kevin Hardy	Troy Hardy	Burnt Islands
Steve Stagg	James Stagg Dennis Stone	Port aux Basques
Carl Bennett	Judy Mauger	Codroy
Bernard Barter	Kevin Duffney	Lourdes
John C. Hardy	Kelly Francis	Burnt Islands
Lester Combdon	Jerry Combdon	Cow head
Joseph Brake	Shawn White	Trout River
Colby Cullihall	Dylan Runbolt	Green Island Cove
Randy Woodward	Roger Woodward Paul Woodward Enos Woodward	Green Island Cove
Douglas Ryland	Cecil Ryland	L'Anse au Loup
Randy Gould	No Crew Member	Port au Choix
Harry Vautier	Dolores Vautier	Lapoile

Appendix 2. Questionnaire from the industry telephone survey on Cod fishery.

Questions for the fixed Gear Cod Telephone Survey (3Pn, 4R) - 2018.

Questions on Biology

1. What zone did you primarily fish in this year 2018 (3Pn, 4Ra, b, c, d)?
2. How would you compare the size (overall length) of fish this year (2018) with last year (2017)? (1 - much smaller, 2 - smaller, 3 - same, 4 - larger, 5 - much larger)
3. How would you compare the condition (fatness, health) of fish captured in late summer / fall season this year (2018) with last year (2017)? (1 - much lower, 2 - lower, 3 - same, 4 - higher, 5 - much higher)

Questions on Catch Rates

4. Using a scale of 1-10 (poor to excellent), how would you rate your catch rates during July-September (4R), and October-November (3Pn) this year (2018)?
5. Using a scale of 1-10 (poor to excellent), how would you rate your catch rates during July-September (4R), and October-November (3Pn) last year (2017)?

*Use the following as a general number index!

In other words, for the amount of gear you fished, would you describe the fishing as; Poor (1-3), average (4-6), good (7-8), excellent (9-10).

Additional Questions on Cod Tagging

6. Did you recapture a cod(s) with tag(s) in 2018?
7. Did you report (i.e. send into FFAW or DFO) yet?

If No to question 7, please inform them that we receive the tags and request that they send in ASAP – try to ensure that they record our address. (FFAW – P.O. Box 548, Corner Brook, NL, A2H 6E6). If possible, provide recovery date, location of recapture, depth of water, length, weight, gear used.

Questions on Atlantic Halibut Fishing / Tagging

8. Did you fish Atlantic Halibut in 2018?
9. Did you recapture Atlantic Halibut(s) with tag(s) in 2018?
10. Did you report Atlantic Halibut Tag(s) (i.e. send into FFAW or DFO) in 2018?

If No to question 10, please inform them that we receive the tags and request that they send in ASAP – try to ensure that they record our address. (FFAW – P.O. Box 548, Corner Brook, NL, A2H 6E6). If possible, provide recovery date, location of recapture, depth of water, length, weight, gear used.

Appendix 3. Fixed gear sentinel survey program, number of activities by zone, site, gear, and month in 2018.

2017

	Gillnet							Longline												
	Month							Month												
Zone	6	7	8	9	10	11	Total	1	2	3	4	5	6	7	8	9	10	11	12	Total	Total
1	-	-	-	-	-		-	-	4	5	-	-	-	8	18	12	11	12	11	81	81
2	-	-	-	-	-		-	-	-	-	-	-	-	9	11	5	2	4	2	33	33
3	12	10	14	4	-	-	40	-	-	-	-	-	-	-	9	5	3	-	-	17	57
4	15	13	8	4	-	-	40	-	-	-	-	-	-	-	2	1	4	-	-	7	47
5	46	42	12	-	-	-	105	-	-	-	-	-	-	-	9	3	-	-	-	12	117
6	84	86	16	-	-	-	194	-	-	-	-	-	-	-	-	-	-	-	-	-	194
Total	157	151	50	8	0	0	379	0	4	5	-	-	-	17	49	26	20	16	13	150	529

2018

	Gillnet							Longline												
	Month							Month												
Zone	6	7	8	9	10	11	Total	1	2	3	4	5	6	7	8	9	10	11	12	Total	Total
1	-	-	-	-	-	-	-	1	1	7	-	-	14	10	13	14	8	8	9	85	85
2	-	-	-	-	-	-	-	-	-	-	-	-	-	9	7	3	1	-	-	20	20
3	-	4	17	14	2	-	37	-	-	-	-	-	-	6	5	-	7	-	-	18	55
4	-	17	11	2	2	2	34	-	-	-	-	-	2	2	-	7	4	-	-	15	49
5	-	42	44	19	-	-	105	-	-	-	-	-	-	-	5	7	-	-	-	12	117
6	-	68	95	32	-	-	195	-	-	-	-	-	-	-	-	-	-	-	-	-	195
Total	0	131	167	67	4	2	371	1	1	7	0	0	16	27	30	31	20	8	9	150	521

Appendix 4. Standardized catch per unit effort (CPUE) for the gillnet sentinel survey program from 1995 to 2018.

Year	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1995	792	5.32	792	5.32
1996	916	6.15	1708	11.48
1997	934	6.28	2642	17.75
1998	1087	7.3	3729	25.05
1999	1237	8.31	4966	33.36
2000	1169	7.85	6135	41.22
2001	1040	6.99	7175	48.21
2002	956	6.42	8131	54.63
2003	454	3.05	8585	57.68
2004	455	3.06	9040	60.74
2005	524	3.52	9564	64.26
2006	489	3.29	10053	67.54
2007	431	2.9	10484	70.44
2008	423	2.84	10907	73.28
2009	413	2.77	11320	76.05
2010	422	2.84	11742	78.89
2011	411	2.76	12153	81.65
2012	417	2.8	12570	84.45
2013	403	2.71	12973	87.16
2014	377	2.53	13350	89.69
2015	400	2.69	13750	92.38
2016	387	2.6	14137	94.98
2017	378	2.54	14515	97.52
2018	369	2.48	14884	100

Month	Frequency	Percent	Cumulative Frequency	Cumulative Percent
6	1472	9.89	1472	9.89
7	5073	34.08	6545	43.97
8	5586	37.53	12131	81.5
9	2221	14.92	14352	96.43
10	532	3.57	14884	100

Zone	Frequency	Percent	Cumulative Frequency	Cumulative Percent
2	760	5.11	760	5.11
3	3183	21.39	3943	26.49
4	2112	14.19	6055	40.68
5	3745	25.16	9800	65.84
6	5084	34.16	14884	100

hrs_cod2	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	1349	9.07	1349	9.07
2	11982	80.59	13331	89.66
3	439	2.95	13770	92.62
4	1098	7.38	14868	100

Frequency missing=16
Regression of the log catch rates with the categories
The GLM Procedure

Class	Level	Values
YEAR	22	1995 à 2018
MONTH	5	6 à 10
zonen	5	2 à 6
hrs_cod2	4	1 à 4

Number of observations read 14909
Number of observations used 14868
Regression of the log catch rates with the categories
GLM Procedure
Dependent Variable: logcpue Log of catch rate

Source	DL	Sum of square	Mean square	F Value	Pr > F
Modèle	34	6817.6798	200.51999	155.59	<.0001
Erreur	14833	19116.367	1.28877		
Total corrected	14867	25934.047			

R-square	Coeff Var	Root MSE	logcpue Mean
0.262885	48.34737	1.135241	2.348093

Source	DL	Type III SS	Mean square	F Value	Pr > F
Month	4	1387.8879	346.97197	269.23	<.0001
zonen	4	2162.718	540.6795	419.53	<.0001
hrs_cod2	3	46.458533	15.486178	12.02	<.0001
Year	23	3200.4945	139.15193	107.97	<.0001

Source	DF	Type III SS	Mean square	F Value	Pr > F
Month	4	1387.8879	346.97197	269.23	<.0001
zonen	4	2162.718	540.6795	419.53	<.0001
hrs_cod2	3	46.458533	15.486178	12.02	<.0001
Year	23	3200.4945	139.15193	107.97	<.0001

Parameter		Estimate		Standard error	t Value	Pr > |t|
Intercept		2.1675	B	0.0859	25.23	<.0001
Month	6	0.2078	B	0.0600	3.47	0.0005
Month	7	0.8569	B	0.0543	15.79	<.0001
Month	8	0.3149	B	0.0534	5.90	<.0001
Month	9	0.0440	B	0.0560	0.79	0.4323
Month	10	0.0000	B	-	-	-
zonen	2	0.7103	B	0.0459	15.49	<.0001
zonen	3	0.8165	B	0.0270	30.21	<.0001
zonen	4	-0.2402	B	0.0303	-7.93	<.0001
zonen	5	0.5347	B	0.0246	21.71	<.0001
zonen	6	0.0000	B	-	-	-
hrs_cod2	1	-0.1807	B	0.0484	-3.73	0.0002
hrs_cod2	2	-0.2163	B	0.0366	-5.91	<.0001
hrs_cod2	4	0.0000	B	-	-	-
Year	1995	-0.8297	B	0.0724	-11.46	<.0001
Year	1996	-0.4019	B	0.0704	-5.71	<.0001
Year	1997	-0.8441	B	0.0701	-12.05	<.0001
Year	1998	-0.5911	B	0.0691	-8.55	<.0001
Year	1999	-0.6871	B	0.0678	-10.13	<.0001
Year	2000	-0.5752	B	0.0684	-8.41	<.0001
Year	2001	-1.1233	B	0.0694	-16.18	<.0001
Year	2002	-0.8562	B	0.0702	-12.20	<.0001
Year	2003	0.0303	B	0.0799	0.38	0.7047
Year	2004	0.0847	B	0.0798	1.06	0.2887
Year	2005	0.0149	B	0.0776	0.19	0.848
Year	2006	0.3327	B	0.0787	4.23	<.0001
Year	2007	0.0662	B	0.0809	0.82	0.4134
Year	2008	-0.0356	B	0.0813	-0.44	0.661
Year	2009	-0.4622	B	0.0816	-5.66	<.0001
Year	2010	-0.4951	B	0.0812	-6.10	<.0001
Year	2011	0.2517	B	0.0817	3.08	0.0021
Year	2012	0.3251	B	0.0813	4.00	<.0001
Year	2013	-0.0550	B	0.0821	-0.67	0.5024
Year	2014	-0.1202	B	0.0833	-1.44	0.1491
Year	2015	0.7336	B	0.0821	8.94	<.0001
Year	2016	0.5637	B	0.0828	6.81	<.0001
Year	2017	-0.1837	B	0.0831	-2.21	0.0271
Year	2018	0.0000	B			

The standard category is defined by:

month = 8

zonen = 3

hrs_cod2 = 2

Year	Predicted catch rate	Standard error
1995	18.105	0.857
1996	27.773	1.256
1997	17.849	0.790
1998	22.990	0.963
1999	20.887	0.829
2000	23.359	0.945
2001	13.501	0.575
2002	17.635	0.770
2003	42.758	2.506
2004	45.152	2.636
2005	42.114	2.306
2006	57.868	3.242
2007	44.321	2.616
2008	40.028	2.394
2009	26.127	1.570
2010	25.282	1.517
2011	53.347	3.236
2012	57.413	3.482
2013	39.254	2.425
2014	36.773	2.328
2015	86.376	5.332
2016	72.875	4.571
2017	34.511	2.195
2018	41.469	2.662

Appendix 5. Standardized catch per unit effort (CPUE) for the longline sentinel fisheries program from 1995 to 2018.

YEAR	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1995	812	9.7	812	9.7
1996	749	8.95	1561	18.64
1997	586	7	2147	25.64
1998	470	5.61	2617	31.26
1999	441	5.27	3058	36.52
2000	495	5.91	3553	42.43
2001	587	7.01	4140	49.44
2002	596	7.12	4736	56.56
2003	394	4.71	5130	61.27
2004	379	4.53	5509	65.79
2005	271	3.24	5780	69.03
2006	320	3.82	6100	72.85
2007	312	3.73	6412	76.58
2008	313	3.74	6725	80.32
2009	277	3.31	7002	83.63
2010	258	3.08	7260	86.71
2011	248	2.96	7508	89.67
2012	198	2.36	7706	92.03
2013	169	2.02	7875	94.05
2014	169	2.02	8044	96.07
2015	157	1.88	8201	97.95
2016	172	2.05	8373	100
2017	145	1.67	8518	98.35
2018	143	1.65	8661	100

Month	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	229	2.64	229	2.64
2	159	1.84	388	4.48
4	192	2.22	580	6.7
5	381	4.4	961	11.1
6	636	7.34	1597	18.44
7	1169	13.5	2766	31.94
8	1805	20.84	4571	52.78
9	1671	19.29	6242	72.07
10	1108	12.79	7350	84.86
11	825	9.53	8175	94.39
12	486	5.61	8661	100

Gear	Frequency	Percent	Cumulative Frequency	Cumulative Percent
51	4334	50.04	4334	50.04
52	4327	49.96	8661	100

Zonen	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	4198	48.47	4198	48.47
2	1649	19.04	5847	67.51
3	1037	11.97	6884	79.48
4	958	11.06	7842	90.54
5	819	9.46	8661	100

hrs_cod2	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	1823	21.07	1823	21.07
2	4391	50.76	6214	71.83
3	1296	14.98	7510	86.81
4	1141	13.19	8651	100

Frequency Missing=16

Regression of the log catch rates with categories

The GLM Procedure

Class	Level	Values
Year	22	1995 à 2018
Month	11	1 à 12
zonen	5	1 à 5
hrs_cod2	4	1 à 4
gear	2	51, 52

Nomber of observations Read 14909

Nomber of observations used 14868

Regression of the log catch rates with categories

The GLM Procedure

Dependent Variable: logcpue Log of catch rate

Source	DL	Sum of square	Mean square	F Value	Pr > F
Model	41	10005,854	244,04522	186,53	<.0001
Error	8609	11263,807	1,30838		
Corrected	8650	21269,662			

R-square	Coeff Var	Root MSE	logcpue Mean
0,470428	24,49068	1,143843	4,670522

Source	DL	Type III SS	Mean square	F Value	Pr > F
Month	10	2674.4535	267.44535	204.41	<.0001
Zonen	4	3040.6977	760.17442	581.01	<.0001
hrs_cod2	3	106.69931	35.566438	27.18	<.0001
Gear	1	5.152975	5.152975	3.94	0.0472
Year	23	1090.8587	47.428641	36.25	<.0001

Parameter		Estimé		Erreur type	t Valeur	Pr > |t|
Intercept		3.7186	B	0.1298	28.65	<.0001
Month	1	-1.8801	B	0.0925	-20.34	<.0001
Month	2	-2.6394	B	0.1055	-25.02	<.0001
Month	4	-1.0862	B	0.0986	-11.01	<.0001
Month	5	0.1434	B	0.0789	1.82	0.0691
Month	6	0.0031	B	0.0705	0.04	0.9649
Month	7	-0.1814	B	0.0643	-2.82	0.0048
Month	8	0.1991	B	0.0626	3.18	0.0015
Month	9	0.0868	B	0.0631	1.37	0.1692
Month	10	0.2321	B	0.0638	3.64	0.0003
Month	11	0.7488	B	0.0657	11.40	<.0001
Month	12	0.0000	B	-	-	-
zonen	1	1.0477	B	0.0520	20.16	<.0001
zonen	2	0.7966	B	0.0558	14.28	<.0001
zonen	3	0.1952	B	0.0623	3.13	0.0017
zonen	4	-1.2605	B	0.0560	-22.52	<.0001
zonen	5	0.0000	B	-	-	-
hrs_cod2	1	0.3929	B	0.0485	8.10	<.0001
hrs_cod2	2	0.1464	B	0.0432	3.39	0.0007
hrs_cod2	3	0.2167	B	0.0481	4.51	<.0001
hrs_cod2	4	0.0000	B	-	-	-
Gear	51	-0.0894	B	0.0450	-1.98	0.0472
Gear	52	0.0000	B	-	-	-
Year	1995	-0.5216	B	0.1113	-4.69	<.0001
Year	1996	-0.3301	B	0.1119	-2.95	0.0032
Year	1997	-0.4684	B	0.1146	-4.09	<.0001
Year	1998	0.1234	B	0.1163	1.06	0.2886
Year	1999	0.3349	B	0.1164	2.88	0.004
Year	2000	0.4651	B	0.1114	4.17	<.0001
Year	2001	0.6175	B	0.1086	5.68	<.0001
Year	2002	0.2850	B	0.1081	2.64	0.0084
Year	2003	0.3701	B	0.1125	3.29	0.001
Year	2004	0.8980	B	0.1129	7.96	<.0001

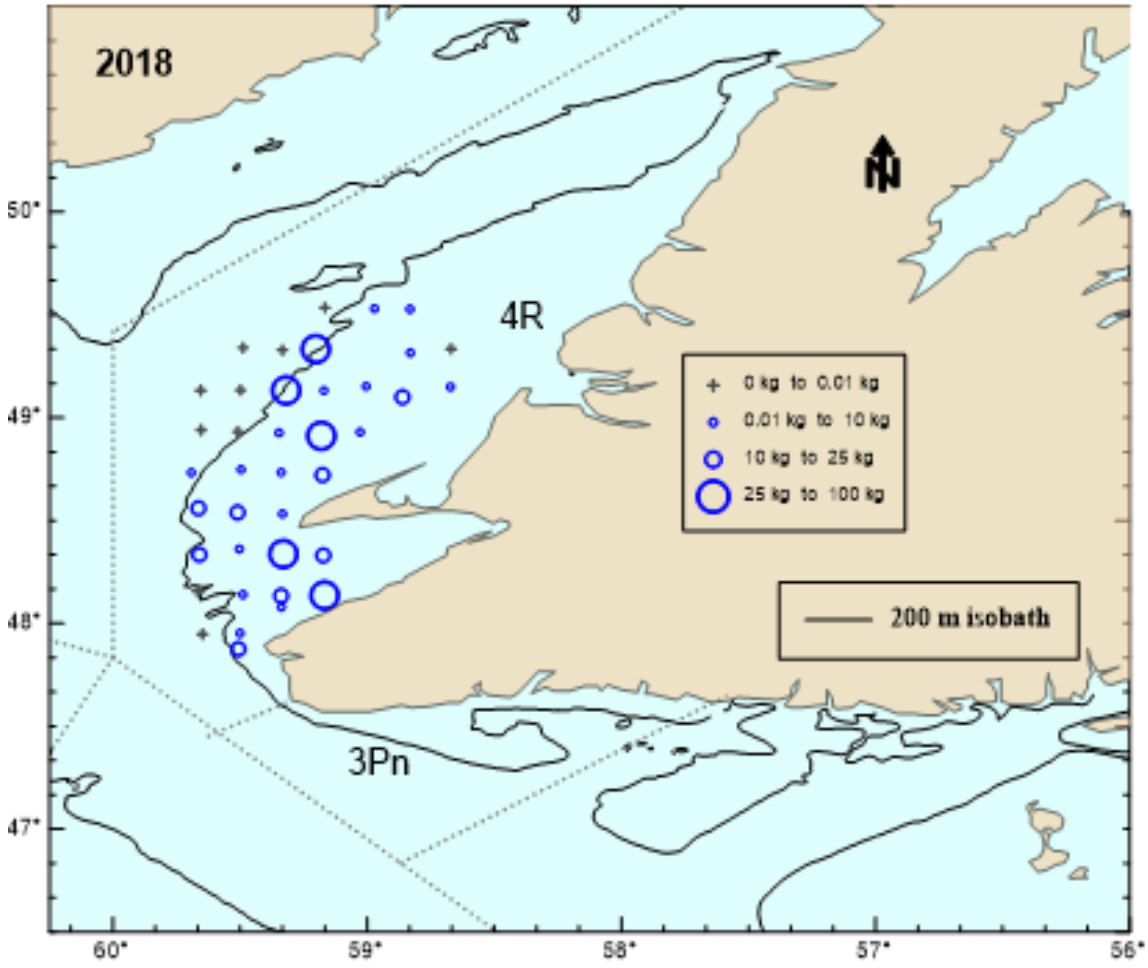
Parameter		Estimé		Erreur type	t Valeur	Pr > |t|
Year	2005	0.7879	B	0.1186	6.64	<.0001
Year	2006	0.9556	B	0.1154	8.28	<.0001
Year	2007	0.7510	B	0.1159	6.48	<.0001
Year	2008	0.3537	B	0.1159	3.05	0.0023
Year	2009	0.2024	B	0.1182	1.71	0.0868
Year	2010	0.0353	B	0.1197	0.29	0.7684
Year	2011	0.3196	B	0.1204	2.65	0.008
Year	2012	0.5725	B	0.1257	4.55	<.0001
Year	2013	0.6874	B	0.1302	5.28	<.0001
Year	2014	0.4060	B	0.1303	3.12	0.0018
Year	2015	0.5032	B	0.1325	3.80	0.0001
Year	2016	0.9019	B	0.1296	6.96	<.0001
Year	2017	0.4962	B	0.1351	3.67	0.0002
Year	2018	0.0000	B	-	-	-

The standard category is defined by:
Gear=52
month = 9
zonen = 4
hrs_cod2 = 2

Year	Predicted catch rate	Standard error
1995	16.789	1.327
1996	20.330	1.652
1997	17.697	1.513
1998	31.979	2.788
1999	39.507	3.480
2000	45.035	3.547
2001	52.468	3.919
2002	37.631	2.763
2003	40.959	3.178
2004	69.438	5.426
2005	62.151	5.416
2006	73.532	6.070
2007	59.924	4.984
2008	40.278	3.322
2009	34.615	2.939
2010	29.281	2.553
2011	38.907	3.447
2012	50.070	4.779

Year	Predicted catch rate	Standard error
2013	56.128	5.730
2014	42.367	4.295
2015	46.678	4.836
2016	69.576	6.939
2017	46.338	4.937
2018	28.213	3.011

Appendix 6. Distribution of catch rates (kg/tow) and bottom temperatures during the May 2018 reproductive potential survey.



Appendix 7. Parameters of the Sequential Population Analysis (PSA) performed using the model ADAPT/NFT (VPA/ADAPT, version 3.4.5, NOAA Fisheries Toolbox, 2014).

1. Catch at age (landing): Ci,t { (i=1,13+);(t=1974,2018)}
   The model assumes that the landed values contain no errors.

2. Abundance index:

   (DFO survey)i,t { (i=1,13);(t=1990,2018)}
   (Mobile sentinel, more than 20 fathoms)i,t { (i=1,13);(t=1995,2002)}
   (Mobile sentinel, more than 10 fathoms)i,t { (i=1,13);(t=2003,2018)}
   (Fixed sentinel – longline, NUE standardized)i,t { (i=3,13);(t=1995,2018)}
   (Fixed sentinel – Gillnet, NUE standardized)i,t { (i=4,13);(t=1995,2018)}

3. Weight at age (commercial catches): CWi,t { (i=1,13);(t=1974,2018)}

4. Weight at age (as of January 1, Rivard methodology) :SWi,t { (i=1,13);(t=1974,2018)}

5. Maturity at age : Mati,t { (i=1,13);(t=1974,2018)}

6. Natural mortality:
   Mi,t { (i=1,13);(t=1974,1985)} =0.2
   Mi,t { (i=1,13);(t=1986,1996)} =0.4
   Mi,t { (i=1,13);(t=1997,2003)} =0.2
   Note: From 2004, the M values were subsequently estimated in five-year blocks (ages 3 to 12) by means of a sensitivity analysis (VPA/ADAPT/NFT).

7. Starting population estimate:
   Age 2=160000; Age 3=140000; Age 4=120000, Age 5=120000; Age 6=100000; Age 7=90000; Age 8=3000; Age 9=2000; Age10=1000; Age 11=300; Age 12=200;

8. Estimate of abundance at age for 2018:

   Geometric mean of abundance estimates from 2014 to 2018.

9. Partial recruitment for 2018 :

   Age 2=.0006; Age 3=.0006; Age 4=.0126, Age5=.0493; Age 6=.2260; Age 7=3427; Age 8=.5485; Age 9=.7989; Age10=.81680; Age 11=1; Age 12=.956; Age 13=.9018..

10. Fishing mortality (Full-F) for the final year: Conventional method

11. Fishing mortality (F) for the final year: Heincke's method

12. Fishing mortality (F) for the last age group: Heincke's method applied to ages 11 and 12.

Appendix 8a. Number of tagged cod by NAFO Division.

	3K	3Pn	3Psa		4Ra	4Rb	4Rc	4Rd	4S	4Sw	Total
1995	-	511	-	-	1157	171	571	-	-	-	2410
1996	123	4170	203	-	3917	1986	1031	773	1647	-	13850
1997	-	1279	6	-	1655	1208	1277	326	1137	-	6888
1998	-	364	42	-	1834	570	547	185	3294	-	6836
1999	-	2067	15	-	1314	913	835	192	1950	-	7286
2000	-	2926	-	-	1624	729	617	660	1730	-	8286
2001	-	3073	-	-	2563	502	356	489	261	-	7244
2002	-	3435	-	-	667	183	450	173	656	-	5564
2003	-	2090	-	-	-	-	-	190	172	-	2452
2004	-	1690	3	-	-	-	-	-	-	-	1693
2005	-	1509	-	-	720	1631	-	131	-	-	3991
2006	-	1354	-	-	596	729	-	250	308	-	3237
2007	-	625	-	-	2173	965	282	233	312	-	4590
2008	-	1296	-	-	178	336	-	-	295	-	2105
2009	-	587	-	-	371	238	-	18	264	24	1502
2010	-	685	-	-	596	141	-	-	116	-	1538
2011	-	1311	-	-	600	182	-	-	54	-	2147
2012	-	1359	-	-	582	534	-	-	-	-	2475
2013	-	786	-	-	493	40	-	-	-	-	1319
2014	-	1511	-	-	615	-	-	-	-	-	2126
2015	-	981	-	-	900	150	-	-	-	-	2031
2016	-	1363	-	-	695	115	-	-	-	-	2173
2017	-	1476	-	-	536	4	83	435	-	-	2534
2018	-	1219	-	-	90	-	-	-	-	-	1309
Total	123	37667	269	-	23876	11327	6049	4055	12196	24	95586

Appendix 8b. Number of tag returns by NAFO Division.

	2J	3K	3L	3Pn	3Ps	3Psa	3Psb	3Psc	3Psd	3Pse	3Psh	4R	4Ra	4Rb	4Rc	4Rd	4S	4Sv	4T	4TF	4Vn	NK	Total
1995	-	-	-	20	-	4	-	-	-	-	-	-	1	6	19	4	-	-	-	-	-	-	54
1996	-	-	-	114	1	16	7	10	2	1	-	-	25	13	28	20	13	-	-	-	-	-	250
1997	-	-	1	109	1	26	8	13	-	1	-	-	20	36	19	24	18	-	-	-	1	-	277
1998	1	2	5	98	11	35	7	20	6	-	1	-	83	69	35	13	22	1	1	-	-	-	410
1999	-	2	1	106	3	33	4	10	2	2	1	-	76	53	64	50	34	-	1	1	-	-	443
2000	-	1	-	210	4	36	2	4	-	-	-	-	67	86	61	76	32	-	-	-	-	2	581
2001	-	-	-	371	5	11	1	10	8	1	-	-	75	84	70	49	38	-	-	-	-	11	734
2002	-	-	-	33	7	13	4	3	1	2	-	-	2	11	9	4	4	-	-	-	-	11	104
2003	-	-	3	231	6	54	2	1	6	1	-	-	9	49	17	40	17	-	1	-	-	5	442
2004	-	-	-	372	13	63	-	-	-	-	-	1	9	102	26	79	8	-	2	-	-	29	704
2005	-	-	3	355	16	38	3	-	-	-	-		18	120	18	188	7	-	-	-	-	25	791
2006	-	-	-	227	5	23	-	-	-	-	-		161	283	82	72	8	-	-	-	-	14	875
2007	-	-	-	126	9	11	-	-	-	-	-	1	64	89	35	42	12	-	-	-	2	6	397
2008	-	-	-	138	8	4	-	-	-	-	-	2	30	55	31	29	4	-	-	-	-	11	312
2009	-	-	1	51	5	4	-	-	-	-	-	-	7	14	17	8	-	-	-	-	-	5	112
2010	-	-	-	120	10	3	-	-	-	-	-	-	7	7	4	2	2	-	-	-	-	1	156
2011	-	-	-	133	1	10	-	-	-	-	-	-	5	4	-	1	-	-	-	-	-	2	156
2012	-	-	-	83	4	2	-	-	-	-	-	-	4	6	6	-	-	-	-	-	-	3	108
2013	-	-	-	105	4	3	1	-	-	-	-	-	7	3	3	-	-	-	-	-	-	4	130
2014	-	1	2	108	-	2	-	-	-	-	-	-	8	2	4	-	-	-	-	-	-	1	128
2015	-	1	-	138	2	-	-	-	-	-	-	1	5	-	-	2	2	-	-	-	-	1	152
2016	-	1	2	140	2	4	-	-	-	-	-	-	10	5	5	23	-	-	-	-	-	2	194
2017	-	-	-	227	1	3	-	-	-	-	-	-	7	-	4	-	2	-	-	-	-	-	244
2018	-	-	-	86	1	9	1	-	-	-	-	-	8	7	8	6	2	-	-	-	2	1	131
Total	1	8	18	3701	119	407	40	71	25	8	2	5	708	1104	565	732	225	1	5	1	5	134	7885

Appendix 9. Input parameters for the projection (AGEPRO-NFT).

Age	1	2	3	4	5	6	7	8	9	10	11	12	13
Weight at age[1]	0.018	0.065	0.179	0.349	0.555	0.809	1.094	1.483	1.916	1.932	2.491	3.44	4.614
Weight at age (Fishery)[2]	0.019	0.072	0.461	0.845	1.229	1.828	2.356	2.879	3.364	3.954	3.927	4.556	5.661
Maturity[3]	0.000	0.020	0.090	0.270	0.630	0.890	0.970	0.980	0.990	0.990	1.000	1.000	1.000
Partial recrutment[4]	0.000	0.000	0.000	0.004	0.026	0.118	0.319	0.643	0.799	0.735	1.000	0.980	0.980
Natural mortality[5]	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7

[1] = Estimated values as of January 1, 2019 (Rivard method) based on DFO research survey.

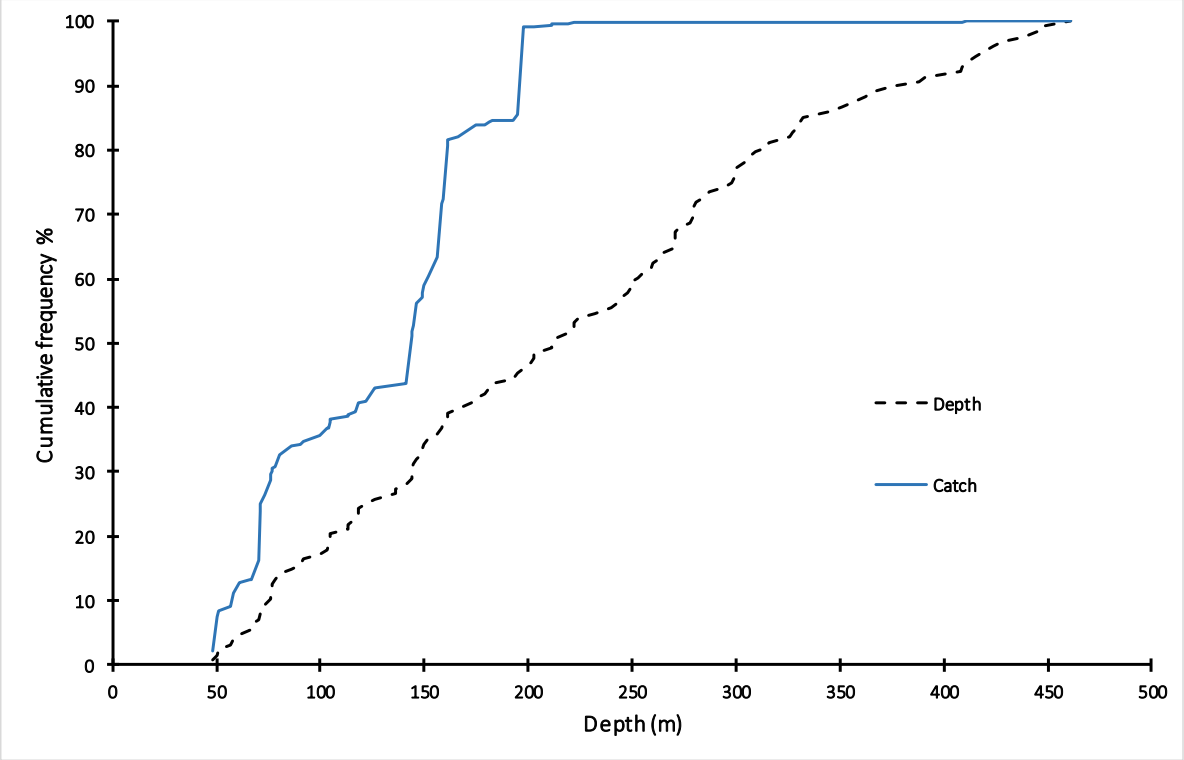
[2] = Average commercial fishery from 2016 to 2018.

[3] = 2016 to 2018 average.

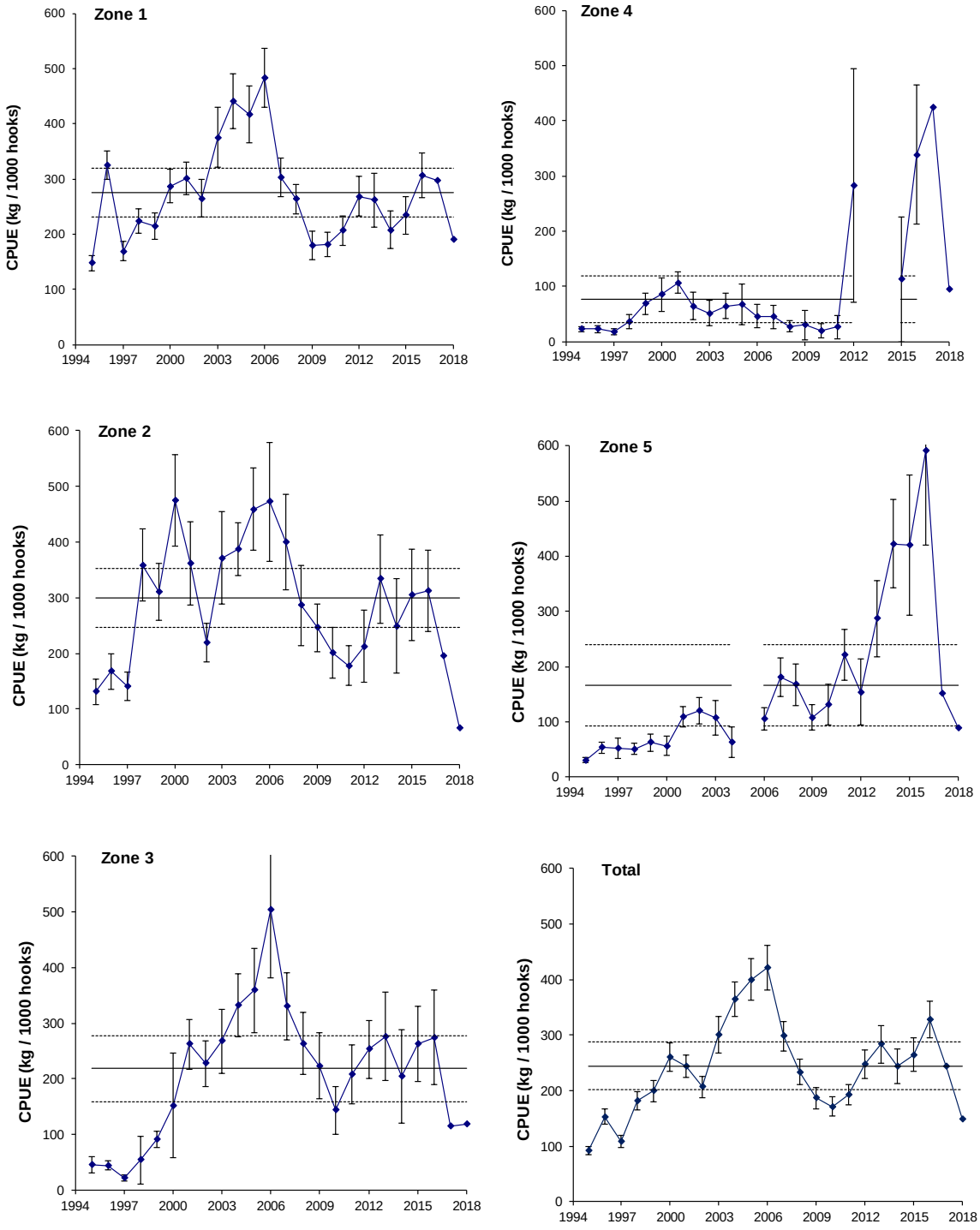
[4] = Average fishing mortality from 2016 to 2018 (weighted by population).

[5] = Values calculated using NFT-ADAPT (2014 to 2018 block).

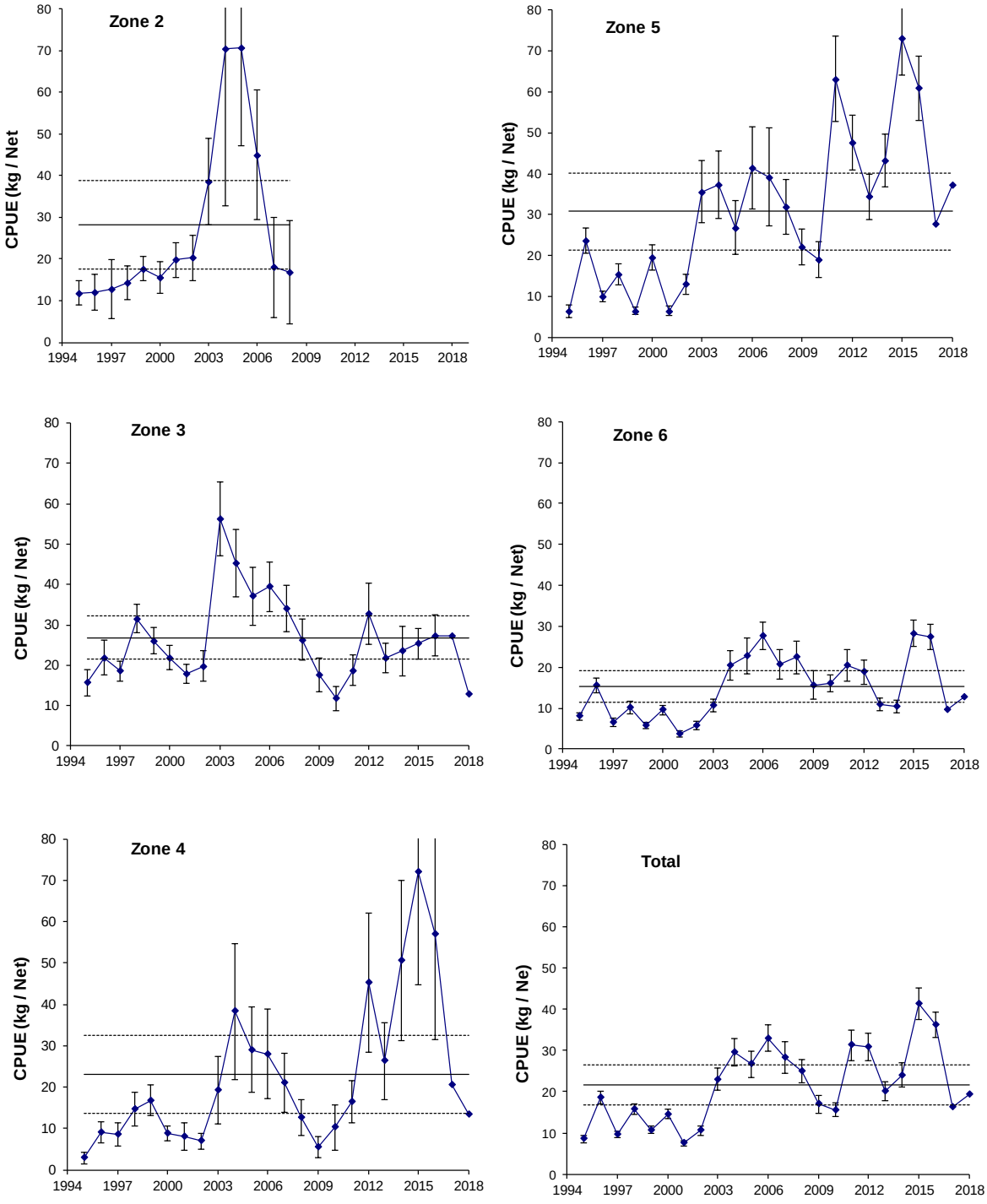
Appendix 10 Distribution of captures by depth in the DFO research survey in 2018.



Appendix 11a. Fixed gear sentinel survey program, longline operations from 1995 to 2016. Total catch over total effort (kg / 1000 hooks) per sentinel fishing area. Annual value with a 95% confidence interval. The solid line represents the 1995 2016 average. The dotted lines represent ± ½ standard deviation around the average.



Appendix 11b. Cod 3Pn, 4RS fixed gear sentinel survey program, gillnet operations from 1995 to 2014. Total catch over total effort (kg / net) per sentinel fishing area. Annual value with a 95% confidence interval. The solid line represents the 1995-2016 average. The dotted lines represent ± ½ standard deviation around the average.



Appendix 12. Average annual longline saturation during sentinel survey program operations. The solid line represents the 1995-2016 average. The dotted lines represent ± ½ standard deviation around the average.