Northwest Atlantic Fisheries Organization

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Canadian Research Report for 2019

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A. STATUS OF FISHERIES

Nominal landings from 2014 to 2019 for fish stocks are listed in Table 1. Length and otolith sampling information is available in 2. Additional information on the status of the fisheries is as follows:

SUBAREA 2

I. American plaice–Subarea 2 + Division 3K

The Div. 2+3K American plaice stock was closed to directed commercial fishing in 1994. An LRP was established in 2012, and the status of the stock was updated in 2019. The stock remains below the LRP, in the critical zone of the Canadian PA framework. Preliminary Canadian landings of this species were 0 t in 2019 and averaged 4 t during the period 2015 to 2018.

Tables 3 & 4 show the total catch length distributions for Divs. 2+3K were available from 12 samples with a total of 461 measured individuals. Lengths varied from 16 cm to 50 cm with a mean of 28.42 cm.

II. Atlantic cod–Divisions 2GH, Divisions 2J3KL

Although the Atlantic cod stock in Div. 2GH has been under a moratorium on directed fishing since 1996, there has been no reported catch since 1993. Bycatch of cod occurs in shrimp fisheries in 2GH and from 2004-2009 estimates of bycatch have ranged between 250 kg to 5,200 kg annually (Orr et al. 2010). More recent data have not been compiled.

The Div. 2J3KL Atlantic cod stock was closed to directed commercial fishing in 1992 but has been subjected to ongoing stewardship and recreational fisheries in the inshore since 2006. Preliminary Canadian landings of this species were 10,410 t in 2019 and averaged 9,122 t during the period 2015 to 2018. This stock is currently below its established LRP and is considered to be within the Critical Zone of the Canadian Precautionary Approach (PA) framework.

Tables 8, 9, & 10 show the total catches. Length distributions for Divs 2J3KL cod were available from 185 samples with a total of 22,078 measured individuals. Lengths varied from 12 cm to 111 cm with a mean of 44.22 cm.

There are no direct estimates of recreational landings for eight of the past 10 years; therefore reported landings are less than total catch in those years. Evidence from tagging data shows that although removals by the recreational fishery have been substantial in some years since 1997, they have been about 25% of the commercial catch in recent years.

III. Atlantic salmon–Subarea 2

The commercial fishery for Atlantic salmon in Subarea 2 has remained closed since 1998. Estimates of recreational catches for Newfoundland and Labrador have been highly variable since 2005 (total catch range of 31,050 to 71,726 salmon). The 2019 preliminary Canadian recreational catch for Subarea 2, including retained and hooked-and-released fish was 4,660 salmon, 24% less than the previous 6-year mean (2013-18). Estimated Labrador Aboriginal and subsistence fisheries harvest was inferred from logbook returns (74% return rate) at 12,859 salmon in 2019 (7,050 small, 5,809 large), which was 5% less than the previous six year mean (2013-18) of 13,449 salmon (8,053 small, 5,397 large). In 2019, two of the four rivers assessed in Subarea 2 were below their lower limit reference point and the remaining two rivers fell in the cautious zone between the lower and upper stock reference points.

IV. Arctic charr–Subarea 2

Commercial landings of Arctic charr from north Labrador in 2019 were 15 t, a decline of 45% from the previous year and the lowest harvest since 2012. Commercial landings have been sporadic over the past decade (2010 – 2019) averaging 20 t per year, driven largely by effort directed towards the commercial fishery. In addition to the commercial Arctic charr fishery at Nain, estimates of subsistence fishery harvests have averaged about 9300 fish (~12 t) annually during the ten year period 2010–2019.

V. Greenland halibut-Subarea 2 + Divisions 3KLMNO

Preliminary landings for the Subarea 2 + Divisions 3KLMNO Greenland halibut stock were 6,062 t in 2019 and averaged 6,019 t during the period 2015 to 2018.

Tables 14, 15, & 16 show the total catches. Length distributions for Divs. Subarea 2 + Divisions 3KLMNO Greenland halibut were available from 146 samples with a total of 32,171 measured individuals. Lengths varied from 10 cm to 102 cm with a mean of 51.45 cm.

VI. Iceland scallop–Divisions 2HJ

Preliminary Canadian landings for the Divs. 2HJ Iceland scallop stock were 6 t in 2019 and averaged 6 t during the period 2015 to 2018.

VII. Northern shrimp–Subarea 2 + Division 3K

The Northern shrimp (*Pandalus borealis*) fishery in Subarea 2 and the northern portion of Subarea 3 is divided into three management areas, each referred to as a shrimp fishing area (SFA): 2G (SFA 4), Hopedale and Cartwright Channels in 2HJ (SFA 5), and Hawke Channel in 2J3K (SFA 6).

VIII. SFA 4 (NAFO Division 2G)

Preliminary Canadian landings for the SFA 4 shrimp stock were 10,247 t in 2019 and averaged 15,391 t during the period 2015 to 2018.

IX. SFA 5 (Hopedale and Cartwright Channels)

Preliminary Canadian landings for the SFA 5 shrimp stock were 18,399 t in 2019 and averaged 23,360 t during the period 2015 to 2018.

X. SFA 6 (Hawke Channel + NAFO Division 3K)

Preliminary Canadian landings for the SFA 6 shrimp stock were 6,907 t in 2019 and averaged 23,158 t during the period 2015 to 2018.

XI. Redfish–Subarea 2 + Division 3K

The Div. 2+3K redfish stock remains under moratorium. Preliminary Canadian landings of this species were 3 t in 2019 and averaged 35 t during the period 2014 to 2018.

In the absence of a limit reference point (LRP) it was not possible to determine the zone within the Canadian Precautionary Approach (PA) framework that this stock currently resides in.

Tables 17 & 18 show the total catches. Length distributions for Divs. 2+3K redfish were available from 8 samples with a total of 1,529 measured individuals. Lengths varied from 5 cm to 23 cm with a mean of 14.39 cm.

XII. Snow crab–Divisions 2HJ

Preliminary Canadian landings for the Divs. 2HJ snow crab stock were 1,768 t in 2019 and averaged 1,745 t during the period 2015 to 2018.

XIII. Squid–Subarea 2+3

Preliminary Canadian landings for the Subarea 2+3 squid stock were 2,540 t in 2019 and averaged 435 t during the period 2015 to 2018.

XIV. Witch flounder-Divisions 2J3KL

The Div. 2J3KL witch flounder stock has been under moratorium since 1994. Preliminary Canadian landings of this species were 35 t in 2019 and averaged 119 t during the period 2015 to 2018.

This stock is currently below its established LRP and is considered to be within the Critical Zone of the Canadian Precautionary Approach (PA) framework.

Table 26 shows the total catches. Length distributions for Divs. 2J3KL witch flounder were available from 3 samples with a total of 623 measured individuals. Lengths varied from 34 cm to 54 cm with a mean of 43.55 cm.

SUBAREA 3

XV. American plaice–Divisions 3LNO

The Div. 3LNO American plaice stock remains under moratorium. Preliminary Canadian landings of this species were 633 t in 2019 and averaged 469 t during the period 2015 to 2018.

Tables 5 & 6 show the total catches. Length distributions for Divs. 3LNO American plaice were available from 57 samples with a total of 11,329 measured individuals. Lengths varied from 26 cm to 70 cm with a mean of 41.32 cm.

XVI. American plaice-Subdivision 3Ps

Preliminary Canadian landings for the Subdiv. 3Ps American plaice stock were 89 t in 2019 and averaged 152 t during the period 2015 to 2018.

Table 7 shows the total catches. Length distributions for Subdiv. 3Ps American plaice were available from 3 samples with a total of 766 measured individuals. Lengths varied from 26 cm to 66 cm with a mean of 38.97 cm.

XVII. Atlantic cod–Divisions 3NO

The Div. 3NO Atlantic cod stock remains under moratorium. Preliminary Canadian landings of this species were 129 t in 2019 and averaged 168 t during the period 2015 to 2018, taken primarily in the yellowtail flounder fishery.

This stock is currently below the established spawning stock biomass limit reference point and is considered to be in the Critical Zone.

Tables 11 & 12 show the total catches. Length distributions for Divs. 3NO cod were available from 48 samples with a total of 436 measured individuals. Lengths varied from 39 cm to 123 cm with a mean of 87.89 cm.

XVIII. Atlantic cod-Subdivision 3Ps

Preliminary Canadian landings for the Subdiv. 3Ps Atlantic cod stock were 3,394 t in 2019 and averaged 5,172 t during the period 2015 to 2018.

A new state-space model was accepted for the provision of advice in 2019 and the limit reference point was revised. It was determined that this stock was below the limit reference point (LRP) and therefore within the Critical Zone of the Canadian Precautionary Approach (PA) framework.

Table 13 shows the total catches. Length distributions for Subdiv. 3Ps cod were available from 98 samples with a total of 15,668 measured individuals. Lengths varied from 33 cm to 126 cm with a mean of 67.74 cm.

XIX. Atlantic salmon-Subarea 3

The commercial fishery for Atlantic salmon in Subarea 3 has remained closed since 1992. The 2019 preliminary Canadian recreational harvest estimate, including retained and hooked-and-released fish, was 21,708 salmon, 17 % less than the previous 5 year mean (2014-2018). Of the eleven rivers assessed in Subarea 3 in 2019, five were below their limit reference point, five were above their upper stock reference point, and one fell in the cautious zone between the two reference points.

XX. Capelin–2+3KL

All capelin catches in Subarea 2 + Div. 3KL were taken inshore by purse seines, tuck seines, and Capelin traps during the inshore spawning migration. Landings in 2018 and 2019 were 19,840 t and 19,509 t, respectively, against TACs in Divs. 2J3KL of 19,823 t in 2018 and 21,277 t in 2019.

XXI. Iceland scallop–Divisions 3LNO and Subdivision 3Ps

Preliminary Canadian landings for the Divs. 3LNO Iceland scallop stock were 0 t in 2019 and averaged 0 t during the period 2015 to 2018.

Preliminary Canadian landings for the Divs. 3Ps Iceland scallop stock were 51 t in 2019 and averaged 248 t during the period 2015 to 2018.

XXII. Redfish – Divisions 3LN

Preliminary Canadian landings for the Divs. 3LN redfish stock were 2,982 t in 2019 and averaged 3,964 t during the period 2015 to 2018.

Tables 19 & 20 show the total catches. Length distributions for Divs. 3LN redfish were available from 74 samples with a total of 18,085 measured individuals. Lengths varied from 22 cm to 63 cm with a mean of 34.29 cm.

XXIII. Redfish – Division 3O

Preliminary Canadian landings for the Divs. 3O redfish stock were 213 t in 2019 and averaged 48 t during the period 2015 to 2018.

Length frequencies were not available for this stock.

XXIV. Redfish–Unit 2 (3Ps4Vs, 3Pn4Vn-June to December, 4Wfgi)

Preliminary Canadian landings for the Unit 2 redfish stock were 2,411 t in 2019 and averaged 850 t during the period 2015 to 2018.

Table 21 shows the total catches. Length distributions for Unit 2 redfish were available from 26 samples with a total of 6,302 measured individuals. Lengths varied from 18 cm to 46 cm with a mean of 27.05 cm. Note these length frequencies are only from Newfoundland and Labrador landings.

XXV. Sea scallop–Division 3KLNO

Preliminary Canadian landings for the Divs. 3KLNO sea scallop stock were 0 t in 2019 and averaged 1 t during the period 2015 to 2018.

XXVI. Sea scallop–Subdivision 3Ps

Preliminary Canadian landings for the Divs. 3Ps sea scallop stock were 924 t in 2019 and averaged 817 t during the period 2015 to 2018.

The abundance in the inshore (north bed) is currently dominated by a modal group of scallop 75 mm while in the offshore (south and middle beds) the modal group is 120mm and 130mm.

XXVII. Northern shrimp–Divisions 3LNO

Preliminary Canadian landings for the Divs. 3LNO Northern shrimp stock were 0 t in 2019 and averaged 0 t during the period 2015 to 2018.

XXVIII. Snow crab–Divisions 3KLNO and Subdivision 3Ps

Preliminary Canadian landings for the Divs. 3KLNO snow crab stock were 21,630 t in 2019 and averaged 16,840 t during the period 2015 to 2018.

Size-at-terminal molt in males increased in 2019 back to time-series lows. A decline in size-at-terminal molt could potentially dampened short-term recruitment prospects into the exploitable biomass.

Preliminary Canadian landings for the Divs. 3Ps snow crab stock were 2,789 t in 2019 and averaged 1,746 t during the period 2015 to 2018.

Size-at-terminal molt in males increased in 2019 to near time-series highs.

XXIX. Thorny skate–Divisions 3LNO and Subdivision 3Ps

Commercial catches of skates comprise a mix of skate species however Thorny skate dominates the catch. Preliminary Canadian landings for the Divs. 3LNO thorny skate stock were 3 t in 2019 and averaged 4 t during the period 2015 to 2018.

Tables 22, 23 show the total catches. Length distributions for Divs. 3LNO thorny skate were available from 13 samples with a total of 721 measured individuals. Lengths varied from 30 cm to 80 cm with a mean of 59.25 cm.

Preliminary Canadian landings for the Subdiv. 3Ps thorny skate stock were 892 t in 2019 and averaged 475 t during the period 2015 to 2018.

Length frequencies were not available for this stock.

XXX. White hake–Divisions 3NO and Subdivision 3Ps

Preliminary Canadian landings for the Divs. 3NO white hake stock were 159 t in 2019 and averaged 194 t during the period 2015 to 2018.

Table 24 shows the total catches. Length distributions for Divs. 3NO white hake were available from 5 samples with a total of 427 measured individuals. Lengths varied from 41 cm to 80 cm with a mean of 50.45 cm.

Preliminary Canadian landings for the Subdiv. 3Ps white hake stock were 186 t in 2019 and averaged 237 t during the period 2015 to 2018.

Table 24 shows the total catches. Length distributions for Subdiv. 3Ps white hake were available from 3 samples with a total of 667 measured individuals. Lengths varied from 41 cm to 80 cm with a mean of 66.73 cm.

The dominant feature of the White hake abundance indices was the peak abundance observed over 1999-2001. Following the very large 1999 year class, the stock declined to a lower level comparable to levels observed prior to the recruitment pulse. The survey indices for this stock remain at low levels relative to the 1999-2002 peak period.

XXXI. Witch flounder-Divisions 3NO

Preliminary Canadian landings for the Divs. 3NO witch flounder stock were 479 t in 2019 and averaged 462 t during the period 2015 to 2018.

Tables 27 & 28 show the total catches. Length distributions for Divs. 3NO witch flounder were available from 36 samples with a total of 7,703 measured individuals. Lengths varied from 32 cm to 60 cm with a mean of 44.01 cm.

XXXII. Witch flounder-Subdivision 3Ps

Preliminary Canadian landings for the Subdiv. 3Ps witch flounder stock were 535 t in 2019 and averaged 378 t during the period 2015 to 2018.

An interim limit reference point was adopted in 2017, and the stock is currently above the LRP, as defined by the Canadian Precautionary Approach (PA) framework.

Table 29 shows the total catches. Length distributions for Subdiv. 3Ps witch flounder were available from 19 samples with a total of 4,757 measured individuals. Lengths varied from 28 cm to 58 cm with a mean of 42.79 cm.

XXXIII. Yellowtail flounder–Divisions 3LNO

Preliminary Canadian landings for the Divs. 3LNO yellowtail flounder stock were 11,535 t in 2019 and averaged 6,326 t during the period 2015 to 2018.

An interim limit reference point was adopted in 2017, and the stock is currently above the LRP, as defined by the Canadian Precautionary Approach (PA) framework.

Tables 30 & 31 show the total catches. Length distributions for Divs. 3LNO yellowtail flounder were available from 241 samples with a total of 58,199 measured individuals. Lengths varied from 18 cm to 56 cm with a mean of 37.47 cm.

SUBAREA 4

XXXIV. Atlantic salmon–Subarea 4

The commercial fishery for Atlantic salmon in Subarea 4 has remained closed since 1992. The preliminary estimate of the 2019 recreational harvest, including retained and hooked-and-released fish, was 13,003 salmon, 39% less than the previous 5 year mean (2014-2018). In 2019, three of the nine assessed rivers in Subarea 4 were above their upper stock reference point while five rivers were below the lower limit reference point and one river fell in the cautious zone between the two reference points.

XXXV. Iceland scallop–Div. 4R

Preliminary Canadian landings for the Div. 4R Iceland scallop stock were 48 in 2019 and averaged 162 t during the period 2015 to 2018.

XXXVI. Sea scallop–Div. 4R

Preliminary Canadian landings for the Div. 4R sea scallop stock were 3 in 2019 and averaged 7 t during the period 2015 to 2018.

XXXVII. Snow crab–Div. 4R

Preliminary Canadian landings for the Div. 4R snow crab stock were 186 in 2019 and averaged 574 t during the period 2015 to 2018.

B. SPECIAL RESEARCH STUDIES

Environmental Studies

Physical oceanographic observations are routinely collected during marine resource assessments and research surveys in the Newfoundland and Labrador Region. The Atlantic Zonal monitoring program (AZMP) initiated in 1998 continued during 2018 with three physical and biological oceanographic offshore surveys carried out along several cross-shelf NAFO and AZMP sections from the Southwest St. Pierre Bank to Beachy Island on the mid-Labrador Shelf. The spring survey was conducted on the CCGS Teleost 6-24 April 2018. The summer survey on R/V Coriolis took place between July 15th and August 2nd, and the fall survey on the CCGS Hudson between November 11th to December 2nd. This program was established to include biological and chemical oceanographic sampling at a high frequency sampling coastal site (Station 27) at biweekly intervals during ice-free period, and along cross-shelf sections at seasonal time scales. The main objectives are to establish the seasonal, temporal, and spatial distribution and abundance of phytoplankton pigments, nutrients, microzooplankton and mesozooplankton in relation to the physical environment. Monitored physical, chemical, and biological variables include temperature, salinity, dissolved oxygen, ocean currents, spring phytoplankton bloom metrics, nutrients and chlorophyll inventories, and zooplankton density, biomass, and community composition. The oceanographic monitoring program currently conducted on the Newfoundland and Labrador Shelf aims at understanding the changes in the ecosystem structure and productivity over time. Data from this effort are used to produce annual reports on the physical, and biogeochemical state of the ocean and studies relating environmental conditions to marine resources.

Physical Environment

The winter North Atlantic Oscillation (NAO) index, a key indicator of the direction and intensity of the winter wind field patterns over the Northwest Atlantic was strongly positive during 2018. However, the spatial patterns of the associated atmospheric sea-level pressure fields resulted in a normal annual air temperature, characterized by a warm month of March, a cold spring and a warm summer. The sea ice volume across the Newfoundland and Labrador Shelf, although close to the long-term mean over 2018, exhibited a strong negative anomaly in March as a consequence of warm air temperature over the Arctic during this month. Annual sea-surface temperature (SST based on infrared satellite imagery) trends on the Newfoundland and Labrador Shelf, while showing an increase of about 1°C since the early 1980s, were mostly below normal during 2018 for NAFO Divisions 2 and 3 (e.g., up to -1.6 SD and -1.9 SD for Hamilton Bank and Hudson Strait, respectively). In 2018, vertically averaged salinity at station 27 was at its second freshest value (negative anomaly) since the beginning of the time series in 1948. Observations from the summer AZMP oceanographic survey indicated that after a predominance of colder than average conditions since 2012, the volume of cold-intermediate-layer (CIL, <0°C) reduced in 2018, specially in the northern part of the region where it was -1.6 SD below normal at Seal Island section (second smallest volume since 1980). The spatially averaged bottom temperature during the spring in 3LNOPs remained slightly above normal at +1.0 SD in 2018. For the fall,

bottom temperature in 2J3KLNO was also above normal at +0.8 SD, a return to positive anomaly after the cold anomaly of 2017 (the first one since 1995). The Labrador Current transport index along the Labrador and northern Newfoundland shelf slope in 2018 was at a record high since the beginning of the time series in 1993 (equal with 1994 at +1.7 SD).

Nutrients and plankton studies

In general, nitrate inventories in the lower water column (50-150 m) were near or below normal compared to the 1999-2015 climatology throughout the NL Shelf in 2018. Chlorophyll concentration of in the first 100 m of the water column was near or above the climatology across the study area. Chlorophyll inventories in 2018 were mostly above near to normal across the region. Spring bloom indices derived from ocean colour satellite data indicated late and short phytoplankton spring bloom on the northeast Newfoundland and Labrador shelves, and near normal bloom timing and duration on the Grand Bank. The magnitude (total production) of the spring bloom was mostly near or below normal across the region. The density of copepod and non-copepod zooplankton in 2018 remained mostly above normal across the Newfoundland region continuing a trend that started in 2016 for copepod, and in 2013 for non-copepod. The density of large, energy-rich *Calanus finmarchicus* copepods increased to above normal levels on the southern Labrador Shelf but remained near of below normal on the northeast Newfoundland Shelf and the Grand Bank. The density of small *Pseudocalanus* copepods in 2018 showed a general decrease compared to the previous year except on the southeastern Grand Ban where density reached its highest level since 1999.

Biological Studies

Multispecies Trawl Surveys

Biological and oceanographic data from fall (Div. 2HJ3KLNO) and spring (3LNOP) multi-species research vessel surveys were collected in 2019 to support stock assessment, distribution and abundance studies, and detailed biological sampling were conducted on important commercial species (eg. Atlantic cod, American plaice, Greenland halibut, redfish, yellowtail flounder, white hake, thorny skate, northern shrimp, snow crab) as well as a suite of indicator species under the Ecosystem Research Initiative of the NL Region. In 2019, the annual spring survey completed a total of 281 of 300 sets planned in 3LNO (Divs 3LNO were not fully completed) and 173 of 178 sets planned in 3Ps . The fall survey completed a total of 486 of 674 sets planned in Divs. 2HJ3KLNO (Divs. 2HJ3KL were not fully completed). Depending upon the species, sampling occurs for length, age, growth, maturity stage, condition, stomach contents analyses. In addition, sampling for lengths and weights were conducted on a suite of other species to support ecosystem monitoring. Analysis of maturity data is conducted regularly on Atlantic cod, American plaice, Greenland halibut, yellowtail flounder and other species and are presented to the annual meeting of NAFO Scientific Council during assessments of cod in Div. 3NO, American plaice in Div. 3LNO, yellowtail flounder in Div. 3LNO, Greenland halibut in SA2+Div. 3KLMNO as needed. For further details see Rideout (2020).

Sentinel Studies

The Sentinel Survey of Atlantic cod (*Gadus morhua*) has been conducted in NAFO Divs. 2J3KL, Subdivision 3Ps and Divs. 3Pn4Rs since October 1994, and currently there are twenty-five years of catch and effort data and biological information. Data collected were tabled at the Regional Stock Assessment in the fall 2019 for Subdiv. 3Ps cod, and in the spring 2020 for Divs. 2J3KL cod. Control and experimental fishing sites were sampled by inshore fish harvesters using traditional fishing gears (i.e. linetrawl and gillnet) based on historic fishing patterns. The objectives of the program are: the use of Atlantic Cod catch rates to develop indices of relative abundance for resource assessments; to incorporate knowledge of inshore fish harvesters in the resource assessment process; to evaluate inter-annual variability in resource distribution over inshore areas; and to collect information on key biological parameters used in assessments (e.g. fish length, sex, and otoliths to determine fish age), as well as biological samples used for genetic, physiological, and toxicological analyses, along with stomach contents for food and feeding studies. Temporal trends in standardized catch rate for gillnet and linetrawl in Subdiv. 3Ps (both control and experimental sites) were similar with the highest values observed at the beginning of the time-series and then declined sharply after 1997 and remained near or

below the historical mean catch rate thereafter. Standardized catch rate for gillnet in Divs. 2J3KL (both control and experimental sites) were higher at the beginning of the time-series, declined rapidly to their lowest values in 2002, then increased and peaked in 2014 before declining once more over 2016-2019. The model fit for linetrawl catch rate was questionable and not considered in further analyses.

Cod Tagging and Telemetry

Ongoing mark-recapture studies continued in 2019, with 2,154 cod tagged and released with Floy tags in Div. 2J3KL. This tagging program provides critical information on mortality to the Northern Cod Assessment Model. In addition to the mark-recapture tagging program, acoustic telemetry studies have been carried out in the region since 2005 providing information on cod movement and stock structure; currently, a network of 73 inshore receivers is maintained by DFO-NL Groundfish. In 2019, 338 Atlantic cod were tagged with acoustic transmitters in Div. 3KL, and 59 receivers are currently deployed and active in Div. 3KL. The Northern Cod Acoustic Tracking (NCAT) Project is also in progress, in collaboration of academic, government and industry organizations including Dalhousie and Memorial Universities, Ocean Frontier Institute (OFI), Ocean Tracking Network (OTN), and the ASP-AGC FIP. This project will expand acoustic tracking of cod to the offshore, with the deployment of 75 offshore recievers and 1300 acoustic tags. In March 2020 18 of 75 acoustic receivers were deployed along the northernmost range of the planned array (2J). Deployment of the remaining recievers is planned for summer 2020, and tagging of offshore cod will begin in spring 2021.

Capelin

In 2019, there was a spring (May) offshore acoustic survey in Div. 3L. This survey targets the primary area of distribution of the age 2 (non-migratory) portion of the capelin stock and produces abundance and biomass indices. In 2019, acoustic data was collected during the fall multispecies bottom trawl survey in Divs. 2J3KL, along with enhanced sampling of the biology and feeding of forage fishes. No analysis of the acoustic data from these years has been conducted to date. In 2018 and 2019, recently emerged larvae into the Bellevue Beach inshore area of Trinity Bay (Div. 3L) were monitored in July and August. In 2018 and 2019, larval surveys were conducted in August and September in Trinity Bay to map capelin larval abundance and dispersal in the Bay. Monitoring of beach spawning of capelin was conducted through logbook recordings by citizen scientists and researchers at a number of sites around the province of Newfoundland.

Snow crab

A trap survey for snow crab was conducted in the northern portion of Div. 2J and Div. 2H in the summers of 2013-2019. The surveys, conducted by the Torngat Joint Fisheries Secretariat with in-kind support from DFO, were performed to quantify the distribution and abundance of commercial-sized males in the Nunatsiavut Settlement Area. The survey covered areas to the north, west, and south of the Makkovik Bank. Small-meshed pots were also incorporated into the study to capture females and small males. Long-term trap surveys in Notre Dame Bay (3K), Bonavista Bay (3L), and Conception Bay (3L) were continued in 2019. The trap survey in White Bay (3K) did not take place in 2019. These surveys collect information on biological and population parameters and are used in annual assessments of snow crab. The surveys have also been used for past and on-going research into the incidence and impacts of Bitter Crab Disease (BCD) in NL snow crab. Similar surveys were initiated in Fortune Bay in 2007, and Trinity Bay and St. Mary's Bay in 2013.These continued in 2019. A post-season trap survey, conducted by snow crab harvesters, which began throughout most of 2J3KLNOPs in 2004 was continued in 2019. However, there continues to be some inconsistencies in coverage each year. A sperm limitation study, extracting and examining female sperm plugs, was conducted in Divisions 3K, 3LNO, and Subdivision 3Ps in 2019 and will be continued in 2020.

Northern shrimp

A Canadian Science Advisory Secretariat framework meeting took place in May 2019 to provide peer review for a population model. The model incorporated North Atlantic Oscillation and predation effects on the Shrimp stocks in SFAS 4-6 and NAFO Divisions 3LNO. While the model was tentatively accepted to provide the direction of change in 1 year, it was not deemed ready for use in setting quotas or implementing new harvest control rules. Some modifications and testing are still required. Research on larval drift and dispersal

has been completed for SFAs 4-6, NAFO Divs. 3LMNO and North of SFA 4. While the results for SFAs 4-6 and Divisions 3LMON have been published, the results including North and Northeastern areas of the Northwest Atlantic Ocean are currently in press. The research includes a simulated release of 100 larvae from 100 sites in a biophysical model. The larvae are then permitted to drift and disperse for 85 days, approximately the period it takes for larvae to settle, and vertically behave as larval shrimp in the water column. Two subsamples of the results were presented; one demonstrated that most larvae hatched in Div. 3L end up in Div. 3M and the other demonstrated that most larvae that settle in Div. 3L originate in areas north of that division. Preliminary research from a study on estimating age from eye stalks of shrimp was inconclusive; there was a high degree of variability between ages and sizes. There does not appear to be a strong relationship between number of growth rings and length of shrimp in NAFO Divs. 2J3KLNO. Further work on ageing has not been pursued and it is uncertain if results will be published.

Arctic charr

Routine sampling of the commercial landings in the north Labrador Arctic charr terminated following the 2014 season along with other research programs. This ended a long-term program focused that began in the early 1970s, although in recent years genetic studies have been carried out with the aim of determining stock structure and the contribution of local stocks to the nearshore mixed stock fishery and better understand climate change impacts on charr in this region. Discussions have also occurred to consider options to resume a Science program on charr in this area. Studies have also examined diel activity and winter movement patterns of overwintering Arctic charr in two southern Labrador lakes. Abundance of Arctic charr is also available at two fish counting facilities: English River in north Labrador, and Muddy Bay Brook (Sandwich Bay) in southern Labrador. These rivers are generally regarded as Atlantic salmon systems, but during last five years (2015–2019) Arctic charr represent 72% of the total charr plus salmon returning to English River, and 93% at Muddy Bay Brook. By comparison with the previous five-year average (2014–2018), returns of Arctic charr in 2019 at English River were 19% below average, but 12% higher than average at Muddy Bay Brook.

Investigations examining fine-scale population structure of Labrador Arctic charr and contributions of stocks to mixed-stock commercial or subsistence fisheries have recently been carried out using sequenced microsatellites and a single nucleotide polymorphism (SNP) array (Layton et al. 2020). Results of these studies provide evidence of river scale population structure and limited gene flow in Labrador charr consistent with natal homing in this species. The general agreement between the genetic assignments of fishery samples based on microsatellite analyses with long-term tagging data suggest that coastal fisheries are exploiting individuals within 100 – 200 km of their natal rivers.

Layton, K. K. S., B. Dempson, P. V. R. Snelgrove, S. J. Duffy, A. M. Messmer, I. G. Paterson, N. W. Jeffery, T. Kess, J. B. Horne, S. J. Salisbury, D. E. Ruzzante, P. Bentzen, B. F. Koop, I. R. Bradbury. 2020. Resolving fine-scale population structure and fishery exploitation using sequenced microsatellites in a northern fish. Evolutionary Applications DOI: 10.1111/eva.12922

Atlantic salmon

Stock composition of Atlantic salmon harvested in three fisheries in the northwest Atlantic was examined using genetic mixture analysis and individual assignment with a single nucleotide polymorphism baseline (96 loci, 9,369 individuals, 31 groups) encompassing the species native range. Sixty-three individuals collected from the St. Pierre et Miquelon fishery in 2019 were analyzed and estimates of stock composition were dominated by two regions, Gulf of St. Lawrence (42%) and Gaspe Peninsula (30%), with smaller contributions (8% or less) from reporting groups in Newfoundland and Labrador and St. Lawrence North Shore Lower. In the 2019 West Greenland harvest (n=1071), North American contributions were largely from Labrador, the Gulf of St. Lawrence, and the Gaspe Peninsula. European contributions (~29% of total) were almost entirely from the British reporting group. Finally, in the 2019 coastal Labrador fishery (n=485) mixture estimates suggest the harvest is dominated by the three Labrador reporting groups, together accounting for >95% of the harvest which is consistent with recent years. Estimation of stock composition in all three fisheries will continue in 2020.

Genomic signatures and correlates of widespread population declines in Atlantic salmon

New genetic methods are improving our ability to track population changes across time. DNA collected from a salmon population today can be used to reconstruct the relative size of that population (effective population size) up to 25 generations ago. This method was used to reconstruct population trends for 172 Atlantic salmon populations across the range, with a focus on changes in recent decades (1975-2005) to help understand factors associated with population declines. Approximately 60% of salmon populations in both Europe and North America showed a significant decline in population size during recent decades. Variables associated with these declines in each continent were investigated, and included various environmental (temperature and precipitation) and anthropogenic (aquaculture and human population density) variables. In each continent, environmental variation including warmer winter temperatures were associated with declines. However, at this broad spatial scale, these factors could only explain a small proportion of the variation in population declines. Other factors operating locally at small spatial scales as well as unidentified factors in the ocean likely reflect the unexplained variance contributing to population loss. In both continents, genetic markers associated with population declines were located near genes that have been previously linked to head morphology, immunity, and migratory behaviour in salmonids. Additionally, changes in adaptive genetic diversity were linked to developmental, physiological and reproductive processes, which may be consistent with genetic changes related to the loss of large salmon and life history changes across many rivers. A subset of this genetic information identified in the study can be used to predict the risk of future losses in salmon populations. Overall, this work highlights the vulnerability of >60% of salmon populations across the range, and highlights the value of genomic resources in conservation management and for forecasting future population trends.

Lehnert, S.J., Kess, T., Bentzen, P., Kent, M.P., Lien, S., Gilbey, J., Clement, M., Jeffery, N.W., Waples, R.S., and Bradbury, I.R. Genomic signatures and correlates of widespread population declines in salmon. Nat Commun 10, 2996 (2019). **https://doi.org/10.1038/s41467-019-10972-w**

Model-based evaluation of the genetic impacts of farm escapes on wild Atlantic salmon

Genetic interactions (i.e. hybridization) between wild Atlantic salmon, *Salmo salar*, and escaped salmon from aquaculture operations have been widely documented, yet the ability to incorporate predictions of risk into siting advice has been limited. We use an eco-genetic individual-based Atlantic salmon model (IBSEM) parameterized for southern Newfoundland populations, with regional environmental data and field-based estimates of aquaculture parr survival, to explore how the proportion of escapees relative to the size of wild populations influences genetic and demographic change in the wild. Our simulations suggest that both demographic decline and genetic change are predicted when the proportion of escapees relative to wild population size exceeds a 10% threshold annually. The occurrence of escapees in southern Newfoundland rivers under a proposed expansion scenario were predicted using river and site locations, simple models of dispersal for early and late escapees. Model predictions of escapee dispersal suggest that under the proposed expansion, the number of escapees is predicted to increase by 49% (1.5X) and the rivers characterized by the greatest proportion of escapees are predicted to occur shift westward (20 rivers total >10% escapees, max 24%). Our results allow the identification of rivers and impacts predicted under proposed aquaculture expansion and illustrate how model-based predictions of both escapee dispersal and genetic impacts can be used to inform both aquaculture management decisions and wild salmon conservation.

Bradbury, I. R., Duffy, S., Lehnert, S. J., Jóhannsson, R., Fridriksson, J. H., Castellani, M., Burgetz, I., et al. 2020. Model-based evaluation of the genetic impacts of farm-escaped Atlantic salmon on wild populations. Aquaculture Environment Interactions, 12: 45-59.

Evaluating past and future climate-linked population decline in Arctic charr in Labrador

Despite widespread biodiversity losses, we still lack an understanding of how most taxa will respond to climate change, particularly from an evolutionary perspective. Here, we integrate genomics and environmental modelling to assess climate change response for the first time in an ecologically and economically integral Arctic species. We use genomic vulnerability to identify highly vulnerable populations of anadromous Arctic charr and reconstruct estimates of effective population size (Ne) spanning the 20th

century to identify past climate-associated declines. We find vulnerable populations near the southern range limit, indicating northward shifts and a possible loss of life history variation in response to future climate change. We uncover past region-wide declines in Ne that correspond to decreases in temperature and biomass in the northwest Atlantic, indicating prior responses to climate change. With future climate change, a loss of exploited anadromous populations in the south will impact ecosystem function and Indigenous food security.

Layton KKS, Snelgrove PVR, Dempson JB, Kess T, Lehnert SJ, Bentzen P, Duffy SJ, Messmer AM, Stanley RRE, DiBacco C, Salisbury SJ, Ruzzante DE, Nugent CM, Ferguson MM, Leong JS, Koop BF, Bradbury IR. In review. Past and future climate-linked loss in the most northerly freshwater fish. Nature Climate Change

Temperature-induced mortality assessment of catch and release angling on Atlantic salmon.

Given the predicted increases in the frequency and intensity of high water temperature events, coupled with documented declines in Atlantic salmon abundance, and continued debate associated with the use of catch and release angling as an effective management tool, a predictive model was built to test interactions between river warming and catch-and-release mortality in recreational fisheries for Atlantic salmon (Salmo salar L.) by compiling and analyzing published data. The model was used to test if warming occurred in rivers where angling occurs, and if angling opportunities have been restricted through increased river closures due to high water temperatures. Results suggest catch and release mortalities are low (< 0.05) at cool river temperatures (< 12°C). At river temperatures often leading to angling fishery closures (between 18 and 20°C), mortalities range from 0.07 to 0.33 (mean = 0.16). River temperatures on the east and southeast coasts of Newfoundland have warmed leading to an increase in fishery closures in recent years. By contrast, river temperatures in southern Labrador have warmed slightly, with only one documented river closure. Accordingly, increasing temperatures will increase the frequency of river closures and likely result in higher mortality in caught and released Atlantic salmon in rivers that remain open to catch and release angling at warm water temperatures.

Van Leeuwen, T.E., Dempson, J.B., Burke, C.M., Kelly, N.I., Robertson, M.J., Lennox, R.J., Havn, T.B., Svenning, M-A., Hinks, R., Guzzo, M.M., Thorstad, E.B., Purchase, C.F., Bates, A.E. 2020. Temperature-induced mortality assessment of catch and release angling on Atlantic salmon (Salmo salar L.). Canadian Journal of Fisheries and Aquatic Sciences (Accepted April 16, 2020)

Tables

Table 1. Summary of preliminary catches (t) for stocks within the DFO, Newfoundland and Labrador Region. Note that unless otherwise specified, this table presents Newfoundland and Labrador landings only. Catches are totaled for a Jan 01- Dec 31 calendar year.

Species	Stock	2014	2015	2016	2017*	2018*	2019*
American plaice	2+3K	9	4	1	3	11	0
	3LNO	717	443	745	226	464	633
	3Ps	49	99	170	207	132	89
Atlantic cod	2GH	0	0	0	0	0	0
	2J3KL	4,484	4,329	9,931	12,781	9,448	10,410
	3NO	166	132	134	287	118	129
	3Ps	4,814	5,121	5,273	5,800	4,495	3,394
Capelin	2J3KL	23,173	23,065	27,708	19,917	19,840	19,509
	3NO	0	0	0	0	0	0
Greenland halibut	2+3KLMNO	7,070	6,572	6,073	5,360	6,071	6,062
Haddock	3LNO	9	63	184	228	28	73
	3Ps	222	191	252	334	188	168
Iceland scallop	2HJ	6	8	5	5	6	6
	3LNO	0	--	--	0	0	0
	3Ps	1	45	368	527	53	51
	4R	310	200	192	115	140	48
Lobster	3K	50	121	76	77	82	116
	3L	81	113	92	95	102	163
	3PN	161	150	157	162	216	297
	3Ps	940	1,100	1,199	1,088	1,263	1,572
	4R	906	1,260	1,354	1,488	1,756	2,511
Pollock	3LNO	0	0	14	1	11	0
	3Ps	313	214	366	580	280	119
Redfish	2+3K	51	5	20	104	9	3
	3LN	1,443	4,431	2,713	4,177	4,536	2,982
	3O	35	31	22	60	80	213
	Unit 2	542	81	380	1,203	1,735	2,411
Sea scallop	3KLNO	0	0	3	0	1	0
	3Ps	1,158	1,126	883	846	414	924
	4R	6	4	7	10	6	3
Shrimp	3L	1,769	0	0	0	0	0
	3M	0	0	0	0	0	0
	SFA 4	14,958	15,050	14,377	16,439	15,697	10,247
	SFA 5	21,850	21,530	22,552	26,102	23,257	18,399
	SFA 6	46,340	48,722	25,143	10,065	8,702	6,907
Snow crab	2HJ	1,736	1,769	1,700	1,758	1,753	1,768

Species	Stock	2014	2015	2016	2017*	2018*	2019*
	3K	7,828	7,182	5,550	5,509	5,984	6,047
	3LNO	34,499	37,159	32,316	23,230	17,787	15,583
	3P	4,904	2,540	1,188	1,173	2,082	2,789
	4R	850	776	694	524	302	186
Squid	2+3	0	0	104	313	1,322	2,540
Thorny skate	3LNO	4	4	3	6	2	3
	3Ps	202	171	401	413	916	892
White hake	3LNO	33	66	94	558	57	159
	3Ps	357	160	271	239	277	186
Witch flounder	2J3KL	166	188	53	98	138	35
	3NO	11	221	798	349	478	479
	3Ps	150	360	481	394	277	535
Yellowtail flounder	3LNO	6,750	5,581	6,327	6,262	7,134	11,535
	3Ps	14	15	5	16	5	4

*Includes DFO Maritimes landings

Table 2. Intensity of the trawl sampling by species, division and month.

Species	NAFO Division	Month	N	SLF	Sum
Thorny Skate	3L	Dec	3	0	--
	3N	Apr	1	0	--
		Dec	3	0	--
		May	3	0	--
		Nov	1	0	--
		Oct	2	0	--
Atlantic Cod	2J	Apr	8	0	10
		Aug	9	2	--
		Feb	1	0	--
		Jul	1	0	--
		Mar	10	0	--
		May	5	0	--
		Sep	6	1	--
	3K	Apr	4	0	--
		Aug	16	2	955
		Jul	4	1	--
		Jun	3	0	--
		Mar	1	0	9
		May	1	0	--
		Nov	4	0	--
		Oct	19	3	53
		Sep	36	5	634
	3L	Aug	13	3	1,397
		Jan	1	0	--
		Oct	7	1	102
		Sep	36	4	290
	3N	Apr	5	0	--
		Dec	11	0	--
		Jan	4	0	--
		Jun	1	0	--
		Mar	5	0	--
		May	9	0	--
		Nov	3	0	--
		Oct	1	0	--
		Sep	6	0	--
	3O	Apr	3	0	--
	3Ps	Apr	1	0	--
		Aug	4	0	33
		Dec	17	3	90
		Feb	9	1	834
		Jan	18	3	251

Species	NAFO Division	Month	N	SLF	Sum
		Jul	25	4	106
		Jun	11	2	353
		May	2	1	--
		Nov	7	2	46
		Oct	4	1	8
White Hake	3O	Apr	5	0	--
	3Ps	Jul	1	0	--
		Jun	1	0	--
		Mar	1	0	--
Redfish	2J	Apr	1	0	--
	3K	Jul	3	1	--
		Jun	3	1	--
		May	1	0	--
	3L	Aug	12	3	--
		Dec	14	3	--
		Jan	2	1	--
		Nov	3	1	--
		Sep	42	11	--
	3N	Sep	1	0	--
	3Ps	Aug	4	1	--
		Feb	6	2	--
		Jan	7	2	--
		Jul	1	0	--
		Mar	7	2	--
		Nov	1	0	--
American Plaice	2J	Apr	3	0	--
		Jan	2	0	--
		Mar	2	0	--
	3K	Jul	4	0	--
		Jun	1	0	--
	3N	Dec	7	1	--
		Jun	1	0	145
		Mar	5	0	--
		May	6	1	40
		Nov	7	2	8
		Oct	16	4	111
		Sep	7	1	18
	3O	Apr	7	2	36
		Sep	1	0	8
	3Ps	Feb	1	0	--
		Jan	1	0	--

Species	NAFO Division	Month	N	SLF	Sum
		Mar	1	0	--
Witch Flounder	3L	Dec	2	0	--
		Nov	1	0	--
	3N	Oct	2	0	--
		Sep	5	0	--
	3O	Apr	22	6	--
		Mar	7	2	--
	3Ps	Jan	5	1	--
		Mar	14	3	--
Yellowtail Flounder	3N	Apr	12	3	--
		Dec	20	5	--
		Jan	9	2	--
		Jul	14	4	--
		Jun	40	9	--
		Mar	17	4	--
		May	17	4	--
		Nov	52	13	--
		Oct	46	11	--
		Sep	12	3	--
	3O	Mar	2	1	--
Greenland Halibut	2J	Apr	11	3	--
		Aug	8	2	--
		Feb	8	2	--
		Jan	3	0	54
		Jul	18	3	349
		Jun	16	2	156
		Mar	8	2	--
		May	5	1	--
	3K	Aug	6	1	--
		Dec	1	0	--
		Jul	18	5	371
		Jun	3	1	157
		May	2	1	--
	3L	Aug	4	1	--
		Dec	1	0	--
		Jul	31	7	491
		May	3	1	62

Table 3. Length composition (0/000) of American plaice from Canadian commercial landings in NAFO Division 2J in 2019.

Length	Apr	Jan	Mar
20	66.31	--	--
22	115.42	206.94	--
24	229.61	586.12	--
26	213.11	--	5.95
28	147.65	206.94	29.76
30	72.82	--	95.24
32	60.81	--	142.86
34	38.50	--	95.24
36	22.39	--	166.67
38	11.00	--	130.95
40	3.80	--	130.95
42	18.59	--	89.29
44	--	--	65.48
46	--	--	29.76
48	--	--	11.90
50	--	--	5.95
SNPT	1000	1000	1000
AL	25.2	22.8	35.2
ALMF			
AW	0.14	0.1	0.45
N	3	2	2
SLF	221	3	168

Table 4. Length composition (0/000) of American plaice from Canadian commercial landings in NAFO Division 3K in 2019.

Length	Jun	Jul
16	55.56	--
18	--	22.27
20	--	38.43
22	--	137.88
24	388.89	130.16
26	55.56	142.73
28	166.67	109.52
30	166.67	153.17
32	111.11	149.09
34	55.56	67.06
36	--	49.70
SNPT	1000	1000
AL	26.1	25.2
ALMF		
AW	0.16	0.14
N	4	1
SLF	51	18

Table 5. Length composition (0/000) of American plaice from Canadian commercial landings in NAFO Division 3N in 2019.

Length	May	Mar	Nov	Oct	Dec	Sep	Jun
26	1.42	--	--	--	--	--	--
28	9.30	5.65	0.32	1.00	--	--	--
30	11.71	5.65	7.36	13.28	1.54	3.19	--
32	25.36	23.04	40.30	35.17	13.24	10.99	--
34	79.37	33.91	64.86	98.33	39.51	75.43	14.42
36	201.02	113.91	88.24	182.85	136.32	112.74	105.77
38	264.75	158.69	121.67	229.12	173.26	190.55	187.50
40	151.20	107.83	98.75	155.88	168.63	211.12	110.58
42	89.16	62.17	86.65	74.62	95.18	192.68	235.58
44	82.67	73.91	150.29	75.27	90.50	135.43	216.35
46	24.73	84.78	149.69	65.06	126.36	36.80	81.73
48	24.36	62.61	97.61	35.72	87.66	27.12	9.62
50	26.39	40.43	45.45	18.74	29.27	3.95	28.85
52	2.85	33.91	17.32	6.28	16.12	--	9.62
54	1.42	39.57	18.33	2.38	16.37	--	--
56	4.27	28.70	6.74	3.47	4.43	--	--
58	--	28.26	4.97	1.13	1.03	--	--
60	--	17.39	0.50	1.13	--	--	--
62	--	40.00	0.22	0.18	0.57	--	--
64	--	5.65	--	--	--	--	--
66	--	16.96	0.72	0.18	--	--	--
68	--	5.65	--	0.23	--	--	--
70	--	11.30	--	--	--	--	--
SNPT	1000	1000	1000	1000	1000	1000	1000
AL	40.1	40	43.3	37.5	40.7	37.8	38.5
ALMF							
AW	0.66	0.64	0.95	0.5	0.71	0.56	0.5
N	7	1	5	6	7	16	7
SLF	986	208	176	1248	1780	3529	1431

Table 6. Length composition (0/000) of American plaice from Canadian commercial landings in NAFO Division 3O in 2019.

Length	Sep	Apr
34	97.56	--
36	268.29	--
38	341.46	11.16
40	239.03	51.68
42	39.02	145.78
44	--	203.23
46	4.88	235.85
48	9.76	201.81
50	--	104.73
52	--	43.66
54	--	2.10
SNPT	1000	1000
AL	44.2	36.4
ALMF		
AW	0.84	0.44
N	7	1
SLF	1766	205

Table 7. Length composition (0/000) of American plaice from Canadian commercial landings in NAFO Division 3Ps in 2019.

Length	Feb	Mar	Jan
26	4.54	3.40	--
28	4.54	27.21	23.81
30	9.09	57.82	79.36
32	72.73	71.43	107.14
34	113.64	156.46	107.14
36	131.82	142.86	123.02
38	163.64	142.86	119.05
40	136.36	125.85	107.14
42	122.73	95.24	107.14
44	81.82	51.02	83.33
46	59.09	37.41	35.71
48	31.82	27.21	31.75
50	22.73	23.81	15.87
52	13.64	10.20	7.94
54	9.09	20.41	19.84
56	13.64	3.40	11.90
58	4.54	3.40	3.97
60	--	--	3.97
62	--	--	11.90
66	4.54	--	--
SNPT	1000	1000	1000
AL	38.3	37.3	36.7
ALMF			
AW	0.51	0.54	0.45
N	1	1	1
SLF	220	252	294

Table 8. Length composition (0/000) of Atlantic cod from Canadian commercial landings in NAFO Division 2J in 2019.

Length	May	Apr	Jul	Mar	Feb	Aug	Sep
12	28.97	--	--	--	--	--	--
15	139.19	63.10	37.50	44.57	--	--	--
18	237.19	206.72	50.00	309.63	142.86	--	--
21	325.86	344.12	250.00	344.88	428.57	--	--
24	193.69	242.12	412.50	256.37	285.71	--	--
27	51.98	81.65	162.50	44.56	142.86	--	--
30	--	24.71	62.50	--	--	--	--
33	--	--	12.50	--	--	--	--
36	--	12.87	12.50	--	--	--	--
39	11.56	12.87	--	--	--	--	--
42	--	--	--	--	--	0.34	--
45	--	11.84	--	--	--	0.34	--
48	--	--	--	--	--	11.61	--
51	--	--	--	--	--	23.16	7.52
54	11.56	--	--	--	--	43.15	46.70
57	--	--	--	--	--	97.60	119.09
60	--	--	--	--	--	165.50	216.21
63	--	--	--	--	--	235.57	241.86
66	--	--	--	--	--	167.67	163.20
69	--	--	--	--	--	112.32	92.31
72	--	--	--	--	--	61.03	40.88
75	--	--	--	--	--	40.64	20.53
78	--	--	--	--	--	15.26	10.30
81	--	--	--	--	--	11.30	10.11
84	--	--	--	--	--	5.72	10.91
87	--	--	--	--	--	2.86	9.10
90	--	--	--	--	--	2.80	5.17
93	--	--	--	--	--	2.17	1.99
96	--	--	--	--	--	0.95	3.15
99	--	--	--	--	--	--	0.99
SNPT	1000	1000	1000	1000	1000	1000	1000
AL	20.2	62.1	20.7	21.8	19	18.6	62
ALMF							
AW	0.08	2.25	0.07	0.08	0.06	0.1	2.2
N	8	9	1	1	10	5	6
SLF	70	1987	7	80	81	36	1093

Table 9. Length composition (0/000) of Atlantic cod from Canadian commercial landings in NAFO Division 3K in 2019.

Length	Jul	Jun	Apr	Mar	May	Oct	Sep	Nov	Aug
12	1.60	12.69	--	--	--	--	--	--	--
15	23.04	47.11	333.66	166.67	--	--	--	--	--
18	80.23	79.26	261.42	333.33	--	--	--	--	--
21	280.71	304.80	161.99	333.33	600.00	--	--	--	--
24	458.19	302.54	189.22	--	400.00	--	--	--	--
27	118.59	187.03	53.72	166.67	--	--	--	--	--
30	26.61	49.37	--	--	--	--	--	--	--
33	5.53	17.21	--	--	--	--	--	--	--
36	5.50	--	--	--	--	--	--	--	--
42	--	--	--	--	--	3.21	0.86	--	--
45	--	--	--	--	--	22.84	3.75	18.89	--
48	--	--	--	--	--	61.48	7.20	56.01	2.06
51	--	--	--	--	--	79.32	25.54	50.24	3.20
54	--	--	--	--	--	115.19	40.67	30.70	13.42
57	--	--	--	--	--	152.63	72.97	49.52	59.50
60	--	--	--	--	--	143.60	117.96	73.09	117.23
63	--	--	--	--	--	129.83	142.04	128.68	173.15
66	--	--	--	--	--	101.09	153.56	182.25	195.65
69	--	--	--	--	--	65.00	117.83	92.14	156.53
72	--	--	--	--	--	38.66	97.06	77.14	113.77
75	--	--	--	--	--	26.31	67.99	67.28	70.52
78	--	--	--	--	--	17.58	50.10	44.34	37.88
81	--	--	--	--	--	21.30	37.55	27.91	18.76
84	--	--	--	--	--	7.70	18.43	28.55	13.15
87	--	--	--	--	--	6.53	21.63	27.91	7.97
90	--	--	--	--	--	3.35	9.41	5.05	4.64
93	--	--	--	--	--	2.86	6.46	11.11	6.92
96	--	--	--	--	--	--	2.00	5.70	3.70
99	--	--	--	--	--	1.53	3.48	11.75	1.95
102	--	--	--	--	--	--	0.91	6.06	--
105	--	--	--	--	--	--	1.48	5.70	--
108	--	--	--	--	--	--	0.49	--	--
111	--	--	--	--	--	--	0.64	--	--
SNPT	1000	1000	1000	1000	1000	1000	1000	1000	1000
AL	17.3	65.4	21.1	21.1	17.8	20	65	58.8	65.3
ALMF									
AW	0.06	2.56	0.07	0.08	0.05	0.07	2.75	1.89	2.53
N	4	16	4	3	1	1	4	19	36
SLF	23	1711	549	122	6	10	171	2614	5006

Table 10. Length composition (0/000) of Atlantic cod from Canadian commercial landings in NAFO Division 3L in 2019.

Length	Jan	Oct	Sep	Aug
42	100.00	0.29	0.37	--
45	--	0.29	2.29	0.32
48	--	22.43	5.50	1.89
51	--	56.72	12.54	1.50
54	100.00	95.96	39.56	2.15
57	100.00	84.16	69.83	10.53
60	100.00	116.05	118.10	60.65
63	--	91.08	142.45	131.88
66	--	99.41	143.29	173.07
69	--	102.73	140.95	203.56
72	100.00	98.24	106.59	140.34
75	--	63.98	86.43	93.17
78	--	53.02	53.96	58.67
81	200.00	39.75	29.40	42.87
84	--	31.26	16.14	25.34
87	--	17.82	13.29	20.81
90	100.00	11.92	6.21	15.81
93	100.00	6.82	4.92	9.74
96	100.00	5.12	3.43	2.77
99	--	2.54	2.25	1.70
102	--	0.42	1.57	2.36
105	--	--	0.74	--
108	--	--	--	0.51
111	--	--	0.17	0.37
SNPT	1000	1000	1000	1000
AL	68.5	70	64.2	65.5
ALMF				
AW	3.1	4.2	2.92	2.71
N	13	1	7	36
SLF	2849	10	1344	4309

Table 11. Length composition (0/000) of Atlantic cod from Canadian commercial landings in NAFO Division 3N in 2019.

Length	Mar	Sep	Dec	Oct	Nov	Apr	Jan	May	Jun
39	121.07	--	--	--	--	--	--	--	--
42	--	117.80	--	--	--	--	--	--	--
45	119.12	--	8.04	--	--	--	--	--	--
48	--	76.41	7.72	62.50	--	--	--	--	--
51	--	76.41	42.97	--	--	--	--	--	--
54	110.36	117.80	34.30	--	--	--	--	--	--
57	19.48	149.30	42.69	62.50	28.30	--	--	--	--
60	--	117.80	25.52	62.50	--	--	--	--	--
63	--	--	7.35	--	49.25	16.42	--	--	--
66	--	--	--	187.50	--	--	--	--	--
69	--	--	8.94	--	28.30	--	31.00	--	--
72	--	--	23.71	--	--	--	130.57	--	--
75	--	--	48.04	187.50	--	--	271.50	17.15	--
78	--	78.53	50.25	62.50	--	--	271.12	--	--
81	--	--	47.03	--	--	--	173.33	--	--
84	121.28	97.64	67.01	62.50	--	44.48	51.27	--	--
87	--	--	41.52	62.50	--	55.23	29.20	--	500.00
90	--	19.10	122.97	--	49.25	45.01	12.82	--	250.00
93	--	--	87.64	187.50	98.51	89.26	--	17.04	250.00
96	8.77	--	38.61	--	288.43	78.09	--	17.04	--
99	10.77	14.56	82.10	--	183.42	67.01	--	46.85	--
102	19.48	--	50.90	62.50	133.58	22.39	14.60	77.79	--
105	8.77	62.78	22.58	--	42.16	141.68	14.60	297.21	--
108	220.71	--	64.41	--	70.47	440.43	--	390.08	--
111	119.12	19.10	57.53	--	28.30	--	--	92.45	--
114	121.07	14.56	--	--	--	--	--	44.38	--
117	--	38.20	--	--	--	--	--	--	--
120	--	--	8.04	--	--	--	--	--	--
123	--	--	10.13	--	--	--	--	--	--
SNPT	1000	1000	1000	1000	1000	1000	1000	1000	1000
AL	98.8	84.4	76	87.5	81.1	103.9	93.1	74.2	65.2
ALMF									
AW	9.14	6.12	3.61	5	7.17	11.2	7.78	4.62	5.48
N	5	11	4	1	5	9	3	1	6
SLF	43	143	68	8	20	68	24	16	27

Table 12. Length composition (0/000) of Atlantic cod from Canadian commercial landings in NAFO Division 3O in 2019.

Length	Apr
87	222.90
90	92.29
93	128.43
96	26.98
99	101.44
102	101.44
105	65.30
108	195.91
111	65.30
SNPT	1000
AL	95.9
ALMF	
AW	8.12
N	3
SLF	19

Table 13. Length composition (0/000) of Atlantic cod from Canadian commercial landings in NAFO Division 3Ps in 2019.

Length	Jan	Nov	Feb	Dec	Jul	Jun	May	Aug	Oct	Apr
33	0.09	0.98	--	--	--	--	--	--	--	--
36	0.24	0.45	1.80	--	--	--	--	--	--	--
39	2.12	1.43	3.61	--	--	--	--	--	--	--
42	9.14	9.00	49.04	1.98	0.22	0.53	10.64	--	--	--
45	44.03	12.31	104.61	3.50	1.07	5.33	60.31	2.87	--	--
48	93.64	20.97	127.31	10.63	3.79	16.29	109.29	3.06	--	--
51	92.69	33.00	103.12	14.81	7.81	34.34	140.93	13.73	1.10	--
54	103.06	60.87	92.84	46.10	31.50	62.28	166.97	35.65	13.39	--
57	113.56	87.79	50.70	78.72	90.91	124.98	163.83	63.68	26.25	--
60	113.34	128.85	42.51	164.68	191.18	199.76	132.03	168.56	137.54	--
63	75.15	179.21	27.52	245.37	209.65	204.59	91.11	226.16	194.51	--
66	39.48	182.91	25.92	238.44	160.48	155.27	66.28	212.17	267.76	--
69	23.79	115.51	13.38	100.90	99.34	82.76	29.99	159.24	174.17	--
72	13.64	76.14	8.50	46.84	66.77	45.04	5.72	87.93	119.13	--
75	21.92	34.76	17.05	18.95	36.39	20.36	14.31	16.39	25.10	--
78	16.55	24.84	16.76	9.99	19.43	15.96	2.86	5.33	23.22	--
81	14.89	13.72	17.16	5.10	19.81	10.53	5.72	--	10.32	--
84	20.26	7.48	10.06	5.71	17.05	7.59	--	2.37	6.35	333.33
87	33.06	2.60	12.93	2.77	13.44	4.25	--	--	--	--
90	28.29	3.64	16.74	2.29	10.01	1.11	--	--	--	--
93	26.44	1.76	23.42	1.77	7.54	3.94	--	--	--	--
96	24.61	0.86	26.25	1.10	4.58	1.55	--	2.87	1.15	--
99	25.00	--	29.34	0.35	2.79	1.33	--	--	--	--
102	23.49	0.45	34.53	--	2.79	2.20	--	--	--	--
105	19.29	--	40.47	--	1.29	--	--	--	--	333.33
108	7.57	--	36.62	--	0.86	--	--	--	--	--
111	1.84	0.45	30.65	--	1.29	--	--	--	--	333.33
114	6.39	--	18.84	--	--	--	--	--	--	--
117	2.61	--	12.03	--	--	--	--	--	--	--
120	0.12	--	4.21	--	--	--	--	--	--	--
123	1.85	--	2.10	--	--	--	--	--	--	--
126	1.84	--	--	--	--	--	--	--	--	--
SNPT	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
AL	97.3	62.3	61.8	66.3	64	63.9	60.9	54.2	61.8	64.2
ALMF										
AW	8.84	2.2	2.17	4.19	3.61	2.31	2.1	1.47	2.26	2.42
N	1	4	17	9	18	25	11	2	7	4
SLF	3	397	2749	812	3475	3605	1550	511	1812	754

Table 14. Length composition (0/000) of Greenland halibut from Canadian commercial landings in NAFO Division 2J in 2019.

Length	Feb	Jan	Apr	Jul	Jun	May	Mar	Aug
10	0.12	4.77	--	--	--	--	--	--
12	0.49	8.70	0.08	--	--	--	--	--
14	--	--	0.05	0.21	--	--	--	--
16	0.88	2.73	0.16	0.10	--	--	--	--
18	10.90	51.04	1.49	0.10	--	--	--	--
20	17.97	53.74	2.51	1.15	--	--	--	--
22	7.61	16.41	2.04	4.27	--	--	--	--
24	7.94	24.61	1.71	3.65	--	--	--	--
26	4.79	9.39	1.57	1.56	--	--	--	--
28	1.76	0.91	1.02	3.40	--	--	--	--
30	1.10	0.91	0.52	1.11	1.29	0.58	--	--
32	0.27	--	0.82	1.15	1.60	0.58	5.74	--
34	5.13	23.61	2.95	1.57	2.93	0.82	9.20	--
36	7.98	--	3.26	2.09	4.40	7.80	11.21	--
38	20.00	0.60	14.96	9.59	8.56	11.84	28.97	--
40	37.12	--	18.81	36.15	21.87	26.16	54.64	--
42	58.48	47.21	47.48	52.18	37.09	55.25	85.52	--
44	84.86	141.63	81.99	79.07	54.79	88.25	122.91	3.73
46	107.70	47.21	117.08	104.98	94.62	130.65	153.41	12.08
48	104.35	47.21	132.06	118.43	127.15	152.12	148.05	33.55
50	114.16	94.42	143.50	98.43	147.32	137.94	128.24	87.22
52	110.96	118.03	117.86	105.68	112.72	111.75	96.37	123.69
54	87.65	47.21	107.98	66.99	81.86	94.29	61.85	142.94
56	62.54	47.21	73.76	57.23	66.12	54.70	45.73	128.55
58	44.19	70.82	49.13	41.86	57.05	40.42	19.63	129.14
60	28.39	47.21	27.60	42.21	40.04	21.21	11.74	93.89
62	27.40	--	17.51	33.99	35.50	19.44	3.65	65.53
64	14.89	--	14.14	30.66	27.20	11.46	7.32	50.48
66	8.79	47.21	5.83	25.43	17.81	11.28	2.61	31.00
68	2.93	--	6.24	20.00	13.22	6.42	1.48	22.04
70	6.87	--	1.86	18.73	10.59	9.25	0.87	16.81
72	3.68	47.21	1.97	13.15	7.70	1.06	--	14.33
74	2.01	--	1.18	6.70	4.86	3.74	0.87	9.10
76	1.43	--	--	5.57	8.10	1.61	--	11.20
78	1.65	--	0.42	2.98	5.22	0.58	--	6.47
80	1.58	--	--	2.50	2.40	--	--	7.42
82	0.80	--	--	1.57	2.78	0.78	--	2.78
84	0.62	--	0.46	3.17	2.41	--	--	2.72
86	--	--	--	0.54	0.63	--	--	2.00
88	--	--	--	0.63	0.92	--	--	2.60
90	--	--	--	0.80	1.24	--	--	0.33

Length	Feb	Jan	Apr	Jul	Jun	May	Mar	Aug
92	--	--	--	--	--	--	--	0.28
94	--	--	--	--	--	--	--	0.12
96	--	--	--	0.21	--	--	--	--
102	--	--	--	0.21	--	--	--	--
SNPT	1000	1000	1000	1000	1000	1000	1000	1000
AL	48.6	56.2	47.3	44.9	50.6	51.1	46.1	48.7
ALMF								
AW	0.93	1.93	0.8	0.22	1.37	1.2	0.97	0.97
N	11	8	8	3	18	16	8	5
SLF	2655	2173	1723	234	3256	2199	1842	1175

Table 15. Length composition (0/000) of Greenland halibut from Canadian commercial landings in NAFO Division 3K in 2019.

Length	Aug	Jul	Jun	May	Dec
10	0.22	--	--	--	--
12	1.18	0.69	2.48	--	--
14	3.27	9.17	64.45	0.29	--
16	2.12	6.30	16.88	--	--
18	0.58	0.46	6.46	0.05	--
20	3.39	3.55	120.66	0.72	--
22	12.47	13.71	363.27	2.12	--
24	8.97	7.93	150.90	0.96	--
26	4.55	3.89	67.44	0.68	--
28	4.30	3.87	77.27	1.30	--
30	4.25	2.31	81.05	1.11	--
32	2.81	2.01	35.45	0.63	--
34	0.87	0.32	6.85	0.10	--
36	0.39	0.09	4.37	0.24	--
38	0.04	0.01	2.48	0.14	--
40	0.33	1.20	--	9.14	9.30
42	4.99	2.61	--	45.70	46.51
44	7.55	7.59	--	75.40	41.86
46	27.38	32.24	--	111.96	27.91
48	60.14	75.53	--	114.25	41.86
50	86.96	111.36	--	116.53	116.28
52	125.00	132.57	--	89.11	283.72
54	137.81	118.61	--	70.83	167.44
56	150.91	117.67	--	89.11	74.42
58	87.84	100.31	--	57.12	51.16
60	84.17	79.62	--	52.55	27.91
62	54.52	62.89	--	54.84	37.21
64	45.86	42.63	--	43.41	13.95
66	36.52	26.06	--	18.28	32.56
68	17.94	11.38	--	27.42	13.95
70	2.84	9.97	--	6.86	13.95
72	4.99	5.86	--	2.29	--
74	4.99	2.68	--	2.29	--
76	7.28	2.82	--	2.29	--
78	--	0.51	--	--	--
80	--	0.35	--	2.29	--
82	0.14	0.50	--	--	--
86	2.43	0.22	--	--	--
88	--	0.22	--	--	--
90	--	0.28	--	--	--
SNPT	1000	1000	1000	1000	1000

Length	Aug	Jul	Jun	May	Dec
AL	52.9	51.7	52.1	21.8	51.1
ALMF					
AW	0.65	1	1.08	0.08	0.91
N	6	1	18	3	2
SLF	1499	215	5179	656	607

Table 16. Length composition (0/000) of Greenland halibut from Canadian commercial landings in NAFO Division 3L in 2019.

Length	May	Dec	Jul	Aug
32	2.27	--	--	--
34	4.43	--	--	--
36	13.54	--	--	--
38	25.34	--	--	--
40	49.26	10.03	0.80	--
42	59.93	50.17	1.27	--
44	68.62	30.10	9.57	--
46	110.59	53.51	22.58	--
48	133.60	53.51	44.35	--
50	99.43	90.30	83.59	--
52	94.54	230.77	109.42	4.00
54	95.59	167.22	129.32	--
56	38.93	107.02	130.51	7.58
58	52.95	53.51	119.96	11.77
60	31.55	76.92	101.79	19.86
62	28.86	43.48	74.91	40.01
64	32.70	16.72	55.91	87.51
66	18.45	16.72	40.33	88.62
68	9.71	--	23.60	134.76
70	8.74	--	18.76	150.07
72	8.98	--	11.88	112.52
74	3.89	--	6.48	98.25
76	3.23	--	4.21	93.43
78	3.24	--	2.74	55.39
80	1.62	--	1.09	26.82
82	--	--	2.00	21.59
84	--	--	1.23	21.38
86	--	--	0.79	10.16
88	--	--	0.91	10.49
90	--	--	0.80	1.32
92	--	--	0.55	4.45
94	--	--	0.09	--
96	--	--	0.33	--
98	--	--	0.03	--
100	--	--	0.15	--
102	--	--	0.03	--
SNPT	1000	1000	1000	1000
AL	69.4	51.5	55.8	49.3

Length	May	Dec	Jul	Aug
ALMF				
AW	3.09	1	1.63	1.08
N	4	1	31	3
SLF	540	299	7293	626

Table 17. Length composition (0/000) of redfish from Canadian commercial landings in NAFO Division 2J in 2019.

Length	Apr
9	125.00
11	125.00
13	250.00
15	375.00
17	125.00
SNPT	1000
AL	13.5
ALMF	
AW	0.03
N	1
SLF	8

Table 18. Length composition (0/000) of redfish from Canadian commercial landings in NAFO Division 3K in 2019.

Length	May	Jul	Jun
5	7.14	--	--
6	35.71	5.13	--
7	--	10.94	12.47
8	21.43	4.06	1.39
9	42.86	25.06	11.55
10	21.43	76.64	35.57
11	28.57	61.64	25.87
12	78.57	77.90	31.87
13	28.57	125.12	96.54
14	114.29	103.35	81.29
15	128.57	123.57	123.79
16	200.00	145.64	205.08
17	200.00	141.47	199.08
18	85.71	72.58	132.10
19	7.14	17.80	32.79
20	--	8.22	7.39
21	--	--	1.85
22	--	--	1.39
23	--	0.87	--
SNPT	1000	1000	1000
AL	14.2	15.4	14.5
ALMF			
AW	0.04	0.05	0.04
N	3	3	1
SLF	752	629	140

Table 19. Length composition (0/000) of redfish from Canadian commercial landings in NAFO Division 3L in 2019.

Length	Jan	Sep	Aug	Dec	Nov
22	4.54	0.35	--	--	--
23	14.80	1.88	0.36	1.22	--
24	21.05	9.15	0.54	6.46	--
25	41.56	19.46	1.44	13.34	5.71
26	105.36	33.26	3.57	19.09	8.14
27	133.77	36.66	4.86	34.94	24.93
28	121.76	43.47	8.85	40.36	50.71
29	112.00	46.40	13.76	65.05	71.17
30	153.08	63.92	30.85	79.19	123.74
31	59.21	69.75	62.13	82.03	110.40
32	72.29	93.08	132.81	84.37	134.57
33	59.21	101.36	152.21	84.22	103.18
34	30.18	130.55	184.92	101.79	124.07
35	22.77	98.34	149.87	81.90	82.90
36	16.52	85.86	93.78	80.77	52.14
37	8.55	62.92	59.45	87.22	68.55
38	5.70	39.12	30.60	65.10	20.10
39	3.98	26.29	31.00	34.38	9.84
40	2.85	16.45	16.50	17.06	4.92
41	5.70	9.16	11.93	8.57	4.92
42	2.85	4.59	4.86	8.85	--
43	--	2.33	2.19	2.84	--
44	1.13	2.26	1.34	--	--
45	--	1.09	0.96	--	--
46	--	0.53	0.48	1.28	--
47	--	0.11	0.28	--	--
48	--	0.30	--	--	--
49	--	0.20	--	--	--
50	--	0.16	--	--	--
51	--	0.14	0.48	--	--
52	1.13	0.24	--	--	--
53	--	0.12	--	--	--
55	--	0.27	--	--	--
59	--	0.10	--	--	--
63	--	0.11	--	--	--
SNPT	1000	1000	1000	1000	1000
AL	34.1	33.2	29.4	32.4	33
ALMF					
AW	0.65	0.52	0.41	0.5	0.59
N	12	14	2	3	42
SLF	3147	3306	502	570	10545

Table 20. Length composition (0/000) of redfish from Canadian commercial landings in NAFO Division 3N in 2019.

Length	Sep
34	66.67
36	66.67
37	66.67
38	66.67
39	66.67
40	133.33
42	66.67
45	133.33
47	66.67
50	66.67
53	66.67
54	133.33
SNPT	1000
AL	43.6
ALMF	
AW	1.6
N	1
SLF	15

Table 21. Length composition (0/000) of redfish from Canadian commercial landings in NAFO Division 3Ps in 2019.

Length	Jan	Nov	Aug	Feb	Jul	Mar
18	0.27	3.52	--	--	--	--
19	--	10.56	0.86	--	--	--
20	0.27	21.13	3.14	1.90	3.83	--
21	0.82	21.13	12.89	6.07	3.83	1.63
22	10.40	119.72	36.63	26.03	26.82	14.29
23	26.64	137.32	77.57	55.16	49.81	32.84
24	49.32	214.79	150.76	119.94	145.59	88.74
25	89.95	151.41	153.71	151.90	95.78	150.25
26	89.25	91.55	133.90	119.17	114.94	127.86
27	108.29	24.65	146.41	99.13	153.26	141.23
28	136.34	45.77	116.83	104.73	126.44	139.87
29	105.83	17.61	77.73	67.25	122.61	108.87
30	71.16	10.56	35.54	105.00	72.80	75.13
31	68.08	14.09	19.32	45.78	38.31	27.76
32	67.29	24.65	6.76	31.99	15.33	24.79
33	31.57	14.09	9.36	20.16	11.49	20.96
34	53.61	28.17	4.98	13.17	19.16	15.44
35	24.66	14.09	5.39	14.33	--	14.38
36	28.87	3.52	1.80	6.32	--	9.65
37	10.93	17.61	0.69	6.01	--	2.93
38	8.58	10.56	0.86	2.77	--	1.33
39	9.98	3.52	2.45	2.49	--	1.52
40	6.20	--	0.69	0.70	--	0.55
41	0.27	--	0.86	--	--	--
42	0.85	--	--	--	--	--
43	0.30	--	0.86	--	--	--
46	0.27	--	--	--	--	--
SNPT	1000	1000	1000	1000	1000	1000
AL	26.2	27.2	29	26.9	27.4	25.5
ALMF						
AW	0.27	0.31	0.39	0.29	0.31	0.27
N	4	6	7	1	7	1
SLF	992	1592	1658	261	1515	284

Table 22. Length composition (0/000) of thorny skate from Canadian commercial landings in NAFO Division 3L in 2019.

Length	Dec
42	31.34
48	61.17
49	15.67
50	77.94
52	61.59
56	29.16
57	31.34
58	30.92
60	76.84
62	76.84
63	61.59
68	46.59
70	61.17
71	31.34
72	107.10
74	31.34
76	59.42
77	15.67
80	30.25
SNPT	1000
AL	63.8
ALMF	
AW	2.59
N	3
SLF	57

Table 23. Length composition (0/000) of thorny skate from Canadian commercial landings in NAFO Division 3N in 2019.

Length	Oct	Apr	May	Dec	Nov
30	3.04	--	--	--	--
31	3.04	--	--	--	--
32	3.25	--	--	--	--
33	17.22	--	--	--	--
34	17.22	222.22	109.65	--	--
35	3.25	--	--	--	--
36	14.19	--	--	--	--
37	10.94	--	--	--	--
38	1.62	--	--	--	--
39	12.36	--	--	6.38	--
40	7.90	--	--	--	--
41	6.49	--	--	--	52.63
42	34.24	--	--	--	--
43	15.60	--	--	--	--
44	20.05	--	104.06	--	--
45	12.56	--	104.06	--	--
46	10.94	--	--	7.60	--
47	13.98	--	--	--	--
48	41.73	--	--	9.76	--
49	24.92	--	--	14.64	--
50	40.31	--	--	39.03	--
51	13.98	--	104.06	24.40	--
52	43.35	--	--	34.15	--
53	15.60	--	208.12	34.73	--
54	12.36	--	--	14.64	--
55	41.52	--	--	53.67	--
56	17.22	222.22	--	19.52	--
57	13.98	--	--	14.64	--
58	26.34	111.11	68.53	41.76	--
59	24.92	--	--	24.40	--
60	24.71	--	--	34.15	--
61	26.13	--	--	43.91	--
62	24.71	--	--	27.12	--
63	40.11	--	--	48.79	--
64	21.68	--	68.53	24.40	--
65	12.36	--	--	17.36	--
66	4.66	111.11	54.82	9.76	--
67	6.28	222.22	68.53	33.50	--
68	15.60	--	54.82	58.55	--
69	14.19	111.11	--	25.90	--
70	15.39	--	--	27.12	52.63

Length	Oct	Apr	May	Dec	Nov
71	34.03	--	--	34.15	--
72	35.86	--	54.82	45.41	157.90
73	12.36	--	--	21.02	105.26
74	9.32	--	--	9.76	--
75	3.25	--	--	18.86	--
76	23.51	--	--	22.52	--
77	7.70	--	--	19.14	--
78	3.25	--	--	17.64	--
79	--	--	--	9.76	--
80	9.32	--	--	24.40	105.26
SNPT	1000	1000	1000	1000	1000
AL	56.3	64.7	53.6	79.3	59.4
ALMF					
AW	2	2.93	1.79	4.82	2.11
N	1	3	3	1	2
SLF	9	195	13	19	428

Table 24. Length composition (0/000) of white hake from Canadian commercial landings in NAFO Division 3O in 2019.

Length	Apr
41	0.61
42	65.11
43	58.29
44	69.30
45	60.01
46	58.43
47	48.70
48	77.84
49	60.01
50	55.26
51	45.41
52	42.20
53	64.53
54	45.46
55	50.91
56	30.83
57	42.20
58	13.06
59	12.94
60	8.16
61	25.15
63	9.70
65	12.94
68	8.16
72	1.25
74	0.56
77	2.51
80	9.70
SNPT	1000
AL	51.2
ALMF	
AW	1.54
N	5
SLF	427

Table 25. Length composition (0/000) of white hake from Canadian commercial landings in NAFO Division 3Ps in 2019.

Length	Mar	Jul	Jun
41	13.24	--	--
43	26.49	--	--
45	39.73	--	--
46	13.24	--	--
47	13.24	4.24	--
48	13.24	--	--
49	33.11	--	--
50	13.24	--	--
51	39.73	--	--
52	6.62	4.24	--
53	19.87	4.24	--
54	39.73	4.24	--
55	52.98	--	--
56	46.36	--	--
57	39.73	4.24	--
58	46.36	4.24	3.57
59	72.85	--	--
60	46.36	4.24	3.57
61	59.60	8.47	14.29
62	46.36	29.66	3.57
63	39.73	8.47	10.71
64	46.36	21.19	21.43
65	13.24	33.90	35.71
66	79.47	38.14	46.43
67	39.73	46.61	53.57
68	13.24	59.32	71.43
69	13.24	46.61	100.00
70	13.24	72.03	75.00
71	13.24	63.56	60.71
72	6.62	63.56	75.00
73	--	80.51	64.29
74	--	46.61	67.86
75	6.62	63.56	85.71
76	--	55.09	50.00
77	6.62	50.85	35.71
78	--	38.14	21.43
79	--	25.42	32.14
80	6.62	33.90	28.57
SNPT	1000	1000	1000

Length	Mar	Jul	Jun
AL	72.3	71.8	58.9
ALMF			
AW	3.22	3.08	1.6
N	1	1	1
SLF	236	280	151

Table 26. Length composition (0/000) of witch flounder from Canadian commercial landings in NAFO Division 3L in 2019.

Length	Dec	Nov
34	5.12	4.13
36	26.21	20.66
38	65.52	90.91
40	148.62	66.12
42	250.57	280.99
44	184.72	194.22
46	169.37	173.55
48	69.66	66.12
50	59.77	82.64
52	18.22	16.53
54	2.24	4.13
SNPT	1000	1000
AL	41.9	42.2
ALMF		
AW	0.48	0.49
N	2	1
SLF	381	242

Table 27. Length composition (0/000) of witch flounder from Canadian commercial landings in NAFO Division 3N in 2019.

Length	Oct	Sep
34	9.73	--
36	29.20	30.67
38	83.04	30.67
40	131.71	41.66
42	249.71	166.43
44	171.83	84.03
46	147.20	183.89
48	78.47	204.17
50	49.26	--
52	34.96	42.37
54	14.90	37.54
56	--	56.31
58	--	113.51
60	--	8.77
SNPT	1000	1000
AL	42	45.8
ALMF		
AW	0.53	0.71
N	2	5
SLF	204	49

Table 28. Length composition (0/000) of witch flounder from Canadian commercial landings in NAFO Division 3O in 2019.

Length	Apr	Mar
32	0.08	--
34	1.82	8.39
36	16.61	34.09
38	82.17	123.90
40	165.75	187.89
42	247.34	263.04
44	232.69	201.49
46	153.46	102.22
48	76.03	48.87
50	22.23	17.46
52	1.82	9.39
54	--	2.56
56	--	0.69
SNPT	1000	1000
AL	41.5	40.8
ALMF		
AW	0.47	0.49
N	22	7
SLF	5625	1825

Table 29. Length composition (0/000) of witch flounder from Canadian commercial landings in NAFO Division 3Ps in 2019.

Length	Mar	Jan
28	0.35	--
30	1.79	0.44
32	14.33	--
34	42.50	6.05
36	103.55	31.56
38	160.83	39.88
40	214.41	90.53
42	181.69	169.27
44	132.78	195.07
46	74.41	184.23
48	36.00	150.16
50	20.22	80.16
52	9.49	35.46
54	5.12	13.90
56	1.69	3.29
58	0.85	--
SNPT	1000	1000
AL	43.1	39.4
ALMF		
AW	0.53	0.41
N	5	14
SLF	1258	3499

Table 30. Length composition (0/000) of yellowtail flounder from Canadian commercial landings in NAFO Division 3N in 2019.

Length	Jul	Apr	Jun	Dec	May	Nov	Mar	Oct	Sep	Jan
18	0.21	--	--	--	--	--	--	--	--	--
20	0.41	0.33	0.60	--	--	--	--	--	--	--
22	2.60	0.28	1.43	--	--	--	--	--	--	--
24	3.39	0.82	1.56	0.37	0.85	1.00	--	--	--	--
26	6.59	1.62	10.90	0.69	4.07	4.57	0.22	0.12	1.68	--
28	9.89	20.63	32.52	7.58	30.60	16.56	2.45	6.56	20.87	--
30	26.71	26.44	58.06	23.40	58.45	36.35	2.31	19.51	41.45	4.31
32	96.16	33.43	93.69	70.10	68.94	64.48	40.23	47.36	115.73	53.01
34	176.53	159.87	161.93	142.92	157.61	118.51	134.45	109.32	178.35	150.78
36	241.29	229.89	206.88	212.64	219.40	184.97	289.63	175.65	221.96	235.43
38	181.80	240.68	184.17	247.22	219.88	226.06	257.47	223.76	209.04	271.39
40	141.53	171.24	142.53	170.83	143.88	187.88	146.59	176.47	131.24	175.23
42	78.41	78.79	68.95	80.56	67.83	108.53	83.74	120.68	49.07	70.54
44	19.64	25.60	24.28	27.26	19.27	36.06	29.62	62.09	17.83	35.34
46	10.53	7.58	8.69	13.66	5.45	8.45	9.75	36.80	7.94	3.97
48	3.08	2.50	2.28	1.60	3.48	3.11	3.08	20.13	3.40	--
50	1.08	0.28	1.00	0.91	0.29	3.19	0.38	1.49	1.44	--
52	0.13	--	0.23	0.13	--	0.16	0.09	0.06	--	--
54	--	--	0.19	--	--	0.11	--	--	--	--
56	--	--	0.10	0.13	--	--	--	--	--	--
SNPT	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
AL	35.6	35.8	36	35.1	34.7	36	34.9	35.9	36.9	34.8
ALMF										
AW	0.39	0.4	0.43	0.4	0.39	0.41	0.37	0.42	0.47	0.38
N	12	20	9	14	40	17	17	52	46	12
SLF	3109	4736	2283	3583	8790	4336	3936	13151	11210	2541

Table 31. Length composition (0/000) of yellowtail flounder from Canadian commercial landings in NAFO Division 3O in 2019.

Length	Mar
32	4.54
34	25.32
36	74.89
38	121.66
40	232.09
42	223.44
44	155.45
46	101.33
48	52.18
50	9.09
SNPT	1000
AL	39.9
ALMF	
AW	0.53
N	2
SLF	524