Northwest Atlantic Fisheries Organization

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Canadian Research Report for 2020

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A. STATUS OF FISHERIES

Nominal landings from 2015 to 2020 for fish stocks are listed in Table 1. Length and otolith sampling information is available in Tables 2-18. Additional information on the status of the fisheries is as follows:

A.1 SUBAREA 2

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 2 t in 2020 and averaged 4 t during the period 2016 to 2019.

Tables 2 & 3 show the total catch length distributions for Divs. 2+3K were available from 15 samples with a total of 511 measured individuals. Lengths varied from 10 cm to 46 cm with a mean of 24.52 cm.

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 5200 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 10 116 t in 2020 and averaged 10 653 t during the period 2016 to 2019. 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 4, 5, & 6 show the total catches. Length distributions for Divs 2J3KL cod were available from 71 samples with a total of 5155 measured individuals. Lengths varied from 15 cm to 102 cm with a mean of 43.69 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.

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). There are no preliminary estimates of recreational Atlantic salmon catch for Subarea 2. Estimated Labrador Aboriginal and subsistence fisheries harvest was inferred from logbook returns (63% return rate) at 13,712 salmon in 2020 (7558 small and 6154 large), which was 3% above the previous seven-year mean (2013-2019) of 13 369 salmon. In 2020, two of three assessed rivers in Subarea 2 were above the upper stock reference point (healthy zone) and one was below the limit reference point (critical zone).

Greenland halibut-Subarea 2 + Divisions 3KLMNO

Preliminary landings for the Subarea 2 + Divisions 3KLMNO Greenland halibut stock were 5575 t in 2020 and averaged 5892 t during the period 2016 to 2019.

Tables 8, 9, & 10 show the total catches. Length distributions for Divs. Subarea 2 + Divisions 3KLMNO Greenland halibut were available from 56 samples with a total of 12 727 measured individuals. Lengths varied from 10 cm to 100 cm with a mean of 48.89 cm.

Iceland scallop–Divisions 2HJ

Preliminary Canadian landings for the Divs. 2HJ Iceland scallop stock were 34 t in 2020 and averaged 6 t during the period 2016 to 2019.

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).

SFA 4 (NAFO Division 2G)

Preliminary Canadian landings for the SFA 4 shrimp stock were 7526 t in 2020 and averaged 14 436 t during the period 2016 to 2019.

SFA 5 (Hopedale and Cartwright Channels)

Preliminary Canadian landings for the SFA 5 shrimp stock were 10 587 t in 2020 and averaged 23 838 t during the period 2016 to 2019.

SFA 6 (Hawke Channel + NAFO Division 3K)

Preliminary Canadian landings for the SFA 6 shrimp stock were 4683 t in 2020 and averaged 13 137 t during the period 2016 to 2019.

Redfish–Subarea 2 + Division 3K

The Div. 2+3K redfish stock remains under moratorium. Preliminary Canadian landings of this species were 4 t in 2020 and averaged 34 t during the period 2015 to 2019.

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 11 & 12 show the total catches. Length distributions for Divs. 2+3K redfish were available from 10 samples with a total of 2323 measured individuals. Lengths varied from 5 cm to 19 cm with a mean of 7.64 cm.

Snow crab–Divisions 2HJ

Preliminary Canadian landings for the Divs. 2HJ snow crab stock were 1372 t in 2020 and averaged 1745 t during the period 2016 to 2019.

Squid–Subarea 2+3

Preliminary Canadian landings for the Subarea 2+3 squid stock were 3088 t in 2020 and averaged 1070 t during the period 2016 to 2019.

Witch flounder-Divisions 2J3KL

The Div. 2J3KL witch flounder stock has been under moratorium since 1994. Preliminary Canadian landings of this species were 83 t in 2020 and averaged 81 t during the period 2016 to 2019.

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

Length distributions for Divs. 2J3KL witch flounder were unavailable in 2020.

SUBAREA 3

American plaice–Divisions 3LNO

The Div. 3LNO American plaice stock remains under moratorium. Preliminary Canadian landings of this species were 443 t in 2020 and averaged 517 t during the period 2016 to 2019.

Length distributions for Divs. 3LNO American plaice were unavailable in 2020.

American plaice-Subdivision 3Ps

Preliminary Canadian landings for the Subdiv. 3Ps American plaice stock were 52 t in 2020 and averaged 152 t during the period 2016 to 2019.

Length distributions for Subdiv. 3Ps American plaice were unavailable in 2020.

Atlantic cod–Divisions 3NO

The Div. 3NO Atlantic cod stock remains under moratorium. Preliminary Canadian landings of this species were 82 t in 2020 and averaged 167 t during the period 2016 to 2019, 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.

Length distributions for Divs. 3NO cod were unavailable in 2020.

Atlantic cod-Subdivision 3Ps

Preliminary Canadian landings for the Subdiv. 3Ps Atlantic cod stock were 2018 t in 2020 and averaged 4741 t during the period 2016 to 2019.

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 7 shows the total catches. Length distributions for Subdiv. 3Ps cod were available from 38 samples with a total of 6462 measured individuals. Lengths varied from 42 cm to 126 cm with a mean of 66.3 cm.

Atlantic salmon-Subarea 3

The commercial fishery for Atlantic salmon in Subarea 3 has remained closed since 1992. Estimates of recreational catches for Newfoundland and Labrador have been highly variable since 2005 (total catch range of 31 050 to 71 726 salmon). There are no preliminary estimates of recreational Atlantic salmon catch for Subarea 3. Of the ten rivers assessed in Subarea 3 in 2020, seven were below their limit reference point (critical zone), two were above their upper stock reference point (healthy zone), and one fell between the two reference points (cautious zone).

Capelin–2+3KL

UPDATE 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.

Iceland scallop–Divisions 3LNO and Subdivision 3Ps

Preliminary Canadian landings for the Divs. 3LNO Iceland scallop stock were 0 t in 2020 and averaged 0 t during the period 2016 to 2019.

Preliminary Canadian landings for the Divs. 3Ps Iceland scallop stock were 0 t in 2020 and averaged 250 t during the period 2016 to 2019.

Redfish – Divisions 3LN

Preliminary Canadian landings for the Divs. 3LN redfish stock were 1525 t in 2020 and averaged 3602 t during the period 2016 to 2019.

Length distributions for Divs. 3LN redfish were unavailable in 2020.

Redfish – Division 3O

Preliminary Canadian landings for the Divs. 3O redfish stock were 474 t in 2020 and averaged 93 t during the period 2016 to 2019.

Length distributions for Div. 3O redfish were unavailable in 2020

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

Preliminary Canadian landings for the Unit 2 redfish stock were 3727 t in 2020 and averaged 1432 t during the period 2016 to 2019.

Table 13 shows the total catches. Length distributions for Unit 2 redfish were available from 5 samples with a total of 1445 measured individuals. Lengths varied from 19 cm to 53 cm with a mean of 27.4 cm. Note these length frequencies are only from Newfoundland and Labrador landings.

Sea scallop–Division 3KLNO

Preliminary Canadian landings for the Divs. 3KLNO sea scallop stock were 0 t in 2020 and averaged 1 t during the period 2016 to 2019.

Sea scallop–Subdivision 3Ps

Preliminary Canadian landings for the Divs. 3Ps sea scallop stock were 909 t in 2020 and averaged 767 t during the period 2016 to 2019.

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.

Northern shrimp–Divisions 3LNO

Preliminary Canadian landings for the Divs. 3LNO Northern shrimp stock were 0 t in 2020 and averaged 0 t during the period 2016 to 2019.

Snow crab–Divisions 3KLNO and Subdivision 3Ps

Preliminary Canadian landings for the Divs. 3KLNO snow crab stock were 24 327 t in 2020 and averaged 14,001 t during the period 2016 to 2019.

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 3249 t in 2020 and averaged 1808 t during the period 2016 to 2019.

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

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 2 t in 2020 and averaged 4 t during the period 2016 to 2019.

Length distributions for Divs. 3LNO thorny skate were unavailable in 2020.

Preliminary Canadian landings for the Subdiv. 3Ps thorny skate stock were 486 t in 2020 and averaged 655 t during the period 2016 to 2019.

Length distributions for Subdiv. 3Ps thorny skate were unavailable in 2020.

White hake–Divisions 3NO and Subdivision 3Ps

Preliminary Canadian landings for the Divs. 3NO white hake stock were 148 t in 2020 and averaged 217 t during the period 2016 to 2019.

Length distributions for Divs. 3NO white hake were unavailable in 2020.

Preliminary Canadian landings for the Subdiv. 3Ps white hake stock were 115 t in 2020 and averaged 243 t during the period 2016 to 2019.

Table 14 shows the total catches. Length distributions for Subdiv. 3Ps white hake were available from 1 samples with a total of 7 measured individuals. Lengths varied from 59 cm to 67 cm with a mean of 63.43 cm.

Witch flounder-Divisions 3NO

Preliminary Canadian landings for the Divs. 3NO witch flounder stock were 427 t in 2020 and averaged 526 t during the period 2016 to 2019.

Table 15 shows the total catches. Length distributions for Divs. 3NO witch flounder were available from 12 samples with a total of 3339 measured individuals. Lengths varied from 32 cm to 54 cm with a mean of 41.81 cm.

Witch flounder-Subdivision 3Ps

Preliminary Canadian landings for the Subdiv. 3Ps witch flounder stock were 107 t in 2020 and averaged 422 t during the period 2016 to 2019.

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 16 shows the total catches. Length distributions for Subdiv. 3Ps witch flounder were available from 1 samples with a total of 312 measured individuals. Lengths varied from 34 cm to 54 cm with a mean of 42.9 cm.

Yellowtail flounder–Divisions 3LNO

Preliminary Canadian landings for the Divs. 3LNO yellowtail flounder stock were 13 023 t in 2020 and averaged 7816 t during the period 2016 to 2019.

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 17 & 18 show the total catches. Length distributions for Divs. 3LNO yellowtail flounder were available from 75 samples with a total of 16 746 measured individuals. Lengths varied from 22 cm to 54 cm with a mean of 37.7 cm.

SUBAREA 4

Atlantic salmon–Subarea 4

The commercial fishery for Atlantic salmon in Subarea 4 has remained closed since 1992. Estimates of recreational catches for Newfoundland and Labrador have been highly variable since 2005 (total catch range of 31 050 to 71 726 salmon). There are no preliminary estimates of recreational Atlantic salmon catch for Subarea 4. In 2020, three of four assessed rivers in Subarea 4 were above their upper stock reference point (healthy zone) and one was between the upper stock reference point and limit reference point (cautious zone).

Iceland scallop–Div. 4R

Preliminary Canadian landings for the Div. 4R Iceland scallop stock were 24 in 2020 and averaged 124 t during the period 2016 to 2019.

Sea scallop–Div. 4R

Preliminary Canadian landings for the Div. 4R sea scallop stock were 7 in 2020 and averaged 6 t during the period 2016 to 2019.

Snow crab–Div. 4R

Preliminary Canadian landings for the Div. 4R snow crab stock were 196 in 2020 and averaged 426 t during the period 2016 to 2019.

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 2019. However, the three annual AZMP surveys suffered from significant reduction of ship times of various origins in 2019. During the spring survey (11-18 April), only section FC was realized. Sections MB, SI, BB and FC were sampled during the summer survey (June 26th to July 13th), while BB, FC, SEGB and part of SWSPB were sampled during the fall (November 17th to December 10th). 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 positive for a 6th consecutive year (since 2012, only 2013 was negative). The air temperatures across the NW Atlantic were warm in the Arctic, between normal and colder than normal on the Newfoundland and Labrador and Scotian Shelf, and warmer than normal in Boston on the coast of the Gulf of Maine. The sea ice volume across the Newfoundland and Labrador shelf was slightly below normal, characterized by a large negative anomaly in March-April, which also led to an early retreat on Newfoundland shelf. Annual sea surface temperature across the NAFO subareas 2, 3 and 4 were below normal overall for the zone for the first time since 1992, yet they would have been near normal if not for tropical storm Dorian that mixed heat deep into the water column. Observations from the summer AZMP oceanographic survey indicate that after a predominance of colder than average conditions since 2012, the volume of the cold intermediate layer (CIL, <0°C) reduced along Bonavista and Flemish Cap section in 2019 (CIL along Seal Island section was normal this year but was reduced in 2018). The spatially averaged bottom temperature in 3LNOPs during the spring was close to normal, except along the slopes of the Grand Banks where it was above normal. For the fall, bottom temperature in 2HJ3KLNO was also above normal, especially in 2J (+1.1 SD) and 3K (+1.0 SD). Deep water temperatures on the Scotian shelf were very warm: record high in Cabot Strait (nearly 5SD above the climatology) and Emerald Basin, and second warmest year in George Basin. The Labrador Current transport index along the Labrador and northern Newfoundland slope in 2019 was back to normal after the 2018 record high since the beginning of the time series that started in 1993.

Nutrients and plankton studies

Biogeochemical variables collected in 2019 from coastal high-frequency monitoring stations and seasonal sampling of standard oceanographic sections covering NAFO Subareas 2-4 are presented and referenced to earlier periods when available. We review interannual variations in phytoplankton spring bloom indices as well as nitrate (50-150 m), chlorophyll a (0-100 m), zooplankton abundance, and zooplankton biomass inventories collected during the 2019 Atlantic Zone Monitoring Program (AZMP). Spring bloom timing and duration were near normal in all regions except on the Newfoundland Shelf and the Grand Bank (GB) where earlier and longer-than-normal blooms were observed. Bloom magnitude was below normal in all regions, especially in the Gulf of St. Lawrence (GSL) where spring production reached a record low after several consecutive years of above-normal production. In general, nitrate inventories increased on the Newfoundland and Labrador (NL) shelves and the FC in 2019 compared to the previous year but remained low on the GB and the Scotian Shelf (SS). Chlorophyll inventories were mostly above normal on the NL shelves, the GB, and the GSL, and near to below normal on the SS. The abundance of copepod and non-copepod zooplankton were near to above normal in all regions although no data were available for the Labrador Shelf, the GB, and the Southern Newfoundland for this report. Copepod abundance increased from below-normal to near or above-normal levels on the SS in 2019 compared to 2018. The abundance of large *Calanus finmarchicus* copepods was mainly near normal in 2019 which represented an increase compared to the previous year. The abundance of small *Pseudocalanus* spp. copepods was near to above normal in all regions in 2019, continuing an increasing trend observed since 1999. Zooplankton biomass was near to below normal in most regions. The low biomass on the NL shelves and the GB in 2019 contrasted with above-normal levels observed in 2018. However, biomass indices for these regions were calculated on partial datasets and the general pattern for 2019 may change when all data become available.

Biological Studies

Multispecies Trawl Surveys

Biological and oceanographic data from fall (Div. 2HJ3KLNO) and spring (3LNOP) multi-species research vessel surveys are collected annually since the early 1970s in order to support stock assessment, distribution and abundance studies, and detailed biological sampling were conducted on important commercial species (e.g. Atlantic cod, American plaice, Greenland halibut, redfish, yellowtail flounder, white hake, thorny skate, northern shrimp, snow crab), as well as a suite of indicators for non-commercial species of the NL Region. In 2020, the annual spring survey was cancelled due to restrictions to travel and social interactions imposed by the Canadian and Provincial Governments during the early phases of the COVID 19 Pandemic. The fall survey completed a total of 474 of 674 sets planned in Divs. 2HJ3KLNO (all Divisions 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 (2021).

Sentinel Studies

The Sentinel Survey of Atlantic cod (*Gadus morhua*) has been conducted in NAFO Subdivision 3Ps and Divs. 3Pn4Rs since 1994, and Divs. 2J3KL since 1995. Data collected and analyses were tabled at the Regional Stock Assessment in the fall 2020 for Subdiv. 3Ps Atlantic Cod, and in the spring 2021 for Divs. 2J3KL Atlantic Cod. 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 2016-2020. 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 2020, with 1045 cod tagged and released with Floy tags in Div. 2J3KL. This tagging program provides critical information on mortality to the Northern Cod Assessment Model and an estimate of the recreational fishery catch. 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 101 inshore receivers is maintained by DFO-NL Groundfish throughout the region. 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 Atlantic Seafood Producers (ASP)-Atlantic Groundfish Council (AGC) Northern Cod Fishery Improvement Project. Seventy-five offshore receivers were deployed in 2020 in Div. 2J3KL. In 2019, 338 Atlantic cod were tagged with acoustic transmitters in Div. 3KL, however due to COVID-19 related restrictions on field work, acoustic transmitters were not deployed in 2020. Deployments of acoustic transmitters in Atlantic Cod are expected to resume in 2021. A total of 215 receivers are currently deployed in Div. 3KL (59 inshore receivers deployed by DFO-NL Groundfish, 75 offshore receivers deployed by the NCAT project, and 81 receivers deployed by other groups in the region).

Capelin

There was no spring (May) offshore acoustic survey in Div. 3L in 2020. 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 2020, 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 has been conducted to date. Recently emerged larvae into the Bellevue Beach inshore area of Trinity Bay (Div. 3L) were monitored in July and August 2020. Larval surveys were also conducted in August and September 2020 in Trinity Bay to map capelin larval abundance and dispersal in the Bay. In 2020, monitoring of beach spawning of capelin was conducted through logbook recordings by citizen scientists and researchers at a number of beaches 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 2013-2020. 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 White Bay (3K), Notre Dame Bay (3K), Bonavista Bay (3L), and Conception Bay (3L) were continued in 2020. 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 monitoring and research into the incidence and impacts of Bitter Crab Disease (BCD) in NL snow crab. Similar surveys were initiated in Fortune Bay (3Ps) in 2007, and Trinity Bay (3L) and St. Mary's Bay (3L) in 2013. The Fortune and St. Mary's Bay surveys did not occur in 2020. A post-season trap survey, conducted by snow crab harvesters, which began throughout most of 2J3KLNOPs4R in 2004 was continued in 2020. These surveys have expanded in spatial scale over the past 5 years and 2020 represented the broadest spatial coverage of the survey throughout the Region in the time series. The frequency of small-mesh pots in this survey has also increased in the past 5 years, with about 80% of the 1200 allocated stations having a small-mesh pot included in 2020. All trap survey series are integral components of the annual stock assessment and are used to monitor present biomass along with recruitment prospects and reproductive capacity of the stock.

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 required and currently underway. Two research studies on larval drift and dispersal have been completed; one for SFAs 4-6 and NAFO Divs. 3LNO and another incorporating SFAs 4-6, NAFO Divs. 3LMNO and North of SFA 4, including West Greenland. 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. The research within SFAs 4-6 and NAFO Divs. 3LNO indicated strong downstream larval connectivity and that a majority of recruits in a particular SFA may come from SFAs farther north. It also indicated low larval shrimp retention in SFAs 4, 5 and NAFO Divs. 3LNO, and higher larval retention in SFA 6. 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.

Atlantic salmon

Atlantic salmon genetic mixed fishery analysis

Stock composition of Atlantic salmon harvested in 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. In 2020 in Labrador, only tissue samples collected from the Labrador subsistence fisheries along the coast (SFA 1A and 2) were analysed for genetic origin as the interception of non-Labrador origin salmon has been more prevalent in this area in the past. All of the 744 tissue samples were analysed using the SNP panel with 31 range-wide reporting groups. As in previous years, the estimated origin of the samples was dominated (>98%) by the Labrador reporting groups. The dominance of the Labrador reporting groups is consistent with previous analyses conducted for the period 2006–2019 which estimated >95.0% of the catch was attributable to Labrador stocks. Furthermore, assignment of harvest within the three Labrador genetic reporting groups suggests largely local harvest within salmon fishing areas. Samples were collected in the West Greenland and Saint Pierre and Miquelon fisheries in 2020 and are currently being analyzed.

Range-wide genetic assignment confirms long-distance oceanic migration in Atlantic salmon over half a century

Atlantic salmon (*Salmo salar*) populations throughout the North Atlantic have declined in recent decades largely due to reduced marine survival, yet our understanding of marine distribution patterns and migratory routes remains limited. Here, we assigned archived individual samples (n = 3891) collected over a half century (1968–2018) throughout the North Atlantic to region of origin using range-wide genetic assignment. In the Northwest Atlantic, the distribution of assignments reinforced the importance of the Labrador Sea as an aggregation area, with 73% of all reporting groups detected. Moreover, individuals from six European reporting groups were identified in the Northwest Atlantic, and detections decreased with decreasing latitude spanning an area from Greenland to southern Newfoundland. In the Northeast Atlantic, six North American reporting groups were detected in samples from around the Faroe Islands. Based on the distribution of samples, estimates of trans-Atlantic migration distance averaged 3861 and 2889 km for North American and European salmon respectively. Our analysis highlights the widespread importance of the Labrador Sea and Faroe Islands to the species marine distribution patterns, and the prevalence of long-distance trans-Atlantic migration. Ultimately, the results suggest that environmental conditions experienced by many Atlantic salmon populations span much of the North Atlantic Ocean.

Bradbury IR, Lehnert SJ, Messmer A, Duffy SJ, Verspoor E, Kess T, Gilbey J, Wennevik V, Robertson M, Chaput G, Sheehan T, Bentzen P, Dempson JB, Reddin D (2021) Range-wide genetic assignment confirms long-distance oceanic migration in Atlantic salmon over half a century. ICES J Mar Sci.

Divergent and linked selection shape patterns of genomic differentiation between European and North American Atlantic salmon (*Salmo salar*)

As populations diverge many processes can shape genomic patterns of differentiation. Regions of high differentiation can arise due to divergent selection acting on selected loci, genetic hitchhiking of nearby loci, or through repeated selection against deleterious alleles (linked background selection); this divergence may then be further elevated in regions of reduced recombination. Atlantic salmon (*Salmo salar*) from Europe and North America diverged >600 000 years ago and despite some evidence of secondary contact, the majority of genetic data indicate substantial divergence between lineages. This deep divergence with potential gene flow provides an opportunity to investigate the role of different mechanisms that shape the genomic landscape during early speciation. Here, using 184 295 SNPs and 80 populations, we investigate the genomic landscape of differentiation across the Atlantic Ocean with a focus on highly differentiated regions and processes shaping them. We found evidence of high (mean FST=0.26) and heterogeneous genomic differentiation between

continents. Genomic regions associated with high trans-Atlantic differentiation ranged in size from single loci (SNPs) within important genes to large regions (1-3Mbp) on four chromosomes (Ssa06, Ssa13, Ssa16, and Ssa19). These regions showed signatures consistent with selection, including high linkage disequilibrium despite no local reduction in recombination. Genes and functional enrichment of processes associated with differentiated regions may highlight continental differences in ocean navigation and parasite resistance. Our results provide insight into potential mechanisms underlying differences between continents, and evidence of near fixed and potentially adaptive trans-Atlantic differences concurrent with a background of high genome-wide differentiation supports subspecies designation in Atlantic salmon.

Lehnert SJ, Kess T, Bentzen P, Clément M, Bradbury IR (2020) Divergent and linked selection shape patterns of genomic differentiation between European and North American Atlantic salmon (Salmo salar). Mol Ecol 29:2160-2175

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

Temperature-induced mortality assessment of catch and release angling on Atlantic salmon. 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. 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). Mortality of Atlantic salmon after catch and release angling: Assessment of a recreational Atlantic salmon fishery in a changing climate. Canadian Journal of Fisheries & Aquatic Sciences, 77(9), 1–11. https://doi.org/10.1139/cjfas-2019-0400

Catchability of Atlantic salmon at high water temperatures

Archived data for Atlantic salmon, *Salmo salar* L., were used to quantify the influence of water temperature on catchability. A significant decline in the number of Atlantic salmon caught at warmer water temperatures was found after accounting for the effects of river water height, fishing effort, run duration and year-to-year differences in fish abundance. Although post-release mortality increases with water temperature, it is somewhat compensated by the reduced catchability of Atlantic salmon. Thus, the catchability component of catch and release is an integral consideration when evaluating the effectiveness of river closure temperature thresholds when managing catch and release angling.

Van Leeuwen, T. E., Dempson, J. B., Cote, D., Kelly, N. I., Bates, A. E. (2021). Catchability of Atlantic salmon at high water temperatures: Implications for river closure temperature thresholds to catch and release angling. Journal of Fisheries Management & Ecology, 28, 147-157. https://doi.org/10.1111/fme.12464

Incursions of Sea Lamprey and Striped Bass in Labrador waters: Episodic events or evidence of a northward range expansion?

While Sea Lamprey have been periodically observed in similar latitudes of Labrador, their numbers have conspicuously increased in estuarine environments in 2020. In contrast, Striped Bass, were not observed from Labrador until 2017 but appear to be declining after the initial surge in abundance that peaked in 2018. It remains unclear whether spawning populations of either species exist. Given the potential to negatively affect species of commercial and cultural importance through predation, further sampling, community outreach, and cross-sectoral cooperation will be needed to determine whether the current observations represent a persistent northern range expansion or simply episodic straying events.

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	2015	2016	2017*	2018*	2019*	2020*
American plaice	2+3K	4	1	3	11	0	2
	3LNO	443	745	226	464	633	443
	3Ps	99	170	207	132	99	52
Atlantic cod	2GH	0	0	0	0	0	0
	2J3KL	4,329	9,931	12,781	9,448	10,452	10,116
	3NO	132	134	287	118	129	82
	3Ps	5,121	5,273	5,800	4,495	3,397	2,018
Capelin	2J3KL	23,065	27,708	19,917	19,840	19,509	16,109
	3NO	0	0	0	0	0	0
Greenland halibut	2+3KLMNO	6,572	6,073	5,360	6,071	6,065	5,575
Haddock	3LNO	63	184	228	28	73	10
	3Ps	191	252	334	188	168	69
Iceland scallop	2HJ	8	5	5	6	6	34
	3LNO	--	--	0	0	0	0
	3Ps	45	368	527	53	51	0
	4R	200	192	115	140	48	24
Lobster	3K	121	76	77	82	116	136
	3L	113	92	95	102	163	125
	3PN	150	157	162	216	297	356
	3Ps	1,100	1,199	1,088	1,263	1,572	1,750
	4R	1,260	1,354	1,488	1,756	2,511	2,549
Pollock	3LNO	0	14	1	11	0	0
	3Ps	214	366	580	280	119	80
Redfish	2+3K	5	20	104	9	4	4
	3LN	4,431	2,713	4,177	4,536	2,982	1,525
	3O	31	22	60	80	213	474
	Unit 2	81	380	1,203	1,735	2,410	3,727
Sea scallop	3KLNO	0	3	0	1	0	0
	3Ps	1,126	883	846	414	924	909
	4R	4	7	10	6	3	7
Shrimp	3L	0	0	0	0	0	0
	3M	0	0	0	0	0	0
	SFA 4	15,050	14,377	16,439	15,697	11,232	7,526
	SFA 5	21,530	22,552	26,102	23,257	23,440	10,587
	SFA 6	48,722	25,143	10,065	8,702	8,638	4,683
Snow crab	2HJ	1,769	1,700	1,758	1,753	1,768	1,372
	3K	7,182	5,550	5,509	5,984	6,047	6,541

Species	Stock	2015	2016	2017*	2018*	2019*	2020*
	3LNO	37,159	32,316	23,230	17,787	15,583	17,786
	3P	2,540	1,188	1,173	2,082	2,789	3,249
	4R	776	694	524	302	186	196
Squid	2+3	0	104	313	1,322	2,540	3,088
Thorny skate	3LNO	4	3	6	2	7	2
	3Ps	171	401	413	916	891	486
White hake	3LNO	66	94	558	57	159	148
	3Ps	160	271	239	277	186	115
Witch flounder	2J3KL	188	53	98	138	35	83
	3NO	221	798	349	478	479	427
	3Ps	360	481	394	277	535	107
Yellowtail flounder	3LNO	5,581	6,327	6,262	7,134	11,541	13,023
	3Ps	15	5	16	5	5	1

*Includes DFO Maritimes landings

Table 2. Length composition (0/000) of American plaice from Canadian commercial landings in NAFO Division 2J in 2020. SNPT= Sum of number per 1000 (should equal 1000). AL= Average length within length frequency. ALMF= Average length of Males/Females. AW=average weight of fish within length frequency. N= number of length frequencies. SLF= number of fish measured in length frequencies.

Length	Apr	Jan	Feb	Mar
10	27.03	--	--	--
14	--	15.23	--	--
16	--	3.90	5.66	--
18	162.16	23.41	28.32	55.56
20	108.11	50.72	45.31	305.56
22	189.19	160.36	188.57	333.33
24	270.27	238.02	266.06	194.44
26	162.16	120.95	154.72	83.33
28	--	167.40	117.00	--
30	54.05	58.52	67.96	27.78
32	--	71.73	54.70	--
34	27.03	39.02	32.05	--
36	--	23.41	16.99	--
38	--	7.80	11.33	--
40	--	7.80	--	--
44	--	7.80	5.66	--
46	--	3.90	5.66	--
SNPT	1000	1000	1000	1000
AL	21.4	24.3	24.7	20.7
ALMF				
AW	0.08	0.14	0.14	0.08
N	2	3	7	1
SLF	37	181	234	36

Table 3. Length composition (0/000) of American plaice from Canadian commercial landings in NAFO Division 3K in 2020. SNPT= Sum of number per 1000 (should equal 1000). AL= Average length within length frequency. ALMF= Average length of Males/Females. AW=average weight of fish within length frequency. N= number of length frequencies. SLF= number of fish measured in length frequencies.

Length	Feb
20	31.83
22	280.28
24	203.80
26	203.80
28	140.14
34	63.66
36	76.48
SNPT	1000
AL	24.3
ALMF	
AW	0.12
N	2
SLF	23

Table 4. Length composition (0/000) of Atlantic cod from Canadian commercial landings in NAFO Division 2J in 2020. SNPT= Sum of number per 1000 (should equal 1000). AL= Average length within length frequency. ALMF= Average length of Males/Females. AW=average weight of fish within length frequency. N= number of length frequencies. SLF= number of fish measured in length frequencies.

Length	Apr	Feb	Mar	Jan
15	0.95	--	--	--
18	111.03	66.97	89.95	--
21	527.05	409.68	540.15	743.72
24	287.20	346.65	229.60	--
27	45.65	39.39	75.73	--
30	22.90	23.64	34.09	76.52
33	5.21	3.94	22.47	76.52
36	--	1.69	8.01	--
39	--	11.82	--	--
42	--	10.13	--	58.54
45	--	23.64	--	--
48	--	21.95	--	--
51	--	10.13	--	--
54	--	3.38	--	--
57	--	6.75	--	44.71
60	--	3.38	--	--
63	--	6.75	--	--
66	--	1.69	--	--
72	--	5.06	--	--
78	--	1.69	--	--
81	--	1.69	--	--
SNPT	1000	1000	1000	1000
AL	20	23.6	22.9	20.5
ALMF				
AW	0.07	0.31	0.52	0.08
N	10	2	4	9
SLF	893	291	5	256

Table 5. Length composition (0/000) of Atlantic cod from Canadian commercial landings in NAFO Division 3K in 2020. SNPT= Sum of number per 1000 (should equal 1000). AL= Average length within length frequency. ALMF= Average length of Males/Females. AW=average weight of fish within length frequency. N= number of length frequencies. SLF= number of fish measured in length frequencies.

Length	Feb	Oct	Sep	Aug	Nov
18	38.25	--	--	--	--
21	579.24	--	--	--	--
24	327.87	--	--	--	--
27	21.86	--	--	--	--
30	10.93	--	--	--	--
33	21.86	--	--	--	--
36	--	0.85	--	--	--
39	--	--	0.68	--	--
42	--	3.88	2.71	11.31	--
45	--	28.47	17.11	14.00	--
48	--	60.88	48.84	15.61	23.06
51	--	123.18	44.07	17.72	95.30
54	--	157.10	62.78	17.32	176.79
57	--	177.08	104.20	40.29	127.59
60	--	146.82	170.53	136.42	147.57
63	--	112.22	193.50	206.26	124.52
66	--	73.15	155.21	192.47	104.54
69	--	44.30	80.54	126.57	69.95
72	--	26.79	50.44	101.36	52.27
75	--	21.35	25.25	46.94	26.14
78	--	5.89	16.56	36.63	14.61
81	--	3.40	13.76	14.36	--
84	--	9.22	5.08	8.04	23.06
87	--	3.07	3.90	7.02	--
90	--	1.33	1.24	3.67	--
93	--	1.01	1.34	1.33	--
96	--	--	0.67	1.33	14.61
99	--	--	0.70	1.33	--
102	--	--	0.88	--	--
SNPT	1000	1000	1000	1000	1000
AL	63.5	20.4	59.4	56.5	60.2
ALMF					
AW	2.42	0.07	1.96	1.67	2.07
N	8	3	2	14	15
SLF	587	183	79	1093	1227

Table 6. Length composition (0/000) of Atlantic cod from Canadian commercial landings in NAFO Division 3L in 2020. SNPT= Sum of number per 1000 (should equal 1000). AL= Average length within length frequency. ALMF= Average length of Males/Females. AW=average weight of fish within length frequency. N= number of length frequencies. SLF= number of fish measured in length frequencies.

Length	Aug
54	2.94
57	16.40
60	52.68
63	94.65
66	162.58
69	172.67
72	140.86
75	153.80
78	78.77
81	39.22
84	37.16
87	23.85
90	9.24
93	7.13
96	7.31
99	0.75
SNPT	1000
AL	69.3
ALMF	
AW	3.14
N	4
SLF	541

Table 7. Length composition (0/000) of Atlantic cod from Canadian commercial landings in NAFO Division 3Ps in 2020. SNPT= Sum of number per 1000 (should equal 1000). AL= Average length within length frequency. ALMF= Average length of Males/Females. AW=average weight of fish within length frequency. N= number of length frequencies. SLF= number of fish measured in length frequencies.

Length	Feb	Jan	Jul	Nov	Jun
42	0.59	0.41	2.53	1.30	--
45	0.59	1.96	5.06	7.81	--
48	27.59	22.64	8.10	6.50	28.88
51	40.08	45.54	9.04	33.12	15.53
54	63.63	83.31	35.73	55.94	29.13
57	102.67	115.74	132.75	95.35	91.42
60	147.80	128.71	144.87	144.20	188.66
63	100.44	126.76	238.03	186.17	220.78
66	78.01	99.89	164.93	203.51	157.72
69	72.17	75.92	92.67	126.66	136.85
72	37.10	39.07	50.29	75.94	44.15
75	31.82	27.39	29.33	34.09	34.70
78	25.10	29.40	12.01	15.61	19.42
81	29.62	18.54	13.73	6.62	5.18
84	22.37	25.69	27.30	2.40	4.53
87	38.28	33.41	16.29	1.79	4.53
90	38.48	41.50	2.53	1.60	--
93	32.45	30.65	2.09	0.70	4.53
96	36.02	18.87	5.06	--	13.99
99	24.96	12.25	2.09	0.70	--
102	14.26	8.86	--	--	--
105	7.98	5.80	--	--	--
108	6.18	2.14	3.47	--	--
111	7.38	2.85	2.09	--	--
114	3.59	1.14	--	--	--
117	5.03	1.57	--	--	--
120	3.43	--	--	--	--
123	1.18	--	--	--	--
126	1.18	--	--	--	--
SNPT	1000	1000	1000	1000	1000
AL	68.6	65.8	63	62.4	61.8
ALMF					
AW	3.37	2.86	2.34	2.24	2.23
N	10	15	6	3	4
SLF	1764	3061	354	181	1102

Table 8. Length composition (0/000) of Greenland halibut from Canadian commercial landings in NAFO Division 2J in 2020. SNPT= Sum of number per 1000 (should equal 1000). AL= Average length within length frequency. ALMF= Average length of Males/Females. AW=average weight of fish within length frequency. N= number of length frequencies. SLF= number of fish measured in length frequencies.

Length	Apr	Feb	Jan	Mar	Jun	Jul
10	40.04	0.11	0.66	0.09	--	--
12	400.46	0.90	6.99	0.29	--	--
14	413.89	0.84	8.44	0.03	--	--
16	24.72	0.17	4.00	--	--	--
18	23.24	0.39	27.35	0.03	--	--
20	50.31	1.12	25.57	0.04	--	--
22	23.24	2.02	7.57	0.02	--	--
24	--	0.62	8.46	0.01	--	--
26	13.23	0.79	12.09	0.01	--	--
28	6.18	1.24	5.29	--	--	--
30	2.35	0.17	0.66	2.61	--	--
32	2.35	0.11	0.36	0.30	--	--
34	--	1.66	0.76	3.09	--	--
36	--	5.80	1.41	6.57	--	--
38	--	8.39	4.55	17.95	4.95	--
40	--	16.11	7.21	23.79	22.50	10.31
42	--	24.41	17.00	43.83	59.40	42.57
44	--	36.68	27.32	62.20	71.37	42.63
46	--	66.62	43.70	92.51	157.13	154.73
48	--	83.88	56.97	113.43	199.86	168.81
50	--	103.20	87.38	102.84	123.79	153.60
52	--	127.67	105.93	96.45	100.68	80.03
54	--	110.07	131.83	104.52	70.11	105.77
56	--	116.82	101.53	82.34	50.02	74.84
58	--	92.97	81.64	73.77	42.88	31.05
60	--	64.53	59.50	46.76	37.46	34.89
62	--	42.48	50.45	32.26	17.70	38.73
64	--	30.85	36.36	30.48	15.53	25.82
66	--	21.12	24.58	21.04	11.98	2.60
68	--	14.26	12.53	10.06	2.93	21.98
70	--	6.45	10.20	10.52	5.37	6.47
72	--	6.78	7.03	6.70	3.71	2.57
74	--	3.38	5.26	3.93	0.97	1.30
76	--	3.01	7.07	3.54	--	1.30
78	--	1.62	5.45	2.09	0.51	--
80	--	0.33	3.08	1.40	0.68	--
82	--	--	0.36	0.97	0.46	--
84	--	1.31	0.69	1.43	--	--

Length	Apr	Feb	Jan	Mar	Jun	Jul
86	--	--	0.49	1.38	--	--
88	--	0.70	0.71	--	--	--
90	--	0.42	0.49	0.34	--	--
92	--	--	0.58	--	--	--
94	--	--	0.49	--	--	--
98	--	--	--	0.40	--	--
SNPT	1000	1000	1000	1000	1000	1000
AL	12.5	51.9	49.9	50	48.7	50.8
ALMF						
AW	0.02	1.21	1.19	1.14	1.05	1.19
N	2	8	11	2	10	11
SLF	321	1939	2554	522	2664	2357

Table 9. Length composition (0/000) of Greenland halibut from Canadian commercial landings in NAFO Division 3K in 2020. SNPT= Sum of number per 1000 (should equal 1000). AL= Average length within length frequency. ALMF= Average length of Males/Females. AW=average weight of fish within length frequency. N= number of length frequencies. SLF= number of fish measured in length frequencies.

Length	Feb	Aug
12	122.58	--
14	83.87	30.96
16	25.81	74.52
18	38.71	41.03
20	135.48	8.71
22	206.45	17.22
24	64.52	18.82
26	64.52	6.39
28	154.84	3.63
30	45.16	1.88
32	51.61	3.11
34	6.45	0.22
46	--	2.06
48	--	11.68
50	--	28.47
52	--	36.47
54	--	55.91
56	--	64.71
58	--	81.12
60	--	100.51
62	--	81.97
64	--	84.46
66	--	74.99
68	--	43.81
70	--	40.88
72	--	23.17
74	--	17.36
76	--	9.44
78	--	7.91
80	--	7.87
82	--	5.64
84	--	7.79
86	--	2.06
90	--	2.39
92	--	0.42
94	--	1.20
100	--	1.20

Length	Feb	Aug
SNPT	1000	1000
AL	51.6	20.3
ALMF		
AW	1.38	0.08
N	6	1
SLF	1583	155

Table 10. Length composition (0/000) of Greenland halibut from Canadian commercial landings in NAFO Division 3L in 2020. SNPT= Sum of number per 1000 (should equal 1000). AL= Average length within length frequency. ALMF= Average length of Males/Females. AW=average weight of fish within length frequency. N= number of length frequencies. SLF= number of fish measured in length frequencies.

Length	Aug	Sep
48	3.79	--
50	--	3.40
52	8.03	2.77
54	3.79	8.95
56	20.74	18.88
58	35.47	14.50
60	24.09	32.25
62	39.27	62.95
64	88.33	66.26
66	97.69	64.54
68	143.22	120.49
70	106.42	117.90
72	129.81	110.61
74	103.95	107.74
76	72.27	92.82
78	32.56	32.38
80	15.62	34.18
82	24.98	26.67
84	12.27	20.94
86	8.03	30.26
88	12.71	3.22
90	4.24	12.17
92	--	7.79
94	4.24	5.55
96	4.24	2.77
98	4.24	--
SNPT	1000	1000
AL	68.5	69.6
ALMF		
AW	2.96	3.18
N	2	3
SLF	249	383

Table 11. Length composition (0/000) of redfish from Canadian commercial landings in NAFO Division 2J in 2020. SNPT= Sum of number per 1000 (should equal 1000). AL= Average length within length frequency. ALMF= Average length of Males/Females. AW=average weight of fish within length frequency. N= number of length frequencies. SLF= number of fish measured in length frequencies.

Length	Apr	Feb	Jan	Mar
5	1.69	3.83	1.93	90.28
6	38.79	34.48	23.12	631.94
7	232.43	609.20	564.55	194.44
8	616.85	275.86	383.43	--
9	94.70	11.49	23.12	6.94
10	1.03	3.83	1.93	--
11	0.68	3.83	1.93	--
12	1.47	3.83	--	--
13	2.06	11.49	--	20.83
14	2.49	3.83	--	6.94
15	5.34	15.33	--	41.67
16	1.42	3.83	--	6.94
17	0.34	11.49	--	--
18	0.69	3.83	--	--
19	--	3.83	--	--
SNPT	1000	1000	1000	1000
AL	7.9	7.8	7.4	6.8
ALMF				
AW	0.01	0.01	0	0.01
N	5	1	2	1
SLF	1135	261	519	144

Table 12. Length composition (0/000) of redfish from Canadian commercial landings in NAFO Division 3K in 2020. SNPT= Sum of number per 1000 (should equal 1000). AL= Average length within length frequency. ALMF= Average length of Males/Females. AW=average weight of fish within length frequency. N= number of length frequencies. SLF= number of fish measured in length frequencies.

Length	Feb
5	11.36
6	75.76
7	492.42
8	246.21
9	7.58
10	3.79
11	15.15
12	18.94
13	18.94
14	41.67
15	7.58
16	26.52
17	22.73
18	3.79
19	7.58
SNPT	1000
AL	8.4
ALMF	
AW	0.01
N	1
SLF	264

Table 13. Length composition (0/000) of redfish from Canadian commercial landings in NAFO Division 3Ps in 2020. SNPT= Sum of number per 1000 (should equal 1000). AL= Average length within length frequency. ALMF= Average length of Males/Females. AW=average weight of fish within length frequency. N= number of length frequencies. SLF= number of fish measured in length frequencies.

Length	Jan	Feb
19	4.47	--
20	4.41	--
21	16.84	7.72
22	27.46	34.75
23	42.78	100.39
24	61.44	196.91
25	74.30	158.30
26	84.73	115.83
27	99.25	96.53
28	115.87	88.80
29	113.25	69.50
30	75.84	54.05
31	56.91	34.75
32	46.72	11.58
33	47.93	3.86
34	43.02	7.72
35	27.82	3.86
36	23.66	3.86
37	7.70	3.86
38	8.09	7.72
39	4.26	--
40	4.92	--
41	5.13	--
42	0.63	--
48	0.63	--
53	1.92	--
SNPT	1000	1000
AL	26.2	28.6
ALMF		
AW	0.27	0.37
N	1	4
SLF	259	1186

Table 14. Length composition (0/000) of white hake from Canadian commercial landings in NAFO Division 3Ps in 2020. SNPT= Sum of number per 1000 (should equal 1000). AL= Average length within length frequency. ALMF= Average length of Males/Females. AW=average weight of fish within length frequency. N= number of length frequencies. SLF= number of fish measured in length frequencies.

Length	Jan
59	142.86
61	142.86
63	142.86
64	285.71
66	142.86
67	142.86
SNPT	1000
AL	63.4
ALMF	
AW	2.27
N	1
SLF	7

Table 15. Length composition (0/000) of witch flounder from Canadian commercial landings in NAFO Division 3O in 2020. SNPT= Sum of number per 1000 (should equal 1000). AL= Average length within length frequency. ALMF= Average length of Males/Females. AW=average weight of fish within length frequency. N= number of length frequencies. SLF= number of fish measured in length frequencies.

Length	Mar
32	2.18
34	5.51
36	32.65
38	133.46
40	217.09
42	276.73
44	184.75
46	113.24
48	29.82
50	2.72
52	1.38
54	0.48
SNPT	1000
AL	40.3
ALMF	
AW	0.42
N	12
SLF	3339

Table 16. Length composition (0/000) of witch flounder from Canadian commercial landings in NAFO Division 3Ps in 2020. SNPT= Sum of number per 1000 (should equal 1000). AL= Average length within length frequency. ALMF= Average length of Males/Females. AW=average weight of fish within length frequency. N= number of length frequencies. SLF= number of fish measured in length frequencies.

Length	Feb
34	6.41
36	19.23
38	96.15
40	173.08
42	266.03
44	179.49
46	141.03
48	70.51
50	19.23
52	25.64
54	3.21
SNPT	1000
AL	41.4
ALMF	
AW	0.53
N	1
SLF	312

Table 17. Length composition (0/000) of yellowtail flounder from Canadian commercial landings in NAFO Division 3N in 2020. SNPT= Sum of number per 1000 (should equal 1000). AL= Average length within length frequency. ALMF= Average length of Males/Females. AW=average weight of fish within length frequency. N= number of length frequencies. SLF= number of fish measured in length frequencies.

Length	Feb	Jan	Apr	Mar
22	1.35	--	--	--
24	--	0.19	--	--
26	4.27	0.79	1.62	--
28	9.22	2.67	6.74	--
30	24.16	21.40	30.64	--
32	54.13	54.53	95.70	9.49
34	168.90	175.40	181.13	65.15
36	208.61	254.43	228.31	228.65
38	235.27	258.29	208.78	263.21
40	167.32	146.22	128.66	224.73
42	76.79	60.95	62.07	124.38
44	30.62	17.90	33.14	48.32
46	11.25	6.18	16.69	22.18
48	4.62	1.04	4.60	6.51
50	2.58	--	1.75	5.29
52	0.42	--	0.18	--
54	0.49	--	--	2.09
SNPT	1000	1000	1000	1000
AL	35.3	35.7	35.5	37.3
ALMF				
AW	0.39	0.4	0.39	0.46
N	35	9	20	10
SLF	9197	2229	4521	761

Table 18. Length composition (0/000) of yellowtail flounder from Canadian commercial landings in NAFO Division 3O in 2020. SNPT= Sum of number per 1000 (should equal 1000). AL= Average length within length frequency. ALMF= Average length of Males/Females. AW=average weight of fish within length frequency. N= number of length frequencies. SLF= number of fish measured in length frequencies.

Length	Feb
34	52.63
36	210.53
38	289.47
40	263.16
42	157.90
44	26.32
SNPT	1000
AL	37.2
ALMF	
AW	0.46
N	1
SLF	38