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Greenland halibut (*Reinhardtius hippoglossoides*) in NAFO Subarea 2 and Divisions 3KLMNO: stock trends based on annual Canadian research vessel survey results

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Abstract

An overview of survey results for Greenland Halibut from Canadian spring and fall surveys through 2020 is provided. The biomass index from the Canadian fall survey of Divs. 2J3K declined between 2014-2017 and appears to have stabilized near the time series low observed in 1992. The abundance index declined in 2012 and has since remained below the series average. Abundance and biomass indices from the Canadian spring surveys in Divs. 3LNO declined from relatively high values in the late 1990s and have remained relatively low, with some signs of improvement in recent years. The spring survey in 2006, 2015 and 2017 are not presented as they are not considered representative of the stock due to missed strata, and the index was not available for 2020 as the spring survey was not conducted due to the COVID-19 pandemic. Abundance and biomass indices from the Canadian fall surveys in Divs. 3LNO have been increasing since 2015; the abundance index has increased above levels observed between 1999-2010 and the biomass index has reached levels near those observed between 2005-2008. Data from the fall survey are not presented for 2014 due to missing strata. An age-based recruitment signal (age 4) indicates that year class strength was below average between 2008-2014, however, there are signals of above average recruitment in 2019 and 2020 from the Divs. 3LNO. A length-based recruitment signal (< 30 cm class) indicates a similar pattern, showing signs of improved recruitment in Divs. 3LNO in recent years.

Introduction

Greenland halibut are widely distributed throughout the waters adjacent to Labrador and eastern Newfoundland. Since 2011 the stock has been managed using harvest control rule tested by management strategy evaluation. The first rule was used from 2011-2016, and the current rule has been in place since 2017. This harvest control rule is based on five survey indices, three of which (Canada Fall 2J3K, Canada Fall 3LNO, and Canada Spring 3LNO) are updated here. Specifically, details of the stratified estimates of abundance and biomass from the Canadian surveys conducted up to and including 2020 are provided.

Methods

Canadian Research Vessel Surveys

The current survey design is stratified random, with the survey area stratified by depth in each NAFO division. The number of survey sets allocated to each stratum is proportional to the area of that stratum, with at least two sets in each survey stratum. A Campelen 1800 shrimp-trawl with a 44 mm codend mesh size and 12.7 mm liner is towed for 15 minutes at a speed of 3.0 knots after bottom-contact is established. The gear geometry is monitored constantly throughout each tow using net-mounted sensors. McCallum and Walsh (**1996**) provide further technical specifications of the Campelen 1800 survey trawl (as well as previous trawls employed in Canadian surveys).

Survey Coverage and Timing

There have been a number of years recently where surveys have been incomplete and are not considered to be representative. These have been mainly due to mechanical issues with the survey vessels. In the fall 2J3K survey, 2008 was incomplete and is not included in the series. For spring 3LNO, 2006, 2015 and 2017 were all incomplete. The fall survey index for 3LNO was not completed in 2014. In addition, decisions to eliminate deep water coverage in 3NO from the survey in order to have sufficient time to complete the survey in other areas and the lack of time to cover the deepwater in 3L in 6 of the last 10 years, means that this index can only be produced to 730 m, limiting the usefulness of this index for this species. Survey coverage in 2H has been too variable to include this area as an index. There have also been reductions in coverage in some years. For example, in 2014, major mechanical issues with the spring survey vessel required an *a priori* reduction of 46 sets (primarily from Divisions 3NO) as well as the deployment of our second research vessel. See Rideout et al. (**2021**) for more details on survey coverage. Finally, the spring survey of 3LNO was not conducted in 2020 because of the COVID-19 pandemic.

Trends in Stock Size

Survey estimates of abundance and biomass and mean numbers and weights per tow are computed using standard stratified estimators. Approximate confidence intervals (95%) are provided for the stratified mean number and weight per tow; computational details can be found in Smith and Somerton (**1981**). Note that there are some instances when the lower confidence bounds of these indices are negative. This is a consequence of violating the distributional assumptions used to produce these confidence intervals. This result commonly arises when a limited number of large catches are taken by the survey.

For the age-disaggregated results in Divisions 2J3K combined, otoliths from Divisions 2J and 3K only were applied. Likewise, to produce survey results at-age from spring and fall surveys of Div. 3LNO, an age-length key from all samples in Divisions 3LNO in each season were used. Recent work (**Dwyer et al., 2013**; **Treble et al., 2008**) suggest that current aging techniques - reading of whole otoliths - likely underestimates the age of individuals of length > 60 cm. This corresponds to a whole otolith age of about 10 years old. Therefore the age-disaggregated results for fish older than 9 years old are likely to be biased, and multiple cohorts may be within the assigned ages; stratified estimates are therefore aggregated for ages 10+. Considerable efforts continue to be directed towards improving methodologies and results; and to incorporate these methods into current aging protocols (see **Albert et al., 2008**; **Dwyer et al., 2013**; **ICES, 2011**).

Results and Discussion

Trends in Stock Size

Figure 1 shows the area covered by Canadian surveys. Healey et al. (**2012**) also provide illustrations of the current survey stratification scheme used in Canadian surveys.

The biomass index from the Canadian fall survey of Divs. 2J3K increased from 2010 to 2014 to reach the highest levels of the time series, but has declined since then, stabalizing near the time-series low of 1992 (Figure 2). The abundance index declined in 2012 and has since been at this lower level, below the series average.

Abundance and biomass indices from the Canadian spring surveys in Div. 3LNO (Figure 3) declined from relatively high values in the late 1990s and has been lower in most years thereafter. In 2013, 2014, and 2016, both abundance and biomass were below the time-series average. The survey in 2006, 2015 and 2017 are not presented as they are not considered representative of the stock due to missed strata, and the index was not available for 2020 since the spring survey was not conducted because of the COVID-19 pandemic. Abundance and biomass indices from 2018 and 2019 are higher than 2016 levels.

The abundance index from the Canadian fall surveys in Div. 3LNO (Figure 4) declined from relatively high values in the late 1990s. The biomass index declined from 1998 to 2002 and then increased to 2005, to a level near that of the beginning of the time series. There has been some increase in both abundance and biomass since 2015; the abundance index has increased above levels observed between 1999-2010 and the biomass index has reached levels near those between 2005-2008.

While there are some parallel trends in the biomass indices from the three Canadian surveys, the overall trend since 2007 is unclear (Figure 5).

Age and Size Composition

Annual stratified mean number per tow at age compositions from the Divisions 2J and 3K combined time series from are presented in Table 3 and trends are shown in Figure 6. Indices for ages 6-9, have declined since 2014 and all are are currently below the time-series average, except the age 9 index from 2020. Indices for ages 3-5 generally increased between 2016-2019, but values from 2020 are below the time series average.

Age compositions for the Div 3LNO combined spring series (Table 4; Figure 6) demonstrate that in most years, younger age groups (ages 1-4) are typically most abundant in this survey. Larger, older fish are generally found in depths greater than those covered by the spring survey (732m). The total abundance over ages 1-4 has been low since the good year classes of the mid 1990s. The surveys in 2006, 2015 and 2017 are not presented as they are not considered representative of the stock due to missed strata, and the index was not available for 2020 since the spring survey was not conducted because of the COVID-19 pandemic.

Age compositions for the Div. 3LNO combined fall series (Table 5; Figure 6) show that there are few fish older than age 8 in this survey which, like the spring survey, is presented only to 730 m in depth. Like the fall survey of 2J3K, indices for ages 3-5 have increased in recent years; however, unlike 2J3K, increases continued through to 2020. The survey in 2014 is not presented as it is not considered representative of the stock due to missed strata.

Treating age 4 as an index of recruitment, there have been some signs of improved year class strength in recent years; estimates from 2019 are near the time-series average, following a series of below average years (2008-2014; Figure 7). Indices from 2020 are mixed, where signals from the fall 3LNO index are positive and those from 2J3K are negative.

Figure 8 shows trends in mean numbers per tow for Greenland halibut <30 cm, between 31-69 cm and ≥ 70 cm over 1996-2020. The value of 30 cm was chosen as it is approximately equal to the mean length at age 4 for Greenland halibut surveyed in Divisions 2J and 3K; it represents the pre-recruitment trend. The value of 70 cm was chosen because it is considered to be an approximation of the length at 50% maturity in female Greenland halibut.

The recruitment signal (< 30cm class) from 2J3K appears to be relatively low and stable between 2012-2020. The MNPT values for the 30-69 cm group increased fairly steadily from 2010 to 2013 as the higher numbers of fish in the <30 cm size class in 2009-2011 grew. The number in the 30-69 cm size group has been declining since 2013. Although the magnitude of the indices for the ≥ 70 cm class is small compared to the other size classes, the abundance of this size class has increased beyond levels observed in the late 1990s. Trends in 3LNO are less clear, especially for the largest size class (≥ 70 cm). The < 30 cm and 30-69 cm indices appear to have

increased since 2015, but the 30-69 cm class remains at relatively low levels; however, there are some signs of improvement from the fall 2020 index.

Distribution

The distribution of Greenland halibut biomass by depth is given in Tables 6-13. These tables also give an overview of the survey coverage in each year. In the fall survey in Div. 2J most of the biomass is found in 200-750 m depth. The main distribution has a narrower depth range in Div. 3K, with the bulk of the biomass being found between 300 and 500 m. In Div. 3L in the spring the bulk of the biomass in most years is in 275-731 m. From 2005-2007 there was also a significant biomass in 184-274 m. In most years in the spring survey in Div. 3N the bulk of the biomass is found between 367 and 731 m. In the spring survey in Div. 3O Greenland halibut distribution is more variable from year to year. In general there are two peaks of distribution, the first between 93 and 274 m and the second in the deepest strata surveyed from 550-731 m. The deepest strata are not surveyed in the spring and the presence of a large proportion of the biomass in the 550-731 m depth range in each of the Divisions indicates that there are fish deeper than the survey. Note that the spring surveys in 2006 and 2015 are not considered to be representative of the stock and are not presented in the tables. The bulk of the biomass in Div. 3L in the fall in most years is in the depth range of 184-366 m, shallower than in the spring. In Div. 3N in the fall most of the biomass is distributed in depths greater than 275 m, with substantial biomass in the deepest strata in many years, indicating the distribution of fish deeper than the survey. In Div. 3O in the fall the bulk of the biomass is often in the deepest strata covered.

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References

Albert, O. T., Kvalsund, M., Vollen, T., and Salberg, A.-B. (2008). Towards accurate age determination of Greenland halibut. *Journal of Northwest Atlantic Fishery Science*, *40*.

Dwyer, K., Campana, S., and Treble, M. (2013). Bomb radiocarbon dating of Greenland halibut otoliths in the Northwest Atlantic: where do we go from here? *NAFO SCR Doc.*, *13/45*. **https://www.nafo.int/Portals/0/PDFs/sc/2013/scr13-045.pdf**

Healey, B., Brodie, W., Ings, D., and Power, D. (2012). Performance and description of canadian multi-species surveys in NAFO subarea 2+ divisions 3KLMNO, with emphasis on 2009-2011. *NAFO SCR Doc.*, *12/19*. **https://www.nafo.int/Portals/0/PDFs/sc/2012/scr12-019.pdf**

ICES. (2011). Report of the Workshop on Age Reading of Greenland Halibut (WKARGH), 14–17 February 2011, Vigo, Spain. *ICES Document CM 2011/ACOM: 41*, 39.

McCallum, B. R., and Walsh, S. J. (1996). Groundfish survey trawls used at the Northwest Atlantic Fisheries Centre, 1971-present. *NAFO SCR Doc.*, *96/50*. **https://archive.nafo.int/open/sc/1996/SCR-96-050.PDF**

Rideout, R. M., Ings, D. W., and M., K.-A. (2021). Temporal And Spatial Coverage Of Canadian (Newfoundland And Labrador Region) Spring And Autumn Multi-Species RV Bottom Trawl Surveys, With An Emphasis On Surveys Conducted In 2020. *NAFO SCR Doc*, *20/004*. **https://www.nafo.int/Portals/0/PDFs/sc/2021/scr21-004.pdf**

Smith, S., and Somerton, G. (1981). *STRAP: A User-Oriented Computer Analysis System for Groundfish Research Trawl Survey Data* (p. 66). Canadian Technical Report of Fisheries; Aquatic Sciences No. 1030.

Treble, M. A., Campana, S. E., Wastle, R. J., Jones, C. M., and Boje, J. (2008). Growth analysis and age validation of a deepwater Arctic fish, the Greenland halibut (*Reinhardtius hippoglossoides*). *Canadian Journal of Fisheries and Aquatic Sciences*, *65*(6), 1047–1059.

Tables

Table 1. Summary of successful sets in autumn surveys in NAFO Subarea 2 and Divisions 3KLMNO in 2020. Number of sets by division and ship are given with depth range in parentheses. All sets conducted in the survey are included.

Division	Vessel				Total
	Teleost		*A. Needler*		
2G					0
2H			39	(107-634)	39
2J			91	(135-1415)	91
3K	69	(139-949)	56	(181-1386)	125
3L	105	(63-670)			105
3N	52	(46-609)			52
3O	60	(66-634)			60
					472

Table 2. Stratified estimates of mean weight per tow (kg) from Canadian research vessel surveys.

Year	Canada Fall 2J3K	Canada Fall 3LNO	Canada Spring 3LNO
1996	21.6	2.5	1.5
1997	24.8	2.8	2.5
1998	23.8	4.0	4.6
1999	32.5	2.8	2.8
2000	24.0	2.4	3.0
2001	22.7	2.0	1.5
2002	14.1	1.4	0.7
2003	15.3	1.6	1.5
2004	17.5	2.0	1.1
2005	20.3	2.7	1.7
2006	25.7	2.4	
2007	29.1	2.4	3.0
2008		2.9	2.1
2009	19.9	1.6	0.7
2010	19.5	1.7	1.7
2011	26.7	2.2	1.0
2012	23.5	1.7	1.9
2013	29.6	2.6	0.7
2014	33.3		0.7
2015	22.3	0.9	
2016	18.5	1.3	0.7
2017	15.1	1.2	
2018	17.1	1.9	1.9
2019	16.3	1.9	1.4
2020	15.8	2.7	

Table 3. Greenland halibut stratified mean number per tow at age from Canadian fall surveys conducted in Divisions 2J and 3K. Only otoliths collected in Div. 2J or 3K are used in the analysis.

Year	0	1	2	3	4	5	6	7	8	9	10+
1996	4.9	98.7	47.8	32.0	9.5	6.3	2.5	0.8	0.2	0.2	0.1
1997	2.2	28.0	58.6	43.6	21.1	10.4	5.0	2.0	0.6	0.2	0.1
1998	1.5	23.3	25.1	31.2	21.9	10.9	4.5	2.1	0.6	0.1	0.1
1999	6.5	16.0	34.4	24.1	28.3	20.0	10.5	3.8	0.7	0.1	0.1
2000	3.1	37.1	21.6	16.3	13.3	13.9	7.3	2.2	0.5	0.1	0.1
2001	8.5	43.9	22.7	17.0	14.1	9.8	7.6	3.4	0.7	0.1	0.1
2002	8.3	40.7	24.1	12.5	9.7	6.0	2.0	0.7	0.2	0.0	0.0
2003	9.9	45.7	26.7	11.7	9.5	6.4	2.3	0.9	0.3	0.0	0.0
2004	4.2	32.5	32.9	13.9	12.3	9.2	2.7	1.2	0.4	0.1	0.1
2005	5.1	16.1	16.2	8.6	13.8	11.0	6.8	4.0	0.7	0.1	0.1
2006	3.7	32.3	18.0	8.5	17.6	13.0	9.1	4.2	1.2	0.2	0.1
2007	2.2	32.6	14.5	12.8	18.8	9.6	10.3	6.2	2.1	0.3	0.2
2008											
2009	5.5	50.6	19.1	11.4	8.4	9.9	5.4	3.6	1.4	0.2	0.1
2010	19.3	46.4	36.5	14.8	9.5	6.7	3.8	2.2	1.0	0.2	0.1
2011	4.8	43.8	41.9	21.0	18.8	10.3	5.5	3.2	1.3	0.3	0.2
2012	5.2	12.3	9.6	11.3	11.9	11.0	9.0	4.3	1.7	0.3	0.2
2013	2.8	24.6	12.7	6.9	7.5	10.8	9.1	7.8	3.9	0.5	0.2
2014	3.1	22.1	30.4	11.4	4.5	8.0	7.4	8.9	6.6	1.0	0.3
2015	0.5	17.2	14.0	15.1	7.8	6.8	4.2	3.9	3.9	0.6	0.2
2016	10.6	29.7	19.5	10.8	8.2	4.8	4.9	3.0	2.1	0.5	0.2
2017	6.4	30.6	22.7	10.2	8.8	5.7	2.6	1.3	1.0	0.4	0.2
2018	1.7	14.0	15.5	18.4	9.0	7.0	5.0	2.2	1.0	0.5	0.2
2019	26.6	16.5	19.5	19.2	12.1	8.8	3.6	1.4	0.4	0.2	0.1
2020	3.6	24.4	25.3	13.5	8.3	6.2	4.3	1.3	0.6	0.3	0.3

Table 4. Greenland halibut stratified mean number per tow at age from Canadian spring surveys conducted in Div. 3LNO. Only otoliths collected in Div. 3L, 3N, or 3O are used in the analysis.

Year	0	1	2	3	4	5	6	7	8	9	10+
1996	0.0	1.6	4.2	4.6	2.2	0.8	0.3	0.1	0.0	0.0	0.0
1997	0.0	1.2	3.9	5.2	3.2	1.5	0.5	0.1	0.0	0.0	0.0
1998	0.0	0.2	0.8	3.9	6.2	5.0	1.2	0.3	0.1	0.0	0.0
1999	0.0	0.3	0.6	1.2	2.0	3.4	1.1	0.2	0.0	0.0	0.0
2000	0.0	0.8	1.1	1.1	1.5	2.0	2.0	0.6	0.0	0.0	0.0
2001	0.0	0.6	0.7	0.7	0.7	0.8	0.7	0.3	0.0	0.0	0.0
2002	0.0	0.6	0.6	0.6	0.6	0.6	0.2	0.0	0.0	0.0	0.0
2003	0.0	0.9	2.1	1.7	1.6	1.1	0.2	0.1	0.0	0.0	0.0
2004	0.0	0.7	0.6	1.2	1.2	1.2	0.3	0.0	0.0	0.0	0.0
2005	0.0	0.4	0.3	1.1	0.9	1.4	0.8	0.2	0.0	0.0	0.0
2006											
2007	0.0	1.6	0.5	0.8	0.4	1.4	1.5	1.1	0.2	0.0	0.0
2008	0.0	0.4	0.8	1.0	0.7	1.3	0.8	0.6	0.3	0.0	0.0
2009	0.0	0.3	0.2	0.2	0.4	0.5	0.3	0.1	0.1	0.0	0.0
2010	0.0	0.8	0.7	0.5	0.4	0.8	1.1	0.4	0.1	0.0	0.0
2011	0.0	2.0	1.4	0.9	0.6	0.6	0.3	0.2	0.1	0.0	0.0
2012	0.0	0.3	0.8	2.5	1.4	1.2	0.5	0.2	0.1	0.0	0.0
2013	0.0	1.3	0.7	0.0	0.4	0.6	0.2	0.1	0.0	0.0	0.0
2014	0.0	1.6	1.2	0.3	0.2	0.2	0.2	0.1	0.1	0.0	0.0
2015											
2016	0.1	0.4	0.6	0.4	0.5	0.3	0.2	0.1	0.1	0.0	0.0
2017											
2018	0.0	3.1	4.5	1.8	1.3	0.9	0.6	0.1	0.1	0.0	0.0
2019	0.0	4.5	2.1	1.8	1.4	0.9	0.3	0.2	0.0	0.0	0.0
2020											

Table 5. Greenland halibut stratified mean number per tow at age from Canadian fall surveys conducted in Div. 3LNO. Only otoliths collected in Div. 3L, 3N, or 3O are used in the analysis.

Year	0	1	2	3	4	5	6	7	8	9	10+
1996	0.3	5.3	4.9	3.8	1.4	1.0	0.4	0.1	0.0	0.0	0.0
1997	0.2	1.2	3.3	4.5	3.6	1.9	0.5	0.1	0.0	0.0	0.0
1998	0.1	0.5	1.8	1.9	3.0	4.1	1.5	0.3	0.1	0.0	0.0
1999	0.2	0.0	0.6	0.7	1.0	2.0	1.7	0.4	0.0	0.0	0.0
2000	0.1	1.8	1.2	0.4	0.8	1.2	1.3	0.5	0.0	0.0	0.0
2001	0.5	1.4	0.6	0.7	1.4	0.7	1.1	0.6	0.0	0.0	0.0
2002	0.1	1.3	0.9	1.0	1.0	0.9	0.4	0.2	0.0	0.0	0.0
2003	0.2	1.8	1.1	1.5	1.9	0.9	0.3	0.0	0.0	0.0	0.0
2004	0.1	1.2	1.3	1.6	1.7	1.5	0.4	0.1	0.0	0.0	0.0
2005	0.1	0.6	0.9	0.5	1.8	1.6	1.1	0.6	0.1	0.0	0.0
2006	0.2	0.8	0.5	0.1	0.7	1.3	1.4	0.6	0.1	0.0	0.0
2007	0.1	0.8	0.5	0.3	0.8	0.6	1.2	0.7	0.2	0.0	0.0
2008	0.3	0.9	0.3	0.8	1.1	0.9	1.0	0.8	0.4	0.0	0.0
2009	0.2	2.1	0.2	0.4	0.5	0.9	0.6	0.3	0.1	0.0	0.0
2010	0.4	1.9	0.6	0.9	0.7	0.7	0.7	0.3	0.1	0.0	0.0
2011	0.3	1.3	4.1	1.2	2.0	0.9	0.7	0.3	0.1	0.0	0.0
2012	0.3	0.6	0.2	0.4	1.2	0.9	0.7	0.3	0.1	0.0	0.0
2013	0.1	2.8	1.0	0.4	0.4	1.0	1.1	0.6	0.3	0.0	0.0
2014											
2015	0.0	0.8	0.6	0.3	0.3	0.3	0.3	0.2	0.1	0.0	0.0
2016	1.0	1.3	0.4	0.6	0.5	0.6	0.4	0.2	0.1	0.0	0.0
2017	0.2	2.6	0.9	1.3	0.6	0.6	0.3	0.2	0.1	0.0	0.0
2018	0.0	3.1	1.8	1.6	0.9	1.1	0.7	0.2	0.1	0.0	0.0
2019	0.2	3.2	2.0	2.0	1.6	1.0	0.5	0.1	0.0	0.0	0.0
2020	0.0	4.7	2.6	1.5	2.0	1.5	0.8	0.2	0.1	0.0	0.0

Table 6. Biomass (tonnes) by stratum from Canadian fall survey in Div. 2J.

Depth Range (m)	Stratum	Area	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
98 - 200	201	633	82	26	91	0	65	27	133	11	135	50
	205	1594	514	35	502	532	281	863	754	706	1055	990
	206	1870	1120	403	349	403	357	1367	1586	890	813	1079
	207	2264	56	51	74	192	16	208	35	192	118	30
	237	733	1	4	19	320	0	5	42	3	0	37
	238	778	15	0	79	0	53	27	6	54	81	18
201 - 300	202	621	89	157	593	1685	574	2215	491	871	2260	898
	209	680	1059	424	282	2204	694	291	1061	1475	811	379
	210	1035	3904	893	1046	613	661	1140	3314	1861	626	285
	213	1583	1338	1145	1962	1426	893	2332	1336	1950	1163	1325
	214	1341	4056	1258	1502	1883	1203	1930	485	1337	2500	2520
	215	1302	1247	1448	1889	1986	1139	1967	3499	1360	1592	3091
	228	2196	5478	3666	4356	2566	2870	2803	1850	1175	2858	3626
	234	530	163	753	352	311	122	348	75	1237	54	1367
301 - 400	203	487	946	2233	3303	2553	2200	4090	1134	2846	6523	1792
	208	588	3707	12593	6479	11101	9423	5230	7812	2894	8453	5500
	211	251	1343	1875	870	3541	640	2964	2336	2016	2414	5397
	216	360	506	1089	1631	881	1103	1076	397	957	697	641
	222	450	1672	930	382	751	995	1151	1086	322	371	164
	229	536	3900	1940	2514	1206	1639	1591	1123	2335	439	728
401 - 500	204	288	3823	7941	6171	3707	4652	5240	1762	7283	8250	8979
	217	241	932	676	621	704	628	1983	458	395	433	1027
	223	158	438	425	598	505	244	346	419	179	699	424
	227	598	5850	9244	1793	13071	4890	4226	1316	6852	1325	6381
	235	414	4373	8365	3256	4183	3929	4170	4733	5739	1990	2852
	240	133	537	501	251	643	204	413	552	178	194	186
501 - 750	212	557	4940	10735	4375	14447	4366	3802	7126	4898	3595	4086
	218	362	1783	1207	1319	1019	690	1413	732	456	844	661
	224	228	702	625	401	293	701	360	130	205	356	538
	230	185	1350	1589	547	2230	786	568	560	383	356	242
	239	120	2586	2725	4866	4064	1959	1945	869	3470	3389	1776
751 - 1000	219	283	405	1727	2249	1401	1731	1297	621	1248	1156	374
	231	186	1013	651	1635	1744	2828	2820	1603	432	720	612
	236	193	698	381	725	1107	592	937	881	533	344	468
1001 - 1250	220	303	1296	503	1196	-	568	786	749	1480	1116	871
	225	195	835	693	655	478	175	1219	65	171	112	481
	232	228	717	935	627	1786	1062	1146	626	56	714	502
1251 - 1500	221	330	131	1246	692	567	401	268	654	124	166	249
	226	201	277	407	1313	626	400	368	243	756	217	217
	233	237	889	596	542	418	628	844	938	438	195	233

Table 6. Continued

Depth Range (m)	Stratum	Area	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
98 - 200	201	633	27	491	-	79	87	507	154	159	22	15
	205	1594	245	1769	-	469	630	1051	343	4504	860	856
	206	1870	403	617	-	384	2870	2184	587	1869	239	230
	207	2264	15	160	-	5	717	754	3570	207	239	1157
	237	733	0	280	-	0	111	-	5	96	0	10
	238	778	8	696	-	8	62	713	1	44	83	2
201 - 300	202	621	797	901	-	164	947	2996	2909	1711	7724	1557
	209	680	2560	1775	-	1204	790	1153	1115	223	3308	717
	210	1035	828	981	-	1397	1281	3088	2746	4573	3596	1289
	213	1583	3620	2343	-	952	1911	2730	2031	2704	2932	928
	214	1341	3241	2087	-	1631	1690	2633	2154	8797	2875	1302
	215	1302	1633	1920	-	2691	4767	1983	7065	2087	5366	2385
	228	2196	3389	3339	-	2473	1452	1735	1478	762	1589	525
	234	530	327	671	-	304	363	16749	1449	2987	583	463
301 - 400	203	487	2581	2064	-	4950	6055	13207	3089	12619	5620	5720
	208	588	20207	3983	-	4542	10744	11136	8229	31005	22176	7541
	211	251	3626	1353	-	1388	1752	3960	4575	2129	10983	6655
	216	360	1457	348	-	1192	1376	890	2534	1222	1781	416
	222	450	593	289	-	404	86	155	1252	2319	1317	230
	229	536	3408	625	-	1041	1552	360	188	1277	700	475
401 - 500	204	288	5950	2949	-	4711	5412	3633	8443	3548	6119	6035
	217	241	444	190	-	716	210	307	676	264	924	567
	223	158	475	224	-	116	135	91	367	212	323	333
	227	598	31416	4173	-	1043	4561	915	2293	1446	1875	912
	235	414	3286	3384	-	1387	2354	1218	3053	2694	10860	5100
	240	133	629	190	-	334	325	283	132	121	33	338
501 - 750	212	557	4734	6766	-	12166	7310	3818	4583	3677	3574	992
	218	362	731	237	-	1489	407	455	491	687	694	1686
	224	228	372	190	-	764	612	206	193	873	900	435
	230	185	629	502	-	1405	458	552	348	786	580	847
	239	120	3456	2219	-	2165	2337	1460	4572	2766	2086	3001
751 - 1000	219	283	761	1083	-	1703	687	1081	132	866	426	1678
	231	186	1561	1865	-	1284	433	924	468	625	667	273
	236	193	642	925	-	749	221	697	230	805	375	322
1001 - 1250	220	303	472	3420	-	353	374	480	306	154	495	805
	225	195	186	408	-	563	111	446	51	126	0	340
	232	228	300	1001	-	1276	440	374	32	267	367	281
1251 - 1500	221	330	17	469	-	488	725	237	192	34	472	1070
	226	201	334	185	-	326	96	138	54	91	132	104
	233	237	566	662	-	273	289	237	78	52	146	131

Table 6. Continued

Depth Range (m)	Stratum	Area	2016	2017	2018	2019	2020
98 - 200	201	633	109	84	89	280	446
	205	1594	692	771	599	934	1527
	206	1870	896	1120	677	250	1614
	207	2264	200	375	90	244	871
	237	733	129	83	18	47	163
	238	778	112	44	437	9	-
201 - 300	202	621	3611	671	747	1083	-
	209	680	1186	445	1895	485	272
	210	1035	432	1209	1187	1167	1538
	213	1583	932	259	34	60	731
	214	1341	1281	360	257	574	916
	215	1302	806	1172	1586	446	1107
	228	2196	515	274	227	138	588
	234	530	2062	357	279	473	2540
301 - 400	203	487	1818	2458	1513	982	2188
	208	588	516	1952	1502	1456	2041
	211	251	237	655	237	998	1616
	216	360	569	341	1214	169	110
	222	450	390	142	361	9	62
	229	536	147	146	241	207	32
401 - 500	204	288	5559	6023	4642	4205	3621
	217	241	505	220	155	641	218
	223	158	888	128	313	98	128
	227	598	865	2769	2571	403	2056
	235	414	6733	1138	191	1503	2831
	240	133	129	136	98	75	111
501 - 750	212	557	14686	2432	5483	1638	2229
	218	362	574	446	574	664	631
	224	228	815	233	395	258	538
	230	185	300	124	262	205	674
	239	120	5500	3093	3004	1476	2452
751 - 1000	219	283	1201	1555	2398	-	1129
	231	186	491	544	639	-	772
	236	193	561	388	768	-	1087
1001 - 1250	220	303	1466	615	1508	-	1351
	225	195	338	640	212	-	131
	232	228	1154	381	-	-	551
1251 - 1500	221	330	307	60	441	-	405
	226	201	122	623	216	-	315
	233	237	398	264	-	-	441

Table 7. Biomass (tonnes) by stratum from Canadian fall survey in Div. 3K.

Depth Range (m)	Stratum	Area	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
98 - 200	608	798	0	44	37	-	0	8	4	0	5	14
	612	445	0	135	0	-	1	0	38	0	0	2
	616	250	0	4	23	-	0	0	0	0	0	-
	618	1347	19	11	15	1	59	0	49	109	55	2
	619	1753	29	57	0	0	13	0	30	109	62	1
201 - 300	609	342	117	386	202	-	177	8	8	86	96	43
	611	600	113	-	-	-	-	-	-	-	-	-
	615	251	39	67	176	-	23	20	0	37	1	34
	620	2545	4213	1275	1171	1367	3389	992	1280	594	1012	794
	621	2537	3967	1320	2524	858	1495	113	1149	1870	1856	185
	624	1105	2516	1610	1752	1805	1186	2358	1027	257	1950	2825
	634	1555	2370	2144	1321	1933	1197	2195	1493	455	497	1930
	635	1274	1344	1545	1266	971	491	215	125	167	0	1052
	636	1455	2336	1171	1054	1002	1015	641	699	303	747	1138
	637	1132	1722	869	2008	1145	-	526	393	403	1095	983
	611	573	-	265	162	-	41	43	164	465	144	33
301 - 400	610	256	344	630	1638	-	1000	1924	183	796	483	521
	614	263	154	399	184	-	164	16	12	120	683	274
	617	593	2464	4941	3865	2919	2227	7873	1476	3044	3603	2680
	623	494	3588	1938	6167	3346	4322	5040	3698	1732	4159	1152
	625	888	4381	3075	3944	6783	3649	6294	917	649	6723	3701
	626	1113	5453	10283	9604	18305	3890	2111	3683	4768	6046	2328
	628	1085	1799	2685	3116	10764	5142	2763	719	1366	2837	4019
	629	495	6569	2179	6213	5900	4291	1429	622	354	518	3839
	630	332	4800	3261	1561	5114	3821	4474	1429	1226	1100	3012
	633	2067	3487	6739	4178	7634	3474	6544	3178	3528	2288	6802
	638	2059	3952	7031	8115	2400	4792	2534	1686	2512	3399	5441
	639	1463	1381	1556	1266	1183	2362	2114	1330	1120	1667	936
401 - 500	613	30	51	192	92	-	64	6	6	47	511	43
	622	691	6896	11901	10364	13165	10064	11830	4285	5965	12425	7972
	627	1255	15576	22176	25568	45497	42775	11732	11721	12754	18257	22914
	631	1321	25499	14500	13683	18514	23958	20494	15856	13580	8550	17898
	640	69	105	59	37	39	144	103	44	96	39	25
	645	216	192	162	75	114	446	253	242	140	180	186
	650	134	147	242	224	39	-	18	109	162	20	193
501 - 750	641	230	394	197	369	1020	-	558	62	602	192	151
	646	325	564	1180	158	84	436	811	205	323	239	122
	651	359	321	1361	1016	734	-	2603	899	754	199	508
751 - 1000	642	418	760	2036	2513	3081	2134	2677	892	1074	942	4877
	647	360	749	2025	2961	2191	2465	3228	1301	1503	819	4436
	652	516	3585	2575	4843	3246	2591	6162	1366	2990	2034	3554
1001 - 1250	643	733	2121	6830	5453	3480	1537	4660	2815	890	1865	2469
	648	228	1641	1118	1687	1552	624	2891	763	475	376	186
	653	531	2306	1643	3660	3927	3045	2514	477	933	668	542
1251 - 1500	644	474	870	2036	2845	1480	1917	2084	137	998	760	1082
	649	212	387	1083	282	681	622	908	174	1125	427	437
	654	479	1016	3612	4808	3358	2287	4953	252	973	981	1241

Table 7. Continued

Depth Range (m)	Stratum	Area	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
98 - 200	608	798	0	-	-	-	79	-	-	-	-	-
	612	445	0	-	-	-	65	-	-	1	-	-
	616	250	0	-	-	-	-	-	-	-	-	-
	618	1347	2	39	-	6	113	481	35	50	20	27
	619	1753	2	1	-	1	149	1855	98	40	22	28
201 - 300	609	342	67	-	-	42	135	-	-	-	-	-
	611	573	372	-	-	-	469	-	-	-	-	-
	615	251	22	-	-	-	222	-	-	323	-	-
	620	2545	906	673	-	2247	3829	13352	1187	3393	1874	1942
	621	2537	639	1221	-	1361	4305	14581	5218	4733	3353	3613
	624	1105	723	1112	-	451	852	2185	375	394	899	515
	634	1555	3313	2820	-	1808	770	912	1117	581	1438	633
	636	1455	1948	2052	-	487	360	429	299	1987	1031	602
	637	1132	1138	734	-	1442	323	1879	1186	740	1379	521
	635	1274	-	1008	-	431	428	658	962	1732	1053	657
301 - 400	610	256	241	-	-	-	2925	-	-	-	-	-
	614	263	303	-	-	-	256	-	-	2322	-	-
	617	593	6949	12226	-	1199	1811	8302	6474	7237	3067	6994
	623	494	591	2533	-	2496	3906	4008	8985	8145	1929	6448
	625	888	1394	3747	-	2479	2689	4128	3821	1648	9312	4417
	626	1113	5332	28371	-	6645	6899	5429	6165	19534	28639	3940
	628	1085	4444	5761	-	891	8831	2593	922	6370	2596	2489
	629	495	7928	5502	-	1846	537	1628	4396	774	8859	3757
	630	332	2633	2286	-	3146	1228	2660	4137	6418	5286	2037
	633	2067	7941	8104	-	2343	3587	2335	3688	856	881	981
	638	2059	2775	9432	-	4335	1272	3479	1513	5616	6950	2708
	639	1463	862	1830	-	1179	404	405	111	1024	864	650
401 - 500	613	30	72	-	-	-	59	-	-	195	-	-
	622	691	5578	12750	-	6792	5107	5238	23531	13563	17532	28859
	627	1255	21080	36798	-	23204	23619	28132	16741	29604	42129	22689
	631	1321	15925	20469	-	17306	11464	15341	20091	18444	17316	19111
	640	69	165	56	-	39	11	38	45	17	34	112
	645	216	387	123	-	151	107	372	137	78	80	208
	650	134	188	64	-	40	28	132	36	38	53	56
501 - 750	641	230	1382	329	-	993	1030	112	37	216	414	583
	646	325	291	717	-	134	514	251	129	331	298	712
	651	359	1104	1595	-	788	493	1118	474	1239	872	1213
751 - 1000	642	418	1962	1991	-	3535	1336	448	585	492	873	860
	647	360	1835	1434	-	2029	1135	1360	1312	1065	770	343
	652	516	1247	2807	-	2343	2480	1049	1293	674	1885	1369
1001 - 1250	643	733	5074	3120	-	1935	2059	288	1096	1060	2844	1294
	648	228	422	1274	-	1628	868	601	761	1105	258	632
	653	531	1344	1787	-	3309	654	703	84	557	1622	459
1251 - 1500	644	474	735	2436	-	2507	1158	1021	646	94	635	1046
	649	212	87	172	-	209	15	430	22	140	324	426
	654	479	773	1722	-	2253	911	1251	1261	881	653	612

Table 7. Continued

Depth Range (m)	Stratum	Area	2016	2017	2018	2019	2020
98 - 200	618	1347	134	136	11	227	268
	619	1753	125	87	28	383	285
201 - 300	620	2545	1620	2384	3296	928	2169
	621	2537	3192	4380	7332	3998	7592
	624	1105	193	484	48	211	328
	634	1555	695	1459	839	599	728
	635	1274	520	1036	2477	792	1540
	636	1455	175	1882	330	496	590
	637	1132	1115	1742	1125	708	702
301 - 400	617	593	504	545	1428	1365	3079
	623	494	4455	12999	5300	3000	4819
	625	888	836	873	6862	978	4885
	626	1113	11326	8768	12499	18545	14138
	628	1085	2829	2353	2080	2184	3488
	629	495	4471	422	1161	-	2631
	630	332	2309	1715	5589	6041	2234
	633	2067	1997	492	1590	88	1970
	638	2059	576	1718	522	1808	1327
	639	1463	469	1125	250	2	391
401 - 500	622	691	6211	15586	10590	10278	3764
	627	1255	14161	14968	16294	28816	12953
	631	1321	18571	5207	10117	12281	8123
	640	69	64	19	25	2	41
	645	216	206	243	139	-	43
	650	134	-	53	45	29	22
501 - 750	641	230	188	246	599	865	336
	646	325	632	382	289	-	382
	651	359	667	759	392	622	579
751 - 1000	642	418	1178	491	-	-	656
	647	360	1415	523	-	-	964
	652	516	1533	1214	-	-	346
1001 - 1250	643	733	2398	1583	-	-	1577
	648	228	1737	608	-	-	244
	653	531	1305	385	-	-	1043
1251 - 1500	644	474	1111	317	-	-	516
	649	212	1065	584	-	-	223
	654	479	-	325	-	-	754

Table 8. Biomass (tonnes) by stratum from Canadian spring survey in Div. 3N.

Depth Range (m)	Stratum	Area	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
34 - 55	375	1593	0	0	0	0	0	0	0	1	0	0
	376	1499	12	0	0	0	0	1	0	0	0	70
56 - 91	360	2992	19	349	130	471	183	23	0	0	71	62
	361	1853	0	0	1	0	0	4	0	0	0	0
	362	2520	0	0	0	0	0	0	0	0	0	0
	373	2520	0	0	0	0	0	0	0	0	0	0
	374	931	9	0	0	0	0	0	73	0	0	0
	383	674	0	0	0	0	0	0	0	0	0	0
92 - 183	359	421	145	133	31	165	96	19	0	2	4	133
	377	100	6	4	0	321	0	0	0	0	0	25
	382	647	0	0	76	0	20	0	0	0	1	356
184 - 274	358	225	259	677	413	458	46	17	29	118	51	27
	378	139	48	37	49	719	4	14	6	82	7	15
	381	182	178	90	10	217	33	7	0	41	0	92
275 - 366	357	164	57	82	375	17	4	43	0	13	134	26
	379	106	85	183	170	1047	312	28	88	736	16	29
	380	116	117	162	58	43	53	28	19	287	72	220
367 - 549	723	155	333	134	300	68	173	71	24	60	27	25
	725	105	242	952	130	37	289	150	68	153	15	201
	727	160	389	1482	1499	328	843	358	22	315	219	174
550 - 731	724	124	196	142	368	575	114	95	201	142	72	24
	726	72	93	254	1463	63	257	139	52	125	91	45
	728	156	1226	-	576	1475	1804	1088	222	686	642	79

Table 8. Continued

Depth Range (m)	Stratum	Area	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
34 - 55	375	1593	-	0	0	0	0	0	0	0	0	-
	376	1499	-	1	0	0	0	0	0	0	0	-
56 - 91	360	2992	-	0	0	0	0	5	0	3	0	-
	361	1853	-	0	0	0	0	0	0	0	0	-
	362	2520	-	0	0	0	0	0	0	0	1	-
	373	2520	-	0	0	0	0	0	0	0	1	-
	374	931	-	0	0	0	0	0	0	0	0	-
	383	674	-	0	0	0	0	0	0	0	0	-
92 - 183	359	421	-	0	30	0	58	17	17	0	5	-
	377	100	-	51	12	1	0	4	3	0	0	-
	382	647	-	0	49	0	0	1	0	3	3	-
184 - 274	358	225	-	5	0	0	31	80	1	4	30	-
	378	139	-	120	21	8	12	31	6	36	0	-
	381	182	-	610	285	35	71	0	5	9	49	-
275 - 366	357	164	-	12	2	17	179	325	113	0	3	-
	379	106	-	297	6	1	10	2	80	15	25	-
	380	116	-	176	135	21	4	9	37	9	1	-
367 - 549	723	155	-	35	15	0	61	12	19	165	36	-
	725	105	-	148	14	53	37	439	97	14	71	-
	727	160	-	348	431	0	45	34	106	218	192	-
550 - 731	724	124	-	92	-	308	107	210	-	73	52	-
	726	72	-	36	61	90	553	176	203	21	126	-
	728	156	-	428	1082	543	787	193	363	307	185	-

Table 8. Continued

Depth Range (m)	Stratum	Area	2016	2017	2018	2019	2020
34 - 55	375	1593	0	-	0	0	-
	376	1499	0	-	0	1	-
56 - 91	360	2992	0	-	276	39	-
	361	1853	0	-	0	0	-
	362	2520	0	-	0	0	-
	373	2520	0	-	0	0	-
	374	931	0	-	0	1	-
	383	674	0	-	1	0	-
92 - 183	359	421	1	-	0	71	-
	377	100	0	-	0	4	-
	382	647	0	-	1	0	-
184 - 274	358	225	0	-	0	1	-
	378	139	0	-	1	70	-
	381	182	2	-	38	177	-
275 - 366	357	164	0	-	2	7	-
	379	106	1	-	18	224	-
	380	116	15	-	167	180	-
367 - 549	723	155	0	-	60	43	-
	725	105	0	-	2586	32	-
	727	160	279	-	188	381	-
550 - 731	724	124	19	-	121	186	-
	726	72	231	-	393	99	-
	728	156	357	-	610	854	-

Table 9. Biomass (tonnes) by stratum from Canadian spring survey in Div. 3L.

Depth Range (m)	Stratum	Area	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
34 - 55	784	268	-	-	0	0	-	0	0	-	0	-
56 - 91	350	2071	0	0	0	0	0	0	0	0	0	0
	363	1780	0	0	0	0	0	0	0	0	0	0
	371	1121	0	0	0	0	0	0	0	0	0	0
	372	2460	0	0	0	0	0	0	0	0	0	0
	384	1120	0	0	0	0	0	0	0	0	0	0
	785	465	-	-	0	0	-	0	0	-	0	-
92 - 183	328	1519	0	0	0	0	18	0	0	0	1	13
	341	1574	2	0	14	0	26	0	0	0	0	0
	342	585	0	0	5	0	0	0	0	0	0	0
	343	525	0	0	2	0	0	0	0	0	0	30
	348	2120	1	9	0	0	0	0	0	0	0	0
	349	2114	1	0	11	0	14	2	0	0	0	5
	364	2817	0	6	0	0	0	1	0	1	0	0
	365	1041	1	0	0	14	0	0	0	0	0	45
	370	1320	0	0	0	0	0	0	0	0	0	0
	385	2356	0	0	0	0	0	0	0	0	12	0
	390	1481	0	24	0	0	6	0	0	0	0	9
	786	84	-	-	0	0	-	0	-	-	0	-
	787	613	-	-	0	0	-	0	-	-	0	-
	788	261	-	-	-	0	-	-	-	-	-	-
	790	89	-	-	-	10	-	-	-	-	-	-
	793	72	-	-	-	3	-	-	-	-	-	-
	794	216	-	-	-	0	-	-	-	0	-	-
	797	98	-	-	-	0	-	-	-	0	-	-
	799	72	-	-	-	-	-	-	-	-	0	-
184 - 274	344	1494	3	-	-	-	-	-	-	-	-	-
	347	983	1	5	0	0	1	0	0	0	0	32
	366	1394	6	169	10	30	0	1	48	148	255	236
	369	961	1	2	79	17	0	1	0	464	0	199
	386	983	1	84	11	633	0	0	0	0	115	494
	389	821	38	435	122	435	1070	143	3	2	36	994
	391	282	9	3	43	0	4	3	16	58	0	238
	344	1582	-	59	0	21	24	3	0	31	34	23
	791	227	-	-	-	113	-	-	-	-	-	-
	795	164	-	-	-	0	-	-	-	0	-	-
275 - 366	345	1432	335	892	302	926	891	495	566	441	1953	429
	346	865	354	1372	639	338	366	513	245	307	469	789
	368	334	137	216	263	228	456	311	327	703	241	362
	387	718	208	2514	2585	2026	4356	439	97	359	724	2967
	388	361	304	382	1404	464	482	220	223	608	989	332
	392	145	288	117	464	100	143	85	74	248	111	356
	789	72	-	-	-	18	-	-	-	-	0	-
	796	175	-	-	-	7	-	-	-	0	-	-
	798	100	-	-	-	23	-	-	-	0	-	-
	800	81	-	-	-	210	-	-	-	-	-	-
367 - 549	729	186	803	236	3921	1351	1286	555	407	589	724	292
	731	216	897	299	3531	1284	1725	664	217	1336	496	288
	733	468	3016	3003	7556	3311	2290	1139	847	3444	1138	2315
	735	272	302	4063	5100	4332	4656	2186	939	598	1207	1685
	792	50	-	-	-	533	-	903	-	147	-	-
550 - 731	730	170	245	0	1693	292	745	772	177	53	54	129
	732	231	462	1420	3220	1219	996	1173	533	465	560	354
	734	228	1327	1361	4169	1324	2887	621	362	367	592	459
	736	175	791	1793	5037	3463	4372	2803	1378	1747	259	1923

Table 9. Continued

Depth Range (m)	Stratum	Area	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
56 - 91	350	2071	-	0	0	0	0	0	0	0	0	-
	363	1780	-	0	0	0	0	0	0	0	0	-
	371	1121	-	0	0	0	0	0	0	0	0	-
	372	2460	-	0	0	0	0	0	0	0	0	-
	384	1120	-	0	0	0	0	0	0	0	0	-
92 - 183	328	1519	-	0	-	0	0	0	0	8	5	-
	341	1574	-	0	0	0	2	0	8	0	216	-
	342	585	-	1	0	2	0	0	0	0	46	-
	343	525	-	0	0	0	-	7	0	0	4	-
	348	2120	-	5	0	0	5	1	0	6	6	-
	349	2114	-	0	0	0	0	3	41	0	4	-
	364	2817	-	0	0	0	0	0	0	0	7	-
	365	1041	-	0	1	0	6	6	0	14	10	-
	370	1320	-	43	0	1	0	1	0	1	1	-
	385	2356	-	0	4	0	0	0	0	2	5	-
	390	1481	-	0	0	0	0	0	0	1	0	-
	786	84	-	-	-	-	-	0	-	-	-	-
	787	613	-	-	-	-	-	0	-	-	-	-
184 - 274	344	1582	-	2	44	0	0	7	93	19	6	-
	347	983	-	665	3	0	1	63	9	8	20	-
	366	1394	-	861	10	209	9	80	-	20	13	-
	369	961	-	1078	48	4	70	12	85	46	12	-
	386	983	-	309	5	0	151	96	95	185	115	-
	389	821	-	1595	692	1	295	379	1042	2	75	-
	391	282	-	872	65	3	33	6	68	33	8	-
275 - 366	345	1432	-	3510	347	533	208	2495	1426	1450	864	-
	346	865	-	2372	100	662	273	592	2384	507	726	-
	368	334	-	638	147	894	169	127	1396	189	62	-
	387	718	-	3783	3905	390	546	380	5341	513	410	-
	388	361	-	1413	894	433	432	147	793	100	135	-
	392	145	-	303	157	20	59	25	118	34	27	-
367 - 549	729	186	-	802	798	164	-	203	157	556	127	-
	731	216	-	437	367	296	488	302	266	180	32	-
	733	468	-	2067	2456	8	1446	283	1562	745	413	-
	735	272	-	1027	1658	374	2128	220	1835	444	1125	-
550 - 731	730	170	-	120	559	1157	683	50	31	87	78	-
	732	231	-	560	957	331	731	-	361	89	357	-
	734	228	-	466	-	81	5239	453	622	123	47	-
	736	175	-	5514	4945	35	1976	2582	450	994	786	-

Table 9. Continued

Depth Range (m)	Stratum	Area	2016	2017	2018	2019	2020
56 - 91	350	2071	2	-	0	0	-
	363	1780	0	-	0	0	-
	371	1121	0	-	0	0	-
	372	2460	0	-	0	0	-
	384	1120	0	-	0	0	-
92 - 183	328	1519	23	-	1	6	-
	341	1574	0	-	3	5	-
	342	585	4	-	0	11	-
	343	525	0	-	0	0	-
	348	2120	3	-	4	14	-
	349	2114	25	-	3	6	-
	364	2817	0	-	1	12	-
	365	1041	0	-	1	66	-
	370	1320	0	-	0	7	-
	385	2356	0	-	4	41	-
	390	1481	0	-	3	24	-
184 - 274	344	1582	1	-	23	236	-
	347	983	7	-	-	46	-
	366	1394	25	-	-	409	-
	369	961	3	-	79	209	-
	386	983	53	-	306	241	-
	389	821	1	-	36	457	-
	391	282	2	-	83	170	-
275 - 366	345	1432	417	-	812	1175	-
	346	865	563	-	-	833	-
	368	334	70	-	488	255	-
	387	718	370	-	1286	1332	-
	388	361	755	-	706	893	-
	392	145	52	-	136	574	-
367 - 549	729	186	247	-	458	595	-
	731	216	226	-	863	294	-
	733	468	361	-	1957	608	-
	735	272	353	-	510	548	-
550 - 731	730	170	254	-	106	499	-
	732	231	1128	-	991	547	-
	734	228	181	-	3123	941	-
	736	175	652	-	1088	980	-

Table 10. Biomass (tonnes) by stratum from Canadian spring survey in Div. 3O.

Depth Range (m)	Stratum	Area	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
56 - 91	330	2089	0	0	0	0	0	0	0	0	0	0
	331	456	0	0	16	0	0	0	0	0	0	0
	338	1898	478	40	62	0	0	0	2	0	13	0
	340	1716	0	0	0	0	0	0	0	0	0	0
	351	2520	0	0	0	0	0	0	0	0	0	0
	352	2580	114	48	0	22	0	0	3	0	0	0
	353	1282	119	146	331	408	25	0	3	0	1	84
92 - 183	329	1721	1	13	0	0	1	1	0	0	0	14
	332	1047	148	376	475	45	4	0	1	6	24	62
	337	948	179	139	4	0	3	31	1	91	17	37
	339	585	0	2	8	0	0	33	0	0	0	0
	354	474	807	122	330	196	0	11	22	8	25	43
184 - 274	333	147	5	62	23	2	9	0	8	0	2	12
	336	121	100	168	11	0	7	3	8	11	6	15
	355	103	249	168	20	0	3	84	5	46	42	13
275 - 366	334	96	20	39	6	24	1	0	1	0	0	3
	335	58	9	92	15	2	2	0	0	0	1	1
	356	61	161	68	47	10	0	3	1	7	1	3
367 - 549	717	166	42	165	55	6	0	1	0	0	6	0
	719	76	9	24	29	12	8	0	21	0	23	18
	721	76	161	59	112	57	30	1	8	2	7	3
550 - 731	718	134	70	116	154	195	26	8	41	60	73	56
	720	105	29	61	111	59	45	23	3	12	63	122
	722	93	57	176	203	291	120	23	43	3	86	51

Table 10. Continued

Depth Range (m)	Stratum	Area	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
56 - 91	330	2089	-	0	0	0	0	0	0	0	0	-
	331	456	-	0	0	0	0	0	0	0	0	-
	338	1898	-	0	0	0	0	9	0	0	0	-
	340	1716	-	0	0	0	0	0	0	0	0	-
	351	2520	-	1	0	0	0	0	0	0	0	-
	352	2580	-	0	0	0	0	0	75	1	0	-
	353	1282	-	0	0	1	0	16	0	0	8	-
92 - 183	329	1721	-	0	0	28	0	0	1	12	44	-
	332	1047	-	0	0	0	2	47	0	0	17	-
	337	948	-	13	1	0	0	0	15	0	0	-
	339	585	-	26	17	4	0	4	0	10	1	-
	354	474	-	1	6	5	2	29	0	6	0	-
184 - 274	333	147	-	0	10	1	5	0	0	1	0	-
	336	121	-	0	16	0	7	2	0	0	0	-
	355	103	-	26	12	11	12	12	0	0	2	-
275 - 366	334	96	-	0	1	2	1	1	0	0	1	-
	335	58	-	1	0	0	4	0	0	0	0	-
	356	61	-	34	17	6	1	1	2	0	0	-
367 - 549	717	166	-	0	0	18	1	19	25	0	0	-
	719	76	-	0	14	5	1	45	0	1	1	-
	721	76	-	0	0	28	2	67	20	2	14	-
550 - 731	718	134	-	35	338	45	27	136	35	63	92	-
	720	105	-	36	148	117	27	-	45	0	7	-
	722	93	-	240	187	42	160	368	116	188	126	-

Table 10. Continued

Depth Range (m)	Stratum	Area	2016	2017	2018	2019	2020
56 - 91	330	2089	0	-	0	0	-
	331	456	0	-	0	0	-
	338	1898	0	-	57	17	-
	340	1716	0	-	0	1	-
	351	2520	0	-	0	0	-
	352	2580	0	-	137	10	-
	353	1282	0	-	435	12	-
92 - 183	329	1721	0	-	34	19	-
	332	1047	1	-	2	70	-
	337	948	10	-	22	68	-
	339	585	0	-	42	11	-
	354	474	9	-	93	26	-
184 - 274	333	147	0	-	10	4	-
	336	121	1	-	2	12	-
	355	103	29	-	28	10	-
275 - 366	334	96	0	-	0	0	-
	335	58	0	-	0	1	-
	356	61	0	-	0	1	-
367 - 549	719	76	0	-	0	9	-
	721	76	0	-	0	2	-
	717	166	-	-	0	1	-
550 - 731	720	105	0	-	5	22	-
	722	93	13	-	124	151	-
	718	134	-	-	25	-	-

Table 11. Biomass (tonnes) by stratum from Canadian fall survey in Div. 3N.

Depth Range (m)	Stratum	Area	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
32 - 55	375	1593	0	1	0	0	0	0	0	1	0	0
	376	1499	0	0	0	0	0	0	0	0	0	0
56 - 91	360	2992	744	1230	808	144	165	0	0	32	0	260
	361	1853	0	0	0	0	0	0	0	0	0	0
	362	2520	0	0	0	0	0	0	2	0	12	0
	373	2520	0	2	0	0	0	0	0	0	0	0
	374	931	0	12	0	0	0	0	0	0	0	0
	383	674	0	0	0	0	0	0	0	0	0	0
92 - 183	359	421	0	160	724	67	28	81	0	0	2	1
	377	100	4	166	30	21	30	1	0	10	7	58
	382	647	0	24	111	0	0	0	96	0	1	42
184 - 274	358	225	140	94	42	13	5	488	1	8	4	4
	378	139	112	262	2198	257	5	237	206	20	135	1
	381	182	802	615	1622	590	253	138	73	67	114	146
275 - 366	357	164	40	58	7	-	6	8	20	21	8	228
	379	106	581	41	31	22	36	404	98	59	629	26
	380	116	178	516	794	330	151	141	95	130	362	138
367 - 549	723	155	115	109	336	14	48	70	8	31	11	64
	725	105	165	1646	65	95	171	58	54	42	-	52
	727	160	1006	371	509	494	391	570	211	209	342	224
550 - 731	724	124	160	589	374	126	67	62	154	-	122	99
	726	72	296	448	765	55	30	517	214	136	52	74
	728	156	1035	455	675	511	201	299	510	291	1084	38

Table 11. Continued

Depth Range (m)	Stratum	Area	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
32 - 55	375	1593	0	1	0	0	0	0	0	0	-	0
	376	1499	0	0	0	0	0	0	0	0	-	0
56 - 91	360	2992	0	0	12	91	0	290	35	1	-	0
	361	1853	0	0	0	0	0	0	0	0	-	0
	362	2520	0	0	0	0	0	0	0	0	-	0
	373	2520	0	2	0	0	0	0	0	1	-	0
	374	931	0	0	0	0	0	0	0	0	-	0
	383	674	0	0	0	14	0	0	0	48	-	0
92 - 183	359	421	22	57	29	60	118	5	0	2	-	0
	377	100	0	11	0	43	52	26	9	0	-	0
	382	647	0	297	5	105	39	73	52	0	-	0
184 - 274	358	225	12	0	6	7	7	2	0	0	-	0
	378	139	274	36	0	20	-	1	1	7	-	209
	381	182	170	109	47	94	195	246	357	1	-	213
275 - 366	357	164	0	29	27	29	9	1	4	0	-	24
	379	106	15	21	172	12	51	242	14	2	-	22
	380	116	201	56	19	119	74	26	55	49	-	10
367 - 549	723	155	0	53	37	29	189	42	0	35	-	186
	725	105	16	104	30	251	-	59	42	64	-	252
	727	160	19	167	183	174	200	66	259	38	-	66
550 - 731	724	124	193	250	156	194	89	46	12	45	-	52
	726	72	104	80	72	510	63	146	58	36	-	73
	728	156	54	451	359	353	126	55	103	71	-	86

Table 11. Continued

Depth Range (m)	Stratum	Area	2016	2017	2018	2019	2020
32 - 55	375	1593	1	0	0	0	0
	376	1499	0	1	1	0	0
56 - 91	360	2992	37	2	103	22	0
	361	1853	0	0	0	0	0
	362	2520	0	1	1	4	0
	373	2520	0	0	2	8	7
	374	931	1	2	2	1	3
	383	674	0	0	9	0	1
92 - 183	359	421	0	7	11	24	10
	377	100	0	17	27	9	5
	382	647	1	242	448	345	0
184 - 274	358	225	0	107	1	8	4
	378	139	1	7	81	6	0
	381	182	203	92	703	436	629
275 - 366	357	164	0	13	3	8	10
	379	106	1	43	1	9	2
	380	116	38	11	100	291	419
367 - 549	723	155	52	54	1	509	137
	725	105	33	501	36	60	56
	727	160	39	359	187	241	336
550 - 731	724	124	30	234	19	414	161
	726	72	496	441	231	384	-
	728	156	215	214	229	654	1287

Table 12. Biomass (tonnes) by stratum from Canadian fall survey in Div. 3L.

Depth Range (m)	Stratum	Area	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
32 - 55	784	268	0	0	0	-	0	0	0	0	0	0
56 - 91	350	2071	0	0	0	0	0	0	0	1	0	0
	363	1780	0	0	0	0	0	0	0	0	0	0
	371	1121	3	0	0	24	0	0	0	0	0	0
	372	2460	0	0	0	0	0	0	0	0	0	0
	384	1120	0	0	0	0	0	0	0	0	0	0
	785	465	0	0	0	-	0	0	0	0	0	0
92 - 183	328	1519	1	6	1	11	18	0	1	0	0	2
	341	1574	2	249	184	0	6	0	13	0	22	0
	342	585	1	84	16	0	6	0	0	0	4	28
	343	525	0	34	45	0	1	0	0	0	43	0
	348	2120	2	129	177	216	22	2	23	0	162	427
	349	2114	2	60	252	416	0	0	0	2	47	182
	364	2817	0	103	414	30	0	1	6	0	56	64
	365	1041	0	169	140	55	-	0	0	0	-	444
	370	1320	14	48	871	555	19	1	55	23	-	0
	385	2356	64	502	334	253	29	47	190	69	348	273
	390	1481	67	200	625	310	69	497	222	13	193	332
	786	84	67	2	4	-	0	0	0	0	0	1
	787	613	1	86	0	-	0	0	0	0	59	0
	788	252	0	-	-	-	-	-	-	-	-	-
	790	89	0	6	6	-	25	0	0	0	29	14
	793	72	0	4	4	-	0	0	5	0	0	53
	794	216	0	15	4	-	-	0	0	0	0	32
	797	98	0	3	14	-	0	0	0	0	23	0
	799	72	0	0	4	-	0	0	0	0	0	6
	788	261	-	45	31	-	0	0	0	0	0	4
184 - 274	344	1582	11	96	885	181	42	0	7	17	918	761
	347	983	0	37	1021	297	160	88	28	0	476	338
	366	1394	338	878	2172	2108	62	265	689	119	-	2545
	369	961	108	888	2347	719	85	296	55	278	-	3319
	386	983	447	1010	1683	1129	473	337	998	453	-	3490
	389	821	900	875	474	673	727	1143	531	563	706	244
	391	282	344	892	257	135	379	89	135	448	144	192
	795	164	5	35	6	-	11	8	0	0	664	58
	791	227	-	193	151	-	201	2	10	12	81	182
275 - 366	345	1432	3747	1775	4359	1665	2659	1248	2343	2052	3998	2281
	346	865	5483	2378	2062	1312	1020	1224	1045	4602	3555	3909
	368	334	690	338	2272	860	857	871	1829	1059	-	1106
	387	718	1765	1613	1609	5284	4896	4503	661	1147	-	586
	388	361	711	814	380	270	704	993	309	554	431	317
	392	145	500	618	215	170	234	116	53	266	165	137
	789	81	0	-	-	-	-	-	-	-	-	-
	791	308	66	-	-	-	-	-	-	-	-	-
	796	175	37	355	289	-	154	96	41	2	318	385
	798	100	76	108	152	-	226	19	50	38	806	1096
	789	72	-	14	10	-	12	1	0	1	67	18
	800	81	-	313	517	-	233	191	215	52	636	725
367 - 549	729	186	648	496	242	239	1002	438	100	218	139	13
	733	468	706	752	2535	1511	1321	906	312	949	364	1216
	735	272	1111	938	2093	2465	728	1504	1177	412	-	808
	792	50	186	349	608	-	316	69	31	200	1021	602
	731	216	-	713	305	1795	891	407	318	306	262	150
550 - 731	730	170	37	330	44	224	125	627	200	183	74	32
	732	231	463	590	705	519	858	319	152	430	130	226
	734	228	642	604	515	184	554	671	214	124	-	34
	736	175	1117	951	1285	498	4028	1038	910	214	-	195

Table 12. Continued

Depth Range (m)	Stratum	Area	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
56 - 91	350	2071	2	0	0	0	0	0	0	0	-	0
	363	1780	0	0	0	0	0	0	0	1	-	0
	371	1121	0	0	0	0	0	20	0	1	-	0
	372	2460	1	0	3	0	0	1	0	0	-	0
	384	1120	1	0	0	0	0	0	0	0	-	0
92 - 183	328	1519	0	0	2	0	3	4	36	49	-	11
	341	1574	20	0	0	2	4	0	154	477	-	34
	342	585	0	0	0	0	0	0	0	0	-	19
	343	525	17	0	0	0	0	0	0	0	-	0
	348	2120	336	3	77	0	2	374	87	1640	-	35
	349	2114	21	0	0	4	31	195	17	13	-	2
	364	2817	0	2	82	6	14	90	68	171	-	32
	365	1041	258	2	41	0	15	574	427	244	-	0
	370	1320	277	0	141	0	39	168	192	458	-	0
	385	2356	233	554	565	17	107	833	871	262	-	43
	390	1481	118	350	127	64	264	311	12	52	-	126
	787	613	1	-	-	-	-	-	-	-	-	-
	788	261	10	-	-	-	4	-	-	-	-	-
	794	216	0	-	-	-	0	-	-	-	-	-
	797	98	0	-	-	-	0	-	-	-	-	-
	799	72	0	-	-	-	0	-	-	-	-	-
	790	89	-	-	-	-	25	-	-	-	-	-
	793	72	-	-	-	-	0	-	-	-	-	-
184 - 274	344	1582	796	661	1783	65	14	678	1270	1716	-	84
	347	983	1123	281	1903	23	206	1444	1358	1273	-	110
	366	1394	2185	2261	2365	496	277	1843	659	1605	-	87
	369	961	1720	829	2690	195	384	2567	1932	2070	-	289
	386	983	1741	652	758	1076	835	2223	1704	1719	-	550
	389	821	644	416	601	662	681	211	979	531	-	581
	391	282	262	68	170	137	77	36	126	267	-	140
	795	164	65	-	-	-	0	-	-	-	-	-
	791	227	-	-	-	-	130	-	-	-	-	-
275 - 366	345	1432	2488	2996	5552	2203	5051	5975	1638	7300	-	948
	346	865	2960	2027	3288	1998	1350	1341	1567	1186	-	1048
	368	334	581	968	2950	982	493	423	435	207	-	72
	387	718	2336	3862	1246	613	1462	435	607	1909	-	1344
	388	361	582	1047	388	542	29	97	186	71	-	110
	392	145	77	93	61	107	59	57	25	35	-	31
	789	72	2	-	-	-	-	-	-	-	-	-
	796	175	380	-	-	-	383	-	-	656	-	-
	800	81	-	-	-	125	286	-	-	-	-	-
	798	100	-	-	-	-	32	-	-	-	-	-
367 - 549	729	186	103	149	81	52	85	38	38	130	-	88
	731	216	227	145	55	170	52	-	14	27	-	74
	733	468	2248	488	172	317	115	76	335	582	-	108
	735	272	1457	1368	1125	1615	1578	198	346	389	-	646
	792	50	-	-	-	-	254	-	-	-	-	-
550 - 731	730	170	196	294	30	151	40	0	125	116	-	97
	732	231	123	377	152	244	437	86	60	95	-	71
	734	228	136	131	205	928	126	407	126	41	-	321
	736	175	445	1862	864	721	593	186	851	450	-	486

Table 12. Continued

Depth Range (m)	Stratum	Area	2016	2017	2018	2019	2020
56 - 91	350	2071	0	0	0	0	0
	363	1780	0	1	3	0	0
	371	1121	0	0	1	1	0
	372	2460	0	0	1	3	1
	384	1120	0	7	2	7	0
92 - 183	328	1519	18	35	23	40	5
	341	1574	6	50	6	9	2
	342	585	26	6	3	7	20
	343	525	3	22	1	77	0
	348	2120	69	57	321	648	158
	349	2114	1	22	4	22	2
	364	2817	0	11	16	53	567
	365	1041	12	127	737	295	677
	370	1320	294	275	61	186	1377
	385	2356	68	178	1127	877	2394
	390	1481	115	35	178	653	637
184 - 274	344	1582	219	316	1810	605	1069
	347	983	67	186	855	640	499
	366	1394	359	959	883	1763	370
	369	961	529	817	1357	1731	727
	386	983	2542	544	1145	755	783
	389	821	346	1010	1092	461	1966
	391	282	458	308	122	552	413
275 - 366	345	1432	995	568	3650	1847	6960
	346	865	1586	2186	1685	1048	1843
	368	334	283	191	161	630	146
	387	718	2316	329	80	158	509
	388	361	106	115	52	94	11
	392	145	40	270	16	120	226
367 - 549	729	186	30	29	55	108	118
	731	216	61	60	77	19	114
	733	468	311	31	94	50	142
	735	272	471	246	198	665	95
550 - 731	730	170	25	211	128	120	634
	732	231	233	346	132	116	377
	734	228	424	234	-	134	572
	736	175	233	470	213	329	955

Table 13. Biomass (tonnes) by stratum from Canadian fall survey in Div. 3O.

Depth Range (m)	Stratum	Area	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
56 - 91	330	2089	0	0	0	0	0	0	0	0	0	0
	331	456	0	0	11	0	0	0	0	0	0	0
	338	1898	39	195	38	39	0	0	0	26	16	0
	340	1716	0	0	0	17	0	0	0	0	0	0
	351	2520	0	0	0	0	0	0	0	0	0	0
	352	2580	4	21	46	0	0	4	0	0	0	0
	353	1282	472	769	544	108	0	0	3	0	180	40
92 - 183	329	1721	28	57	11	50	46	3	0	0	0	0
	332	1047	25	81	74	0	0	0	0	16	26	0
	337	948	48	30	21	67	0	0	0	7	0	17
	339	585	0	103	8	-	46	16	0	1	0	0
	354	474	5	59	15	1094	95	71	24	84	39	6
184 - 274	336	121	3	7	5	0	0	0	0	12	5	0
	355	103	39	22	3	1	0	1	5	3	25	2
	333	147	-	10	0	0	3	0	0	0	5	0
275 - 366	335	58	7	2	0	3	3	0	0	5	0	0
	356	61	8	6	8	8	9	6	7	0	2	1
	334	96	-	6	6	0	0	0	0	0	0	0
367 - 549	719	76	11	4	14	36	18	10	1	0	31	0
	721	76	50	35	47	26	23	42	5	25	0	6
	717	166	-	42	27	6	0	72	0	27	1	3
550 - 731	720	105	82	-	92	105	181	141	152	131	17	79
	722	93	153	490	124	160	73	106	40	437	23	109
	718	134	-	131	158	186	20	26	107	355	35	82

Table 13. Continued

Depth Range (m)	Stratum	Area	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
56 - 91	330	2089	0	0	0	0	0	0	0	0	-	0
	331	456	0	0	0	0	0	0	0	0	-	4
	338	1898	0	2	5	2	0	4	0	0	-	0
	340	1716	0	0	0	0	0	0	0	0	-	0
	351	2520	0	0	0	0	0	0	0	0	-	0
	352	2580	0	0	9	0	0	0	0	0	-	0
	353	1282	0	88	96	0	102	4	3	8	-	0
92 - 183	329	1721	0	0	0	0	0	0	66	0	-	4
	332	1047	0	7	0	0	0	0	0	2	-	2
	337	948	0	6	22	0	2	3	18	0	-	3
	339	585	0	181	60	0	4	0	0	264	-	16
	354	474	77	5	0	6	0	0	0	0	-	0
184 - 274	333	147	0	0	5	0	0	0	0	0	-	0
	336	121	0	0	33	-	1	0	0	0	-	0
	355	103	9	2	29	0	0	0	0	1	-	0
275 - 366	334	96	1	0	0	0	0	0	2	0	-	1
	335	58	1	1	3	0	0	0	0	0	-	0
	356	61	0	3	1	0	0	2	0	0	-	0
367 - 549	717	166	0	51	25	0	6	0	54	0	-	0
	719	76	0	0	0	46	8	0	17	23	-	0
	721	76	1	34	15	0	72	22	11	0	-	0
550 - 731	720	105	34	101	60	35	108	145	64	174	-	66
	722	93	84	100	93	494	291	51	53	71	-	55
	718	134	-	265	432	77	76	193	87	19	-	13

Table 13. Continued

Depth Range (m)	Stratum	Area	2016	2017	2018	2019	2020
56 - 91	330	2089	0	3	0	0	1
	331	456	0	0	0	0	0
	338	1898	0	0	41	12	0
	340	1716	0	1	0	7	0
	351	2520	0	0	0	0	0
	352	2580	0	28	0	415	0
	353	1282	19	4	563	158	89
92 - 183	329	1721	1	29	3	0	17
	332	1047	19	5	0	0	0
	337	948	0	8	9	5	0
	339	585	6	1	90	96	97
	354	474	0	29	10	31	0
184 - 274	333	147	0	3	0	0	0
	355	103	0	8	0	1	2
	336	121	-	1	1	1	2
275 - 366	334	96	0	3	1	1	2
	335	58	0	0	0	0	0
	356	61	0	0	0	1	2
367 - 549	717	166	1	39	0	3	5
	719	76	0	0	0	3	1
	721	76	0	0	0	4	13
550 - 731	718	134	11	3	54	32	46
	720	105	1	39	68	28	124
	722	93	44	-	31	206	74

Figures

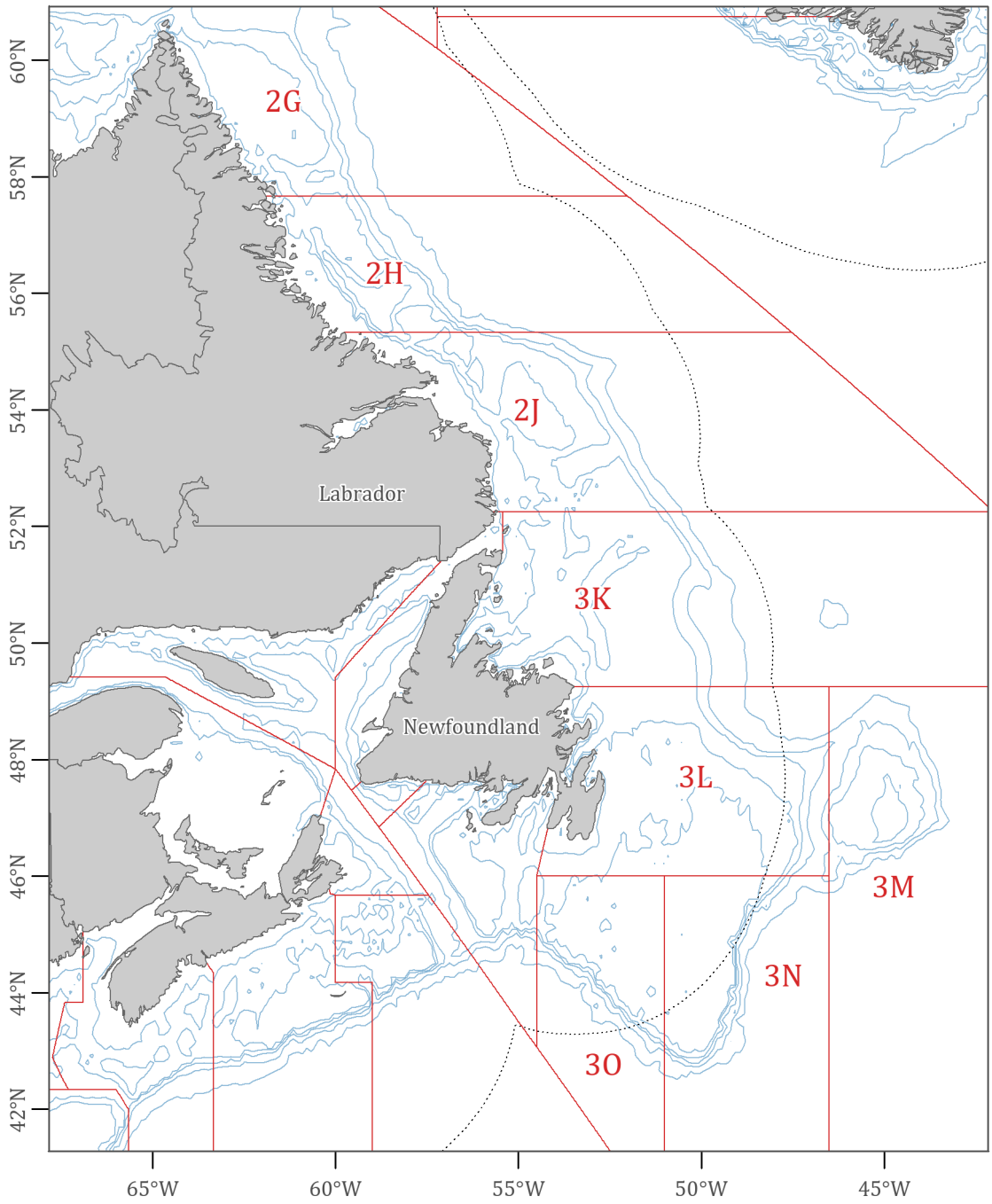

Figure 1. Map of stock area, with NAFO dividing lines, select isobaths (100, 200, 400, 1000, and 2000 m), and the EEZ boundary.

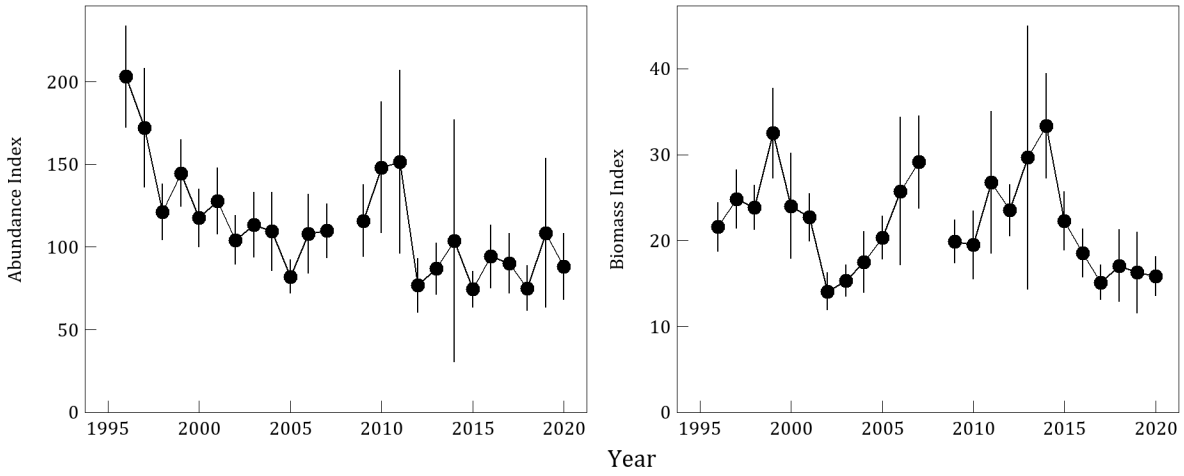

Figure 2. Abundance (left) and biomass (right) indices (with 95% CI) from Canadian autumn surveys in Divs. 2J and 3K. The 2008 survey was considered incomplete.

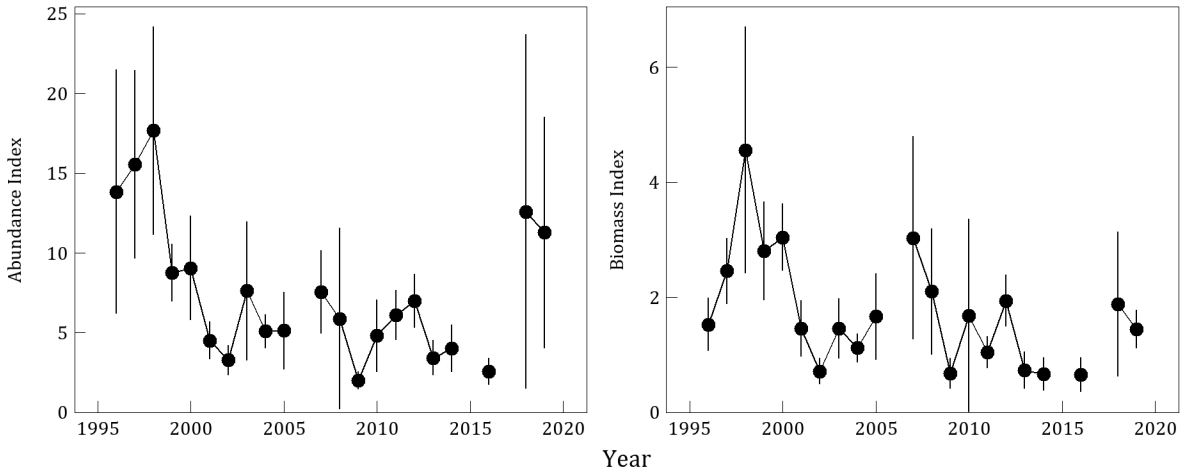

Figure 3. Aabundance (left) and biomass (right) indices (with 95% CI) from Canadian spring surveys in Divs. 3LNO. The 2006, 2015, and 2017 surveys were considered incomplete, and the 2020 survey was canceled due to the COVID-19 pandemic.

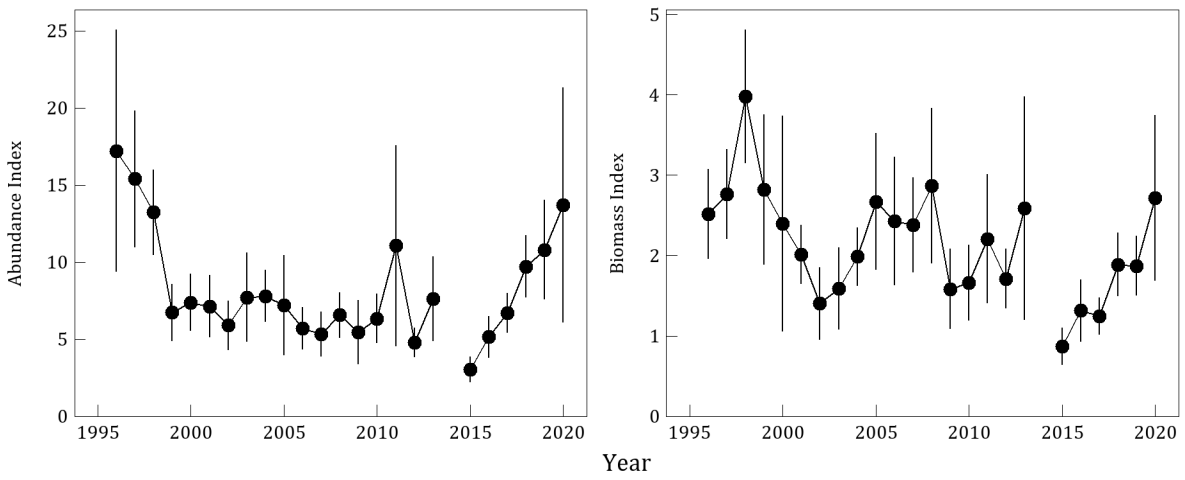

Figure 4. Abundance (left) and biomass (right) indices (with 95% CI) from Canadian autumn surveys in Divs. 3LNO. The 2014 survey was considered incomplete.

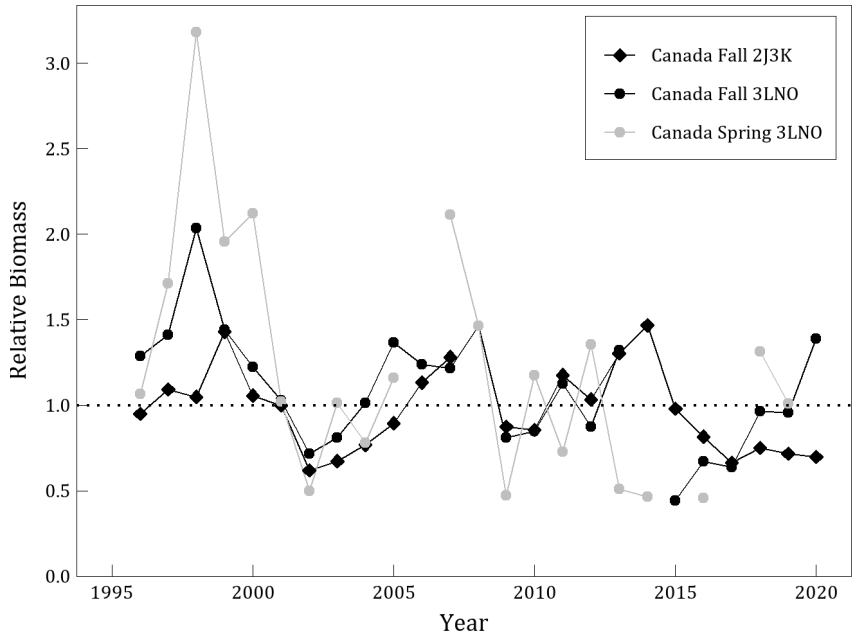

Figure 5. Relative biomass indices from Canadian autumn surveys in Divs. 2J3K, Canadian spring surveys in Divs. 3LNO, and Canadian autumn surveys in Divs. 3LNO. Each series is scaled to its average and the average line is shown as thin dotted line. See above description of missing surveys.

Figure 6. Scaled mean numbers per tow (MNPT) from Canadian autumn surveys in Divs. 2J3K, Canadian spring surveys in Divs. 3LNO, and Canadian autumn surveys in Divs. 3LNO. Each series is scaled to its average and the average line is shown as thin dotted line. See above description of missing surveys.

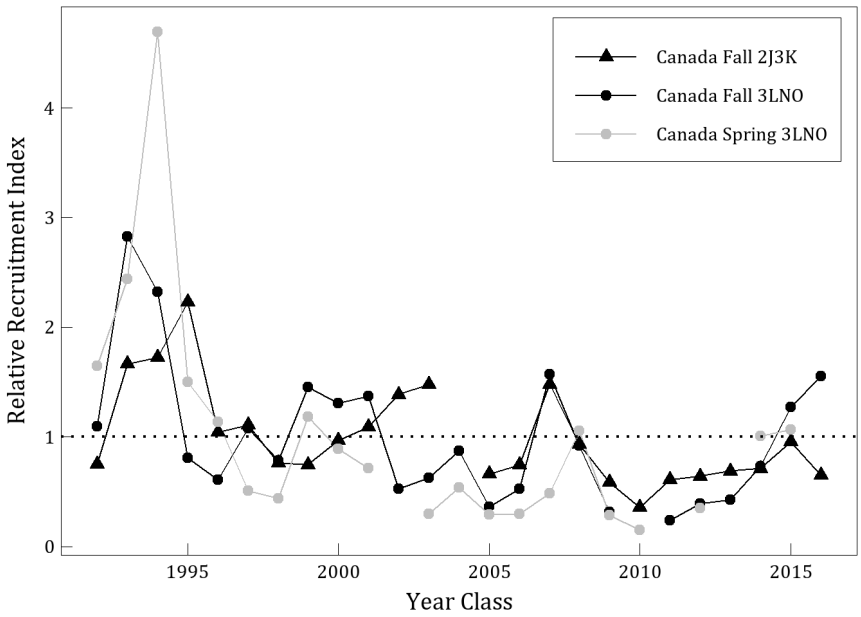

Figure 7. Relative recruitment indices (age 4) from Canadian autumn surveys in Divs. 2J3K, Canadian spring surveys in Divs. 3LNO, and Canadian autumn surveys in Divs. 3LNO. Each series is scaled to its average and the average line is shown as thin dotted line. See above description of missing surveys.

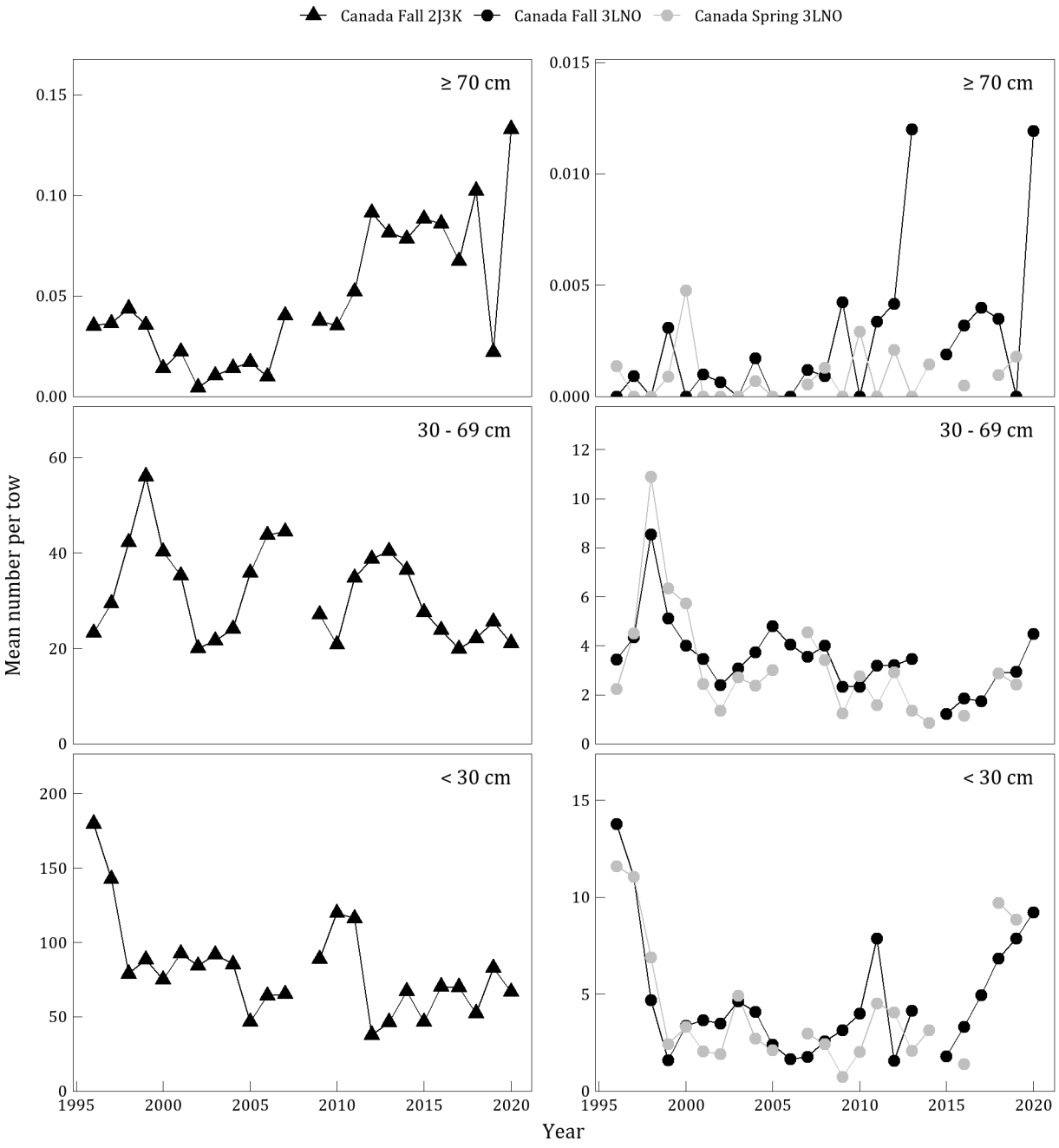

Figure 8. Mean number per tow by size class (< 30, 30 - 69, and ≥ 70 cm groups) from the Canadian autumn surveys in Divs. 2J3K (left) and the spring and autum surveys in Divs. 3LNO (right). See above description of missing surveys.

Colophon

This version of the document was generated on 2021-06-08 16:16:44 using the R markdown template for SCR documents from **NAFOdown**.

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

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#>  labeling        0.4.2      2020-10-20 [1] CRAN (R 4.0.3)
#>  lattice         0.20-41    2020-04-02 [2] CRAN (R 4.0.4)
#>  latticeExtra    0.6-29     2019-12-19 [1] CRAN (R 4.0.2)
#>  lifecycle       1.0.0      2021-02-15 [1] CRAN (R 4.0.4)
#>  magrittr        2.0.1      2020-11-17 [1] CRAN (R 4.0.3)
#>  Matrix          1.2-17     2019-03-22 [1] CRAN (R 4.0.4)
#>  memoise         2.0.0      2021-01-26 [1] CRAN (R 4.0.4)
#>  munsell         0.5.0      2018-06-12 [1] CRAN (R 4.0.2)
#>  NAFOdown      * 0.0.1.9000 2021-05-30 [1] local
#>  nnet            7.3-15     2021-01-24 [2] CRAN (R 4.0.4)
#>  officer         0.3.18     2021-04-02 [1] CRAN (R 4.0.5)
#>  pillar          1.5.1      2021-03-05 [1] CRAN (R 4.0.4)
#>  pkgbuild        1.2.0      2020-12-15 [1] CRAN (R 4.0.3)
#>  pkgconfig       2.0.3      2019-09-22 [1] CRAN (R 4.0.2)
#>  pkgload         1.2.0      2021-02-23 [1] CRAN (R 4.0.4)
#>  plyr            1.8.6      2020-03-03 [1] CRAN (R 4.0.2)
#>  png             0.1-7      2013-12-03 [1] CRAN (R 4.0.0)
#>  prettyunits     1.1.1      2020-01-24 [1] CRAN (R 4.0.2)
#>  processx        3.4.5      2020-11-30 [1] CRAN (R 4.0.3)
#>  ps              1.6.0      2021-02-28 [1] CRAN (R 4.0.4)
#>  purrr           0.3.4      2020-04-17 [1] CRAN (R 4.0.2)
#>  R6              2.5.0      2020-10-28 [1] CRAN (R 4.0.3)
#>  RColorBrewer    1.1-2      2014-12-07 [1] CRAN (R 4.0.0)
#>  Rcpp            1.0.6      2021-01-15 [1] CRAN (R 4.0.3)
#>  RcppEigen     * 0.3.3.9.1  2020-12-17 [1] CRAN (R 4.0.3)
#>  remotes         2.2.0      2020-07-21 [1] CRAN (R 4.0.2)
#>  reshape         0.8.8      2018-10-23 [1] CRAN (R 4.0.2)
#>  rlang           0.4.11     2021-04-30 [1] CRAN (R 4.0.5)
#>  rmarkdown       2.8        2021-05-07 [1] CRAN (R 4.0.5)
#>  rpart           4.1-15     2019-04-12 [2] CRAN (R 4.0.4)
#>  rprojroot       2.0.2      2020-11-15 [1] CRAN (R 4.0.3)
#>  Rstrap        * 1.14.1     2021-05-28 [1] local
#>  rstudioapi      0.13       2020-11-12 [1] CRAN (R 4.0.3)
#>  scales          1.1.1      2020-05-11 [1] CRAN (R 4.0.2)
#>  sessioninfo     1.1.1      2018-11-05 [1] CRAN (R 4.0.2)
#>  sf            * 0.9-7      2021-01-06 [1] CRAN (R 4.0.3)
#>  showtext        0.9-2      2021-01-10 [1] CRAN (R 4.0.4)
#>  showtextdb      3.0        2020-06-04 [1] CRAN (R 4.0.2)
#>  sp            * 1.4-5      2021-01-10 [1] CRAN (R 4.0.3)
#>  stringi         1.6.2      2021-05-17 [1] CRAN (R 4.0.4)
#>  stringr         1.4.0      2019-02-10 [1] CRAN (R 4.0.2)
#>  survival        3.2-7      2020-09-28 [2] CRAN (R 4.0.4)
#>  sysfonts        0.8.3      2021-01-10 [1] CRAN (R 4.0.4)
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#>  systemfonts     1.0.1      2021-02-09 [1] CRAN (R 4.0.4)
#>  TeachingDemos   2.12       2020-04-07 [1] CRAN (R 4.0.5)
#>  testthat        3.0.2      2021-02-14 [1] CRAN (R 4.0.4)
#>  tibble          3.1.0      2021-02-25 [1] CRAN (R 4.0.3)
#>  tidyr         * 1.1.3      2021-03-03 [1] CRAN (R 4.0.3)
#>  tidyselect      1.1.0      2020-05-11 [1] CRAN (R 4.0.2)
#>  TMB           * 1.7.19     2021-02-05 [1] CRAN (R 4.0.4)
#>  units           0.7-0      2021-02-25 [1] CRAN (R 4.0.4)
#>  usethis         2.0.1      2021-02-10 [1] CRAN (R 4.0.5)
#>  utf8            1.2.1      2021-03-12 [1] CRAN (R 4.0.4)
#>  uuid            0.1-4      2020-02-26 [1] CRAN (R 4.0.0)
#>  vctrs           0.3.6      2020-12-17 [1] CRAN (R 4.0.3)
#>  viridisLite     0.3.0      2018-02-01 [1] CRAN (R 4.0.2)
#>  vroom           1.4.0      2021-02-01 [1] CRAN (R 4.0.4)
#>  withr           2.4.2      2021-04-18 [1] CRAN (R 4.0.5)
#>  xfun            0.23       2021-05-15 [1] CRAN (R 4.0.5)
#>  xml2            1.3.2      2020-04-23 [1] CRAN (R 4.0.2)
#>  yaml            2.2.1      2020-02-01 [1] CRAN (R 4.0.2)
#>  zip             2.1.1      2020-08-27 [1] CRAN (R 4.0.2)
#>
#> [1] C:/Users/RegularP/Documents/R/win-library/4.0
#> [2] C:/Program Files/R/R-4.0.4/library
```