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Allocation Shares for Canada and the USA of the Transboundary Resources of Atlantic Cod, Haddock, and Yellowtail Flounder on Georges Bank Through Fishing Year 2023

I.A. Andrushchenko¹, E.N. Brooks² and E. Way-Nee¹

¹Fisheries and Oceans Canada
125 Marine Science Drive
St. Andrews, New Brunswick E5B 0E4
Canada

²NOAA/NMFS Northeast Fisheries Science Center
166 Water Street
Woods Hole, Massachusetts 02543-1097
USA

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ABSTRACT

The development of consistent management by Canada and the United States of America (USA) for the transboundary resources of Atlantic Cod, Haddock, and Yellowtail Flounder on Georges Bank led to a sharing allocation agreement by the Transboundary Management Guidance Committee (TMGC). For Atlantic Cod and Haddock, the agreement is limited to the Eastern Georges Bank management unit (Fisheries and Oceans Canada (DFO) Statistical Unit Areas 5Zj and 5Zm; USA Statistical Areas 551, 552, 561, and 562). The management unit for Yellowtail Flounder encompasses the entire Georges Bank east of the Great South Channel (DFO Statistical Unit Areas 5Zh, 5Zj, 5Zm, and 5Zn; USA Statistical Areas 522, 525, 551, 552, 561, and 562). Two principles are incorporated in the sharing formulae: 1) historical utilization based on reported landings during 1967 through 1994; 2) spatial-temporal changes in resource distributions determined from the DFO and USA National Marine Fisheries Service (NMFS) survey results that are updated annually. From 2010 onward, utilization will account for 10% and distribution for 90% of the allocation. This report uses the 2021 DFO and NMFS survey results to update the calculation for the 2023 fishing year allocations.

The resource distributions in 2021 were: 25% USA, 75% Canada, for Atlantic Cod; 42% USA, 58% Canada, for Haddock; and 48% USA, 52% Canada, for Yellowtail Flounder. The 2023 fishing year allocations (calendar year for Canada; May 1, 2023 to April 30, 2024 for the USA), updated with the 2021 resource distributions, resulted in shares for Atlantic Cod of 26% USA, 74% Canada, for Haddock of 42% USA, 58% Canada, and for Yellowtail Flounder of 53% USA, 47% Canada.

RÉSUMÉ

INTRODUCTION

The designation of units for management entails a compromise between the biological realities of stock structure and the practical convenience of analysis and policy making (Gulland 1980). For Yellowtail Flounder, Canada and the United States of America (USA) use a common management unit (for Canada the Fisheries and Oceans Canada (DFO) Statistical Unit Areas 5Zh, 5Zj, 5Zm, and 5Zn; for the USA the USA Statistical Areas 522, 525, 551, 552, 561, and 562) encompassing the entire bank east of the Great South Channel (Figure 1), referred to hereafter as Georges Bank. For Atlantic Cod and Haddock, Canada uses only the eastern portion of Georges Bank, while the USA employs a management unit comprising all of Georges Bank and extending south and west of Cape Cod. The Transboundary Management Guidance Committee (TMGC) agreed that, for the purpose of developing a sharing formula for Atlantic Cod and Haddock, the management unit would be limited to the eastern portion of Georges Bank (Figure 1; DFO Statistical Unit Areas 5Zj and 5Zm; USA Statistical Areas 551, 552, 561, and 562), referred to as Eastern Georges Bank.

Consistent fisheries management advice utilizing an allocation sharing arrangement for Eastern Georges Bank was provided for the first time in the 2003 TMGC Guidance Document (TMGC 2003) for application to the 2004 fishing year quotas, and subsequently in the 2005 to 2021 TMGC Guidance Documents for application to the 2006 to 2022 fishing year quotas, respectively (TMGC 2020). The analyses are based on calendar year data. The fishing year for Canadian fisheries starts on January 1st and ends on December 31st, whereas the fishing year for USA fisheries starts on May 1st and ends on April 30th the following year.

Principles of resource sharing for transboundary stocks include consideration of access to resources occurring or produced within national boundaries and historical participation in exploitation of the resources (Gavaris and Murawski 2004). The former has emerged from the effective property rights associated with Exclusive Economic Zones, as well as, the distribution of stocks occurring in areas under national jurisdiction (UN 1995). The latter recognizes traditional involvement and investment in the development of a fishery. Both principles were incorporated in the TMGC sharing proposal, but historical participation gradually was down-weighted so that after an eight year phase-in period the annual allocation would be based primarily on resource distribution (90%).

Details for calculating the national allocations for Canada and the USA were described by Murawski and Gavaris (2004). The approach incorporates both resource utilization and resource distributions relative to the Canada/USA east coast maritime boundary. Results for fishing years 2005 to 2022 have been reported annually, most recently by Andrushchenko et al. (2021).

DATA AND METHODS

DATA

The allocation for this analysis used data for years 1988–2021. The NMFS survey did not sample in calendar year 2020 due to COVID-19 restrictions; imputed values were used in the allocation analysis to deal with these missing data points (see Andrushchenko et al. 2021). For the 2021 calendar year, all surveys went out and data were collected according to protocol for NMFS and DFO surveys.

FORMULA

The TMGC agreed approach for calculating the respective country shares (TMGC 2002), that takes into historical utilization and adapts to shifts in resource distribution, is as follows:

$$\%share_{year,country} = (\alpha_{year} \times \%utilization_{year,country}) + (\beta_{year} \times \%resource\ distribution_{year,country})$$

where α_{year} = percentage weighting for utilization in year

β_{year} = percentage weighting for resource distribution in year

$$\alpha_{year} + \beta_{year} = 100\%$$

The initial sharing formula was based on the weighting of country utilization by 40% and resource distribution from surveys by 60%. Thereafter, the percentage weighting was changed in 5% annual increments until the weightings reached 10% country utilization from landings and 90% resource distribution from surveys. This sharing agreement was implemented in 2003, with the end of the transition to a 90:10 resource distribution-to-utilization weighting in the 2010 fishing year.

RESOURCE UTILIZATION

Historical participation in exploitation of these resources was assessed for the three species using landings records (Table 1). The TMGC agreed to use the percentage of the total landings by country from 1967 to 1994 (inclusive), as the measure of country utilization.

RESOURCE DISTRIBUTION

Resource distribution patterns are determined based on two NMFS (spring and fall) and one DFO (winter/spring) survey. Surveys of Georges Bank have been conducted by DFO since 1986 (February/March), and by NMFS each fall (October) since 1963 and each spring (April/May) since 1968. Each of the three surveys cover Canadian and USA waters on both sides of the Hague line (Figure 2). Further details about DFO and USA Northeast Fisheries Science Center (NEFSC) vessels and calibrations can be found in Gross et al. (2014) and Andrushchenko et al. (2018).

Swept area biomass, considered a relative index of abundance, was computed for each species in each stratum (Table 2, Figure 2) and apportioned to USA and Canadian sectors in each year. DFO survey sampling strata were revised in 1987 to incorporate the international boundary. Thus, only results since 1987 have been used from this survey. Since both the DFO and NMFS survey designs are based on randomization within strata, the data were post-stratified to Canadian and USA zones within the existing survey strata.

Estimates of biomass indices were calculated for each stratum or stratum section, unless no observations occurred within a stratum (Tables 3 to 11). Prior to 2005, on the few occasions where no observations were available in a stratum section, density and distribution patterns from adjacent areas and years were used as substitute values. The magnitude of these derived values was generally small and did not influence results. When such values are combined over surveys, they have only a minor effect on the annual aggregate biomass index estimates within the transboundary management units. In recent years, missing observations have been assumed to be zero, as derived values did not influence results when adjusted prior to 2005 (Tables 3 to 11). The swept area biomasses for each groundfish species were summed individually to derive the biomass index on the Canadian and USA side for each management unit. Age- and size-specific distribution patterns were not considered while developing the biomass indices.

The biomass index estimate derived from each survey represents a synoptic snapshot of resource distribution at a specific time during a year. Combining the results of multiple surveys requires an understanding of seasonal movement patterns and how much of the biological year each survey represents. For Atlantic Cod, the DFO and the NMFS spring surveys in each year were averaged to characterize the distribution during the winter-spring period. This result was averaged with the NMFS fall survey distribution percentage, thereby giving equal weight to the

winter-spring and summer-fall periods. Prior to initiation of the DFO survey in 1987, the NMFS spring survey was used alone to characterize the winter-spring period. For Haddock and Yellowtail Flounder, the results from all three surveys in each year were averaged to represent the annual distribution pattern. Prior to 1987, only the NMFS spring and fall surveys were averaged for these two species.

A robust locally-weighted regression algorithm (Cleveland 1979), referred to as LOESS, was adopted for removing both unpredictable fluctuations and sampling variation from survey observations. A 30% smoothing parameter was chosen as it reflected current trends, was responsive to changes, and provided the most appropriate results for contemporary resource sharing. The recommended default of two robustness iterations also was adopted (Cleveland 1979). Resource distributions are updated annually by incorporating data from the latest survey (i.e., 2020) and dropping data from the earliest survey used in the previous year (i.e., 1987) so that a 33-year window is maintained. After the surveys were combined, the LOESS smoother was applied to the 1989 to 2021 survey data. The fixed resource utilization (10% weighting) and the 2021 resource distributions (90% weighting) were applied to the agreed sharing formula to determine national allocation shares of each of the three transboundary groundfish species for the upcoming fishing year (i.e., 2023), two years ahead of the survey data that is used (i.e., 2021).

RESULTS AND CONCLUSIONS

The country utilization aspect of the sharing formula, based on each country's landings during the period of 1967 to 1994 (Table 1), resulted in the following percentage weightings for utilization:

Stock	Canada	USA
Eastern Georges Bank Atlantic Cod	60%	40%
Eastern Georges Bank Haddock	55%	45%
Georges Bank Yellowtail Flounder	2%	98%

The 2010 fishing year marked the end of transition to a 90/10 weighting of resource distribution and country utilization. Historical utilization now accounts for only 10% of the sharing formula.

The biomass indices for DFO were updated with the 2021 survey values for each species (Tables 3 to 11; Figures 3 to 5). The proportion resource distribution by country, for each survey and for the combined surveys summarized in Tables 12 to 14, include the proxy data for the missing 2020 NMFS spring and fall surveys. The results from the smoothing algorithm for the most recent 33-year time period were determined for Atlantic Cod, Haddock, and Yellowtail Flounder (Tables 12 to 14, respectively; Figure 6). The smoothed percentages for the time series differ from those previously calculated, due to dropping the earliest year of survey data (1988) and the incorporation of the next recent year of survey data (2021) in the smoothing algorithm. The resulting smoothed resource distributions for Eastern Georges Bank in 2021 were, for Atlantic Cod: 75% Canada, 25% USA; for Haddock: 58% Canada, 42% USA; and for Yellowtail Flounder: 52% Canada, 48% USA (Table 15b, Figure 6).

The 2021 smoothed resource distributions and the fixed resource utilization (Table 15a) were applied to the agreed sharing formula and result in shares for the 2023 fishing year (calendar year for Canada; May 1, 2023 to April 30, 2024 for the USA) for Atlantic Cod of 74% Canada, 26% USA; for Haddock of 58% Canada, 42% USA; and for Yellowtail Flounder of 47% Canada, 53% USA (Table 15b).

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TABLES

Table 1. Annual landings (mt) of Atlantic Cod, Haddock, and Yellowtail Flounder from the transboundary management units on Georges Bank from 1967 to 1994. The Transboundary Management Guidance Committee (TMGC) agreed to use the percentage of total landings by country from this time period as the measure of country utilization.

Year	Atlantic Cod			Haddock			Yellowtail Flounder		
	Canada	USA	Total	Canada	USA	Total	Canada	USA	Total
1967	8,188	3,115	11,303	12,999	11,999	24,998	133	8,407	8,540
1968	9,055	3,244	12,299	9,195	7,646	16,841	122	12,799	12,921
1969	5,876	3,676	9,552	3,941	6,621	10,562	327	15,944	16,271
1970	2,580	3,211	5,791	1,970	3,154	5,124	70	15,505	15,575
1971	2,950	4,389	7,339	1,610	3,533	5,143	102	11,878	11,980
1972	2,535	2,708	5,243	609	1,551	2,160	8	14,157	14,165
1973	3,222	3,064	6,286	1,565	1,396	2,961	12	15,899	15,911
1974	1,370	3,792	5,162	462	955	1,417	5	14,607	14,612
1975	1,833	3,108	4,941	1,353	1,705	3,058	8	13,205	13,213
1976	2,320	2,037	4,357	1,362	974	2,336	11	11,336	11,347
1977	6,156	4,256	10,412	2,871	2,428	5,299	38	9,444	9,482
1978	8,777	5,502	14,279	9,968	4,724	14,692	56	4,519	4,575
1979	5,979	6,408	12,387	5,080	5,212	10,292	17	5,475	5,492
1980	8,065	6,418	14,483	10,017	5,615	15,632	81	6,481	6,562
1981	8,498	8,092	16,590	5,658	9,075	14,733	12	6,182	6,194
1982	17,825	8,565	26,390	4,872	6,280	11,152	18	10,634	10,652
1983	12,131	8,573	20,704	3,208	4,453	7,661	43	11,350	11,393
1984	5,761	10,551	16,312	1,463	5,120	6,583	4	5,764	5,768
1985	10,442	6,641	17,083	3,484	1,684	5,168	3	2,477	2,480
1986	8,411	5,697	14,108	3,415	2,201	5,616	27	3,041	3,068
1987	11,844	4,793	16,637	4,703	1,418	6,121	56	2,743	2,799
1988	12,740	7,645	20,385	5,941	1,694	7,635	47	1,866	1,913
1989	7,895	6,182	14,077	3,060	785	3,845	32	1,134	1,166
1990	14,364	6,414	20,778	3,340	1,188	4,528	13	2,751	2,764
1991	13,459	6,353	19,812	5,423	931	6,354	25	1,784	1,809
1992	11,673	5,080	16,753	4,090	1,629	5,719	15	2,859	2,874
1993	8,524	4,027	12,551	3,725	424	4,149	675	2,089	2,764
1994	5,278	1,229	6,507	2,412	32	2,444	2,139	1,589	3,728
Total mt 1967–94	217,751	144,770	362,521	117,796	94,427	212,223	4,099	215,919	220,018
Percentage 1967–94	60%	40%	100%	55%	45%	100%	2%	98%	100%

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Table 2. Fisheries and Oceans (DFO) and National Marine Fisheries Service (NMFS) strata (or strata section) areas (in square nautical miles) used in the calculation of biomass indices. The designation 'eGB' denotes the Eastern Georges Bank management unit used for Atlantic Cod and Haddock. The designation '~eGB' denotes the portion of the stratum not in the Eastern Georges Bank management unit.

DFO/NMFS Strata	Canada	USA(eGB)	USA(~eGB)
DFO 5Z1	795	0	0
5Z2	1,252	0	0
5Z3	0	1,504	791
5Z4	0	1,350	1,729
NMFS 13	0	0	2,374
14	0	0	656
15	0	0	230
16	1,553	1,427	0
17	284	76	0
18	127	45	0
19	0	1,059	1,395
20	0	335	886
21	210	78	136
22	125	106	223

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Table 3. Atlantic Cod biomass (mt) index by strata sections of Eastern Georges Bank (see Figure 2) from the National Marine Fisheries Service (NMFS) spring survey. Light shaded cells represent missing values calculated from adjacent strata sections. Cells with “-” represent missing values assumed to be zero while “0” represents observed zeros. Only the 33 year moving average data are shown. The 2020 NMFS spring survey was cancelled due to COVID-19 restrictions.

Year	USA 16	CAN 16	USA 17	CAN 17	USA 18	CAN 18	USA 19	USA 20	USA 21	CAN 21	USA 22	CAN 22	USA total	CAN total
1988	1,236	4,560	0	334	-	42	1,403	243	60	1,229	0	269	2,942	6,432
1989	583	4,630	0	33	-	9	1,875	550	0	250	-	0	3,008	4,923
1990	1,128	4,693	0	519	-	146	475	449	57	108	-	603	2,110	6,068
1991	559	3,512	-	178	-	157	1,920	154	115	617	-	36	2,748	4,499
1992	0	2,116	-	293	-	9	491	316	55	639	-	1,240	862	4,296
1993	749	695	-	1,322	-	0	2,229	472	-	134	-	229	3,451	2,380
1994	143	0	0	21	0	-	96	43	36	658	-	73	318	752
1995	350	7,548	-	63	0	-	302	503	-	265	-	150	1,154	8,026
1996	1,161	1,545	-	221	-	0	1,211	74	358	1,653	0	0	2,803	3,419
1997	756	1,561	11	107	0	28	471	0	116	176	-	343	1,355	2,214
1998	235	6,238	0	187	-	72	0	-	110	5,408	186	263	531	12,168
1999	1,053	2,482	0	13	-	0	337	667	0	338	495	25	2,552	2,858
2000	1,458	3,281	0	11	0	-	967	1,513	27	302	-	96	3,965	3,691
2001	191	1,795	-	59	-	0	275	166	207	155	-	340	839	2,349
2002	1,341	2,243	0	23	-	46	318	-	0	477	0	64	1,659	2,851
2003	478	3,194	25	50	-	0	387	61	242	318	149	131	1,342	3,694
2004	309	2,252	-	12	-	119	252	2,462	119	11,393	-	0	3,142	13,776
2005	1,235	1,599	0	266	0	-	0	64	-	697	121	151	1,420	2,713
2006	3,162	511	0	457	-	0	524	277	509	1,011	-	0	4,472	1,979
2007	2,287	1,759	15	128	0	0	398	237	452	260	-	82	3,388	2,229
2008	1,488	1,669	0	18	0	0	368	300	6	788	0	345	2,162	2,820
2009	1,024	2,673	7	0	0	100	535	47	256	3,045	37	0	1,906	5,817
2010	541	1,070	0	410	0	125	667	461	941	1,010	94	198	2,704	2,813
2011	474	1,573	0	133	0	74	56	0	0	460	0	196	530	2,436
2012	1,075	3,504	6	182	0	0	646	1,412	-	695	-	146	3,139	4,528
2013	40	1,158	0	54	0	77	740	1,312	-	7,808	61	239	2,153	9,335
2014	0	1,304	0	93	0	0	1,214	1,773	40	202	-	45	3,027	1,644
2015	411	394	0	284	0	422	106	462	-	411	-	113	979	1,624
2016	24	2,867	0	0	0	13	83	146	0	935	0	20	253	3,835
2017	81	6,929	0	30	0	115	4,260	350	57	80	89	467	4,837	7,620
2018	220	508	0	73	0	68	1,938	-	0	300	-	0	2,158	948
2019	185	8,204	0	0	0	49	192	58	20	333	451	22	905	8,609
2020	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	1,191	969	0	22	0	0	139	1,881	60	197	0	54	3,271	1,242

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Table 4. Atlantic Cod biomass (mt) index by strata sections of Eastern Georges Bank (see Figure 2) from the National Marine Fisheries Service (NMFS) fall survey. Shaded cells represent missing values calculated from adjacent strata sections. Cells with “-” represent missing values assumed to be zero while “0” represents observed zeros. Only the 33 year moving average data are shown. The 2020 NMFS fall survey was cancelled due to COVID-19 restrictions.

Year	USA 16	CAN 16	USA 17	CAN 17	USA 18	CAN 18	USA 19	USA 20	USA 21	CAN 21	USA 22	CAN 22	USA total	CAN total
1988	0	2,154	-	251	-	610	2	6	-	385	30	1,400	38	4,799
1989	0	2,329	-	216	0	-	0	7	3	893	23	13	33	3,451
1990	12	2,647	0	285	-	27	0	0	-	1,014	-	16	12	3,989
1991	0	118	-	109	0	-	-	0	0	88	0	7	0	322
1992	57	643	0	704	-	0	0	35	13	380	-	57	105	1,784
1993	0	92	-	188	-	0	0	0	-	54	-	26	0	361
1994	0	56	-	157	-	201	0	0	7	1,583	-	0	7	1,997
1995	0	23	-	127	-	71	0	67	28	1,171	0	-	95	1,392
1996	0	652	-	311	-	48	0	-	66	181	-	93	66	1,284
1997	0	0	-	57	-	0	0	0	-	1,285	-	0	0	1,342
1998	0	1,031	-	31	-	170	0	0	-	769	-	-	0	2,001
1999	0	58	-	154	-	56	0	0	-	465	22	15	22	748
2000	0	269	-	226	-	48	0	0	0	234	0	0	0	778
2001	40	423	-	431	-	0	0	0	0	288	-	9	40	1,151
2002	0	2,955	0	366	-	34	207	0	0	7,312	61	16	268	10,684
2003	0	133	-	0	-	0	135	0	0	405	-	23	135	561
2004	0	5,982	0	485	0	50	0	0	41	731	61	0	102	7,247
2005	0	486	0	445	0	40	0	77	32	366	0	102	109	1,440
2006	59	1,781	0	0	0	0	0	-	-	190	-	0	59	1,972
2007	0	149	0	34	-	0	47	47	4	214	-	21	98	418
2008	0	368	0	131	0	73	0	0	0	108	0	23	0	704
2009	0	834	0	16	0	0	0	332	16	724	24	31	356	1,605
2010	0	457	0	0	0	47	0	0	0	480	45	0	45	984
2011	0	3,317	0	77	0	160	0	0	112	93	0	0	112	3,647
2012	0	120	0	0	0	158	0	0	0	622	171	0	171	900
2013	0	2,745	0	110	0	12	25	98	-	551	-	0	123	3,419
2014	0	631	0	0	0	0	0	122	-	972	-	36	122	1,639
2015	0	3,751	0	665	0	41	0	515	0	897	-	74	515	5,427
2016	0	0	0	52	0	47	214	2,951	0	2,287	-	0	3,165	2,387
2017	0	376	0	250	0	30	0	-	0	70	0	0	0	727
2018	0	2,203	0	0	0	41	0	58	0	151	0	0	58	2,395
2019	0	0	0	0	0	78	0	805	0	798	0	0	805	875
2020	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	0	1,288	0	409	0	306	0	32	0	16	0	9	32	2,028

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Table 5. Atlantic Cod biomass (mt) index by strata and strata sections of Eastern Georges Bank (see Figure 2) from the Fisheries and Oceans Canada (DFO) survey.

Year	CAN 5Z1	CAN 5Z2	USA 5Z3	USA 5Z4	USA total	CAN total
1988	1,894	12,927	3,856	775	4,631	14,821
1989	2,040	8,664	2,766	1,076	3,842	10,704
1990	1,708	48,900	4,622	1,435	6,057	50,608
1991	2,204	17,398	3,820	1,646	5,467	19,601
1992	2,087	7,602	4,005	887	4,892	9,689
1993	719	9,427	3,875	2,524	6,399	10,146
1994	817	11,821	455	47	502	12,638
1995	919	3,277	3,368	553	3,921	4,197
1996	1,090	22,489	3,927	4,667	8,594	23,579
1997	377	7,336	2,095	1,196	3,290	7,714
1998	332	4,091	551	32	583	4,423
1999	211	6,880	1,206	880	2,086	7,092
2000	228	21,947	9,281	842	10,123	22,174
2001	1,499	15,563	257	718	975	17,062
2002	2,298	17,043	309	683	992	19,341
2003	720	3,571	1,130	797	1,927	4,291
2004	685	4,248	699	29	728	4,933
2005	1,597	7,306	192	17,105	17,298	8,903
2006	127	8,469	2,652	1,299	3,951	8,595
2007	836	8,930	911	552	1,462	9,766
2008	5,880	6,603	327	848	1,175	12,483
2009	2,195	20,917	0	54	54	23,113
2010	218	8,694	16,963	477	17,440	8,913
2011	3,702	4,031	543	161	704	7,733
2012	444	1,311	504	203	708	1,755
2013	7,079	1,538	1,819	677	2,496	8,617
2014	586	1,483	122	218	340	2,069
2015	482	2,785	225	102	327	3,267
2016	693	2,342	600	20	620	3,036
2017	937	4,343	9,260	25	9,285	5,281
2018	2,100	3,111	1,976	293	2,269	5,211
2019	103	3,619	278	59	337	3,722
2020	474	3,507	233	0	233	3,981
2021	411	1,054	311	44	355	1,465

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Table 6. Haddock biomass (mt) index by strata sections of Eastern Georges Bank (see Figure 2) from the National Marine Fisheries Service (NMFS) spring survey. Light shaded cells represent missing values calculated from adjacent strata sections. Cells with “-” represent missing values assumed to be zero while “0” represents observed zeros. Only the 33 year moving average data are shown. The 2020 NMFS spring survey was cancelled due to COVID-19 restrictions.

Year	USA 16	CAN 16	USA 17	CAN 17	USA 18	CAN 18	USA 19	USA 20	USA 21	CAN 21	USA 22	CAN 22	USA total	CAN total
1988	3,085	2,097	0	13	-	0	169	0	0	310	0	0	3,255	2,419
1989	5,778	2,961	28	146	-	79	123	0	0	751	-	256	5,929	4,193
1990	1,612	8,848	0	64	-	-	0	0	33	1,305	-	21	1,645	10,238
1991	1,012	6,001	-	37	-	0	0	0	0	28	-	0	1,012	6,067
1992	442	1,530	-	80	-	0	93	0	-	376	-	0	536	1,986
1993	266	3,234	-	439	-	0	0	0	-	387	-	154	266	4,214
1994	2	801	11	1	0	-	0	-	6	5,644	-	0	19	6,446
1995	2,297	578	42	60	0	-	778	0	2	3,356	-	888	3119	4,881
1996	3,720	1,021	23	32	-	0	8,581	0	8	972	31	0	12,362	2,026
1997	218	1,884	10	28	0	11	0	0	45	1,239	-	74	273	3,237
1998	574	6,600	3	84	-	5	0	-	282	227	0	108	859	7,024
1999	6,267	3,485	0	1,598	-	0	0	74	42	366	37	38	6,420	5,487
2000	4,238	3,712	0	220	0	-	198	668	522	151	-	55	5,626	4,138
2001	297	1,537	-	446	-	0	71	0	1,215	4,339	-	15	1,583	6,337
2002	13,973	9,781	0	332	-	15	8,094	-	0	897	93	78	22,161	11,103
2003	2,149	14,472	2	77	-	0	699	291	1,123	1,438	19	46	4,282	16,034
2004	25,198	27,752	-	978	-	75	3,503	28,736	715	669	-	3	58,152	29,477
2005	1,575	3,031	680	948	0	-	4,991	144	-	3,945	132	484	7,522	8,408
2006	11,166	8,302	5	323	-	97	758	3,059	143	4,140	-	40	15,131	12,901
2007	9,617	23,430	7	64	0	90	19,906	12,979	295	795	-	124	42,804	24,502
2008	40,456	5,465	2	135	0	164	87	1,869	484	151	0	204	42,898	6,120
2009	22,760	4,635	88	245	0	37	1,061	1,502	6,546	6,224	0	19	31,957	11,159
2010	11,191	11,361	92	85	0	147	12,458	2,895	1,364	2,968	36	109	28,037	14,670
2011	5,332	6,871	17	859	0	157	515	0	364	2,642	0	740	6,228	11,270
2012	28,213	15,155	15	2,039	1	315	3,285	2,483	-	3,635	-	101	33,997	21,245
2013	5,291	13,149	0	557	0	294	5,952	5,047	-	18,415	123	326	16,413	32,741
2014	3,228	7,953	133	2,523	0	496	14,247	21,918	701	2,405	-	1,230	40,227	14,607
2015	13,773	6,688	367	941	59	753	54,810	13,065	-	5,685	-	699	82,074	14,766
2016	24,635	29,393	9	326	0	1,106	4,735	11,066	1,009	6,696	936	178	42,390	37,699
2017	6,122	23,207	0	765	0	220	48,725	9,304	418	1,230	134	588	64,704	26,009
2018	9,248	5,329	540	1,090	0	592	26,772	-	445	3,626	-	471	37,006	11,109
2019	7,205	23,707	0	2,720	0	181	14,820	7,897	3,108	715	862	2,095	33,892	29,418
2020	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	21,318	4,593	0	1,041	0	68	3,532	24,742	1,531	1,335	2,184	46	53,308	7,083

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Table 7. Haddock biomass (mt) index by strata sections of Eastern Georges Bank (see Figure 2) from the National Marine Fisheries Service (NMFS) fall survey. Light shaded cells represent missing values calculated from adjacent strata sections. Cells with “-” represent missing values assumed to be zero while “0” represents observed zeros. Only the 33 year moving average data are shown. The 2020 NMFS fall survey was cancelled due to COVID-19 restrictions.

Year	USA 16	CAN 16	USA 17	CAN 17	USA 18	CAN 18	USA 19	USA 20	USA 21	CAN 21	USA 22	CAN 22	USA total	CAN total
1988	50	1,134	-	366	-	1,588	0	0	-	1,724	0	413	50	5,224
1989	4	528	-	987	2	1,114	0	8	6	1,331	46	296	66	4,257
1990	51	29	0	1,396	-	401	0	0	-	885	-	132	51	2,842
1991	20	92	-	561	0	0	-	0	8	0	0	178	28	831
1992	171	292	0	585	-	173	0	8	0	6	-	21	179	1,077
1993	0	443	-	217	-	0	0	0	-	4,103	-	83	0	4,846
1994	0	0	-	284	-	347	0	0	0	1,162	-	0	0	1,793
1995	4	5,214	-	843	-	1,373	0	0	0	6,575	0	-	4	14,005
1996	10	2,057	-	1,138	-	639	0	-	1	179	-	0	10	4,012
1997	0	4	-	133	-	0	2	5	8	6,012	-	0	15	6,149
1998	7	3,409	-	285	-	471	0	37	7	2,241	-	-	51	6,406
1999	0	151	-	113	-	2,021	0	0	-	13,900	0	0	0	16,184
2000	100	1,646	-	365	-	1,351	0	0	0	9,432	0	0	100	12,795
2001	1,013	1,471	-	2,264	-	395	0	0	0	21,540	-	491	1,013	26,161
2002	314	21,420	8	591	-	201	0	144	0	19,620	206	223	671	42,054
2003	2,736	3,312	-	331	-	95	342	219	123	6,453	-	0	3,420	10,191
2004	3,275	24,845	746	1,115	0	693	0	5	1,766	8,248	223	1,181	6,014	36,083
2005	5,647	13,381	2	1,071	0	98	3	120	585	5,617	2,650	11,761	9,009	31,927
2006	2,088	20,548	0	837	0	571	0	-	-	4,502	-	7,275	2,088	33,732
2007	203	2,560	6	788	-	39	0	0	11,208	2,860	-	15,315	11,417	21,561
2008	89	2,578	2	4,246	0	775	0	0	0	8,005	0	7,470	91	23,074
2009	11,958	14,743	0	2,070	0	0	12,254	304	240	3,999	188	36	24,944	20,848
2010	2,936	14,967	50	1,554	1	1,087	0	0	2,677	2,604	697	707	6,361	20,919
2011	9,122	29,552	1,606	2,549	1	2,355	166	0	1,178	1,096	0	443	12,073	35,995
2012	564	21,501	0	798	0	680	0	0	784	29,443	736	7,528	2,084	59,950
2013	61,804	27,768	676	1,060	89	447	22,938	6,321	-	3,769	-	7,276	91,828	40,320
2014	28,032	24,214	5,450	7,395	75	2,543	16	4,393	-	5,710	-	6,441	37,966	46,303
2015	15,406	63,954	4	10,087	0	1,252	186,527	14,234	12,602	6,342	-	257	228,773	81,892
2016	4,249	75,958	0	5,347	0	1,871	2,751	3,418	5,738	20,514	-	519	16,156	104,209
2017	421	10,170	7	3,645	0	456	52	-	7,339	4,838	2,446	47	10,266	19,156
2018	248	14,094	0	179	0	1,186	27	1,546	3,249	973	599	13	5,668	16,446
2019	73	1,344	0	44	0	807	0	1,160	15	964	1,708	750	2,954	3,906
2020	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	68	43,959	0	8,321	0	3,027	0	14	408	1,284	2	426	491	57,015

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Table 8. Haddock biomass (mt) index by strata and strata sections of Eastern Georges Bank (see Figure 2) from the Fisheries and Oceans Canada (DFO) survey.

Year	CAN 5Z1	CAN 5Z2	USA 5Z3	USA 5Z4	USA total	CAN total
1988	1,350	16,559	8,305	96	8,401	17909
1989	982	9,377	641	198	839	10,359
1990	3,943	15,963	3,424	4,155	7,579	19,907
1991	3,084	13,597	7,383	3,260	10,643	16,680
1992	3,544	10,403	5,953	576	6,530	13,946
1993	2,064	2,367	110	2,411	2,521	4,432
1994	8,871	9,968	19	90	108	18,839
1995	2,244	18,041	336	0	336	20,285
1996	4,947	16,985	440	839	1,279	21,933
1997	1,853	11,022	1,298	179	1,476	12,875
1998	15,844	29,323	89	11	99	45,167
1999	14,775	15,221	506	319	825	29,996
2000	4,682	41,522	11,048	158	11,206	46,205
2001	9,471	43,754	2,022	513	2,535	53,225
2002	5,695	28,569	3,391	11,863	15,254	34,264
2003	1,583	89,462	4,334	27,407	31,741	91,045
2004	21,198	71,574	5,479	1,796	7,274	92,772
2005	9,638	39,589	1,931	5,209	7,140	49,226
2006	5,445	53,525	35,052	6,285	41,337	58,970
2007	9,705	43,079	3,811	5,009	8,820	52,784
2008	35,446	47,657	34,798	6,063	40,861	83,102
2009	29,750	41,728	0 ¹	82	82	71,478
2010	1,137	44,993	5,148	19,991	25,139	46,130
2011	12,095	32,436	4,114	10,518	14,632	44,530
2012	4,365	29,550	25,010	18,497	43,508	33,915
2013	21,809	50,425	60,218	31,062	91,281	72,235
2014	26,210	40,788	1,423	909	2,332	66,997
2015	5,630	28,722	150,689	47,854	198,542	34,352
2016	6,344	160,556	66,166	4,793	70,959	166,900
2017	4,493	41,845	67,797	9,119	76,915	46,338
2018	2,032	40,680	59,654	9,492	69,146	42,712
2019	5,011	80,610	8,671	2,612	11,283	85,621
2020	1,939	15,882	14,404	540	14,944	17,821
2021	7,512	12,205	7,479	534	8,013	19,717

¹ No Haddock were caught in 7 tows in this stratum section.

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Table 9. Yellowtail Flounder biomass (mt) index by strata and strata sections of Georges Bank (see Figure 2) from the National Marine Fisheries Service (NMFS) spring survey. Cells with “-” represent missing values assumed to be zero while “0” represents observed zeros. Only the 33 year moving average data is shown. The 2020 NMFS spring survey was cancelled due to COVID-19 restrictions.

Year	USA 13	USA 14	USA 15	USA 16	CAN 16	USA 17	CAN 17	USA 18	CAN 18	USA 19	USA 20	USA 21	CAN 21	USA total	CAN total
1988	193	0	0	183	146	0	0	-	0	46	6	40	0	467	146
1989	179	0	0	115	322	0	0	-	0	65	2	2	3	363	324
1990	545	0	0	30	117	0	7	-	-	37	0	0	0	612	124
1991	233	0	0	139	286	-	0	-	0	7	0	0	0	380	286
1992	295	0	0	178	1,200	-	9	-	0	169	45	0	25	688	1,233
1993	84	0	0	83	349	-	8	-	0	49	0	0	6	217	363
1994	103	0	0	127	383	0	0	0	-	70	0	55	37	356	419
1995	298	0	0	439	1,854	-	0	0	-	41	12	4	44	794	1,898
1996	103	0	0	1,020	1,724	-	9	-	0	229	120	13	23	1,485	1,756
1997	95	0	0	432	3,631	0	0	3	0	35	59	2	0	626	3,631
1998	704	0	0	910	676	0	0	-	0	38	65	19	302	1,737	978
1999	768	0	0	2,571	6,830	0	0	-	0	5	67	36	3	3,448	6,833
2000	681	0	0	2,003	4,927	0	6	0	-	180	33	61	0	2,956	4,933
2001	61	0	0	2,486	2,389	-	8	-	0	101	20	240	17	2,908	2,413
2002	66	0	0	3,656	3,876	0	0	-	0	663	8	4	3,150	4,397	7,026
2003	173	0	0	895	6,384	0	28	-	0	21	0	14	-	1,103	6,412
2004	261	0	-	535	1,219	-	0	-	0	74	16	0	62	886	1,281
2005	216	0	0	2,094	1,025	0	0	0	-	44	0	0	33	2,354	1,058
2006	93	5	0	1,258	1,051	0	0	-	0	87	58	2	2	1,504	1,053
2007	372	382	3	733	3,271	0	6	0	0	38	81	89	0	1,699	3,277
2008	234	0	0	968	1,241	44	969	0	0	92	22	28	29	1,388	2,238
2009	1,338	0	0	4,298	5,566	61	116	0	0	380	24	69	104	6,171	5,786
2010	573	974	0	4,059	6,352	0	6	1	0	2,491	80	3	39	8,182	6,397
2011	3,238	110	0	1,821	251	7	0	0	0	368	89	6	0	5,640	251
2012	1,637	0	0	4,763	817	0	7	0	1	1,098	424	14	111	7,936	936
2013	133	0	0	665	1,151	6	28	0	0	138	54	6	175	1,002	1,354
2014	360	0	0	498	299	0	0	0	0	563	0	102	0	1,523	299
2015	395	0	0	295	166	0	40	0	0	128	187	11	37	1,016	243
2016	68	0	0	89	92	0	0	0	0	60	25	0	6	242	98
2017	48	0	0	118	43	0	0	0	0	55	0	0	0	221	43
2018	7	0	0	0	5	0	0	0	0	0	0	0	0	7	5
2019	73	0	0	182	80	0	3	0	0	0	6	0	3	261	86
2020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	25	0	0	787	334	0	0	0	0	0	0	9	57	822	391

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Table 10. Yellowtail Flounder biomass (mt) index by strata and strata sections of Georges Bank (see Figure 2) from the National Marine Fisheries Service (NMFS) fall survey. Cells with “-” represent missing values assumed to be zero while “0” represents observed zeros. Only the 33 year moving average data are shown. The 2020 NMFS fall survey was cancelled due to COVID-19 restrictions.

Year	USA 13	USA 14	USA 15	USA 16	CAN 16	USA 17	CAN 17	USA 18	CAN 18	USA 19	USA 20	USA 21	CAN 21	USA total	CAN total
1988	18	0	0	121	60	-	0	-	0	0	4	0	13	144	73
1989	794	0	0	202	83	-	0	0	-	9	21	0	0	1,026	83
1990	388	0	0	282	76	0	0	-	0	32	0	0	0	702	76
1991	90	0	0	661	99	-	0	3	-	0	0	25	0	779	99
1992	177	0	0	9	419	0	0	-	0	16	22	0	0	224	419
1993	47	0	0	24	327	-	12	-	0	0	7	18	0	96	339
1994	113	0	0	105	755	-	18	-	0	11	0	118	19	347	792
1995	47	0	0	80	214	-	0	-	0	3	10	71	0	211	214
1996	90	0	0	1,494	284	-	0	-	0	0	0	10	0	1,593	284
1997	232	0	0	1,808	1,999	-	0	-	0	38	0	37	3	2,115	2,003
1998	818	0	0	592	2,364	-	3	-	0	0	20	5	0	1,435	2,367
1999	770	0	0	2,935	3,962	-	191	-	0	224	114	157	0	4,200	4,154
2000	171	0	0	5,580	1,097	-	4	-	0	60	22	144	20	5,978	1,121
2001	641	0	0	7,877	2,139	-	13	-	0	177	47	111	0	8,853	2,153
2002	161	0	0	1,784	1,861	0	7	-	0	5	10	214	75	2,174	1,943
2003	92	0	0	2,825	1,613	-	0	-	0	158	0	43	3	3,119	1,616
2004	161	0	0	5,915	78	0	0	0	0	172	12	67	121	6,327	198
2005	145	0	0	1,133	1,260	0	7	0	0	41	29	56	9	1,404	1,276
2006	1475	0	-	2,909	294	0	45	1	0	25	3	16	37	4,429	376
2007	274	0	0	5,739	753	3	0	0	0	52	6	114	115	6,188	868
2008	852	0	0	3,090	3,654	0	0	0	0	0	0	31	58	3,973	3,712
2009	4,209	0	0	10,518	785	0	45	0	0	1,180	151	161	136	16,219	966
2010	1,497	4	0	2,371	1,579	18	74	4	0	61	0	20	39	3,975	1,692
2011	2,139	0	3	2,511	880	14	0	0	0	63	0	13	841	4,742	1,721
2012	49	0	0	4,888	400	0	0	0	0	29	0	617	49	5,583	449
2013	164	0	0	1,255	542	0	0	0	0	260	114	0	28	1,793	570
2014	392	0	0	1,478	762	0	0	0	0	0	5	0	3	1,875	765
2015	0	0	0	180	1,016	0	0	0	0	28	0	0	34	208	1,050
2016	68	0	0	211	57	0	0	0	0	3	3	4	139	289	196
2017	1	0	0	118	29	0	0	0	0	61	0	0	0	180	29
2018	0	0	0	392	126	0	0	0	0	0	0	0	0	392	126
2019	26	0	0	88	214	0	0	0	0	2	3	0	4	118	217
2020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	0	0	0	295	232	0	0	0	0	0	0	4	0	299	232

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Table 11. Yellowtail Flounder biomass (mt) index by strata of Georges Bank (see Figure 2) from the Fisheries and Oceans Canada (DFO) survey.

Year	CAN 5Z1	CAN 5Z2	USA 5Z3	USA 5Z4	USA total	CAN total
1988	30	253	136	816	952	283
1989	29	111	50	281	331	140
1990	39	358	129	1,053	1,181	397
1991	57	444	262	996	1,258	501
1992	119	432	327	1,599	1,925	550
1993	59	1,634	178	771	949	1,693
1994	91	501	745	1,417	2,162	591
1995	35	785	487	719	1,206	820
1996	35	2,799	1,229	1,241	2,470	2,833
1997	868	2,464	2,431	7,529	9,960	3,332
1998	93	2,484	613	1,102	1,715	2,577
1999	190	6,616	408	10,452	10,860	6,806
2000	2,019	5,526	6,430	5,974	12,404	7,545
2001	443	4,995	963	15,757	16,720	5,438
2002	66	5,052	5,854	9,727	15,581	5,118
2003	48	5,739	75	10,387	10,462	5,786
2004	84	5,637	63	3,271	3,334	5,720
2005	51	1,028	392	11,886	12,278	1,079
2006	35	776	962	4,805	5,767	812
2007	196	2,959	102	10,088	10,189	3,155
2008	64,491	1,656	262	910	1,172	66,147
2009	70,851	1,077	45	72	117	71,927
2010	5,332	3,226	178	402	580	8,558
2011	1	477	800	2,552	3,351	479
2012	89	1,121	385	4,055	4,440	1,210
2013	212	252	77	157	234	464
2014	79	98	79	257	336	177
2015	40	108	80	595	675	147
2016	20	235	31	1,441	1,473	255
2017	20	90	15	217	232	110
2018	22	68	24	138	162	90
2019	20	19	0	18	18	38
2020	10	47	0	68	68	57
2021	46	76	0	17	17	122

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Table 12. Resource distribution for Eastern Georges Bank Atlantic Cod on the Canadian and USA sides of the international boundary for the National Marine Fisheries Service (NMFS) and Fisheries and Oceans Canada (DFO) surveys, the distribution resulting from combining the surveys, and the smoothed resource distribution. The combined distribution was obtained by averaging the NMFS spring and DFO surveys to represent winter-spring and subsequently averaging with NMFS fall which represented summer-fall. All values of the smoothed resource distribution in the final two columns were updated to reflect the results of the most recent LOESS application. Open box highlights current year results. Only the 33 year moving average data are shown. Due to the cancellation of the NMFS spring and fall surveys in 2020, the % values for NMFS fall and spring in 2020 are an average of the previous two years (2018–2019).

Year	NMFS fall		NMFS spring		DFO		Combined surveys		Smoothed	
	%CAN	%USA	%CAN	%USA	%CAN	%USA	%CAN	%USA	%CAN	%USA
1989	99	1	62	38	74	26	83	17	86	14
1990	100	0	74	26	89	11	91	9	86	14
1991	100	0	62	38	78	22	85	15	85	15
1992	94	6	83	17	66	34	85	15	85	15
1993	100	0	41	59	61	39	76	24	84	16
1994	100	0	70	30	96	4	91	9	83	17
1995	94	6	87	13	52	48	82	18	83	17
1996	95	5	55	45	73	27	80	20	84	16
1997	100	0	62	38	70	30	83	17	84	16
1998	100	0	96	4	88	12	96	4	84	16
1999	97	3	53	47	77	23	81	19	85	15
2000	100	0	48	52	69	31	79	21	85	15
2001	97	3	74	26	95	5	90	10	84	16
2002	98	2	63	37	95	5	88	12	84	16
2003	81	19	73	27	69	31	76	24	82	18
2004	99	1	81	19	87	13	91	9	80	20
2005	93	7	66	34	34	66	71	29	77	23
2006	97	3	31	69	69	31	73	27	77	23
2007	81	19	40	60	87	13	72	28	78	22
2008	100	0	57	43	91	9	87	13	79	21
2009	82	18	75	25	100	0	85	15	81	19
2010	96	4	51	49	34	66	69	31	82	18
2011	97	3	82	18	92	8	92	8	82	18
2012	84	16	59	41	71	29	75	25	81	19
2013	97	3	81	19	78	22	88	12	81	19
2014	93	7	35	65	86	14	77	23	79	21
2015	91	9	62	38	91	9	84	16	77	23
2016	43	57	94	6	83	17	66	34	76	24
2017	100	0	61	39	36	64	74	26	74	26
2018	98	2	31	69	70	30	74	26	74	26
2019	52	48	90	10	92	8	72	28	74	26
2020	75	25	61	39	94	6	76	24	75	25
2021	98	2	28	72	80	20	76	24	75	25

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Table 13. Resource distribution for Eastern Georges Bank Haddock on the Canadian and USA sides of the international boundary for the National Marine Fisheries Service (NMFS) and Fisheries and Oceans Canada (DFO) surveys, the distribution resulting from combining the surveys, and the smoothed resource distribution. The combined distribution was obtained by averaging over all surveys. All values of the smoothed resource distribution in the final two columns were updated to reflect the results of the most recent LOESS application. Open box highlights current year results. Only the 33 year moving average data are shown. Due to the cancellation of the NMFS spring and fall surveys in 2020, the % values for NMFS fall and spring in 2020 are an average of the previous two years (2018–2019).

Year	NMFS fall		NMFS spring		DFO		Combined surveys		Smoothed	
	%CAN	%USA	%CAN	%USA	%CAN	%USA	%CAN	%USA	%CAN	%USA
1989	98	2	41	59	93	7	77	23	79	21
1990	98	2	86	14	72	28	86	14	80	20
1991	97	3	86	14	61	39	81	19	82	18
1992	86	14	79	21	68	32	78	22	84	16
1993	100	0	94	6	64	36	86	14	85	15
1994	100	0	100	0	99	1	100	0	86	14
1995	100	0	61	39	98	2	86	14	88	12
1996	100	0	14	86	94	6	69	31	89	11
1997	100	0	92	8	90	10	94	6	88	12
1998	99	1	89	11	100	0	96	4	86	14
1999	100	0	46	54	97	3	81	19	85	15
2000	99	1	42	58	80	20	74	26	81	19
2001	96	4	80	20	95	5	91	9	78	22
2002	98	2	33	67	69	31	67	33	76	24
2003	75	25	79	21	74	26	76	24	74	26
2004	86	14	34	66	93	7	71	29	72	28
2005	78	22	53	47	87	13	73	27	69	31
2006	94	6	46	54	59	41	66	34	66	34
2007	65	35	36	64	86	14	62	38	64	36
2008	100	0	12	88	67	33	60	40	61	39
2009	46	54	26	74	100	0	57	43	61	39
2010	77	23	34	66	65	35	59	41	61	39
2011	75	25	64	36	75	25	72	28	59	41
2012	97	3	38	62	44	56	60	40	59	41
2013	31	69	67	33	44	56	47	53	58	42
2014	55	45	27	73	97	3	59	41	57	43
2015	26	74	15	85	15	85	19	81	54	46
2016	87	13	47	53	70	30	68	32	53	47
2017	64	36	29	71	38	62	43	57	53	47
2018	74	26	23	77	38	62	45	55	53	47
2019	57	43	46	54	88	12	64	36	54	46
2020	66	34	35	65	54	46	52	48	56	44
2021	99	1	12	88	71	29	61	39	58	42

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Table 14. Resource distribution for Georges Bank Yellowtail Flounder on the Canadian and USA sides of the international boundary for the National Marine Fisheries Service (NMFS) and Fisheries and Oceans Canada (DFO) surveys, the distribution resulting from combining the surveys, and the smoothed resource distribution. The combined distribution was obtained by averaging over all surveys. All values of the smoothed resource distribution in the final two columns were updated to reflect the results of the most recent LOESS application. Open box highlights current year results. Only the 33 year moving average data are shown. Due to the cancellation of the NMFS spring and fall surveys in 2020, the % values for NMFS fall and spring in 2020 are an average of the previous two years (2018-2019).

Year	NMFS fall		NMFS spring		DFO		Combined surveys		Smoothed	
	%CAN	%USA	%CAN	%USA	%CAN	%USA	%CAN	%USA	%CAN	%USA
1989	7	93	47	53	30	70	28	72	21	79
1990	10	90	17	83	25	75	17	83	28	72
1991	11	89	43	57	28	72	28	72	35	65
1992	65	35	64	36	22	78	51	49	41	59
1993	78	22	63	37	64	36	68	32	48	52
1994	70	30	54	46	21	79	48	52	51	49
1995	50	50	71	29	40	60	54	46	51	49
1996	15	85	54	46	53	47	41	59	50	50
1997	49	51	85	15	25	75	53	47	50	50
1998	62	38	36	64	60	40	53	47	48	52
1999	50	50	66	34	39	61	52	48	46	54
2000	16	84	63	37	38	62	39	61	44	56
2001	20	80	45	55	25	75	30	70	43	57
2002	47	53	62	38	25	75	44	56	42	58
2003	34	66	85	15	36	64	52	48	40	60
2004	3	97	59	41	63	37	42	58	38	62
2005	48	52	31	69	8	92	29	71	36	64
2006	8	92	41	59	12	88	20	80	36	64
2007	12	88	66	34	24	76	34	66	39	61
2008	48	52	62	38	98	2	69	31	43	57
2009	6	94	48	52	100	0	51	49	44	56
2010	30	70	44	56	94	6	56	44	41	59
2011	27	73	4	96	13	87	14	86	38	62
2012	7	93	11	89	21	79	13	87	34	66
2013	24	76	57	43	67	33	49	51	31	69
2014	29	71	16	84	35	65	27	73	31	69
2015	83	17	19	81	18	82	40	60	32	68
2016	40	60	29	71	15	85	28	72	31	69
2017	14	86	16	84	32	68	21	79	34	66
2018	24	76	43	57	36	64	34	66	38	62
2019	65	35	25	75	68	32	52	48	42	58
2020	45	55	33	67	46	54	41	59	47	53
2021	44	56	32	68	88	12	55	45	52	48

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Table 15a. Resource utilization of Eastern Georges Bank Atlantic Cod and Haddock, and Georges Bank Yellowtail Flounder (Ytl) for USA and Canada Values are a percentage.

Country	Resource Utilization		
	Cod	Haddock	Ytl
USA	40	45	98
Canada	60	55	2

Table 15b. Smoothed distribution of Eastern Georges Bank Atlantic Cod and Haddock (Had), and Georges Bank Yellowtail Flounder (Ytl) and the weightings used in the USA/Canada allocation sharing formula. Allocation shares are updated annually based on resource distribution. Values are a percentage.

Country	Survey Year	Resource Distribution			Fishing Year	Weighting		Allocation Shares		
		Cod	Had	Ytl		Utilization	Distribution	Cod	Had	Ytl
USA	2000	18	20	54	2002	40	60	27	30	72
Canada	2000	82	80	46	2002	40	60	73	70	28
USA	2001	14	16	64	2003	40	60	24	28	78
Canada	2001	86	84	36	2003	40	60	76	72	22
USA	2002	12	26	62	2004	40	60	23	34	76
Canada	2002	88	74	38	2004	40	60	77	66	24
USA	2003	18	27	56	2005	35	65	26	33	71
Canada	2003	82	73	44	2005	35	65	74	67	29
USA	2004	14	29	56	2006	30	70	22	34	69
Canada	2004	86	71	44	2006	30	70	78	66	31
USA	2005	21	29	63	2007	25	75	26	33	72
Canada	2005	79	71	37	2007	25	75	74	67	28
USA	2006	26	32	73	2008	20	80	29	35	78
Canada	2006	74	68	27	2008	20	80	71	65	22
USA	2007	29	36	73	2009	15	85	31	37	77
Canada	2007	71	64	27	2009	15	85	69	63	23
USA	2008	23	40	60	2010	10	90	25	40.5	64
Canada	2008	77	60	40	2010	10	90	75	59.5	36
USA	2009	17	43	50	2011	10	90	19	43	55
Canada	2009	83	57	50	2011	10	90	81	57	45
USA	2010	22	43	44	2012	10	90	24	43	49
Canada	2010	78	57	56	2012	10	90	76	57	51
USA	2011	13	37	37	2013	10	90	16	38	43
Canada	2011	87	63	63	2013	10	90	84	62	57
USA	2012	19	37	81	2014	10	90	21	38	83
Canada	2012	81	63	19	2014	10	90	79	62	17
USA	2013	16	45	67	2015	10	90	18	45	70
Canada	2013	84	55	33	2015	10	90	82	55	30
USA	2014	19	43	72	2016	10	90	21	43	75
Canada	2014	81	57	28	2016	10	90	79	57	25
USA	2015	18	61	66	2017	10	90	20	59	69
Canada	2015	82	39	34	2017	10	90	80	41	31
USA	2016	26	38	68	2018	10	90	27	39	71
Canada	2016	74	62	32	2018	10	90	73	61	29
USA	2017	28	51	74	2019	10	90	29	50	76
Canada	2017	72	49	26	2019	10	90	71	50	24
USA	2018	28	55	71	2020	10	90	29	54	74
Canada	2018	72	45	29	2020	10	90	71	46	26
USA	2019	29	46	60	2021	10	90	30	46	64
Canada	2019	71	54	40	2021	10	90	70	54	36
USA	2020	27	47	57	2022	10	90	28	47	61
Canada	2020	73	53	43	2022	10	90	72	53	39
USA	2021	25	42	48	2023	10	90	26	42	53
Canada	2021	75	58	52	2023	10	90	74	58	47

FIGURES

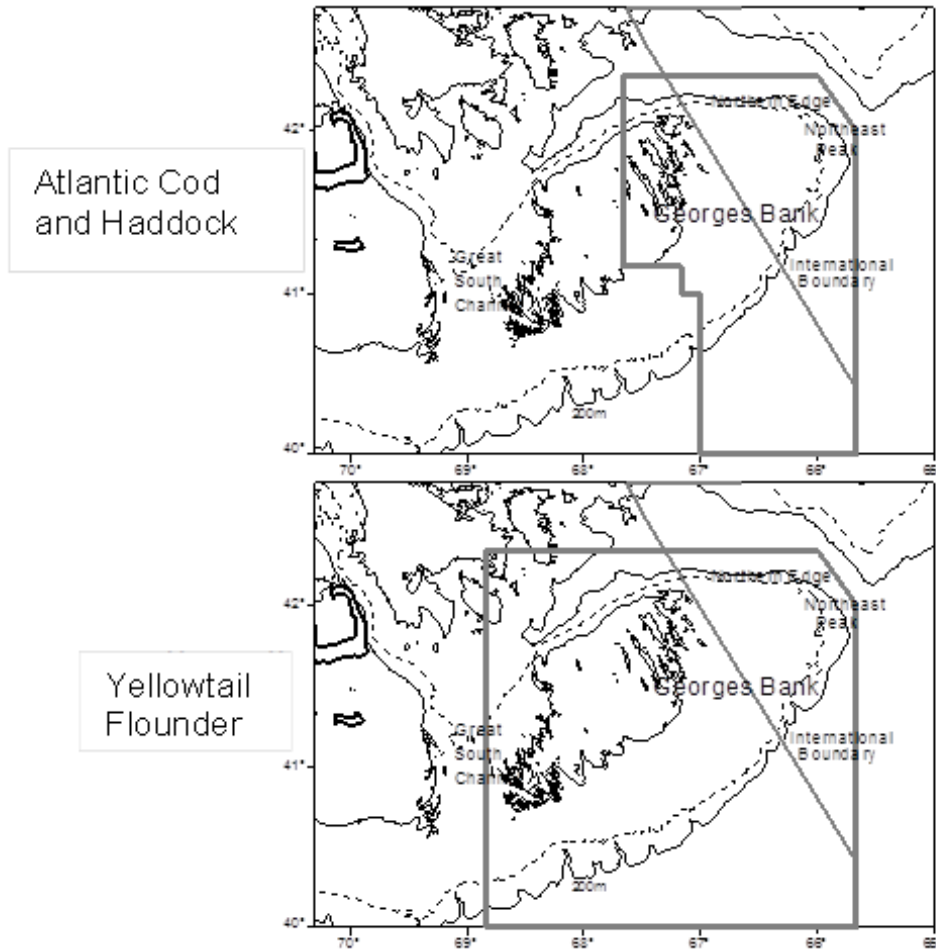


Figure 1. The management areas for Atlantic Cod, Haddock (upper panel), and Yellowtail Flounder (lower panel) on Georges Bank (thick grey line), including the Canada/USA boundary line (thin grey line) across which resource distribution was determined.

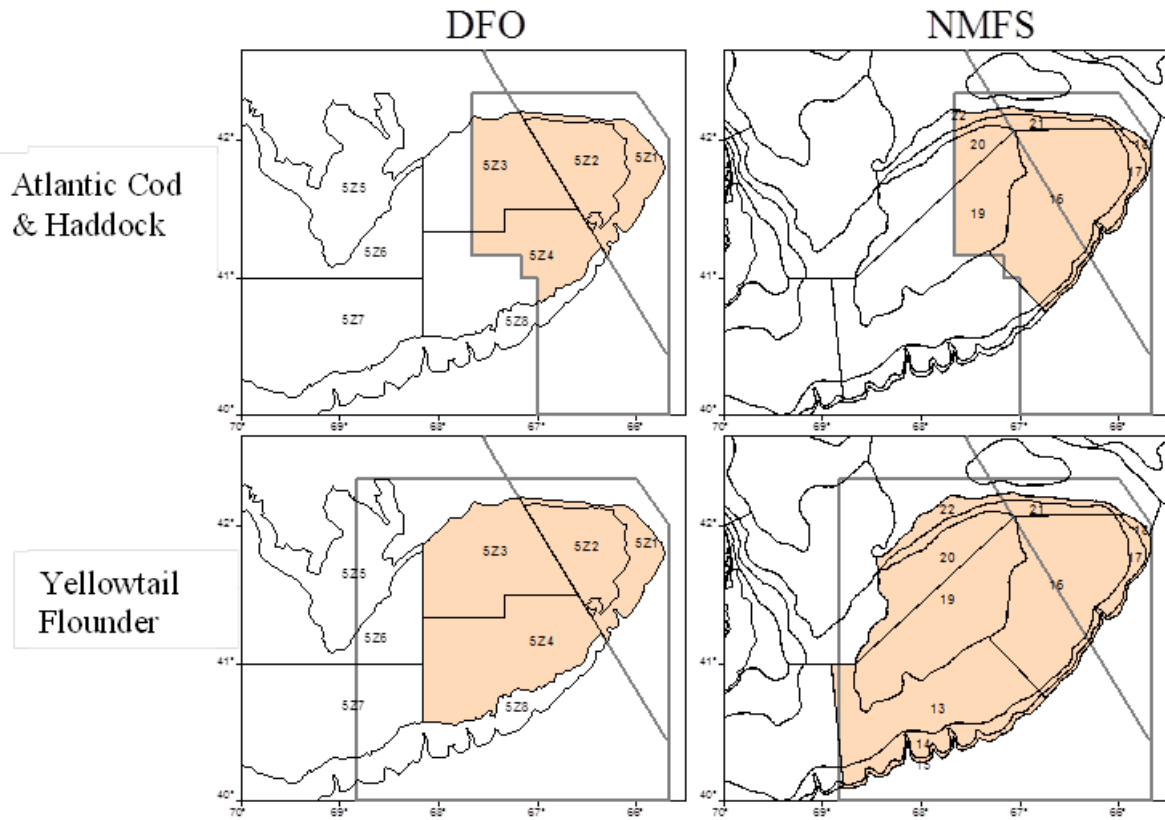


Figure 2. National Marine Fisheries Service (NMFS) and Fisheries and Oceans Canada (DFO) survey strata used to develop biomass indices on either side of the Canada/USA boundary for eastern Georges Bank Atlantic Cod and Haddock (upper panels) and Georges Bank Yellowtail Flounder (lower panels) in relation to the management unit borders. Strata boundaries (thin black lines) with strata labels are shown. The shaded area represents the strata and strata sections that were used to approximate the respective management units (thick grey lines).

Update of Allocation Shares for Canada and the USA of the Transboundary Resources on Georges Bank Through Fishing Year 2023

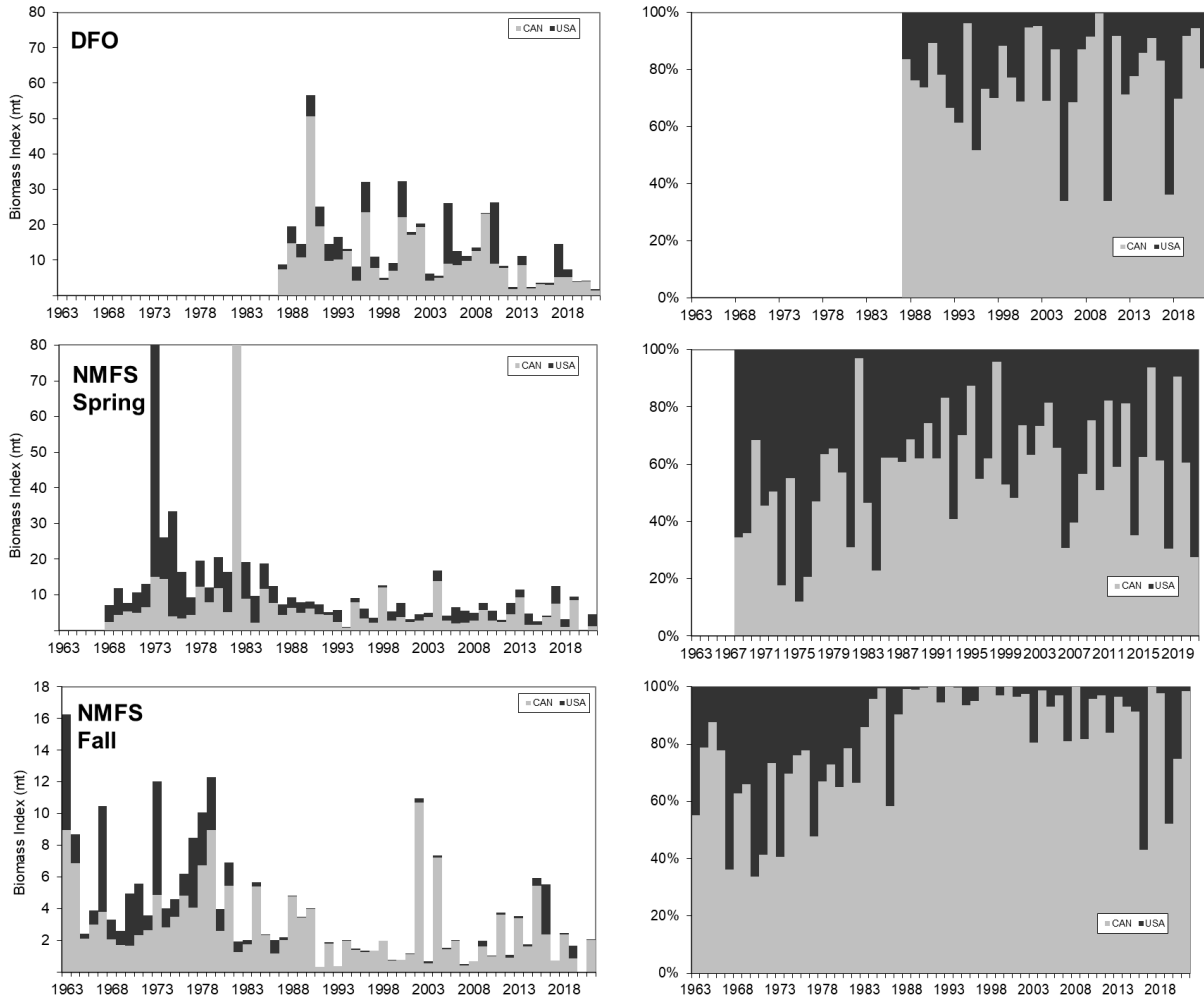


Figure 3. Relative indices of biomass (left) and percentage resource distribution (right) in relation to the international boundary for Atlantic Cod on Eastern Georges Bank. The 2020 National Marine Fisheries Service (NMFS) fall and spring surveys were cancelled due to COVID-19 restrictions; therefore, biomass estimates are not available. The percentage resource distribution for the missing years are filled using the values calculated in Andrushchenko et al. 2021.

Update of Allocation Shares for Canada and the USA of the Transboundary Resources on Georges Bank Through Fishing Year 2023

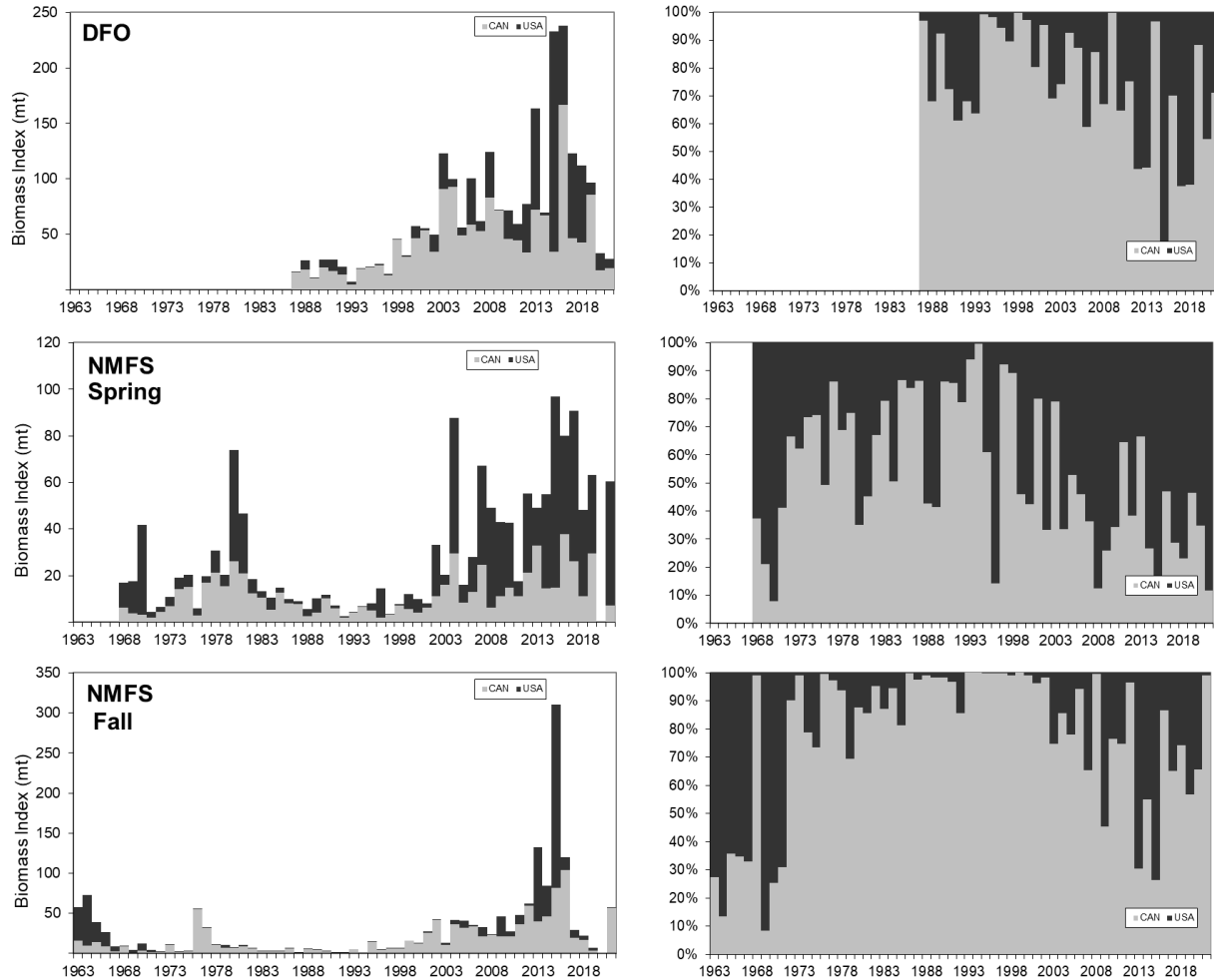


Figure 4. Relative indices of biomass and percentage resource distribution in relation to the international boundary for Haddock on Eastern Georges Bank. The 2020 National Marine Fisheries Service (NMFS) fall and spring surveys were cancelled due to COVID-19 restrictions; therefore biomass estimates are not available. The percentage resource distribution for the missing years are filled using the values calculated in Andrushchenko et al. 2021.

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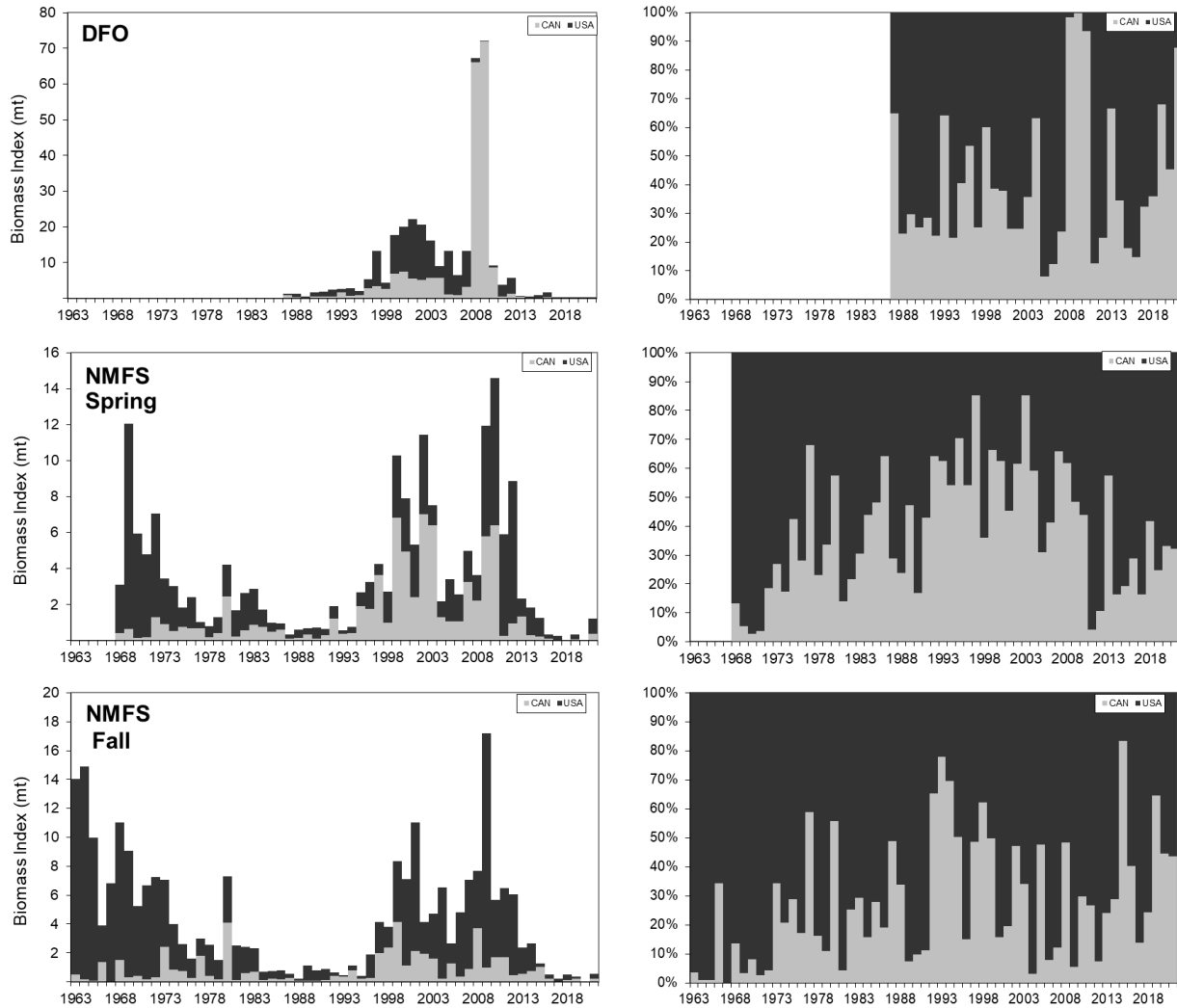


Figure 5. Relative indices of biomass and percentage resource distribution in relation to the international boundary for Yellowtail Flounder on Georges Bank. The 2020 National Marine Fisheries Service (NMFS) fall and spring surveys were cancelled due to COVID-19 restrictions; therefore biomass estimates are not available. The percentage resource distribution for the missing years are filled using the values calculated in Andrushchenko et al. 2021.

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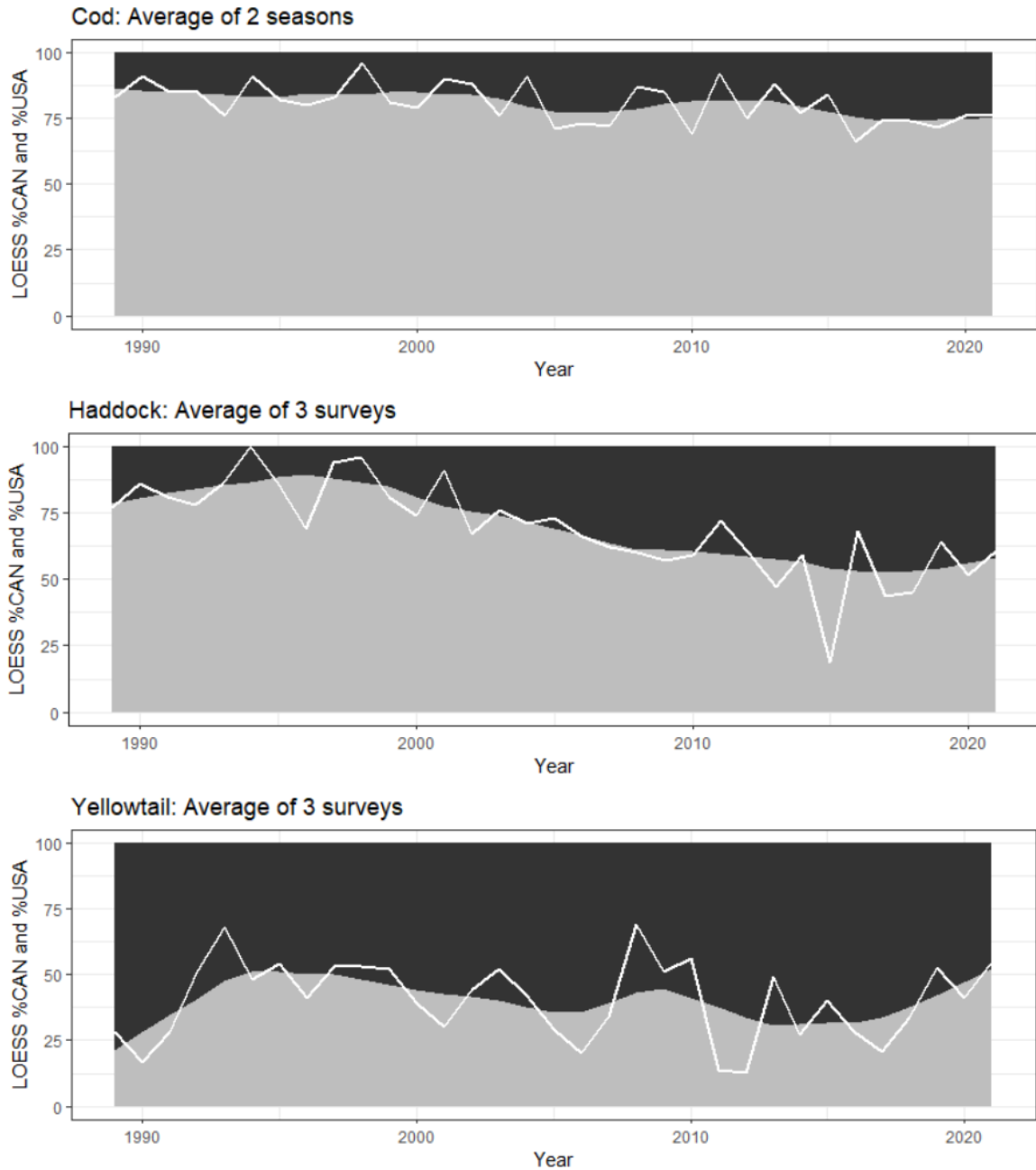


Figure 6. Observed annual percentage (white line) and smoothed trends of proportion of Eastern Georges Bank Atlantic Cod (upper panel), Eastern Georges Bank Haddock (middle panel), and Georges Bank Yellowtail Flounder (bottom panel) on the Canadian (grey) and US (black) side of the international boundary.