

Table A1. A brief chronology of management measures affecting Gulf of Maine cod.

1973

Total Allowable Catch (TAC) limits implemented by the International Commission for the Northwest Atlantic Fisheries (ICNAF) for Division 5Y (Gulf of Maine) cod.

Minimum codend mesh size at 4 ½" (114 mm).

1977

Fishery Conservation and Management Act (FCMA) implemented. Management under the auspices of the New England Fishery Management Council.

1977-1982

Management of groundfish resources under the Fishery Management Plan (FMP) for Atlantic groundfish.

Carried forward TACs; implemented by vessel tonnage class and calendar quarter with trip limits.

Minimum codend mesh size increased to 5 1/8" (130 mm).

1982-1985

Management of groundfish resources under the "Interim" Plan for Atlantic groundfish.

Eliminated direct catch controls; primary tools for fishery management were minimum mesh sizes and minimum landing sizes.

1983

Minimum codend mesh size increased to 5 ½" (140 mm).

1985

Northeast Multi-species FMP implemented. Amendments 1-4 retained indirect controls, including minimum mesh and minimum fish landing sizes.

1989

Minimum fish size = 19" (48 cm) for commercial and recreational sectors.

1994

January 1 Amendment 5

50% reduction in F and effort over 5-7 years.

Days at Sea (DAS) monitoring

Implemented a Mandatory Reporting Scheme

May 1 Amendment 5 (again)

Minimum codend mesh size increased to 6" (152 mm), diamond or square.

1996

May 1 Amendment 7

Established rebuilding program based on Fmax target fishing mortality

Established Target TACs

Accelerated Days at Sea reductions

Established Framework Adjustment Process and the Multi-species Monitoring Committee to permit annual adjustments to management measures

Minimum fish size increased to 20" (51 cm) for recreational sector.

Table A1 (Continued).

1997

May 1 Framework 20
Target TAC: 2,605 mt
Gulf of Maine cod trip limit: 1,000 or 1,500 lbs/day
Minimum fish size increased to 21" (53 cm) for recreational sector.

1998

May 1 Framework 25
Target TAC: 1,800 mt with trigger provision
Gulf of Maine cod trip limit 700 lbs/day
Series of 1-month rolling closures from Massachusetts Bay to Penobscot Bay.
Year-round closure of portions of Jeffreys Ledge and Stellwagen Bank (WGOM Closed Area)

June 25 Framework trigger pulled
Gulf of Maine cod trip limit: 400 lbs/day

1999

February 1 Framework 26
Additional month-block (30x30 minutes) closures implemented for February and April

May 1 Framework 27
Target TAC: 1,300 mt with trigger provision
Gulf of Maine cod trip limit: 200 lbs/day
Minimum square mesh increased to 6.5" (165 mm).

May 28 Framework trigger pulled
Gulf of Maine cod trip limit: 30 lbs/day

August 3 Interim Rule
Gulf of Maine cod trip limit: 100 lbs/day

2000

January 5 Framework 31
Gulf of Maine cod trip limit: 400 lbs/day- 4,000 maximum/trip.
Additional month-block (30x30 minutes) closures implemented for February

May 1 Framework 33
Target TAC: 1,900 mt with trigger provision
Continuation of most Framework 27 and 31 measures
Year-round closure of WGOM area extended until April, 2002.

November 1 Framework trigger pulled
One-month closure of Cashes Ledge

2001

January 1 Framework trigger pulled
Additional month-block (30x30 minutes) closures implemented for January

May 1 Annual Adjustment
Target TAC: 1,118 mt
Continuation of most Framework 27 and 31, and 33 measures.

Table A2. Commercial Landings (metric tons, live) of Atlantic cod the Gulf of Maine (NAFO Division 5Y), 1960 - 2000.¹

Year	Gulf of Maine				Total
	USA	Canada	USSR	Other	
1960	3448	129	-	-	3577
1961	3216	18	-	-	3234
1962	2989	83	-	-	3072
1963	2595	3	133	-	2731
1964	3226	25	-	-	3251
1965	3780	148	-	-	3928
1966	4008	384	-	-	4392
1967	5676	297	-	-	5973
1968	6360	61	-	-	6421
1969	8157	59	-	268	8484
1970	7812	26	-	423	8261
1971	7380	119	-	163	7662
1972	6776	53	11	77	6917
1973	6069	68	-	9	6146
1974	7639	120	-	5	7764
1975	8903	86	-	26	9015
1976	10172	16	-	-	10188
1977	12426	-	-	-	12426
1978	12426	-	-	-	12426
1979	11680	-	-	-	11680
1980	13528	-	-	-	13528
1981	12534	-	-	-	12534
1982	13582	-	-	-	13582
1983	13981	-	-	-	13981
1984	10806	-	-	-	10806
1985	10693	-	-	-	10693
1986	9664	-	-	-	9664
1987	7527	-	-	-	7527
1988	7958	-	-	-	7958
1989	10397	-	-	-	10397
1990	15154	-	-	-	15154
1991	17781	-	-	-	17781
1992	10891	-	-	-	10891
1993	8287	-	-	-	8287
1994*	7877	-	-	-	7877
1995*	6798	-	-	-	6798
1996*	7194	-	-	-	7194
1997*	5421	-	-	-	5421
1998*	4156	-	-	-	4156
1999*	1636	-	-	-	1636
2000*	3730	-	-	-	3730

* Provisional

¹ USA 1960-1993 landings from NMFS, NEFSC Detailed Weighout Files and Canvass data.

² USA 1994-2000 landings estimated by prorating NMFS, NEFSC Detailed Weighout data by Vessel Trip Reports.

Table A3. Distribution of USA commercial landings (metric tons, live) of Atlantic cod from the Gulf of Maine (Area 5Y), by gear type, 1965 - 2000. The percentage of total USA commercial landings of Atlantic cod from the Gulf of Maine, by gear type, is also presented for each year. Data only reflect Gulf of Maine cod landings that could be identified by gear type.

Year	Landings (metric tons, live)						Percentage of Annual Landings					
	Otter Trawl	Sink Gill Net	Line Trawl	Handline	Other Gear	Total	Otter Trawl	Sink Gill Net	Line Trawl	Handline	Other Gear	Total
1965	2480	501	462	168	1	3612	68.7	13.9	12.8	4.6	-	100.0
1966	2549	830	308	150	4	3841	66.4	21.6	8.0	3.9	0.1	100.0
1967	4312	734	206	274	<1	5526	78.0	13.3	3.7	5.0	-	100.0
1968	4143	1377	213	339	4	6076	68.2	22.7	3.5	5.6	-	100.0
1969	6553	851	258	162	4	7828	83.7	10.9	3.3	2.1	-	100.0
1970	5967	951	407	178	9	7512	79.4	12.7	5.4	2.4	0.1	100.0
1971	5117	1043	927	98	8	7193	71.1	14.5	12.9	1.4	0.1	100.0
1972	4004	1492	1234	54	2	6786	59.0	22.0	18.2	0.8	-	100.0
1973	3542	1182	1305	23	9	6061	58.4	19.5	21.5	0.4	0.2	100.0
1974	5056	1412	904	36	17	7425	68.1	19.0	12.2	0.5	0.2	100.0
1975	6255	1480	920	12	8	8675	72.1	17.1	10.6	0.1	0.1	100.0
1976	6701	2511	621	4	41	9878	67.8	25.4	6.3	0.1	0.4	100.0
1977	8415	2872	534	6	166 [a]	11993	70.2	23.9	4.5	-	1.4	100.0
1978	7958	3438	393	10	91 [b]	11890	66.9	28.9	3.3	0.1	0.8	100.0
1979	7567	2900	334	19	167 [c]	10987	68.9	26.4	3.0	0.2	1.5	100.0
1980	8420	3733	251	48	61	12513	67.3	29.8	2.0	0.4	0.5	100.0
1981	7937	4102	276	23	45	12383	64.1	33.1	2.2	0.2	0.4	100.0
1982	9758	3453	188	46	34	13479	72.4	25.6	1.4	0.3	0.3	100.0
1983	9975	3744	77	4	67	13867	71.9	27.0	0.6	-	0.5	100.0
1984	6646	3985	22	3	69	10725	62.0	37.2	0.2	-	0.6	100.0
1985	7119	3090	55	6	326 [d]	10596	67.2	29.1	0.5	0.1	3.1	100.0
1986	6664	2692	56	12	180 [e]	9604	69.4	28.0	0.6	0.1	1.9	100.0
1987	4356	2994	70	13	68	7501	58.1	39.9	0.9	0.2	0.9	100.0
1988	4513	3308	68	27	22	7938	56.9	41.7	0.8	0.3	0.3	100.0
1989	6152	4000	72	36	119 [f]	10379	59.3	38.5	0.7	0.4	1.1	100.0
1990	10420	4343	126	20	186 [g]	15095	69.0	28.8	0.8	0.1	1.2	100.0
1991	13049	4158	212	59	266 [h]	17744	73.5	23.4	1.2	0.3	1.5	100.0
1992	7344	3081	359	94	14	10891	67.4	28.3	3.3	0.9	0.1	100.0
1993	4876	3130	236	16	29	8287	58.8	37.8	2.8	0.2	0.3	100.0
1994	4205	3317	338	[i]	17	7877	53.4	42.1	4.3	[i]	0.2	100.0
1995	3450	3050	281	[i]	17	6798	50.8	44.9	4.1	[i]	0.3	100.0
1996	4012	2825	335	[i]	22	7194	55.8	39.3	4.7	[i]	0.3	100.0
1997	2798	2175	426	[i]	22	5421	51.6	40.1	7.9	[i]	0.4	100.0
1998	2329	1431	381	[i]	15	4156	56.0	34.4	9.2	[i]	0.4	100.0
1999	838	494	302	[i]	2	1630	51.2	30.2	18.5	[i]	0.1	100.0
2000	2007	1393	309	[i]	20	3730	53.8	37.4	8.3	[i]	0.5	100.0

[a] Of 166 mt landed, 107 mt were by mid-water pair trawl and 42 mt were by drifting gill nets.
 [b] Of 91 mt landed, 56 mt were by Danish seine and 27 mt were by drifting gill nets.
 [c] Of 167 mt landed, 199 mt were by drifting gill nets and 38 mt were by Danish seine.
 [d] Of 326 mt landed, 268 mt were by longline and 37 mt were by Danish seine.
 [e] Of 181 mt landed, 152 mt were by longline and 23 mt were by Danish seine.
 [f] Of 199 mt landed, 75 mt were by longline and 27 mt were by Danish seine.
 [g] Of 186 mt landed, 159 mt were by longline and 16 mt were by Danish seine.
 [h] Of 266 mt landed, 245 mt were by longline and 9 mt were by Danish seine.
 [i] Handline and line trawl combined.

Table A4. Discard and total catch estimates (metric tons, live) for Gulf of Maine cod by otter trawl, shrimp trawl, and sink gillnet gear derived from 1989-2000 NEFSC Sea Sample data.

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Discard Estimates						
Year	Total Landings	Included Landings	Discard Estimate	Discard to Landings Ratio	Total Discard	Total Catch

1989	10397	10182	1513	0.1486	1545	11942
1990	15154	14827	3521	0.2375	3598	18752
1991	17781	17374	1025	0.0590	1049	18830
1992	10891	10511	582	0.0554	603	11494
1993	8287	8058	320	0.0397	329	8616
1994	7877	7522	228	0.0303	239	8116
1995	6798	6500	408	0.0627	426	7224
1996	7194	6837	189	0.0277	199	7393
1997	5421	4974	164	0.0330	179	5600
1998	4156	3760	139	0.0370	154	4310
1999	1636	1332	2141	1.6074	2630	4266
2000	3730	3401	1067	0.3137	1170	4900
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Table A5a. 1999 Discard estimation procedure for Gulf of Maine cod based on 1999 VTR records.

D/K Ratio	Month of the Year												Total
	1	2	3	4	5	6	7	8	9	10	11	12	
50	0.164	0.149	0.149	0.176	0.785	8.403	5.706	0.820	1.153	1.227	2.548	2.157	
100	0.428	0.006	0.041	0.019	1.135	10.731	13.596	3.718	4.393	6.027	7.216	3.136	
Other	0.114	0.052	0.318	0.011	0.042	3.651	4.837	0.014	0.016	0.028	0.208	0.208	
Total													
Landings	1	2	3	4	5	6	7	8	9	10	11	12	Total
50	141.6	68.1	112.5	112.5	185.4	44.9	20.5	22.2	21.1	18.9	30.3	57.8	835.8
100	81.1	36.2	30.3	111.4	109.8	29.2	38.9	36.2	38.9	31.4	24.3	38.4	606.1
Other	38.9	17.3	30.3	26.5	23.2	2.7	3.8	4.9	9.2	9.2	11.4	16.8	194.1
Total	261.7	121.6	173.0	250.3	318.4	76.8	63.3	63.3	69.2	59.5	66.0	113.0	1636.0
Disc	1	2	3	4	5	6	7	8	9	10	11	12	Total
50	23.2	10.2	16.8	19.8	145.5	377.1	117.2	18.2	24.3	23.2	77.1	124.8	977.4
100	34.7	0.2	1.3	2.1	124.6	313.3	529.2	134.7	171.0	189.0	175.6	120.4	1795.9
Other	4.5	0.9	9.6	0.3	1.0	9.9	18.3	0.1	0.1	0.1	0.3	3.5	48.6
Total	62.4	11.3	27.7	22.1	271.0	700.2	664.8	152.9	195.4	212.3	253.0	248.6	2821.9
Catch	1	2	3	4	5	6	7	8	9	10	11	12	Total
50	164.9	78.3	129.3	132.2	330.9	421.9	137.8	40.3	45.4	42.1	107.4	182.6	1813.2
100	115.8	36.4	31.5	113.4	234.3	342.5	568.2	170.9	209.9	220.3	199.9	158.8	2402.0
Other	43.4	18.2	39.9	26.8	24.2	12.6	22.1	4.9	9.3	9.3	11.7	20.3	242.7
Total	324.1	132.9	200.7	272.5	589.5	777.0	728.0	216.2	264.6	271.8	319.0	361.6	4457.9

Table A5b. Discard estimation procedure for Gulf of Maine cod based on 2000 VTR records.

D/K Ratio	Month of the Year												Total
	1	2	3	4	5	6	7	8	9	10	11	12	
50	1.223	0.506	0.555	0.193	0.389	0.346	0.581	0.285	0.414	0.476	0.426	0.345	
100	0.816	0.258	0.282	0.447	0.287	0.876	1.039	0.567	1.764	0.674	1.127	0.694	
Other	0.242	0.056	0.041	0.183	0.164	0.017	0.233	0.556	0.554	0.200	0.088	0.117	
Total													
Landings	1	2	3	4	5	6	7	8	9	10	11	12	Total
50	170.6	92.1	90.2	58.4	398.1	215.9	133.6	77.6	57.0	68.7	170.1	340.2	1872.5
100	58.9	25.7	69.6	55.6	169.6	357.5	253.7	192.5	108.9	116.4	115.0	121.5	1644.9
Other	30.4	15.9	20.1	8.9	30.8	22.0	7.9	4.2	14.0	9.8	4.2	44.4	212.6
Total	259.8	133.6	179.9	122.9	598.6	595.3	395.3	274.3	179.9	194.9	289.3	506.1	3730.0
Disc	1	2	3	4	5	6	7	8	9	10	11	12	Total
50	208.6	46.5	50.1	11.3	155.0	74.6	77.6	22.1	23.6	32.7	72.4	117.4	891.8
100	48.0	6.6	19.6	24.9	48.8	313.2	263.7	109.1	192.1	78.4	129.5	84.3	1318.2
Other	7.4	0.9	0.8	1.6	5.1	0.4	1.8	2.3	7.8	2.0	0.4	5.2	35.6
Total	264.0	54.1	70.5	37.8	208.8	388.2	343.1	133.5	223.4	113.1	202.3	206.8	2245.6
Catch	1	2	3	4	5	6	7	8	9	10	11	12	Total
50	379.2	138.6	140.3	69.7	553.1	290.5	211.2	99.7	80.6	101.4	242.5	457.6	2764.3
100	106.9	32.3	89.3	80.5	218.4	670.6	517.4	301.7	301.0	194.8	244.5	205.8	2963.1
Other	37.7	16.8	20.9	10.5	35.9	22.3	9.8	6.5	21.8	11.8	4.6	49.6	248.2
Total	523.9	187.7	250.4	160.7	807.4	983.5	738.4	407.9	403.3	308.0	491.6	712.9	5975.6

Table A6a. Estimated Discard-to-Kept Ratios (discarded pounds to landed pounds).				
Sensitivity Trial	Calendar Year 1999		Calendar Year 2000	
	1996 Data	1997 Data	1996 Data	1997 Data
Minimum Share = 50%	1.80	1.95	0.73	0.72
Minimum Share = 25%	2.27	2.25	0.92	0.84
Minimum Share = 10%	2.47	2.34	0.99	0.87
Minimum Payment	2.00	2.05	0.81	0.78

Table A6b. Estimated Discards of Gulf of Maine Cod (metric tons).				
Sensitivity Trial	Calendar Year 1999		Calendar Year 2000	
	1996 Data	1997 Data	1996 Data	1997 Data
Minimum Share = 50%	2949	3194	2707	2701
Minimum Share = 25%	3719	3686	3432	3133
Minimum Share = 10%	4038	3832	3682	3253
Minimum Payment	3270	3362	3028	2919

Table A7. USA sampling of commercial Atlantic cod landings from the Gulf of Maine cod stock (NAFO Division 5Y), 1982 - 2000.

Year	Number of Samples				Number of Samples, by Market Category & Quarter															Annual Sampling Intensity			
	Length Samples		Age Samples		Scrod					Market					Large					No. of Tons Landed/Sample			
	No.	No. Fish Measured	No.	No. Fish Aged	Q1	Q2	Q3	Q4	Σ	Q1	Q2	Q3	Q4	Σ	Q1	Q2	Q3	Q4	Σ	Scrod	Market	Large	Σ
1982	48	3848	48	866	6	7	6	6	25	4	3	7	4	18	0	2	1	2	5	134	348	792	266
1983	71	5241	67	1348	14	10	10	4	38	4	10	6	2	22	1	3	5	2	11	106	294	318	197
1984	55	3925	55	1224	7	5	6	7	25	4	3	5	6	18	1	6	3	2	12	85	319	245	193
1985	69	5426	66	1546	5	6	7	5	23	8	6	7	4	25	7	5	3	6	21	95	229	132	155
1986	53	3970	51	1160	5	5	6	3	19	5	6	8	2	21	1	5	4	3	13	124	242	170	182
1987	43	3184	42	939	4	4	3	4	15	5	5	3	5	18	4	2	3	1	10	83	224	225	175
1988	34	2669	33	741	4	3	4	4	15	1	5	3	5	14	1	2	2	0	5	147	271	391	234
1989	32	2668	32	714	3	3	3	3	12	4	1	5	4	14	2	2	1	1	6	209	430	311	325
1990	39	2982	38	789	3	7	3	5	18	4	7	4	3	18	0	2	1	0	3	300	378	966	387
1991	56	4519	56	1152	2	10	4	3	19	5	11	11	3	30	0	3	3	1	7	250	313	519	318
1992	51	4086	51	1002	2	8	6	3	19	6	7	7	3	23	3	1	1	4	9	104	232	375	214
1993	23	1753	23	447	3	3	3	1	10	1	2	4	1	8	1	1	2	1	5	177	453	527	360
1994	30	2696	33	665	0	2	2	4	8	1	4	4	6	15	0	2	3	2	7	180	284	272	263
1995	31	2568	32	662	4	2	2	4	12	2	7	1	2	12	0	5	0	2	7	133	300	202	219
1996	77	7027	71	1483	6	5	7	9	27	7	9	10	12	38	1	3	3	5	12	62	116	79	93
1997	78	6657	74	1521	7	10	3	9	29	11	9	9	7	36	1	8	2	2	13	37	91	71	69
1998	46	4205	46	912	4	7	0	3	14	8	9	9	3	29	0	0	2	1	3	53	81	321	90
1999	15	1305	16	350	6	0	1	0	7	4	2	0	0	6	2	0	0	0	2	36	144	245	109
2000	61	4687	57	1300	12	5	3	4	24	12	14	4	6	36	0	0	0	1	1	14	62	1131	61

Source: 1982-1985 from Serchuk and Wigley (Woods Hole Lab. Ref 86-12); 1986-2000 from NEFSC files.

Table A8. Percentage (by weight) of USA commercial Atlantic cod landings from the Gulf of Maine (NAFO Division 5Y), by market category, 1964 - 2000.

Year	Gulf of Maine			Total [a]
	Large	Market	Scrod	
1964	29	59	12	100
1965	39	54	7	100
1966	42	48	10	100
1967	41	41	17	100
1968	47	43	9	100
1969	35	55	9	100
1970	43	52	6	100
1971	52	42	6	100
1972	58	35	7	100
1973	52	36	11	100
1974	39	33	28	100
1975	32	42	26	100
1976	29	45	20	100
1977	33	42	22	100
1978	38	44	17	100
1979	37	49	14	100
1980	36	45	19	100
1981	29	45	22	100
1982	29	45	24	100
1983	25	45	28	100
1984	26	51	19	100
1985	25	51	20	100
1986	22	51	23	100
1987	29	52	16	100
1988	26	45	23	100
1989	17	55	23	100
1990	34	43	19	100
1991	26	51	20	100
1992	31	49	18	100
1993	32	44	21	100
1994	24	54	18	100
1995	21	53	23	100
1996	13	61	23	100
1997	17	60	20	100
1998	23	57	18	100
1999	29	53	16	100
2000	30	59	9	100

[a] Includes landings of 'mixed' cod.

Table A9a. Commercial landings at age (thousands of fish; metric tons) of Atlantic cod from the Gulf of Maine stock (NAFO Division 5Y), 1982 - 2000.

Year	Age											Total
	1	2	3	4	5	6	7	8	9	10	11+	
Commercial Landings at Age in Numbers (000's)												
1982	30	1380	1633	1143	633	69	91	61	41	4	33	5118
1983	-	866	2357	1058	638	422	47	61	23	9	15	5496
1984	4	446	1240	1500	437	194	74	19	15	11	17	3957
1985	-	407	1445	991	630	128	78	32	4	11	11	3737
1986	-	84	2164	813	250	177	39	24	20	4	8	3583
1987	2	216	595	1109	277	66	51	9	8	8	3	2344
1988	-	160	1443	953	406	43	9	17	1	2	1	3035
1989	-	337	1583	1454	449	81	35	6	3	5	7	3960
1990	-	205	3425	2064	430	157	27	30	10	15	17	6380
1991	-	344	934	4161	851	143	41	30	6	1	1	6512
1992	-	313	530	484	2018	202	62	7	12	3	-	3631
1993	-	76	1487	641	129	457	28	6	2	-	-	2825
1994	-	29	1016	1135	288	72	54	17	13	1	1	2626
1995	-	218	880	1153	194	12	8	22	3	1	-	2491
1996	-	65	584	1738	347	45	5	2	3	-	-	2789
1997	-	53	438	435	832	68	4	1	1	1	1	1834
1998	-	94	390	542	165	193	8	1	1	1	-	1395
1999	-	-	178	192	90	27	28	6	2	-	-	523
2000	-	42	239	569	141	64	8	7	3	-	-	1074
2000a	-	42	233	523	112	34	5	32	30	9	1	1020
Commercial Landings at Age in Weight (Tons)												
1982	24	1595	2717	3160	3019	461	813	608	531	41	613	13582
1983	-	1009	3913	2619	2410	2518	271	643	227	102	269	13981
1984	3	516	2071	4080	1607	1145	603	186	193	152	250	10816
1985	-	513	2523	2816	2814	705	615	363	51	141	152	10693
1986	-	110	3976	2375	1153	1072	296	243	253	54	132	9664
1987	2	283	1001	3641	1340	451	455	88	116	110	40	7527
1988	-	203	2715	2311	2097	295	85	191	11	36	14	7958
1989	-	420	2811	4351	1737	325	323	67	43	87	163	10397
1990	-	219	5794	4687	1834	1200	290	354	153	214	350	15095
1991	-	388	1463	10455	3520	1045	399	369	93	32	17	17781
1992	-	480	1019	1313	6175	1011	594	88	161	49	-	10891
1993	-	99	2809	1611	561	2819	281	79	27	-	-	8286
1994	-	43	1975	3576	991	442	451	218	156	20	6	7877
1995	-	361	1689	3200	997	96	92	291	45	27	-	6798
1996	-	110	1247	4131	1267	333	49	18	39	-	-	7194
1997	-	92	977	1308	2658	316	36	15	7	10	2	5421
1998	-	120	816	1614	693	812	67	13	12	13	-	4157
1999	-	-	315	520	361	155	203	54	28	-	-	1636
2000	-	68	578	1962	621	366	45	55	36	-	-	3730
2000a	-	68	541	1690	443	180	25	294	345	125	20	3730

a 2000 Estimates include additional length data from sea sample trips.

Table A9b. Mean weight (kg) and mean length (cm) at age of commercial landings of Atlantic cod from the Gulf of Maine stock (NAFO Division 5Y), 1982 - 2000.

Year	Age											Average
	1	2	3	4	5	6	7	8	9	10	11+	
Commercial Landings Mean Weight(kg) at Age												
1982	0.801	1.156	1.664	2.764	4.770	6.739	8.944	9.931	12.922	10.618	18.456	2.654
1983	-	1.164	1.660	2.475	3.778	5.962	5.808	10.522	10.089	10.898	17.813	2.544
1984	0.589	1.159	1.670	2.721	3.677	5.898	8.119	9.595	12.889	13.951	15.028	2.731
1985	-	1.260	1.746	2.840	4.466	5.525	7.901	11.218	11.420	13.386	14.523	2.861
1986	-	1.304	1.837	2.923	4.619	6.067	7.669	10.030	12.463	12.907	16.554	2.698
1987	1.028	1.313	1.684	3.283	4.831	6.824	8.878	10.023	13.752	14.738	14.596	3.212
1988	-	1.268	1.881	2.426	5.166	6.767	9.932	11.126	14.960	15.763	20.356	2.622
1989	-	1.247	1.776	2.993	3.864	4.872	9.267	11.938	14.806	18.196	21.521	2.626
1990	-	1.071	1.692	2.271	4.265	7.645	10.734	11.758	15.015	14.784	20.295	2.366
1991	-	1.130	1.568	2.512	4.136	7.309	9.642	12.322	15.547	24.328	21.885	2.731
1992	-	1.533	1.922	2.714	3.061	5.000	9.566	12.462	13.449	16.631	-	2.999
1993	-	1.293	1.889	2.513	4.356	6.174	9.999	13.869	17.544	-	-	2.933
1994	-	1.450	1.943	3.151	3.444	6.132	8.321	12.628	12.052	21.532	19.369	3.000
1995	-	1.652	1.921	2.775	5.142	8.290	10.755	12.914	16.433	21.504	-	2.728
1996	-	1.687	2.136	2.376	3.648	7.376	10.440	11.928	13.471	-	-	2.580
1997	-	1.733	2.233	3.007	3.193	4.649	8.543	13.439	14.787	16.075	21.356	2.958
1998	-	1.277	2.089	2.979	4.191	4.211	8.538	11.747	19.369	20.847	-	2.980
1999	-	-	1.774	2.704	4.020	5.727	7.254	9.231	12.542	-	-	3.128
2000	-	1.627	2.415	3.447	4.399	5.702	5.551	8.344	10.952	-	-	3.474
2000a	-	1.627	2.323	3.233	3.971	5.298	5.115	9.297	11.340	13.830	17.514	3.657
Commercial Landings Mean Length (cm) at Age												
1982	43.2	48.3	53.8	63.4	76.8	86.1	94.6	97.9	107.4	101.0	120.7	59.9
1983	-	48.6	53.8	61.4	70.8	82.4	80.5	98.8	97.5	100.0	118.7	59.8
1984	39.0	48.4	54.1	63.4	69.7	81.8	91.5	96.7	106.9	109.6	112.0	61.6
1985	-	49.8	55.1	64.6	74.9	80.3	90.8	101.9	103.1	108.2	109.7	62.8
1986	-	50.3	55.9	65.0	75.4	82.6	89.9	98.7	105.8	107.5	116.2	61.6
1987	47.0	50.4	54.4	67.8	76.9	86.5	93.8	98.7	109.5	111.7	111.3	65.4
1988	-	50.1	56.4	61.1	78.7	86.4	98.6	102.3	113.0	114.8	125.0	61.4
1989	-	49.8	55.5	65.7	71.5	76.7	95.8	103.4	112.6	120.4	126.8	61.7
1990	-	47.5	54.8	60.0	73.7	90.0	100.9	104.0	111.8	112.6	124.6	59.2
1991	-	47.7	52.6	61.8	72.6	88.6	97.2	105.0	113.3	132.5	128.0	62.2
1992	-	53.1	56.6	62.9	65.6	77.0	97.3	106.1	109.1	117.0	-	64.3
1993	-	50.5	56.8	61.7	74.2	83.7	98.6	110.0	119.1	-	-	63.5
1994	-	52.4	57.2	66.6	68.1	82.7	92.0	106.4	104.9	127.3	123.0	64.4
1995	-	54.4	56.9	63.4	78.6	92.5	101.1	107.2	116.1	127.2	-	62.3
1996	-	54.6	58.8	60.7	69.3	88.9	99.9	104.8	108.7	-	-	61.8
1997	-	55.0	59.7	65.4	66.4	74.9	93.3	108.7	112.2	115.6	127.0	64.7
1998	-	50.1	58.4	65.1	72.9	72.7	92.9	102.2	123.0	126.0	-	64.4
1999	-	-	55.5	63.4	71.7	80.8	88.3	96.2	106.6	-	-	64.9
2000	-	54.1	60.8	66.2	74.6	82.1	81.3	93.3	102.0	-	-	68.3
2000a	-	54.1	60.2	64.8	72.2	80.0	79.1	96.7	103.2	110.1	119.0	68.6

a 2000 Estimates include additional length data from sea sample trips.

Table A10a. Commercial landings at age (thousands of fish; metric tons) of Atlantic cod from the Gulf of Maine stock (NAFO Division 5Y), 1982 - 2000.
(Partial Input data for Virtual Population Analysis).

Year	Age							Total
	1	2	3	4	5	6	7+	
<u>Commercial Landings at Age in Numbers (000's)</u>								
1982	30	1380	1633	1143	633	69	230	5118
1983	-	866	2357	1058	638	422	155	5496
1984	4	446	1240	1500	437	194	136	3957
1985	-	407	1445	991	630	128	136	3737
1986	-	84	2164	813	250	177	95	3583
1987	2	216	595	1109	277	66	79	2344
1988	-	160	1443	953	406	43	30	3035
1989	-	337	1583	1454	449	81	56	3960
1990	-	205	3425	2064	430	157	99	6380
1991	-	344	934	4161	851	143	79	6512
1992	-	313	530	484	2018	202	84	3631
1993	-	76	1487	641	129	457	36	2825
1994	-	29	1016	1135	288	72	86	2626
1995	-	218	880	1153	194	12	34	2491
1996	-	65	584	1738	347	45	10	2789
1997	-	53	438	435	832	68	8	1834
1998	-	94	390	542	165	193	10	1395
1999	-	-	178	192	90	27	36	523
2000	-	42	239	569	141	64	18	1074
2000a	-	42	233	523	112	34	77	1020
<u>Commercial Landings at Age in Weight (Tons)</u>								
1982	24	1595	2717	3160	3019	461	2606	13582
1983	-	1009	3913	2619	2410	2518	1512	13981
1984	3	516	2071	4080	1607	1145	1384	10816
1985	-	513	2523	2816	2814	705	1322	10693
1986	-	110	3976	2375	1153	1072	978	9664
1987	2	283	1001	3641	1340	451	809	7527
1988	-	203	2715	2311	2097	295	337	7958
1989	-	420	2811	4351	1737	325	683	10397
1990	-	219	5794	4687	1834	1200	1361	15095
1991	-	388	1463	10455	3520	1045	910	17781
1992	-	480	1019	1313	6175	1011	892	10891
1993	-	99	2809	1611	561	2819	387	8286
1994	-	43	1975	3576	991	442	851	7877
1995	-	361	1689	3200	997	96	455	6798
1996	-	110	1247	4131	1267	333	106	7194
1997	-	92	977	1308	2658	316	70	5421
1998	-	120	816	1614	693	812	104	4157
1999	-	-	315	520	361	155	285	1636
2000	-	68	578	1962	621	366	136	3730
2000a	-	68	542	1690	443	180	809	3730

a 2000 Estimates include additional length data from sea sample trips.

Table A10b. Mean weight (kg) and mean length (cm) at age of commercial landings of Atlantic cod from the Gulf of Maine stock (NAFO Division 5Y), 1982 - 2000. (Partial Input data for Virtual Population Analysis)

Year	Age							Average
	1	2	3	4	5	6	7+	
Commercial Landings Mean Weight (kg) at Age								
1982	0.801	1.156	1.664	2.764	4.770	6.739	11.330	2.654
1983	-	1.164	1.660	2.475	3.778	5.962	9.755	2.544
1984	0.589	1.159	1.670	2.721	3.677	5.898	10.176	2.731
1985	-	1.260	1.746	2.840	4.466	5.525	9.721	2.861
1986	-	1.304	1.837	2.923	4.619	6.067	10.295	2.698
1987	1.028	1.313	1.684	3.283	4.831	6.824	10.241	3.212
1988	-	1.268	1.881	2.426	5.166	6.767	11.233	2.622
1989	-	1.247	1.776	2.993	3.864	4.872	12.200	2.626
1990	-	1.071	1.692	2.271	4.265	7.645	13.747	2.366
1991	-	1.130	1.568	2.512	4.136	7.309	11.449	2.731
1992	-	1.533	1.922	2.714	3.061	5.000	10.614	2.999
1993	-	1.293	1.889	2.513	4.353	6.174	11.063	2.933
1994	-	1.450	1.943	3.151	3.444	6.132	10.018	3.000
1995	-	1.652	1.921	2.775	5.142	8.290	12.969	2.728
1996	-	1.687	2.136	2.376	3.648	7.376	11.647	2.580
1997	-	1.733	2.233	3.007	3.193	4.649	12.479	2.958
1998	-	1.277	2.089	2.979	4.191	4.211	10.262	2.980
1999	-	-	1.774	2.704	4.020	5.727	7.901	3.128
2000	-	1.627	2.415	3.447	4.399	5.702	7.553	3.474
2000a	-	1.627	2.323	3.233	3.971	5.298	10.491	3.657
Commercial Landings Mean Length (cm) at Age								
1982	43.2	48.3	53.8	63.4	76.8	86.1	101.6	59.9
1983	-	48.6	53.8	61.4	70.8	82.4	95.1	59.8
1984	39.0	48.4	54.1	63.4	69.7	81.8	98.0	61.6
1985	-	49.8	55.1	64.6	74.9	80.3	96.7	62.8
1986	-	50.3	55.9	65.0	75.4	82.6	98.4	61.6
1987	47.0	50.4	54.4	67.8	76.9	86.5	98.4	65.4
1988	-	50.1	56.4	61.1	78.7	86.4	103.1	61.4
1989	-	49.8	55.5	65.7	71.5	76.7	103.6	61.7
1990	-	47.5	54.8	60.0	73.7	90.0	108.8	59.2
1991	-	47.7	52.6	61.8	72.6	88.6	102.2	62.2
1992	-	53.1	56.6	62.9	65.6	77.0	100.4	64.3
1993	-	50.5	56.8	61.7	74.2	83.7	101.6	63.5
1994	-	52.4	57.2	66.6	68.1	82.7	97.6	64.4
1995	-	54.4	56.9	63.4	78.6	92.5	107.1	62.3
1996	-	54.6	58.8	60.7	69.3	88.9	103.5	61.8
1997	-	55.0	59.7	65.4	66.4	74.9	104.6	64.7
1998	-	50.1	58.4	65.1	72.9	72.7	97.7	64.4
1999	-	-	55.5	63.4	71.7	80.8	90.7	64.9
2000	-	54.1	60.8	66.2	74.6	82.1	89.5	68.3
2000a	-	54.1	60.2	64.8	72.2	80.0	100.0	68.6

a 2000 Estimates include additional length data from sea sample trips.

Table A11. Estimated number (000' s) and weight (metric tons, live) of Atlantic cod caught by marine recreational fishermen from the Gulf of Maine stock, 1979 - 2000. ¹

Year	Total Cod Caught		Total Cod Retained (excluding those caught and released)						
	No. of Cod (000' s)	Wt. of Cod (mt)	No. of Cod (000' s)	Wt. of Cod (mt)	Sample Mean Weight (kg)	Number Measured	Percent of Total Landings		
1979	2698	3466	not estimated		-----	not estimated	-----		
1980	2254	6860	not estimated		-----	not estimated	-----		
1981	2933	5944	2738	5549	1.595	380	30.7		
1982	1833	2138	1736	2025	1.121	377	13.0		
1983	1455	1388	1237	1180	1.323	882	7.8		
1984	1098	1705	905	1405	1.520	596	11.5		
1985	1671	1964	1471	1729	1.238	295	13.9		
1986	1114	967	993	862	1.942	75	8.2		
1987	2625	2317	2054	1813	1.738	320	19.4		
1988	1487	2114	1300	1848	2.049	407	18.8		
1989	1769	2690	1193	1814	1.736	404	14.9		
1990	1725	3882	1247	2806	1.964	206	15.6		
1991	1770	3635	1419	2914	2.004	370	14.1		
1992	585	1154	332	655	2.001	922	5.7		
1993	1564	2378	772	1174	1.831	290	12.4		
1994	VTR P/C 1424	2578	VTR P/C 516	934	1.844	750	10.6		
1995	393	1206	1799	247	517	771	1.716	1028	10.2
1996	278	812	2112	174	351	913	2.099	1068	11.3
1997	208	434	671	123	161	250	2.692	525	4.4
1998	299	331	1245	119	219	824	2.507	580	16.5
1999	226	539	1680	143	264	823	3.448	212	33.5
2000	241	1211	2853	160	487	1147	2.733	144	23.5

¹ 1981-2000 from Revised Marine Recreational Fishery Statistics Survey database expanded catch estimates.

² VTR P/C are estimates of the number of cod caught and retained derived from VTR records of Part/Charter vessels.

Table A12a. Recreational landings at age (thousands of fish; metric tons) of Atlantic cod from the Gulf of Maine stock (NAFO Division 5Y), 1982 - 2000. (Partial input data for Virtual Population Analysis)

Year	Age							Total
	1	2	3	4	5	6	7+	
<u>Recreational Landings at Age in Numbers (000's)</u>								
1982	58	615	717	243	84	6	12	1735
1983	14	471	539	126	47	26	14	1237
1984	20	367	332	136	32	11	6	904
1985	49	582	666	131	35	5	1	1469
1986	26	124	586	116	25	20	95	992
1987	39	691	823	416	53	13	18	2053
1988	6	360	697	196	28	8	4	1299
1989	5	193	701	244	36	10	5	1194
1990	7	89	770	309	58	10	6	1249
1991	5	103	415	787	95	8	6	1419
1992	-	37	70	42	166	14	2	331
1993	1	76	511	146	11	24	3	772
1994	1	28	364	93	27	2	2	517
1995	-	61	272	171	10	2	-	516
1996	-	21	104	205	21	1	-	352
1997	-	8	56	31	62	4	-	161
1998	-	16	95	74	15	18	1	219
1999	1	8	113	81	39	10	13	264
2000	-	44	182	212	32	15	2	487
<u>Recreational Landings at Age in Weight (Tons)</u>								
1982	26	556	1018	559	373	33	132	2697
1983	6	412	751	272	158	173	168	1940
1984	9	304	480	332	103	47	78	1353
1985	18	494	899	305	115	20	5	1856
1986	11	103	970	304	99	114	1247	2848
1987	11	634	1184	1111	224	96	189	3449
1988	1	310	1049	425	107	26	26	1944
1989	3	208	1111	628	124	61	43	2178
1990	1	80	1147	727	212	66	63	2296
1991	1	119	582	1749	287	48	34	2820
1992	-	56	130	119	509	69	19	902
1993	1	73	841	292	33	108	41	1389
1994	-	35	593	214	56	7	17	922
1995	-	91	443	331	36	4	-	905
1996	-	32	193	406	54	7	3	695
1997	-	13	111	74	149	12	1	360
1998	-	27	207	195	51	59	5	544
1999	-	10	238	260	178	58	82	827
2000	-	69	371	603	118	96	9	1265

Table A12b. Mean weight (kg) and mean length (cm) at age of recreational landings of Atlantic cod from the Gulf of Maine stock (NAFO Division 5Y), 1982 - 2000. (Partial input data for Virtual Population Analysis)

Year	Age							Average
	1	2	3	4	5	6	7+	
<u>Recreational Landings Mean Weight (kg) at Age</u>								
1982	0.452	0.904	1.420	2.297	4.417	5.542	10.872	1.554
1983	0.410	0.874	1.394	2.159	3.350	6.635	12.136	1.568
1984	0.450	0.827	1.447	2.432	3.236	4.215	11.892	1.497
1985	0.371	0.848	1.349	2.330	3.298	3.780	5.2091	1.263
1986	0.413	0.832	1.655	2.630	3.884	5.600	12.995	2.871
1987	0.269	0.918	1.439	2.672	4.252	7.134	10.283	1.680
1988	0.184	0.860	1.504	2.165	3.816	3.443	6.067	1.497
1989	0.615	1.081	1.586	2.575	3.498	6.285	7.851	1.824
1990	0.148	0.900	1.489	2.354	3.640	6.587	13.783	1.838
1991	0.171	1.156	1.403	2.223	3.013	5.696	5.696	1.987
1992	0.456	1.495	1.858	2.832	3.074	4.820	7.221	2.725
1993	0.582	0.959	1.645	2.001	3.131	4.566	11.797	1.799
1994	0.183	1.240	1.632	2.302	2.046	4.613	8.947	1.783
1995	-	1.501	1.627	1.931	3.404	1.871	6.062	1.754
1996	0.582	1.541	1.853	1.979	2.706	7.829	12.378	1.974
1997	0.327	1.585	1.989	2.376	2.410	3.104	9.111	2.235
1998	0.456	1.724	2.183	2.640	3.376	3.261	3.526	2.482
1999	0.335	1.204	2.105	3.225	4.572	5.698	6.598	3.131
2000	-	1.571	2.036	2.841	3.652	6.543	4.271	2.598
<u>Recreational Landings Mean Length (cm) at Age</u>								
1982	33.9	42.9	50.2	59.0	74.1	79.9	98.4	49.9
1983	33.5	42.9	50.1	57.9	67.1	84.5	101.2	49.9
1984	34.2	42.0	50.5	60.1	66.1	71.0	100.1	49.3
1985	32.0	42.4	49.3	60.0	67.0	70.1	78.9	47.5
1986	33.7	41.6	53.3	62.0	70.8	80.4	113.4	59.1
1987	27.8	43.4	50.5	62.5	72.3	86.0	98.6	51.3
1988	26.2	42.8	51.3	58.2	69.9	66.2	81.3	50.5
1989	38.4	46.2	52.5	61.6	67.8	83.9	97.5	54.2
1990	23.7	43.1	51.1	59.8	69.7	84.4	110.0	53.9
1991	24.9	47.0	50.4	58.5	64.5	80.0	80.9	55.8
1992	35.0	51.3	54.7	63.1	64.9	75.4	86.6	61.6
1993	38.0	44.3	53.2	56.6	64.9	72.8	103.1	53.9
1994	26.3	48.2	53.2	59.1	57.2	71.7	95.1	54.4
1995	-	51.8	53.2	55.9	67.1	55.1	83.0	54.2
1996	38.0	52.3	55.4	56.6	62.0	90.1	106.3	56.4
1997	32.4	52.3	56.9	60.0	64.4	72.8	95.7	60.6
1998	35.0	54.3	58.6	62.2	67.1	65.9	68.6	60.7
1999	33.0	47.4	57.8	66.6	74.4	80.0	84.5	64.9
2000	-	52.6	57.0	63.5	68.8	83.5	72.1	61.1

Table A13a. Total (commercial and recreational) landings at age (thousands of fish; metric tons) of Atlantic cod from the Gulf of Maine stock (NAFO Division 5Y), 1982 - 2000. (Input data for Virtual Population Analysis)

Year	Age							Total
	1	2	3	4	5	6	7+	
<u>Total Landings at Age in Numbers (000's)</u>								
1982	88	1995	2350	1386	717	75	242	6853
1983	14	1337	2896	1184	685	448	169	6733
1984	24	813	1572	1636	469	205	142	4861
1985	49	989	2111	1122	665	133	137	5206
1986	26	208	2750	929	275	197	190	4575
1987	41	907	1418	1525	330	79	97	4397
1988	6	520	2140	1149	434	51	34	4334
1989	5	530	2284	1698	485	91	61	5154
1990	7	294	4195	2373	488	167	105	7629
1991	5	447	1349	4948	946	151	85	7931
1992	-	350	600	526	2184	218	86	3962
1993	1	152	1998	787	140	481	39	3597
1994	1	57	1380	1228	315	74	88	3143
1995	-	279	1152	1324	204	14	34	3007
1996	-	86	688	1943	368	46	10	3141
1997	-	61	494	466	894	72	8	1995
1998	-	110	485	616	180	211	11	1614
1999 ¹	1	8	563	566	267	78	104	1586
2000 ²	-	97	485	934	211	96	25	1849
<u>Total Landings at Age in Weight (Tons)</u>								
1982	50	2151	3735	3719	3392	494	2738	16279
1983	6	1421	4664	2891	2568	2691	1680	15921
1984	12	820	2551	4412	1710	1192	1462	12169
1985	18	1007	3442	3121	2929	725	1327	12549
1986	11	213	4946	2679	1252	1186	2225	12512
1987	13	917	2185	4752	1564	547	998	10976
1988	1	513	3764	2736	2204	321	363	9902
1989	3	628	3922	4979	1861	386	726	12575
1990	1	299	6941	5414	2046	1266	1424	17391
1991	1	507	2045	12204	3807	1093	944	20601
1992	-	536	1149	1432	6684	1080	911	11793
1993	1	172	3650	1903	594	2927	428	9675
1994	-	78	2568	3790	1047	449	868	8799
1995	-	452	2132	3531	1033	100	455	7703
1996	-	142	1440	4537	1321	340	109	7889
1997	-	105	1088	1382	2807	328	71	5781
1998	-	147	1023	1809	744	871	109	4701
1999 ¹	-	10	1036	1573	1093	449	801	4963
2000 ²	-	156	1103	3090	905	559	181	5996

1. Includes 2,500 mt of estimated discards

2. Includes 1,000 mt of estimated discards.

Table A13b. Mean weight (kg) and mean length (cm) at age of total landings (commercial and recreational) of Atlantic cod from the Gulf of Maine stock (NAFO Division 5Y), 1982 - 2000. (Input data for Virtual Population Analysis)

Year	Age							Average
	1	2	3	4	5	6	7+	
<u>Total Landings Mean Weight (kg) at Age</u>								
1982	0.568	1.078	1.589	2.683	4.731	6.587	11.314	2.375
1983	0.429	1.063	1.610	2.442	3.749	6.007	9.941	2.365
1984	0.500	1.009	1.623	2.697	3.646	5.815	10.296	2.503
1985	0.367	1.018	1.621	2.782	4.405	5.451	9.686	2.410
1986	0.423	1.024	1.799	2.884	4.553	6.020	11.711	2.735
1987	0.317	1.011	1.541	3.116	4.739	6.924	10.289	2.496
1988	0.167	0.987	1.759	2.381	5.078	6.294	10.676	2.285
1989	0.600	1.185	1.717	2.932	3.837	4.242	11.902	2.440
1990	0.143	1.017	1.655	2.282	4.193	7.581	13.562	2.280
1991	0.171	1.134	1.516	2.466	4.024	7.238	11.106	2.598
1992	0.468	1.531	1.915	2.722	3.060	5.000	10.593	2.977
1993	1.000	1.132	1.627	2.418	4.243	6.085	10.974	2.690
1994	0.468	1.368	1.861	3.086	3.324	6.068	9.864	2.800
1995	0.468	1.620	1.851	2.667	5.064	7.143	13.382	2.562
1996	0.468	1.651	2.093	2.335	3.590	7.391	10.900	2.512
1997	0.468	1.721	2.202	2.966	3.140	4.556	8.875	2.898
1998	0.466	1.336	2.109	2.937	4.133	4.128	9.909	2.913
1999	0.331	1.250	1.841	2.776	4.100	5.736	7.702	3.129
2000	0.468	1.600	2.274	3.310	4.291	5.811	7.307	3.243
<u>Total Landings Mean Length (cm) at Age</u>								
1982	37.1	46.6	52.7	62.6	76.5	85.6	101.4	57.4
1983	33.5	46.6	53.1	61.0	70.5	82.5	95.6	58.0
1984	28.5	45.5	53.3	63.1	69.5	81.2	98.1	59.3
1985	32.0	45.4	53.3	64.1	74.5	79.9	96.6	58.5
1986	33.7	45.1	55.3	64.6	75.0	82.4	105.9	61.1
1987	26.4	45.1	52.1	66.4	76.2	86.4	98.4	58.8
1988	26.2	45.0	54.7	60.6	78.1	83.2	100.5	58.1
1989	38.4	48.5	54.6	65.1	71.2	77.5	103.1	60.0
1990	23.7	46.2	54.1	60.0	73.2	89.7	108.9	58.3
1991	24.9	47.5	51.9	61.3	71.8	88.1	100.7	61.1
1992	31.3	52.9	56.4	62.9	65.5	76.9	100.1	64.1
1993	38.0	47.4	55.9	60.8	73.5	83.2	101.7	61.4
1994	26.3	50.3	56.1	66.0	67.2	82.4	97.5	62.8
1995	31.2	53.8	56.0	62.4	78.0	87.2	107.1	60.9
1996	31.2	54.0	58.3	60.3	68.9	88.9	103.5	61.2
1997	31.2	54.6	59.4	65.0	66.3	74.8	104.6	64.4
1998	35.0	50.7	58.4	64.8	72.4	72.1	95.1	63.9
1999	33.0	47.4	56.0	63.9	72.1	80.7	89.9	64.9
2000	31.2	53.4	59.4	65.6	73.7	82.3	88.1	66.4

Table A14. Mean weight at age (kg) at the beginning of the year (January 1) for Atlantic cod from the Gulf of Maine stock (NAFO Division 5Y), 1982 - 2001. Values derived from total landings (commercial and recreational) mean weight-at-age data (mid-year) using procedures described by Rivard (1980).

Year	<u>Age</u>										
	1	2	3	4	5	6	7	8	9	10	11+
1982	0.415	0.882	1.282	2.27	4.199	5.582	8.246	9.853	14.071	11.713	18.456
1983	0.28	0.777	1.317	1.97	3.172	5.331	6.256	9.701	10.01	11.867	17.813
1984	0.35	0.658	1.313	2.084	2.984	4.669	6.957	7.465	11.646	11.864	15.028
1985	0.22	0.713	1.279	2.125	3.447	4.458	6.826	9.544	10.468	13.135	14.523
1986	0.274	0.613	1.353	2.162	3.559	5.15	6.509	8.902	11.824	12.141	16.554
1987	0.18	0.654	1.256	2.368	3.697	5.615	7.339	8.767	11.744	13.553	14.596
1988	0.063	0.559	1.334	1.915	3.978	5.461	8.233	9.939	12.245	14.723	20.356
1989	0.461	0.445	1.302	2.271	3.023	4.641	7.919	10.889	12.835	16.499	21.521
1990	0.051	0.781	1.4	1.979	3.506	5.393	7.232	10.438	13.388	14.795	20.295
1991	0.057	0.403	1.242	2.02	3.03	5.509	8.586	11.501	13.52	19.112	21.885
1992	0.301	0.512	1.474	2.031	2.747	4.486	8.362	10.962	12.873	16.08	18.479
1993	0.855	0.728	1.672	2.152	3.398	4.315	7.071	11.518	14.786	14.856	18.479
1994	0.252	1.17	1.451	2.374	2.835	5.074	7.168	11.237	12.929	19.436	19.369
1995	0.249	0.871	1.591	2.228	3.953	4.873	8.121	10.366	14.405	16.099	18.479
1996	0.244	0.879	1.841	2.079	3.094	6.118	9.303	11.326	13.19	16.422	18.479
1997	0.277	0.897	1.907	2.492	2.708	4.044	7.938	11.845	13.281	14.716	21.356
1998	0.286	0.791	1.905	2.543	3.501	3.6	6.3	10.018	16.134	17.557	18.479
1999	0.151	0.765	1.568	2.42	3.47	4.869	5.527	8.878	12.138	17.829	18.479
2000	0.301	0.728	1.686	2.469	3.451	4.881	5.412	8.212	10.231	13.170	17.514
2001	0.226	0.728	3.518	3.067	4.438	5.335	6.082	4.834	10.525	12.569	17.514
Avg 1982-1998	0.283	0.725	1.466	2.180	3.343	4.960	7.551	10.251	12.903	14.975	18.479
Avg 1996-1998	0.269	0.856	1.884	2.371	3.101	4.587	7.847	11.063	14.202	16.232	19.438

Table A15. Standardized stratified mean catch per tow in numbers and weight (kg) for Atlantic cod from NEFSC offshore spring and autumn research vessel bottom trawl surveys in the Gulf of Maine (Strata 26-30 and 36-40), 1963 - 2000 [a,b]

Year	Gulf of Maine [c]			
	Spring		Autumn	
	No/Tow	Wt/Tow	No/Tow	Wt/Tow
1963	-	-	5.92	17.9
1964	-	-	4.00	22.8
1965	-	-	4.49	12.0
1966	-	-	3.78	12.9
1967	-	-	2.56	9.2
1968	5.44	17.9	4.39	19.4
1969	3.25	13.2	2.76	15.4
1970	2.21	11.1	4.90	16.4
1971	1.43	7.0	4.37	16.5
1972	2.06	8.0	9.31	13.0
1973	7.54	18.8	4.46	8.7
1974	2.91	7.4	4.33	9.0
1975	2.51	6.0	6.15	8.6
1976	2.78	7.6	2.15	6.7
1977	3.88	8.5	3.08	10.2
1978	2.06	7.7	5.75	12.9
1979	4.27	9.5	3.49	17.5
1980	2.15	6.2	7.04	14.2
1981	4.86	10.8	2.42	8.1
1982	3.75	8.6	7.77	16.1
1983	3.91	10.5	4.22	8.8
1984	3.40	5.8	2.42	8.8
1985	2.52	7.7	2.92	8.5
1986	1.96	3.6	1.95	5.1
1987	1.68	3.0	2.98	3.4
1988	3.13	3.3	5.90	6.6
1989	2.26	2.5	4.65	4.6
1990	2.36	3.1	2.99	4.9
1991	2.39	2.9	1.25	2.8
1992	2.41	8.7	1.43	2.4
1993	2.50	5.9	1.23	1.0
1994	1.27	2.4	2.14	2.7
1995	1.91	2.4	2.01	3.7
1996	2.46	5.4	1.32	2.4
1997	2.19	5.6	0.87	1.9
1998	1.71	4.2	0.84	1.5
1999	2.30	5.1	1.81	3.5
2000	3.08	3.2	2.60	4.7

[a] During 1963-1984, BMW oval doors were used in the spring and autumn surveys; since 1985, Portugeuse polyvalent doors have been used in both surveys. Adjustments have been made to the 1963-1984 catch per tow data to standardize these data to polyvalent door equivalents. Conversion coefficients of 1.56 (numbers) and 1.62 (weight) were used in this standardization (NEFSC 1991).

[b] Spring surveys during 1973-1981 were accomplished with a '41 Yankee' trawl; in all other years, spring surveys were accomplished with a '36 Yankee' trawl. No adjustments have been made to the catch per tow data for these differences.

[c] In the Gulf of Maine, spring surveys during 1980-1982, 1989-1991 and 1994, and autumn surveys during 1977-1978, 1980, 1989-1991 and 1993 were accomplished with the R/V DELAWARE II; in all other years, the surveys were accomplished using the R/V ALBATROSS IV. Adjustments have been made to the R/V DELAWARE II catch per tow data to standardize these to R/V ALBATROSS IV equivalents. Conversion coefficients 0.79 (number) and 0.67 (weight) were used in this standardization (NEFSC 1991).

Table A16. Standardized [for both door and gear changes] stratified mean number per tow at age and standardized stratified mean weight (kg) per tow of Atlantic cod in NEFSC offshore spring and autumn research vessel bottom trawl surveys in the Gulf of Maine, 1963-2000. [a, b]

Year	Age Group											Totals					Standardized Mean Wt (kg)/Tow	
	0	1	2	3	4	5	6	7	8	9	10+	0+	1+	2+	3+	4+		5+
Spring [c, d, e]																		
1968	0.128	0.613	1.234	1.407	0.846	0.538	0.207	0.129	0.111	0.059	0.165	5.438	5.310	4.697	3.463	2.056	1.211	17.92
1969	0.000	0.000	0.036	0.307	0.880	0.807	0.633	0.256	0.144	0.089	0.101	3.253	3.253	3.253	3.217	2.909	2.030	13.20
1970	0.000	0.159	0.123	0.055	0.094	0.273	0.466	0.615	0.075	0.059	0.287	2.206	2.206	2.047	1.923	1.869	1.775	11.06
1971	0.000	0.025	0.142	0.109	0.292	0.048	0.083	0.300	0.206	0.154	0.072	1.431	1.431	1.406	1.264	1.154	0.863	6.98
1972	0.000	0.353	0.153	0.519	0.197	0.200	0.036	0.106	0.101	0.229	0.164	2.058	2.058	1.705	1.552	1.033	0.836	8.04
1973	0.000	0.034	4.249	0.906	0.619	0.349	0.195	0.095	0.223	0.251	0.612	7.535	7.535	7.500	3.251	2.345	1.725	18.79
1974	0.000	0.476	0.056	1.359	0.329	0.222	0.114	0.048	0.048	0.020	0.232	2.905	2.905	2.429	2.373	1.014	0.685	7.44
1975	0.006	0.094	0.699	0.106	1.065	0.259	0.111	0.005	0.005	0.019	0.144	2.512	2.505	2.412	1.713	1.607	0.541	6.03
1976	0.000	0.042	0.304	1.048	0.153	0.897	0.086	0.108	0.066	0.000	0.073	2.777	2.777	2.735	2.430	1.382	1.229	7.55
1977	0.000	0.025	0.298	0.521	1.994	0.109	0.791	0.006	0.101	0.000	0.037	3.883	3.883	3.858	3.560	3.039	1.045	8.54
1978	0.000	0.034	0.105	0.285	0.348	0.766	0.075	0.320	0.008	0.106	0.008	2.055	2.055	2.020	1.916	1.630	1.282	7.70
1979	0.044	0.535	1.630	0.212	0.499	0.401	0.685	0.059	0.142	0.012	0.053	4.273	4.229	3.694	2.064	1.852	1.353	9.49
1980	0.070	0.070	0.440	0.343	0.123	0.418	0.239	0.303	0.000	0.129	0.014	2.149	2.079	2.009	1.569	1.226	1.103	6.18
1981	0.000	1.014	0.662	0.986	1.216	0.328	0.287	0.110	0.155	0.106	0.000	4.864	4.864	3.850	3.188	2.202	0.986	10.79
1982	0.015	0.336	1.019	0.516	0.694	0.864	0.117	0.108	0.000	0.042	0.039	3.751	3.737	3.400	2.381	1.865	1.171	8.62
1983	0.012	0.626	0.978	0.833	0.641	0.357	0.181	0.092	0.000	0.090	0.101	3.912	3.900	3.274	2.296	1.463	0.822	10.50
1984	0.000	0.151	1.033	1.147	0.741	0.190	0.053	0.058	0.030	0.000	0.000	3.402	3.402	3.251	2.218	1.072	0.331	5.83
1985	0.000	0.028	0.238	0.622	0.665	0.677	0.095	0.114	0.052	0.000	0.026	2.517	2.517	2.489	2.251	1.629	0.964	7.65
1986	0.000	0.417	0.330	0.647	0.387	0.074	0.046	0.027	0.011	0.000	0.018	1.957	1.957	1.540	1.210	0.563	0.176	3.60
1987	0.000	0.049	0.638	0.486	0.300	0.128	0.011	0.045	0.011	0.000	0.014	1.682	1.682	1.633	0.995	0.509	0.209	3.01
1988	0.029	0.663	1.053	0.633	0.355	0.217	0.087	0.063	0.000	0.027	0.000	3.127	3.098	2.435	1.382	0.749	0.394	3.30
1989	0.000	0.023	0.649	0.790	0.632	0.090	0.077	0.000	0.000	0.000	0.000	2.261	2.261	2.238	1.589	0.799	0.167	2.53
1990	0.000	0.000	0.190	1.327	0.627	0.167	0.032	0.018	0.000	0.000	0.000	2.362	2.362	2.362	2.172	0.845	0.217	3.08
1991	0.000	0.043	0.209	0.355	1.477	0.268	0.024	0.018	0.000	0.000	0.000	2.394	2.394	2.351	2.142	1.787	0.310	2.89
1992	0.000	0.050	0.230	0.240	0.280	1.310	0.220	0.070	0.000	0.010	0.000	2.410	2.410	2.360	2.130	1.890	1.610	8.66
1993	0.000	0.200	0.500	0.800	0.330	0.090	0.480	0.060	0.020	0.000	0.023	2.503	2.503	2.303	1.803	1.003	0.673	5.87
1994	0.000	0.016	0.316	0.387	0.213	0.095	0.047	0.126	0.024	0.024	0.018	1.266	1.266	1.251	0.935	0.547	0.334	2.43
1995	0.000	0.050	0.180	1.120	0.370	0.150	0.030	0.000	0.010	0.000	0.000	1.910	1.910	1.860	1.680	0.560	0.190	2.43
1996	0.000	0.060	0.020	0.590	1.330	0.400	0.060	0.000	0.000	0.000	0.000	2.465	2.465	2.405	2.385	1.795	0.465	5.43
1997	0.000	0.158	0.132	0.399	0.264	0.876	0.242	0.120	0.000	0.000	0.000	2.191	2.191	2.033	1.901	1.502	1.238	5.62
1998	0.000	0.018	0.224	0.330	0.517	0.142	0.421	0.022	0.037	0.000	0.000	1.710	1.710	1.692	1.468	1.138	0.621	4.18
1999	0.000	0.166	0.344	0.713	0.344	0.315	0.134	0.273	0.000	0.000	0.011	2.301	2.301	2.135	1.791	1.078	0.734	5.09
2000	0.026	1.184	0.725	0.438	0.457	0.107	0.101	0.024	0.022	0.000	0.000	3.083	3.057	1.873	1.148	0.710	0.253	3.21

[a] Strata 26-30 and 36-40.

[c] Spring surveys during 1973-1981 were accomplished with a '41 Yankee' trawl; in all other years, spring surveys were accomplished with a '36 Yankee' trawl. No adjustments have been made to the catch per tow data for these differences.

[d] During 1963-1984, BMW oval doors were used in the spring and autumn surveys; since 1985, Portuguese polyvalent doors have been used in both surveys. Adjustments have been made to the 1963-1984 catch per tow data to standardize these data to polyvalent door equivalents. Conversion coefficients of 1.56 (numbers) and 1.62 (weight) were used in this standardization (NEFSC 1991).

[e] In the Gulf of Maine, spring surveys during 1980-1982, 1989-1991 and 1994, and autumn surveys during 1977-1978, 1980, 1989-1991 and 1993, were accomplished with the R/V DELAWARE II; in all other years, the surveys were accomplished using the R/V ALBATROSS IV. Adjustments have been made to the R/V DELAWARE II catch per tow data to standardize these to R/V ALBATROSS IV equivalents. Conversion coefficients of 0.79 (numbers) and 0.67 (weight) were used in this standardization (NEFSC 1991).

Table A16 (Continued). [a,b]

Year	Age Group											Totals					Standardized Mean Wt (kg) / Tow	
	0	1	2	3	4	5	6	7	8	9	10+	0+	1+	2+	3+	4+		5+
Autumn [d,e]																		
1963	0.050	0.649	1.349	1.253	0.849	0.579	0.537	0.300	0.183	0.095	0.075	5.917	5.867	5.218	3.869	2.616	1.767	17.95
1964	0.000	0.092	0.122	0.471	0.856	0.853	0.783	0.373	0.237	0.114	0.101	4.003	4.003	3.911	3.789	3.318	2.462	22.79
1965	0.002	0.850	0.880	0.824	0.750	0.496	0.374	0.170	0.080	0.044	0.025	4.494	4.493	3.643	2.763	1.939	1.189	12.00
1966	0.170	0.204	0.640	0.697	0.718	0.558	0.441	0.192	0.078	0.048	0.036	3.783	3.613	3.409	2.769	2.072	1.354	12.91
1967	0.012	0.129	0.215	0.574	0.671	0.384	0.268	0.162	0.070	0.041	0.034	2.562	2.549	2.420	2.204	1.630	0.959	9.23
1968	0.012	0.036	0.179	0.719	1.256	0.973	0.627	0.261	0.156	0.072	0.095	4.387	4.374	4.338	4.159	3.440	2.184	19.44
1969	0.016	0.059	0.123	0.354	0.630	0.552	0.466	0.220	0.145	0.129	0.062	2.758	2.742	2.683	2.560	2.206	1.576	15.37
1970	0.743	0.941	0.265	0.551	0.329	0.488	0.423	0.789	0.131	0.094	0.147	4.900	4.157	3.217	2.952	2.401	2.072	16.43
1971	1.346	0.178	0.239	0.211	0.597	0.460	0.434	0.254	0.318	0.200	0.128	4.365	3.019	2.841	2.602	2.391	1.794	16.52
1972	0.031	5.579	1.217	1.526	0.234	0.094	0.172	0.039	0.159	0.242	0.016	9.307	9.276	3.697	2.480	0.955	0.721	12.96
1973	0.636	0.328	2.173	0.139	0.507	0.212	0.078	0.028	0.051	0.168	0.136	4.457	3.820	3.493	1.320	1.181	0.674	8.73
1974	0.282	1.123	0.189	1.744	0.292	0.359	0.078	0.012	0.012	0.042	0.198	4.332	4.050	2.927	2.738	0.994	0.702	8.97
1975	0.047	0.147	3.067	0.134	2.356	0.254	0.109	0.017	0.003	0.003	0.012	6.150	6.103	5.956	2.889	2.755	0.399	8.62
1976	0.000	0.243	0.209	0.632	0.100	0.768	0.058	0.095	0.000	0.016	0.031	2.151	2.151	1.908	1.699	1.067	0.967	6.74
1977	0.000	0.022	0.359	0.550	1.155	0.152	0.593	0.038	0.097	0.022	0.096	3.083	3.083	3.061	2.703	2.153	0.998	10.22
1978	0.249	1.369	0.371	1.118	0.656	1.430	0.112	0.325	0.009	0.060	0.051	5.749	5.500	4.131	3.760	2.642	1.987	12.89
1979	0.005	0.368	0.594	0.162	0.836	0.392	0.782	0.051	0.215	0.000	0.083	3.488	3.483	3.115	2.521	2.359	1.523	17.54
1980	0.027	1.264	2.602	1.754	0.497	0.232	0.335	0.207	0.030	0.018	0.071	7.037	7.010	5.745	3.144	1.390	0.893	14.21
1981	0.012	0.619	0.382	0.549	0.474	0.089	0.119	0.037	0.108	0.000	0.028	2.418	2.406	1.786	1.404	0.855	0.381	8.05
1982	0.000	0.700	3.142	2.473	1.167	0.248	0.000	0.039	0.000	0.000	0.000	7.769	7.769	7.068	3.927	1.454	0.287	16.07
1983	0.045	1.660	0.977	0.852	0.139	0.264	0.197	0.000	0.000	0.000	0.090	4.223	4.178	2.518	1.541	0.690	0.551	8.81
1984	0.044	0.384	0.421	0.565	0.399	0.220	0.204	0.089	0.000	0.031	0.066	2.423	2.379	1.995	1.574	1.009	0.610	8.81
1985	0.266	0.378	0.910	0.763	0.209	0.218	0.074	0.000	0.034	0.021	0.049	2.922	2.656	2.278	1.368	0.605	0.396	8.49
1986	0.000	0.301	0.490	0.654	0.333	0.086	0.042	0.000	0.000	0.024	0.021	1.951	1.951	1.650	1.160	0.506	0.173	5.10
1987	0.138	0.599	1.324	0.600	0.257	0.061	0.000	0.000	0.000	0.000	0.000	2.979	2.841	2.242	0.918	0.318	0.061	3.41
1988	0.000	1.951	2.245	0.960	0.528	0.110	0.076	0.033	0.000	0.000	0.000	5.903	5.903	3.952	1.707	0.747	0.219	6.61
1989	0.000	0.416	2.391	1.356	0.294	0.174	0.014	0.000	0.000	0.009	0.000	4.653	4.653	4.238	1.847	0.491	0.197	4.58
1990	0.006	0.029	0.367	1.643	0.623	0.278	0.028	0.010	0.000	0.000	0.000	2.985	2.978	2.949	2.583	0.939	0.317	4.91
1991	0.008	0.142	0.142	0.221	0.632	0.079	0.000	0.024	0.000	0.000	0.000	1.248	1.240	1.098	0.956	0.735	0.103	2.78
1992	0.060	0.290	0.450	0.140	0.040	0.330	0.110	0.000	0.010	0.000	0.000	1.430	1.370	1.080	0.630	0.490	0.450	2.45
1993	0.040	0.198	0.569	0.363	0.032	0.000	0.032	0.000	0.000	0.000	0.000	1.232	1.193	0.995	0.427	0.063	0.032	1.00
1994	0.030	0.210	0.880	0.830	0.090	0.050	0.000	0.050	0.000	0.000	0.000	2.140	2.110	1.900	1.020	0.190	0.100	2.74
1995	0.010	0.070	0.280	1.230	0.330	0.080	0.010	0.000	0.000	0.000	0.000	2.010	2.000	1.930	1.650	0.420	0.090	3.67
1996	0.030	0.120	0.380	0.190	0.540	0.060	0.000	0.000	0.000	0.000	0.000	1.320	1.290	1.170	0.790	0.600	0.060	2.35
1997	0.000	0.297	0.086	0.160	0.182	0.149	0.000	0.000	0.000	0.000	0.000	0.872	0.872	0.575	0.490	0.330	0.149	1.87
1998	0.050	0.097	0.320	0.115	0.192	0.039	0.031	0.000	0.000	0.000	0.000	0.843	0.793	0.696	0.376	0.261	0.069	1.50
1999	0.025	0.431	0.363	0.590	0.243	0.132	0.023	0.000	0.000	0.000	0.000	1.807	1.782	1.351	0.998	0.408	0.165	3.50
2000	0.008	0.533	0.984	0.394	0.507	0.134	0.010	0.034	0.000	0.000	0.000	2.804	2.596	2.063	1.079	0.685	0.178	4.65

[a] Strata 26-30 and 36-40.

[b] Autumn catch per tow at age values for 1963-1969 obtained by applying combined 1970-1981 age-length keys to stratified mean catch per tow at length distributions from each survey.

[d] During 1963-1984, BMV oval doors were used in the spring and autumn surveys; since 1985, Portugeuse polyvalent doors have been used in both surveys. Adjustments have been made to the 1963-1984 catch per tow data to standardize these data to polyvalent door equivalents. Conversion coefficients of 1.56 (numbers) and 1.62 (weight) were used in this standardization (NEFSC 1991).

[e] In the Gulf of Maine, spring surveys during 1980-1982, 1989-1991 and 1994, and autumn surveys during 1977-1978, 1980, 1989-1991 and 1993 were accomplished with the R/V DELAWARE II; in all other years, the surveys were accomplished using the R/V ALBATROSS IV. Adjustments have been made to the R/V DELAWARE II catch per tow data to standardize these to R/V ALBATROSS IV equivalents. Conversion coefficients of 0.79 (numbers) and 0.67 (weight) were used in this standardization (NEFSC 1991).

Table A17. Stratified mean catch per tow in numbers and weight (kg) of Atlantic cod in State of Massachusetts inshore spring and autumn bottom trawl surveys in territorial waters adjacent to the Gulf of Maine (Mass. Regions 4-5), 1978 - 2000. [a]

Year	Age Group											Total s				Stratified Mean Weight/tow (kg)
	0	1	2	3	4	5	6	7	8	9	10+	0+	1+	2+	3+	
Gulf of Maine Area (Mass. Regions 4-5)																
Spring																
1978	21.965	12.784	4.162	4.572	0.872	1.028	0.000	0.000	0.023	0.000	0.000	45.406	23.441	10.657	6.495	12.16
1979	56.393	36.630	2.581	1.533	4.659	1.995	0.183	0.000	0.000	0.000	0.069	104.043	47.650	11.020	8.439	20.53
1980	8.156	50.311	12.679	0.971	0.745	0.737	0.080	0.214	0.000	0.025	0.000	73.918	65.762	15.451	2.772	17.71
1981	19.753	24.794	23.884	3.122	1.279	0.041	0.146	0.022	0.022	0.000	0.000	73.063	53.310	28.516	4.632	21.79
1982	1.489	16.235	7.060	3.418	1.147	0.232	0.011	0.057	0.045	0.000	0.000	29.694	28.205	11.970	4.910	13.42
1983	0.453	27.703	18.572	5.331	0.501	1.221	0.142	0.022	0.000	0.000	0.000	53.945	53.492	25.789	7.217	19.77
1984	0.206	2.896	5.408	2.271	0.865	0.138	0.162	0.000	0.000	0.000	0.000	11.946	11.740	8.844	3.436	8.63
1985	0.793	2.711	3.822	2.794	0.692	0.000	0.000	0.000	0.000	0.000	0.000	10.812	10.019	7.308	3.486	6.42
1986	0.957	19.960	3.222	0.887	0.426	0.090	0.019	0.000	0.000	0.000	0.000	25.561	24.604	4.644	1.422	7.77
1987	0.659	8.590	6.997	2.268	0.257	0.147	0.048	0.000	0.000	0.087	0.000	19.053	18.394	9.804	2.807	9.59
1988	1.595	11.841	11.356	2.511	1.370	0.000	0.039	0.000	0.000	0.000	0.000	28.712	27.117	15.276	3.920	9.66
1989	0.157	20.679	25.260	6.580	0.458	0.106	0.124	0.000	0.000	0.000	0.000	53.364	53.207	32.528	7.268	18.26
1990	4.10	6.33	6.89	17.77	2.64	0.18	0.05	0.02	0.000	0.000	0.000	37.980	33.88	27.55	20.66	19.51
1991	0.32	5.88	3.56	2.54	5.03	0.36	0.000	0.000	0.000	0.000	0.000	17.69	17.37	11.49	7.93	11.37
1992	1.36	6.42	6.35	3.58	0.65	1.37	0.12	0.04	0.00	0.00	0.00	19.88	18.53	12.11	5.76	10.10
1993	69.03	3.40	7.76	3.60	1.45	0.05	0.30	0.00	0.00	0.00	0.00	85.59	16.56	13.16	5.40	7.63
1994	3.90	4.45	5.67	2.46	0.52	0.23	0.03	0.06	0.00	0.03	0.00	17.35	13.45	9.00	3.33	4.83
1995	9.84	6.41	1.36	3.89	1.20	0.09	0.00	0.00	0.00	0.00	0.00	22.79	12.95	6.54	5.18	4.49
1996	6.39	1.37	0.65	1.15	2.00	0.38	0.00	0.00	0.00	0.00	0.00	11.96	5.57	4.20	3.55	4.06
1997	10.40	3.66	1.25	1.05	0.22	0.50	0.03	0.00	0.00	0.00	0.00	17.09	6.69	3.03	1.78	2.97
1998	20.72	3.15	1.80	0.99	1.06	0.08	0.46	0.04	0.00	0.00	0.00	28.30	7.58	4.43	2.63	5.76
1999	116.22	14.36	3.57	3.46	1.20	1.08	0.06	0.22	0.04	0.00	0.00	140.08	23.84	9.48	5.91	14.19
2000	1.83	27.99	7.12	2.85	2.60	0.78	0.77	0.06	0.13	0.00	0.00	44.10	42.47	14.48	7.36	22.36
Autumn																
1978	151.533	2.082	0.000	0.120	0.140	0.318	0.000	0.080	0.000	0.000	0.000	154.273	2.740	0.658	0.658	3.02
1979	4.933	3.430	0.042	0.000	0.026	0.000	0.000	0.000	0.000	0.000	0.000	8.431	3.498	0.068	0.026	0.99
1980	5.680	8.834	0.052	0.000	0.000	0.050	0.000	0.000	0.000	0.000	0.000	14.616	8.936	0.102	0.050	1.57
1981	2.018	5.652	7.290	0.729	0.000	0.000	0.000	0.000	0.000	0.000	0.000	15.689	13.671	8.019	0.729	6.65
1982	4.667	2.346	1.005	0.060	0.050	0.000	0.000	0.000	0.000	0.000	0.000	8.128	3.461	1.115	0.110	1.35
1983	1.308	0.651	0.100	0.013	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.072	0.764	0.113	0.013	0.18
1984	12.296	0.344	0.022	0.013	0.000	0.000	0.000	0.000	0.000	0.000	0.000	12.675	0.379	0.035	0.013	0.18
1985	2.832	0.419	0.018	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.279	0.447	0.028	0.010	0.09
1986	2.478	1.150	0.833	0.000	0.067	0.000	0.000	0.000	0.000	0.000	0.000	4.528	2.050	0.900	0.067	0.55
1987	389.584	2.386	0.020	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	391.990	2.406	0.020	0.000	0.45
1988	4.571	20.490	0.679	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	25.740	21.169	0.679	0.000	1.57
1989	2.971	2.700	0.350	0.210	0.185	0.000	0.000	0.000	0.000	0.000	0.000	6.416	3.445	0.745	0.395	1.27
1990	9.37	9.13	1.74	0.31	0.06	0.03	0.000	0.000	0.000	0.000	0.000	20.638	11.27	2.14	0.40	1.56
1991	4.65	4.20	0.81	0.03	0.05	0.01	0.00	0.00	0.00	0.00	0.00	9.74	5.09	0.89	0.08	0.80
1992	24.30	2.01	0.11	0.00	0.00	0.06	0.00	0.00	0.00	0.00	0.00	26.48	2.18	0.17	0.06	0.42
1993	49.92	3.32	0.61	0.33	0.00	0.00	0.01	0.00	0.00	0.00	0.00	54.21	4.29	0.97	0.36	1.97
1994	33.49	14.13	6.37	0.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	54.26	20.77	6.64	0.27	4.47
1995	2.56	0.64	0.54	0.79	0.02	0.00	0.00	0.00	0.00	0.00	0.00	4.55	1.99	1.35	0.81	0.74
1996	7.59	0.15	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	7.78	0.19	0.04	0.03	0.09
1997	2.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.04	0.02	0.00	0.00	0.02
1998	2.61	1.04	0.62	0.08	0.11	0.00	0.00	0.00	0.00	0.00	0.00	4.46	1.85	0.81	0.19	0.56
1999	6.34	0.98	0.28	0.00	0.06	0.00	0.00	0.00	0.00	0.00	0.00	7.65	1.31	0.33	0.05	0.43
2000	0.04	0.54	0.27	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.91	0.87	0.33	0.06	0.34

[a] Massachusetts sampling strata 25-36.

Table A18. Estimates of instantaneous total mortality (Z) and fishing mortality (F)¹ for Gulf of Maine Atlantic cod, 1964 - 2000, derived from NEFSC offshore spring and autumn bottom trawl survey data.²

Time Period	Gulf of Maine					
	Spring		Autumn		Geometric Mean	
	Z	F	Z	F	Z	F
1964-1967	-	-	0.39	0.19	0.39	0.19
1968-1976	0.36	0.16	0.44	0.24	0.40	0.20 ³
1977-1982	0.56	0.36	0.44	0.37	0.50	0.30 ⁴
1983-1987	0.93	0.73	1.12	0.92	1.02	0.82
1988-1992	1.24	1.04	0.86	0.66	1.03	0.83 ⁵
1993-1997	0.73	0.53	1.05	0.85	0.88	0.68
1998-1999	0.81	0.61	N/a	N/a	0.81	0.61

¹ Instantaneous natural mortality (M) assumed to be 0.20.

² Estimates derived from:

Spring: $\ln(\sum \text{age } 4+ \text{ for year } i \text{ to } j / \sum \text{age } 5+ \text{ for years } i+1 \text{ to } j+1)$.
 Autumn: $\ln(\sum \text{age } 3+ \text{ for years } i-1 \text{ to } j-1 / \sum \text{age } 4+ \text{ for years } i \text{ to } j)$.

³ Excludes autumn 1967-1968 data (3+/4+) since these gave large negative Z value.

⁴ Excludes autumn 1976-1977 data (3+/4+) since these gave large negative Z value.

⁵ Excludes spring 1991-1992 data (4+/5+) since these gave unreasonably low Z value.

Table A19. Comparative VPA Results for Gulf of Maine Cod Assuming 3 Discard scenarios in 1999 and 2000.

Discard Option 1: Lower End of Range

1999 Discards = 2,000 mt
 2000 Discards = 1,000 mt

 Approximate Statistics Assuming Linearity Near Solution
 Sum of Squares: 133.743222421604
 Mean Square Residuals: 0.45184

	PAR.	EST.	STD. ERR.	T-STATISTIC	C. V.
N 2	4.61E+03	2.26E+03	2.04E+00	0.49	
N 3	6.28E+03	1.97E+03	3.18E+00	0.31	
N 4	2.01E+03	5.86E+02	3.44E+00	0.29	
N 5	8.10E+02	3.29E+02	2.46E+00	0.41	
N 6	1.85E+02	8.97E+01	2.06E+00	0.49	

Discard Option 2: Middle of the Range.

1999 Discards = 2,500 mt
 2000 Discards = 1,000 mt

 Approximate Statistics Assuming Linearity Near Solution
 Sum of Squares: 134.032264575886
 Mean Square Residuals: 0.45281

	PAR.	EST.	STD. ERR.	T-STATISTIC	C. V.
N 2	4.63E+03	2.27E+03	2.04E+00	0.49	
N 3	6.31E+03	1.99E+03	3.18E+00	0.31	
N 4	2.02E+03	5.89E+02	3.44E+00	0.29	
N 5	8.03E+02	3.30E+02	2.43E+00	0.41	
N 6	1.76E+02	8.79E+01	2.01E+00	0.50	

Discard Option 3: Upper End of Range

1999 Discards = 3,000 mt
 2000 Discards = 2,000 mt

 Approximate Statistics Assuming Linearity Near Solution
 Sum of Squares: 134.72526691389
 Mean Square Residuals: 0.45515

	PAR.	EST.	STD. ERR.	T-STATISTIC	C. V.
N 2	4.67E+03	2.30E+03	2.03E+00	0.49	
N 3	6.36E+03	2.01E+03	3.17E+00	0.32	
N 4	1.99E+03	5.94E+02	3.36E+00	0.30	
N 5	7.32E+02	3.29E+02	2.23E+00	0.45	
N 6	1.56E+02	8.42E+01	1.86E+00	0.54	

Table A19 (Continued).

STOCK NUMBERS (Jan 1) in thousands - D: \ASSESS\GMcod\gmcod2001\gmcod2001_recr_2.2

Lower End of Range

Ages	1996	1997	1998	1999	2000	2001
1+	12303	11878	12375	18196	19150	14007

Middle of Range

Ages	1996	1997	1998	1999	2000	2001
1+	12480	12095	12571	18399	19200	14048

Upper End of Range

Ages	1996	1997	1998	1999	2000	2001
1+	12766	12566	13007	18842	19464	14004

FISHING MORTALITY - D: \ASSESS\GMcod\gmcod2001\gmcod2001_recr_2.2

Lower End of Range

Ages	1996	1997	1998	1999	2000
4, 5	1.01	0.89	0.73	0.70	0.71

Middle of Range

Ages	1996	1997	1998	1999	2000
4, 5	1.01	0.88	0.70	0.77	0.73

Upper End of Range

Ages	1996	1997	1998	1999	2000
4, 5	1.00	0.85	0.67	0.80	0.87

Table A20. Final VPA Results for Gulf of Maine Cod, 1982-2000

STOCK NUMBERS (Jan 1) in thousands - D:\ASSESS\GMcod\gmcod2001\gmcod2001_recr_2.2

	1982	1983	1984	1985	1986	1987	1988
1	7769	7539	10464	7004	10161	12538	25198
2	10891	6281	6160	8545	5690	8296	10228
3	5359	7112	3933	4307	6101	4471	5971
4	3026	2262	3202	1797	1616	2507	2377
5	1796	1223	780	1142	456	483	673
6	170	822	382	214	333	125	97
7	541	305	260	216	315	150	63
1+	29552	25543	25180	23227	24674	28569	44607
	1989	1990	1991	1992	1993	1994	1995
1	4302	4021	6992	6411	9327	3325	3386
2	20625	3518	3286	5720	5249	7635	2721
3	7903	16406	2614	2286	4367	4160	6200
4	2953	4404	9637	920	1328	1767	2157
5	907	881	1459	3413	277	375	336
6	158	303	280	338	818	100	22
7	104	188	155	132	65	116	53
1+	36951	29721	24421	19219	21430	17478	14876
	1996	1997	1998	1999	2000	2001	
1	3020	4745	4498	9549	5656	00	
2	2773	2473	3885	3683	7817	4630	
3	1975	2192	1969	3081	3008	6312	
4	4033	995	1348	1174	2013	2024	
5	568	1544	393	546	449	803	
6	90	132	455	159	206	176	
7	19	14	23	209	53	102	
1+	12480	12095	12571	18399	19200	14048	

Table A20 (Continued).

FISHING MORTALITY -	D: \ASSESS\GMcod\gmcod2001\gmcod2001_recr_2.2						
	1982	1983	1984	1985	1986	1987	1988
1	0.01	0.00	0.00	0.01	0.00	0.00	0.00
2	0.23	0.27	0.16	0.14	0.04	0.13	0.06
3	0.66	0.60	0.58	0.78	0.69	0.43	0.50
4	0.71	0.86	0.83	1.17	1.01	1.12	0.76
5	0.58	0.96	1.09	1.03	1.10	1.41	1.25
6	0.67	0.92	0.90	1.16	1.06	1.20	0.87
7	0.67	0.92	0.90	1.16	1.06	1.20	0.87
F(4, 5)	0.64	0.91	0.96	1.10	1.05	1.26	1.01
F(wb)	0.47	0.60	0.51	0.59	0.54	0.49	0.38
	1989	1990	1991	1992	1993	1994	1995
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.03	0.10	0.16	0.07	0.03	0.01	0.12
3	0.38	0.33	0.84	0.34	0.70	0.46	0.23
4	1.01	0.91	0.84	1.00	1.06	1.46	1.13
5	0.89	0.95	1.26	1.23	0.82	2.62	1.11
6	1.01	0.94	0.91	1.22	1.05	1.70	1.17
7	1.01	0.94	0.91	1.22	1.05	1.70	1.17
F(4, 5)	0.95	0.93	1.05	1.11	0.94	2.04	1.12
F(wb)	0.30	0.49	0.78	0.53	0.40	0.44	0.41
	1996	1997	1998	1999	2000		
1	0.00	0.00	0.00	0.00	0.00		
2	0.03	0.03	0.03	0.00	0.01		
3	0.49	0.29	0.32	0.23	0.20		
4	0.76	0.73	0.70	0.76	0.72		
5	1.26	1.02	0.71	0.78	0.73		
6	0.83	0.92	0.72	0.78	0.73		
7	0.83	0.92	0.72	0.78	0.73		
F(4, 5)	1.01	0.88	0.70	0.77	0.73		
F(wb)	0.50	0.40	0.32	0.30	0.23		
MEAN BIOMASS (using catch mean weights at age)							
	1982	1983	1984	1985	1986	1987	1988
1	3975	2928	4736	2321	3890	3596	3813
2	9560	5331	5225	7385	5177	7148	8899
3	5705	7889	4426	4451	7270	5108	7540
4	5340	3399	5389	2721	2706	4345	3632
5	5895	2709	1597	2891	1164	1138	1804
6	747	2966	1346	640	1139	464	373
7	4089	1821	1624	1148	2097	829	415
1+	35312	27044	24343	21557	23444	22628	26477
	1989	1990	1991	1992	1993	1994	1995
1	2338	521	1083	2719	8453	1410	1436
2	21846	3095	3125	7675	5302	9429	3772
3	10275	21056	2459	3378	5250	5676	9327
4	5022	6083	14785	1457	1824	2660	3177
5	2114	2197	3085	5558	737	416	946
6	389	1374	1224	902	2841	272	87
7	718	1519	1040	745	408	510	387
1+	42702	35845	26800	22434	24814	20372	19133

Table A20 (Continued).

	1996	1997	1998	1999	2000		
1	1281	2013	1908	2864	2399		
2	4080	3806	4632	4167	11260		
3	2992	3822	3242	4619	5647		
4	6054	1922	2606	2093	4358		
5	1074	2800	1068	1429	1252		
6	417	362	1230	580	779		
7	132	77	152	1023	252		
1+	16028	14802	14838	16775	25946	00	
SSB AT THE START OF THE SPAWNING SEASON -MALES AND FEMALES (MT) (using SSB mean weights)							
	1982	1983	1984	1985	1986	1987	1988
1	218	143	248	60	108	87	61
2	2326	1174	993	2765	1608	2465	2629
3	3630	5002	2764	4445	6762	4801	6729
4	5197	3283	4945	3039	2857	4768	3877
5	6421	3100	1821	3204	1308	1365	2102
6	820	3633	1483	763	1390	554	442
7	5296	2513	2229	1672	2991	1221	567
1+	23908	18848	14484	15947	17024	15262	16406
	1989	1990	1991	1992	1993	1994	1995
1	77	22	42	205	848	32	33
2	4241	732	349	784	1029	3279	854
3	8868	11771	1527	1723	3516	4815	8171
4	5481	5872	13262	1238	1876	3149	3810
5	2284	2372	3221	6871	738	665	1066
6	599	1327	1255	1173	2808	370	87
7	1012	2104	1430	1101	580	831	567
1+	22561	24200	21088	13096	11396	13141	14587
	1996	1997	1998	1999	2000		
1	29	51	50	56	66		
2	891	812	1123	1035	2087		
3	2887	3431	3063	4005	4225		
4	7074	2102	2919	2395	4221		
5	1379	3411	1182	1610	1325		
6	465	444	1407	656	860		
7	177	106	199	1364	331		
1+	12901	10357	9943	11121	13114		

Table A21. Yield and spawning stock biomass per recruit estimates and input data for Gulf of Maine cod.

The NEFC Yield and Stock Size per Recruit Program - PDBYPRC
 PC Ver. 2.0 [Method of Thompson and Bell (1934)] 1-Jan-1999

 Run Date: 28- 6-2001; Time: 10: 23: 22.61
 GULF OF MAINE COD (5Y) - 2001 UPDATED AVE WTS, FPAT AND MAT VECTORS

Proportion of F before spawning: .1667
 Proportion of M before spawning: .1667
 Natural Mortality is Constant at: .200
 Initial age is: 1; Last age is: 11
 Last age is a PLUS group;
 Original age-specific PRs, Mats, and Mean Wts from file:
 ==> yrcodgma.dat

 Age-specific Input data for Yield per Recruit Analysis

Age	Fish Mort Pattern	Nat Mort Pattern	Proportion Mature	Average Weights Catch	Stock
1	.0000	1.0000	.0400	.441	.283
2	.0134	1.0000	.3800	1.229	.725
3	.2867	1.0000	.8900	1.782	1.466
4	.9889	1.0000	.9900	2.694	2.180
5	1.0000	1.0000	1.0000	4.089	3.343
6	1.0000	1.0000	1.0000	6.031	4.960
7	1.0000	1.0000	1.0000	9.003	7.551
8	1.0000	1.0000	1.0000	11.615	10.251
9	1.0000	1.0000	1.0000	14.175	12.903
10	1.0000	1.0000	1.0000	16.411	14.975
11+	1.0000	1.0000	1.0000	18.479	18.479

 Summary of Yield per Recruit Analysis for:
 GULF OF MAINE COD (5Y) - 2001 UPDATED AVE WTS, FPAT AND MAT VECTORS

Slope of the Yield/Recruit Curve at F=0.00: --> 27.9322
 F Level at slope=1/10 of the above slope (F0.1): -----> .153
 Yield/Recruit corresponding to F0.1: -----> 1.6797
 F Level to produce Maximum Yield/Recruit (Fmax): -----> .267
 Yield/Recruit corresponding to Fmax: -----> 1.8015
 F Level at 20 % of Max Spawning Potential (F20): -----> .363
 SSB/Recruit corresponding to F20: -----> 5.6681

Listing of Yield per Recruit Results for:
 GULF OF MAINE COD (5Y) - 2001 UPDATED AVE WTS, FPAT AND MAT VECTORS

	FMORT	TOTCTHN	TOTCTHW	TOTSTKN	TOTSTKW	SPNSTKN	SPNSTKW	% MSP
	.00	.00000	.00000	5.5167	30.0615	3.8396	28.3409	100.00
	.05	.11706	.97975	4.9338	21.7023	3.2551	20.0950	70.90
	.10	.19534	1.44901	4.5447	16.5838	2.8643	15.0665	53.16
	.15	.25146	1.67194	4.2664	13.2304	2.5843	11.7852	41.58
F0.1	.15	.25406	1.67973	4.2535	13.0825	2.5714	11.6408	41.07
	.20	.29373	1.76902	4.0573	10.9224	2.3736	9.5355	33.65
	.25	.32676	1.79997	3.8943	9.2722	2.2090	7.9325	27.99
Fmax	.27	.33641	1.80149	3.8469	8.8186	2.1610	7.4929	26.44
	.30	.35333	1.79603	3.7637	8.0552	2.0767	6.7541	23.83
	.35	.37519	1.77411	3.6565	7.1343	1.9679	5.8648	20.69
F20%	.36	.38029	1.76668	3.6315	6.9303	1.9426	5.6681	20.00
	.40	.39351	1.74357	3.5669	6.4217	1.8768	5.1784	18.27
	.45	.40912	1.70964	3.4908	5.8596	1.7992	4.6381	16.37
	.50	.42259	1.67520	3.4254	5.4087	1.7323	4.2053	14.84
	.55	.43435	1.64181	3.3686	5.0413	1.6740	3.8532	13.60
	.60	.44472	1.61027	3.3186	4.7380	1.6225	3.5626	12.57
	.65	.45394	1.58092	3.2743	4.4844	1.5768	3.3199	11.71
	.70	.46220	1.55386	3.2348	4.2700	1.5358	3.1147	10.99
	.75	.46966	1.52903	3.1992	4.0868	1.4989	2.9394	10.37
	.80	.47643	1.50633	3.1670	3.9290	1.4653	2.7882	9.84
	.85	.48261	1.48560	3.1378	3.7917	1.4347	2.6567	9.37
	.90	.48828	1.46666	3.1110	3.6714	1.4067	2.5413	8.97
	.95	.49351	1.44936	3.0865	3.5653	1.3808	2.4393	8.61
	1.00	.49835	1.43352	3.0638	3.4710	1.3569	2.3486	8.29

Table A22a. Starting conditions and input data for short-term (2001-2003) and long-term (2001-2025) stochastic stock biomass and catch projections for Gulf of Maine cod.

Input for Projections:

Number of Years: 3; Initial Year: 2001; Final Year: 2003
 Number of Ages : 7; Age at Recruitment: 1; Last Age: 7
 Natural Mortality is assumed Constant over time at: .200
 Proportion of F before spawning: .1667
 Proportion of M before spawning: .1667
 Last age is a PLUS group;

Age-specific Input data for Projection # 1

Age	Fish Mort Pattern	Nat Mort Pattern	Proportion Mature	Average Catch	Weights Stock
1	.0010	1.0000	.0400	0.441	0.283
2	.0134	1.0000	.3800	1.229	0.725
3	.2867	1.0000	.8900	1.782	1.466
4	1.0000	1.0000	.9900	2.694	2.180
5	1.0000	1.0000	1.0000	4.089	3.343
6	1.0000	1.0000	1.0000	6.031	4.960
7+	1.0000	1.0000	1.0000	10.881	10.881

Table A22b. Results of short-term stochastic stock biomass and catch projections for Gulf of Maine cod.

Projections for 2001-2003; F(2001)=0.73, Basis: Status quo 2000 point estimate. Recruitment (age 1) 2001 and 2002 year classes derived from Beverton-Holt's spawning stock-recruitment relationship based on 1981-1999 year classes.

SSB was estimated to be 13,100 t in 2000.

2001			2002			2003
F	Catch	SSB	F	Catch	SSB	SSB
0.73	7540	18210	$F_{0.1}=0.15$	2619	21339	29819
0.73	7540	18210	$F_{msy}=0.23$	3884	21122	28153
0.73	7540	18210	$F_{max}=0.27$	4482	21015	27374
0.73	7540	18210	$F_{SO}=0.73$	10107	19862	20401

Table A23. Long-term (25 yr) Projections for Gulf of Maine cod at F0.1 (0.15), Fmsy (0.23) and Fmax (0.27).

A) F0.1 = 0.15

PROJECTION RUN: GM Cod F0.1 25 yr projection
 INPUT FILE: gmc2001mod5.in
 OUTPUT FILE: gmc2001mod5_F01.out
 RECRUITMENT MODEL: 5
 NUMBER OF SIMULATIONS: 100

F-BASED PROJECTIONS

TIME-VARYING F

YEAR	F
2001	0.730
2002	0.150
2003	0.150
2004	0.150
2005	0.150
2006	0.150
2007	0.150
2008	0.150
2009	0.150
2010	0.150
2011	0.150
2012	0.150
2013	0.150
2014	0.150
2015	0.150
2016	0.150
2017	0.150
2018	0.150
2019	0.150
2020	0.150
2021	0.150
2022	0.150
2023	0.150
2024	0.150
2025	0.150

PERCENTILES OF SPAWNING STOCK BIOMASS (000 MT)

YEAR	1%	5%	10%	25%	50%	75%	90%	95%	99%
2001	12.397	13.705	14.578	16.323	18.210	20.442	22.278	23.559	27.247
2002	14.141	16.331	17.389	19.059	21.339	24.107	26.764	28.120	31.894
2003	21.298	23.704	25.015	27.087	29.819	33.068	36.313	38.050	42.339
2004	28.288	31.246	32.752	35.553	39.049	42.958	46.889	49.369	54.707
2005	37.130	40.900	42.899	46.704	51.394	56.591	61.670	65.011	72.334
2006	42.726	47.054	49.427	53.691	58.943	64.873	70.803	74.464	82.868
2007	49.741	54.075	56.505	60.864	66.118	72.062	77.897	81.714	89.707
2008	54.106	58.988	61.735	66.724	72.684	79.418	86.107	90.334	99.409
2009	58.281	63.596	66.501	71.888	78.380	85.547	92.755	97.432	106.650
2010	62.379	67.842	70.975	76.586	83.416	90.955	98.410	103.306	113.095
2011	65.782	71.580	74.800	80.635	87.742	95.516	103.260	108.446	118.213
2012	68.706	74.659	77.968	83.999	91.278	99.290	107.195	112.334	122.463
2013	71.004	77.136	80.524	86.698	94.103	102.236	110.348	115.427	126.060
2014	72.983	79.115	82.648	88.784	96.288	104.609	112.722	117.933	128.586
2015	74.684	80.698	84.263	90.465	98.054	106.421	114.597	119.894	130.496
2016	75.712	81.900	85.502	91.744	99.415	107.781	115.961	121.203	131.929
2017	76.708	82.924	86.460	92.794	100.514	108.842	117.100	122.351	132.953
2018	77.442	83.650	87.220	93.605	101.306	109.682	118.078	123.300	133.940
2019	78.078	84.175	87.783	94.260	101.951	110.303	118.783	124.111	134.857
2020	78.301	84.668	88.256	94.707	102.464	110.815	119.242	124.453	135.459
2021	78.750	85.087	88.614	95.070	102.831	111.231	119.625	124.930	135.835
2022	78.917	85.276	88.961	95.390	103.080	111.512	119.894	125.364	136.318
2023	79.225	85.615	89.163	95.583	103.287	111.723	120.182	125.668	136.640
2024	79.481	85.722	89.296	95.726	103.428	111.909	120.423	125.786	137.046
2025	79.584	85.928	89.436	95.833	103.584	112.097	120.425	125.875	136.951

PERCENTILES OF TOTAL JANUARY 1 STOCK BIOMASS (000 MT)

YEAR	1%	5%	10%	25%	50%	75%	90%	95%	99%
2001	16.976	19.063	19.892	21.970	24.424	27.174	29.536	31.219	35.279
2002	19.197	21.392	22.507	24.480	27.054	30.064	32.968	34.695	38.753
2003	26.874	29.583	31.037	33.601	36.812	40.495	44.077	46.357	51.159
2004	35.066	38.422	40.217	43.501	47.532	52.011	56.418	59.285	65.393
2005	45.691	50.077	52.454	56.778	62.088	67.973	73.754	77.477	85.465
2006	52.471	57.414	60.175	65.057	71.017	77.710	84.422	88.624	97.959
2007	60.604	65.699	68.387	73.397	79.372	86.073	92.689	96.979	106.093
2008	65.992	71.506	74.744	80.463	87.322	94.981	102.707	107.591	118.017
2009	70.880	76.841	80.250	86.439	93.849	102.047	110.266	115.564	125.960
2010	75.360	81.629	85.201	91.616	99.401	107.956	116.491	122.036	133.111
2011	79.137	85.670	89.283	95.952	104.020	112.782	121.631	127.450	138.541
2012	82.167	88.909	92.692	99.538	107.772	116.824	125.749	131.457	142.792
2013	84.692	91.534	95.417	102.342	110.687	119.849	128.893	134.657	146.269
2014	86.715	93.614	97.538	104.469	112.948	122.244	131.263	137.211	149.056
2015	88.299	95.234	99.223	106.213	114.774	124.039	133.237	139.043	150.888
2016	89.460	96.497	100.452	107.478	116.120	125.482	134.559	140.496	152.513
2017	90.423	97.471	101.468	108.531	117.183	126.479	135.760	141.710	153.493
2018	91.251	98.131	102.185	109.347	118.019	127.323	136.609	142.522	154.377
2019	91.801	98.672	102.774	109.974	118.606	127.925	137.359	143.204	155.109
2020	91.987	99.110	103.177	110.408	119.086	128.439	137.736	143.568	155.560
2021	92.271	99.550	103.515	110.745	119.419	128.747	138.156	144.001	156.056
2022	92.574	99.761	103.804	111.072	119.641	129.033	138.326	144.435	156.725
2023	92.858	100.093	104.066	111.192	119.849	129.264	138.560	144.662	156.808
2024	93.145	100.252	104.145	111.381	119.977	129.412	138.848	144.740	157.222
2025	93.202	100.354	104.318	111.460	120.146	129.645	138.921	144.856	157.002

PERCENTILES OF LANDINGS (000 MT)

YEAR	1%	5%	10%	25%	50%	75%	90%	95%	99%
2001	4.869	5.651	5.970	6.730	7.540	8.371	9.204	9.823	10.962
2002	1.709	1.947	2.070	2.307	2.619	2.939	3.275	3.458	4.087
2003	2.477	2.832	3.027	3.332	3.722	4.207	4.717	4.968	5.549
2004	3.633	4.068	4.259	4.596	5.058	5.580	6.096	6.417	7.106
2005	4.765	5.282	5.550	6.058	6.690	7.402	8.101	8.568	9.551
2006	5.538	6.102	6.425	6.997	7.717	8.519	9.328	9.834	10.996
2007	6.454	7.028	7.368	7.964	8.693	9.525	10.348	10.884	12.058
2008	7.043	7.707	8.089	8.764	9.594	10.540	11.477	12.102	13.371
2009	7.634	8.346	8.763	9.500	10.398	11.407	12.415	13.061	14.384
2010	8.172	8.938	9.376	10.152	11.106	12.160	13.225	13.898	15.301
2011	8.657	9.467	9.904	10.709	11.707	12.799	13.886	14.598	15.977
2012	9.073	9.890	10.348	11.181	12.195	13.323	14.436	15.169	16.604
2013	9.381	10.224	10.694	11.553	12.585	13.727	14.856	15.606	17.091
2014	9.648	10.497	10.986	11.846	12.889	14.053	15.193	15.939	17.447
2015	9.867	10.728	11.212	12.077	13.135	14.296	15.450	16.201	17.705
2016	10.041	10.883	11.381	12.251	13.324	14.501	15.649	16.403	17.900
2017	10.136	11.011	11.514	12.398	13.471	14.638	15.810	16.557	18.038
2018	10.281	11.127	11.623	12.511	13.587	14.758	15.927	16.665	18.168
2019	10.346	11.203	11.692	12.597	13.672	14.852	16.032	16.790	18.288
2020	10.391	11.252	11.769	12.656	13.743	14.913	16.107	16.837	18.385
2021	10.435	11.315	11.817	12.709	13.799	14.971	16.148	16.918	18.425
2022	10.466	11.354	11.849	12.751	13.835	15.019	16.181	16.960	18.504
2023	10.498	11.393	11.897	12.780	13.861	15.036	16.223	17.002	18.556
2024	10.548	11.417	11.909	12.797	13.882	15.063	16.271	17.019	18.611
2025	10.563	11.426	11.924	12.804	13.897	15.078	16.282	17.033	18.616

Table A23 (Continued).

B) Fmsy = 0.23

PROJECTION RUN: GM Cod Fmsy 25 yr projection
 INPUT FILE: gmc2001mod5.in
 OUTPUT FILE: gmc2001mod5_Fmsy.out
 RECRUITMENT MODEL: 5
 NUMBER OF SIMULATIONS: 100

F-BASED PROJECTIONS

TIME-VARYING F

YEAR	F
2001	0.730
2002	0.230
2003	0.230
2004	0.230
2005	0.230
2006	0.230
2007	0.230
2008	0.230
2009	0.230
2010	0.230
2011	0.230
2012	0.230
2013	0.230
2014	0.230
2015	0.230
2016	0.230
2017	0.230
2018	0.230
2019	0.230
2020	0.230
2021	0.230
2022	0.230
2023	0.230
2024	0.230
2025	0.230

PERCENTILES OF SPAWNING STOCK BIOMASS (000 MT)

YEAR	1%	5%	10%	25%	50%	75%	90%	95%	99%
2001	12.397	13.705	14.578	16.323	18.210	20.442	22.278	23.559	27.247
2002	14.001	16.165	17.214	18.870	21.122	23.859	26.506	27.866	31.562
2003	20.161	22.434	23.655	25.610	28.153	31.195	34.270	35.911	39.813
2004	25.737	28.334	29.699	32.220	35.368	38.889	42.428	44.709	49.617
2005	32.202	35.437	37.195	40.462	44.538	49.033	53.443	56.370	62.517
2006	36.023	39.534	41.589	45.178	49.617	54.622	59.663	62.815	70.053
2007	40.691	44.313	46.319	50.016	54.474	59.497	64.495	67.813	74.554
2008	43.427	47.457	49.743	53.875	58.852	64.446	70.019	73.615	80.985
2009	46.132	50.389	52.771	57.219	62.532	68.430	74.340	78.163	85.661
2010	48.599	53.082	55.588	60.111	65.699	71.811	77.945	81.830	89.800
2011	50.703	55.321	57.898	62.615	68.320	74.591	80.909	84.991	92.817
2012	52.335	57.114	59.743	64.589	70.397	76.817	83.165	87.276	95.551
2013	53.702	58.539	61.226	66.118	72.014	78.514	85.002	89.077	97.665
2014	54.779	59.638	62.422	67.261	73.211	79.853	86.256	90.475	98.825
2015	55.710	60.465	63.258	68.173	74.165	80.800	87.351	91.539	99.930
2016	56.226	61.068	63.882	68.871	74.914	81.509	88.064	92.273	100.642
2017	56.792	61.637	64.406	69.408	75.522	82.052	88.692	92.793	101.151
2018	57.126	61.977	64.766	69.811	75.869	82.530	89.096	93.281	101.737
2019	57.383	62.167	65.069	70.134	76.245	82.832	89.501	93.757	102.336
2020	57.508	62.459	65.261	70.357	76.462	83.095	89.772	94.006	102.591
2021	57.638	62.650	65.462	70.518	76.670	83.310	89.847	94.151	102.624
2022	57.812	62.707	65.644	70.648	76.720	83.418	90.024	94.322	103.158
2023	58.032	62.932	65.700	70.756	76.821	83.430	90.210	94.492	103.164
2024	58.130	62.965	65.735	70.798	76.881	83.593	90.301	94.586	103.420
2025	58.132	63.086	65.791	70.837	76.953	83.678	90.320	94.609	103.336

PERCENTILES OF TOTAL JANUARY 1 STOCK BIOMASS (000 MT)

YEAR	1%	5%	10%	25%	50%	75%	90%	95%	99%
2001	16.976	19.063	19.892	21.970	24.424	27.174	29.536	31.219	35.279
2002	19.197	21.392	22.507	24.480	27.054	30.064	32.968	34.695	38.753
2003	25.873	28.449	29.843	32.299	35.382	38.893	42.338	44.528	49.146
2004	32.564	35.584	37.271	40.272	44.003	48.122	52.219	54.878	60.616
2005	40.586	44.471	46.586	50.414	55.095	60.320	65.458	68.775	75.728
2006	45.280	49.516	51.939	56.187	61.312	67.126	72.886	76.571	84.687
2007	50.931	55.251	57.589	61.926	67.105	72.923	78.644	82.420	90.302
2008	54.382	59.142	61.804	66.678	72.538	79.037	85.606	89.693	98.359
2009	57.610	62.631	65.436	70.609	76.804	83.684	90.511	94.981	103.585
2010	60.365	65.589	68.571	73.838	80.328	87.395	94.454	98.977	107.888
2011	62.698	68.046	71.041	76.522	83.149	90.361	97.600	102.203	111.193
2012	64.451	69.991	73.017	78.583	85.325	92.693	99.901	104.606	113.962
2013	65.912	71.469	74.583	80.185	86.941	94.405	101.750	106.482	116.200
2014	66.966	72.549	75.739	81.347	88.205	95.748	103.049	107.813	117.080
2015	67.817	73.399	76.634	82.270	89.171	96.681	104.071	108.795	118.426
2016	68.304	74.046	77.227	82.940	89.861	97.392	104.790	109.637	119.128
2017	68.915	74.558	77.743	83.450	90.460	97.899	105.367	110.151	119.464
2018	69.338	74.857	78.069	83.874	90.794	98.341	105.831	110.598	120.155
2019	69.438	75.050	78.349	84.154	91.108	98.630	106.222	110.970	120.581
2020	69.533	75.297	78.560	84.354	91.337	98.863	106.317	111.121	120.793
2021	69.800	75.527	78.742	84.500	91.494	99.006	106.521	111.303	120.929
2022	69.895	75.599	78.824	84.647	91.508	99.123	106.598	111.530	121.424
2023	69.991	75.772	78.933	84.672	91.603	99.173	106.752	111.602	121.353
2024	70.162	75.827	78.938	84.761	91.643	99.298	106.814	111.616	121.639
2025	70.186	75.857	79.034	84.774	91.723	99.412	106.875	111.683	121.398

PERCENTILES OF LANDINGS (000 MT)

YEAR	1%	5%	10%	25%	50%	75%	90%	95%	99%
2001	4.869	5.651	5.970	6.730	7.540	8.371	9.204	9.823	10.962
2002	2.531	2.887	3.066	3.421	3.884	4.357	4.859	5.132	6.054
2003	3.473	3.954	4.256	4.663	5.214	5.891	6.615	6.958	7.773
2004	4.890	5.462	5.710	6.160	6.761	7.447	8.125	8.540	9.432
2005	6.123	6.759	7.107	7.752	8.561	9.467	10.365	10.965	12.248
2006	6.872	7.573	7.974	8.685	9.593	10.594	11.606	12.248	13.749
2007	7.785	8.498	8.915	9.653	10.568	11.613	12.649	13.351	14.819
2008	8.330	9.145	9.609	10.436	11.467	12.635	13.807	14.567	16.145
2009	8.887	9.750	10.258	11.152	12.249	13.475	14.699	15.493	17.089
2010	9.396	10.307	10.820	11.758	12.910	14.180	15.468	16.290	17.972
2011	9.829	10.785	11.303	12.261	13.450	14.771	16.067	16.940	18.606
2012	10.187	11.148	11.696	12.678	13.883	15.225	16.565	17.410	19.177
2013	10.439	11.434	11.980	12.993	14.208	15.574	16.916	17.795	19.587
2014	10.647	11.660	12.230	13.232	14.469	15.850	17.202	18.085	19.850
2015	10.858	11.838	12.416	13.416	14.666	16.038	17.418	18.309	20.079
2016	10.994	11.961	12.542	13.563	14.816	16.205	17.572	18.464	20.234
2017	11.059	12.057	12.642	13.677	14.934	16.314	17.701	18.583	20.349
2018	11.162	12.147	12.724	13.763	15.022	16.405	17.780	18.643	20.469
2019	11.197	12.195	12.769	13.827	15.081	16.476	17.867	18.764	20.586
2020	11.228	12.230	12.824	13.863	15.135	16.513	17.931	18.808	20.637
2021	11.270	12.288	12.854	13.900	15.182	16.572	17.954	18.857	20.631
2022	11.295	12.307	12.884	13.932	15.192	16.597	17.966	18.871	20.718
2023	11.336	12.330	12.920	13.953	15.213	16.603	17.998	18.922	20.782
2024	11.331	12.358	12.921	13.962	15.219	16.624	18.032	18.917	20.807
2025	11.351	12.356	12.931	13.964	15.234	16.637	18.046	18.950	20.813

Table A23 (Continued).

C) Fmax = 0.27

PROJECTION RUN: GM Cod Fmax 25 yr projection
 INPUT FILE: gmc2001mod5.in
 OUTPUT FILE: gmc2001mod5_Fmax.out
 RECRUITMENT MODEL: 5
 NUMBER OF SIMULATIONS: 100

F-BASED PROJECTIONS

TIME-VARYING F

YEAR	F
2001	0.730
2002	0.270
2003	0.270
2004	0.270
2005	0.270
2006	0.270
2007	0.270
2008	0.270
2009	0.270
2010	0.270
2011	0.270
2012	0.270
2013	0.270
2014	0.270
2015	0.270
2016	0.270
2017	0.270
2018	0.270
2019	0.270
2020	0.270
2021	0.270
2022	0.270
2023	0.270
2024	0.270
2025	0.270

PERCENTILES OF SPAWNING STOCK BIOMASS (000 MT)

YEAR	1%	5%	10%	25%	50%	75%	90%	95%	99%
2001	12.397	13.705	14.578	16.323	18.210	20.442	22.278	23.559	27.247
2002	13.930	16.082	17.126	18.774	21.015	23.733	26.374	27.740	31.398
2003	19.630	21.841	23.017	24.917	27.374	30.319	33.307	34.906	38.655
2004	24.591	27.017	28.323	30.737	33.724	37.077	40.459	42.640	47.337
2005	30.100	33.099	34.752	37.808	41.623	45.816	49.939	52.718	58.389
2006	33.134	36.428	38.326	41.661	45.781	50.429	55.119	58.070	64.756
2007	36.975	40.364	42.219	45.625	49.773	54.470	59.129	62.207	68.593
2008	39.185	42.891	44.992	48.794	53.386	58.554	63.712	67.047	73.854
2009	41.355	45.268	47.432	51.511	56.379	61.807	67.206	70.708	77.619
2010	43.352	47.427	49.675	53.802	58.901	64.490	70.099	73.634	80.923
2011	44.991	49.182	51.519	55.772	60.978	66.699	72.455	76.168	83.409
2012	46.256	50.542	52.922	57.321	62.584	68.442	74.183	77.925	85.460
2013	47.264	51.647	54.077	58.480	63.819	69.729	75.625	79.279	87.149
2014	48.075	52.499	54.989	59.372	64.771	70.741	76.582	80.398	88.000
2015	48.771	53.087	55.632	60.043	65.478	71.482	77.406	81.203	88.740
2016	49.222	53.525	56.084	60.574	66.046	72.006	77.940	81.751	89.277
2017	49.571	53.953	56.450	60.971	66.493	72.390	78.366	82.132	89.806
2018	49.912	54.196	56.726	61.266	66.741	72.757	78.700	82.545	90.132
2019	50.041	54.334	56.962	61.494	67.026	73.000	79.061	82.906	90.621
2020	50.100	54.576	57.082	61.652	67.180	73.182	79.211	83.047	90.817
2021	50.256	54.724	57.262	61.792	67.327	73.336	79.251	83.171	90.867
2022	50.355	54.768	57.384	61.887	67.365	73.388	79.372	83.233	91.272
2023	50.548	54.901	57.402	61.948	67.416	73.424	79.552	83.392	91.276
2024	50.561	54.903	57.416	61.983	67.453	73.521	79.613	83.474	91.430
2025	50.585	54.985	57.471	62.004	67.527	73.577	79.600	83.473	91.375

PERCENTILES OF TOTAL JANUARY 1 STOCK BIOMASS (000 MT)

YEAR	1%	5%	10%	25%	50%	75%	90%	95%	99%
2001	16.976	19.063	19.892	21.970	24.424	27.174	29.536	31.219	35.279
2002	19.197	21.392	22.507	24.480	27.054	30.064	32.968	34.695	38.753
2003	25.402	27.906	29.278	31.684	34.698	38.138	41.517	43.667	48.197
2004	31.418	34.307	35.922	38.821	42.415	46.386	50.342	52.909	58.528
2005	38.355	42.022	44.038	47.662	52.098	57.037	61.926	65.068	71.726
2006	42.240	46.247	48.495	52.472	57.307	62.775	68.192	71.694	79.282
2007	46.915	50.961	53.208	57.259	62.120	67.619	73.051	76.579	84.026
2008	49.761	54.197	56.679	61.222	66.679	72.723	78.829	82.651	90.602
2009	52.376	57.047	59.660	64.426	70.152	76.551	82.853	87.011	94.925
2010	54.653	59.415	62.128	66.984	72.984	79.484	86.002	90.168	98.450
2011	56.472	61.340	64.109	69.115	75.214	81.863	88.490	92.760	100.917
2012	57.795	62.836	65.630	70.764	76.921	83.657	90.270	94.546	103.323
2013	58.873	64.029	66.842	71.957	78.128	84.980	91.674	96.000	104.978
2014	59.746	64.789	67.678	72.831	79.085	86.000	92.639	97.057	105.399
2015	60.354	65.453	68.387	73.515	79.807	86.691	93.473	97.771	106.474
2016	60.711	65.891	68.800	74.011	80.361	87.165	93.991	98.373	107.075
2017	61.139	66.290	69.181	74.399	80.780	87.598	94.383	98.736	107.314
2018	61.442	66.483	69.441	74.710	81.004	87.874	94.711	99.088	107.942
2019	61.557	66.629	69.604	74.924	81.235	88.114	95.036	99.317	108.163
2020	61.541	66.836	69.780	75.047	81.417	88.280	95.098	99.459	108.340
2021	61.808	66.973	69.899	75.132	81.504	88.389	95.211	99.595	108.346
2022	61.857	67.009	69.959	75.220	81.516	88.437	95.232	99.750	108.890
2023	61.910	67.143	70.059	75.241	81.562	88.462	95.401	99.849	108.737
2024	62.050	67.156	70.030	75.315	81.604	88.591	95.442	99.854	108.976
2025	62.070	67.191	70.077	75.303	81.631	88.644	95.470	99.868	108.720

PERCENTILES OF LANDINGS (000 MT)

YEAR	1%	5%	10%	25%	50%	75%	90%	95%	99%
2001	4.869	5.651	5.970	6.730	7.540	8.371	9.204	9.823	10.962
2002	2.921	3.333	3.539	3.949	4.482	5.028	5.613	5.928	6.986
2003	3.896	4.436	4.777	5.231	5.857	6.622	7.418	7.815	8.750
2004	5.391	6.009	6.280	6.774	7.426	8.169	8.906	9.358	10.326
2005	6.595	7.271	7.646	8.340	9.213	10.184	11.156	11.807	13.217
2006	7.286	8.035	8.457	9.220	10.191	11.267	12.356	13.045	14.687
2007	8.141	8.910	9.353	10.139	11.117	12.241	13.361	14.112	15.683
2008	8.654	9.516	10.008	10.881	11.977	13.218	14.457	15.272	16.945
2009	9.167	10.072	10.611	11.557	12.712	14.007	15.309	16.153	17.865
2010	9.638	10.586	11.132	12.112	13.322	14.662	16.026	16.891	18.675
2011	10.037	11.027	11.569	12.574	13.817	15.209	16.572	17.478	19.254
2012	10.356	11.343	11.924	12.948	14.212	15.614	17.015	17.913	19.765
2013	10.587	11.601	12.173	13.229	14.495	15.934	17.341	18.250	20.163
2014	10.750	11.805	12.397	13.439	14.730	16.165	17.577	18.525	20.358
2015	10.941	11.953	12.554	13.597	14.900	16.334	17.778	18.720	20.591
2016	11.061	12.062	12.664	13.727	15.027	16.478	17.911	18.851	20.720
2017	11.110	12.140	12.744	13.821	15.135	16.573	18.017	18.949	20.791
2018	11.194	12.222	12.818	13.900	15.207	16.652	18.087	19.006	20.915
2019	11.226	12.261	12.856	13.945	15.258	16.716	18.175	19.107	21.019
2020	11.242	12.287	12.900	13.979	15.301	16.749	18.228	19.154	21.094
2021	11.299	12.338	12.928	14.012	15.344	16.797	18.233	19.186	21.064
2022	11.306	12.353	12.955	14.039	15.356	16.819	18.247	19.206	21.113
2023	11.333	12.375	12.988	14.061	15.365	16.816	18.272	19.243	21.187
2024	11.352	12.399	12.983	14.060	15.368	16.840	18.312	19.244	21.244
2025	11.369	12.398	12.989	14.058	15.383	16.848	18.314	19.286	21.236