

Appendix 4.

Precision estimates of the 2001 age-specific stock sizes, catchability coefficients, and 2000 instantaneous fishing mortality rates (F) and spawning stock biomass (SSB) for Gulf of Maine cod.

NLLS ESTIMATE is from the final assessment run.

Standard errors, coefficients of variation (C.V.), and bias estimates are derived from 700 bootstrap replications.

F on ages 4+ represents the fully-recruited portion of the stock.

The number of bootstraps: 600

Appendix 4:Table 1. Bootstrap Output Variable: N hat

	NLLS ESTIMATE	BOOTSTRAP MEAN	BOOTSTRAP StdError	C.V. FOR NLLS SOLN			
N 2	4630	4975	2179	0.47			
N 3	6312	6721	1822	0.29			
N 4	2024	2063	568	0.28			
N 5	803	851	318	0.40			
N 6	176	186	74	0.42			

	BIAS ESTIMATE	BIAS STD ERROR	PERCENT BIAS	NLLS EST CORRECTED FOR BIAS	C.V. FOR CORRECTED ESTIMATE	LOWER 80%CI	UPPER 80%CI
N 2	345	89	7.44	4286	0.508345	2578	7261
N 3	408	74	6.47	5904	0.308619	4176	8188
N 4	39	23	1.92	1985	0.285995	1409	2711
N 5	48	13	6.03	754	0.420904	448	1172
N 6	10	03	5.62	167	0.445920	94	278

Appendix 4:Table 2. Bootstrap Output Variable: Q_unscaled

	NLLS ESTIMATE	BOOTSTRAP MEAN	BOOTSTRAP StdError	C.V. FOR NLLS SOLN			
q WHSpr2	0.0000604	0.0000603	0.0000082	0.14			
q WHSpr3	0.0001404	0.0001414	0.0000195	0.14			
q WHSpr4	0.0002222	0.0002225	0.0000306	0.14			
q WHSpr5	0.0003137	0.0003149	0.0000424	0.14			
q WHSpr6	0.0004130	0.0004177	0.0000578	0.14			
q WHAut2	0.0000541	0.0000544	0.0000077	0.14			
q WHAut3	0.0001353	0.0001366	0.0000197	0.15			
q WHAut4	0.0002464	0.0002473	0.0000331	0.13			
q WHAut5	0.0003563	0.0003633	0.0000504	0.14			
q WHAut6	0.0005884	0.0005966	0.0000836	0.14			
q MASpr2	0.0008324	0.0008413	0.0001213	0.15			
q MASpr3	0.0006576	0.0006683	0.0000957	0.15			
q MASpr4	0.0004270	0.0004326	0.0000603	0.14			
q MAAut2	0.0002482	0.0002509	0.0000349	0.14			
q CM_CPE3	0.0000143	0.0000143	0.0000025	0.18			
q CM_CPE4	0.0000241	0.0000244	0.0000044	0.18			
q CM_CPE5	0.0000246	0.0000251	0.0000044	0.18			
q CM_CPE6	0.0000259	0.0000263	0.0000044	0.17			

	BIAS ESTIMATE	BIAS STD ERROR	PERCENT BIAS	NLLS EST CORRECTED FOR BIAS	C.V. FOR CORRECTED ESTIMATE	LOWER 80%CI	UPPER 80%CI
q WHSpr2	-0.00000005	0.000000335	-0.079	0.000060402	0.14	0.0000519	0.0000731
q WHSpr3	0.00000099	0.000000796	0.703	0.000139431	0.14	0.0001158	0.0001653
q WHSpr4	0.00000025	0.000001248	0.111	0.000221987	0.14	0.0001853	0.0002602
q WHSpr5	0.00000120	0.000001732	0.383	0.000312546	0.14	0.0002643	0.0003759
q WHSpr6	0.00000470	0.000002361	1.138	0.000408344	0.14	0.0003431	0.0004891
q WHAut2	0.00000027	0.000000314	0.508	0.000053816	0.14	0.0000449	0.0000650
q WHAut3	0.00000135	0.000000806	1.001	0.000133901	0.15	0.0001123	0.0001632
q WHAut4	0.00000092	0.000001351	0.373	0.000245495	0.13	0.0002103	0.0002948
q WHAut5	0.00000707	0.000002056	1.984	0.000349212	0.14	0.0002920	0.0004159
q WHAut6	0.00000820	0.000003411	1.394	0.000580202	0.14	0.0004900	0.0007040
q MASpr2	0.00000890	0.000004953	1.070	0.000823495	0.15	0.0007062	0.0010044
q MASpr3	0.00001066	0.000003907	1.621	0.000646944	0.15	0.0005532	0.0008006
q MASpr4	0.00000562	0.000002461	1.315	0.000421347	0.14	0.0003590	0.0005072
q MAAut2	0.00000269	0.000001425	1.082	0.000245505	0.14	0.0002071	0.0002942
q CM_CPE3	-0.00000001	0.000000103	-0.050	0.000014300	0.18	0.0000117	0.0000182
q CM_CPE4	0.00000026	0.000000178	1.088	0.000023860	0.18	0.0000185	0.0000297
q CM_CPE5	0.00000050	0.000000179	2.008	0.000024154	0.18	0.0000197	0.0000300
q CM_CPE6	0.00000044	0.000000180	1.715	0.000025426	0.17	0.0000203	0.0000315

Appendix 4: Table 3. Bootstrap Output Variable: N t1

	NLLS ESTIMATE	BOOTSTRAP MEAN	BOOTSTRAP StdError	C.V. FOR NLLS SOLN			
Age 1	6616.3	6626.8	214.2	0.0324			
Age 2	4630.3	4974.9	2178.6	0.4705			
Age 3	6312.1	6720.5	1822.0	0.2886			
Age 4	2023.7	2062.5	567.7	0.2805			
Age 5	803.0	851.4	317.6	0.3955			
Age 6	176.5	186.4	74.3	0.4208			
Age 7	102.3	102.6	29.2	0.2857			

	BIAS ESTIMATE	BIAS STD ERROR	PERCENT BIAS	NLLS EST CORRECTED FOR BIAS	C.V. FOR CORRECTED ESTIMATE	LOWER 80%CI	UPPER 80%CI
Age 1	10.52	8.74	0.159	6605.75	0.03	6323.1	6872.5
Age 2	344.57	88.94	7.442	4285.76	0.51	2577.7	7260.6
Age 3	408.44	74.38	6.471	5903.65	0.31	4175.9	8188.2
Age 4	38.81	23.18	1.918	1984.91	0.29	1409.2	2710.6
Age 5	48.46	12.96	6.035	754.50	0.42	447.8	1172.3
Age 6	9.92	3.03	5.623	166.54	0.45	94.3	278.5
Age 7	0.31	1.19	0.302	102.00	0.29	70.0	144.0

Appendix 4:Table 4. Bootstrap Output Variable: F t

	NLLS ESTIMATE	BOOTSTRAP MEAN	BOOTSTRAP StdError	C.V. FOR NLLS SOLN			
Age 1	0.0000	0.0000	0.0000	0.84			
Age 2	0.0138	0.0140	0.0040	0.29			
Age 3	0.1963	0.2060	0.0592	0.30			
Age 4	0.7191	0.7494	0.2721	0.38			
Age 5	0.7333	0.7785	0.2878	0.39			
Age 6	0.7262	0.7639	0.2066	0.28			
Age 7	0.7262	0.7639	0.2066	0.28			

	BIAS ESTIMATE	BIAS STD ERROR	PERCENT BIAS	NLLS EST CORRECTED FOR BIAS	C.V. FOR CORRECTED ESTIMATE	LOWER 80%CI	UPPER 80%CI
Age 1	0.0000000	0.0000000	14.487	0.0000002	0.98	0.0000	0.0000
Age 2	0.0001437	0.0001641	1.041	0.0136654	0.29	0.0106	0.0206
Age 3	0.0097562	0.0024153	4.971	0.1865110	0.32	0.1497	0.2702
Age 4	0.0303115	0.0111074	4.215	0.6887542	0.40	0.5419	1.0393
Age 5	0.0451848	0.0117492	6.162	0.6880971	0.42	0.5217	1.0970
Age 6	0.0377481	0.0084335	5.198	0.6884257	0.30	0.5617	0.9307
Age 7	0.0377481	0.0084335	5.198	0.6884257	0.30	0.5617	0.9307

Appendix 4:Table 5. Bootstrap Output Variable: F full t

	NLLS ESTIMATE	BOOTSTRAP MEAN	BOOTSTRAP StdError	C.V. FOR NLLS SOLN			
	0.7262	0.7639	0.2066	0.28			

	BIAS ESTIMATE	BIAS STD ERROR	PERCENT BIAS	NLLS EST CORRECTED FOR BIAS	C.V. FOR CORRECTED ESTIMATE	LOWER 80%CI	UPPER 80%CI
	0.03775	0.00843	5.20	0.68843	0.30	0.5617	0.9307

Appendix 4:Table 6. Bootstrap Output Variable: Mean Biomass

NLLS ESTIMATE	BOOTSTRAP MEAN	BOOTSTRAP StdError	C.V. FOR NLLS SOLN			
25946.1513	27159.6758	4140.1812	0.16			
BIAS ESTIMATE	BIAS STD ERROR	PERCENT BIAS	NLLS EST CORRECTED FOR BIAS	C.V. FOR CORRECTED ESTIMATE	LOWER 80%CI	UPPER 80%CI
1213.5245	169.0222	4.68	24732.6269	0.17	20665.6199	30456.5066

Appendix 4:Table 7. Bootstrap Output Variable: SSB spawn t

NLLS ESTIMATE	BOOTSTRAP MEAN	BOOTSTRAP StdError	C.V. FOR NLLS SOLN			
13114.3862	13491.5023	1729.6101	0.13			
BIAS ESTIMATE	BIAS STD ERROR	PERCENT BIAS	NLLS EST CORRECTED FOR BIAS	C.V. FOR CORRECTED ESTIMATE	LOWER 80%CI	UPPER 80%CI
377.12	70.61	2.88	12737.27	0.14	10661.8182	14812.9775

Appendix 4:Table 8. Bootstrap Output Variable: Jan 1 biomass

NLLS ESTIMATE	BOOTSTRAP MEAN	BOOTSTRAP StdError	C.V. FOR NLLS SOLN			
20371.5112	21131.1575	2569.7442	0.13			
BIAS ESTIMATE	BIAS STD ERROR	PERCENT BIAS	NLLS EST CORRECTED FOR BIAS	C.V. FOR CORRECTED ESTIMATE	LOWER 80%CI	UPPER 80%CI
759.65	104.91	3.73	19611.87	0.13	16853.60	23009.58