

S. Atlantic halibut by Jon Brodziak and Laurel Col

1.0 Background

The Atlantic halibut (*Hippoglossus hippoglossus*) is distributed from Labrador to southern New England in the northwest Atlantic (Bigelow and Schroeder 1953). The Atlantic halibut stock within Gulf of Maine-Georges Bank waters (NAFO Subarea 5) has been exploited since the 1830s. The Gulf of Maine-Georges Bank Atlantic halibut stock was last assessed in 2002 (Brodziak 2002). Based on that assessment, the stock was overfished (B_{2001} was 7% of B_{MSY}) and it was unknown whether overfishing was occurring. In this report, we update the Atlantic halibut assessment using fishery data and available survey data for 2002-2004. Updated survey biomass indices are used for stock status determination.

2.0 Assessment for 2005

2.1 2001-2004 Catches

Records of Atlantic halibut landings from the Gulf of Maine and Georges Bank begin in 1893 (Table S1, Figure S1). Substantial landings occurred prior to this, however, as the halibut fishery declined in the late 1800s (Hennemuth and Rockwell 1987). Landings have decreased since the 1890s as components of the resource have been sequentially depleted. Annual landings averaged 662 mt during 1893-1940 and declined to an average of 144 mt during 1941-1976. During 1977-2000, landings averaged 89 mt per year. Total reported commercial landings of halibut increased from a record low of 17 mt in 2000 to 25 mt in 2004. Of the 2004 landings, 9 mt (36%) were landed by U.S. fishermen and 16 mt were landed by Canadian fishermen (Division 5Zc). Despite moderate recent increases, annual commercial landings averaged only 25 mt during 2001-2004, less than one-third of the average annual landings during 1977-2000.

2.2 Survey Indices

The NEFSC spring and fall bottom trawl surveys provide measures of the relative abundance of Atlantic halibut within the Gulf of Maine and Georges Bank region (offshore survey strata 13-30 and 36-40, Table S2). Both indices have high interannual variability since relatively few halibut are captured during these surveys; in some years, no halibut are caught. The survey indices suggest that relative abundance increased during the 1970s to early 1980s and subsequently declined in the 1990s. However, it is unknown whether abundance trends in the Gulf of Maine and Georges Bank region have been influenced by changes in the seasonal distribution and availability of Atlantic halibut. NEFSC spring survey indices were computed for 2002-2005 (Table S2) and NEFSC autumn survey indices were computed for 2002-2004 (Table S2, Figure S2) using standardized research survey data.

3.0 Assessment Results

3.1 Index-Based Results

An updated index-based assessment was conducted. The 5-year average of the NEFSC fall survey biomass constituted the stock biomass index, except for 1963-1967 where one- to four-year averages were sequentially used (Table S2 and Figure S3). Total commercial fishery landings were used for the catch time series (Table S1). Although no estimates of fishing

mortality are available, exploitation rate indices (annual landings/5-year moving average of survey index) suggest that exploitation rates have probably been stable since the 1970s, and appear to have declined during the 1990s (Table S2). Thus, although the Atlantic halibut stock in the Gulf of Maine and Georges Bank region remains depleted, exploitation rates do not appear to have increased since the 1970s. The autumn exploitation rate index in 2004 was 0.09, an increase of about 28% over the 2000 exploitation rate (0.07), but still much lower than the rates observed during the 1970s-1980s.

4.0 Sources of Uncertainty

- Discarding and misreporting of Atlantic halibut landings is a potential source of uncertainty.
- Fishery-dependent information on the size and age composition of Atlantic halibut catches are limited, although an experimental fishery in the Gulf of Maine has provided some valuable data (Sigourney 2002).
- Stock structure of Atlantic halibut within the Gulf of Maine and Georges Bank region is uncertain. Wise and Jensen (1959) documented movements of tagged Atlantic halibut between Georges Bank and Browns Bank, but movement rates were not estimated in their study. Recently, one halibut released near Stonington, Maine in April 2000 during the Gulf of Maine experimental fishery was recaptured off Port au Basque, Newfoundland in May 2002 after growing from 32 to 40 inches in total length (Kohl Kanwit, Maine DMF, personal communication). To date, preliminary tag-recapture data from a Maine DMR tagging study indicate that about 23% of Atlantic halibut recaptures were reported in Canadian waters.
- The portion of the Atlantic halibut population within Gulf of Maine and Georges Bank region is a transboundary stock. Conservation measures for both USA and Canadian fisheries may be needed to rebuild this stock.

5.0 Summary Stock Status

5.1 Biological Reference Points

For Gulf of Maine-Georges Bank Atlantic halibut stock, the stock biomass index (B_{MSY}) to produce MSY is $B_{MSY} = 5400$ mt; there is currently no F_{MSY} proxy for this stock (NEFMC 1998, NEFSC 2002). The overfished threshold ($B_{THRESHOLD}$) for Gulf of Maine-Georges Bank Atlantic halibut is $B_{THRESHOLD} = \frac{1}{2} B_{MSY} = 2700$ mt.

5.2 Stock Status in 2004

In 2004, the 5-year average stock biomass index was 288 (11% of $B_{THRESHOLD}$ and 5% of B_{MSY}). Based on the stock biomass index, the Gulf of Maine-Georges Bank Atlantic halibut stock was overfished in 2004. In 2004, no estimate of fishing mortality was available and overfishing status was unknown.

5.3 Comparison with Projected Amendment 13 Rebuilding Trajectory

There is no Amendment 13 rebuilding trajectory for Gulf of Maine-Georges Bank Atlantic halibut.

6.0 GARM Comments

The Panel noted that the magnitude of discards recorded by at sea observers in recent years has increased, although this increase may be a function of increased observer coverage. Most of the fish observed at sea in both the landings and discards appear to be below the median length of maturity (103 cm = 41 inches), especially for females. The current minimum retention size is 91 cm = 36 inches.

Gulf of Maine/ Georges Bank Atlantic halibut is a component of a larger transboundary stock. Tagging information indicates movement across the US-Canada border. US landings are a small fraction of the Canadian landings. Additional conservation measures for the USA and Canadian fisheries may promote rebuilding of this stock.

7.0 References

Bigelow, H.B, and Schroeder, W.C. 1953. Fishes of the Gulf of Maine. Fishery Bulletin of the Fish and Wildlife Service, No. 74, 577 p.

Brodziak, J. 2002. Atlantic halibut. In NEFSC, *Assessment of 20 northeast groundfish stocks through 2001*, pp.306-313. *NEFSC Ref. Doc. 02-16*, 509 p.
Available at: <http://www.nefsc.noaa.gov/nefsc/publications/crd/crd0216/>

Hennemeth, R.C., and Rockwell, S. 1987. History of fisheries conservation and management. *In* Georges Bank. *Edited by* R. Backus, R. Price, and D. Bourne. MIT Press, Cambridge, MA. pp. 431-446.

New England Fishery Management Council. 1998. Evaluation of existing overfishing definitions and recommendations for new overfishing definitions to comply with the Sustainable Fisheries Act. NEFMC, 50 Water Street, Mill 2 Newburyport, MA 01950.

Northeast Fisheries Science Center [NEFSC]. 2001. Assessment of 19 Northeast groundfish stocks through 2000. NEFSC Reference Document 01-20, Woods Hole, MA, 02543.

Northeast Fisheries Science Center [NEFSC]. 2002. Final Report of the Working Group on Re-Evaluation of Biological Reference Points for New England Groundfish. NEFSC Reference Document 02-04, Woods Hole, MA, 02543.

Sigourney, D. B. 2002. Biology of the Atlantic halibut (*Hippoglossus hippoglossus*) in the Gulf of Maine-Georges Bank region. M.Sc. Thesis, Univ. Mass. Amherst, Amherst, MA 01003.

Wise, J.P., and Jensen, A.C. 1959. Movement of tagged halibut off New England. *Trans. Amer. Fish. Soc.* 88:357-358.

Table S1. Reported landings (mt) of Atlantic halibut from the Gulf of Maine and Georges Bank, 1893-2004.

Year	USA	Canada	Other	Total	Year	USA	Canada	Other	Total
1893	634	0	0	634	1950	116	0	0	116
1894	843	0	0	843	1951	154	0	0	154
1895	4200	0	0	4200	1952	123	0	0	123
1896	4908	0	0	4908	1953	104	0	0	104
1897	733	0	0	733	1954	125	0	0	125
1898	564	0	0	564	1955	74	0	0	74
1899	407	0	0	407	1956	62	0	0	62
1900	311	0	0	311	1957	80	0	0	80
1901	287	0	0	287	1958	73	0	0	73
1902	367	0	0	367	1959	59	0	0	59
1903	502	0	0	502	1960	63	0	0	63
1904	332	0	0	332	1961	79	5	0	84
1905	580	0	0	580	1962	86	35	25	146
1906	542	0	0	542	1963	94	88	1	183
1907	447	0	0	447	1964	115	120	1	236
1908	891	0	0	891	1965	128	153	18	299
1909	193	0	0	193	1966	110	110	62	282
1910	329	0	0	329	1967	102	386	26	514
1911	389	0	0	389	1968	74	193	3	270
1912	460	0	0	460	1969	63	96	9	168
1913	402	0	0	402	1970	52	67	19	138
1914	329	0	0	329	1971	81	38	0	119
1915	336	0	0	336	1972	63	37	8	108
1916	478	0	0	478	1973	51	38	0	89
1917	293	0	0	293	1974	46	29	1	76
1918	375	0	0	375	1975	70	36	0	106
1919	496	0	0	496	1976	58	33	0	91
1920	896	0	0	896	1977	50	31	0	81
1921	689	0	0	689	1978	84	50	0	134
1922	694	0	0	694	1979	125	29	0	154
1923	508	0	0	508	1980	80	88	0	168
1924	616	0	0	616	1981	80	118	0	198
1925	843	0	0	843	1982	85	116	0	201
1926	944	0	0	944	1983	72	131	0	203
1927	831	0	0	831	1984	75	62	0	137
1928	781	0	0	781	1985	61	57	0	118
1929	570	0	0	570	1986	44	32	0	76
1930	716	0	0	716	1987	27	23	0	50
1931	511	0	0	511	1988	47	81	0	128
1932	443	0	0	443	1989	13	65	0	78
1933	279	0	0	279	1990	16	58	0	74
1934	192	0	0	192	1991	30	58	0	88
1935	292	0	0	292	1992	22	47	0	69
1936	374	0	0	374	1993	15	50	0	65
1937	187	0	0	187	1994	22	24	0	46
1938	146	0	0	146	1995	11	8	0	19
1939	124	0	0	124	1996	13	12	0	25
1940	497	0	0	497	1997	14	14	0	28
1941	145	0	0	145	1998	8	9	0	17
1942	250	0	0	250	1999	12	8	0	20
1943	76	0	0	76	2000	11	6	0	17
1944	77	0	0	77	2001	11	11	0	22
1945	55	0	0	55	2002	10	10	0	20
1946	124	0	0	124	2003	17	14	0	31
1947	196	0	0	196	2004	9	16	0	25
1948	156	0	0	156					
1949	157	0	0	157					

Table S2. Stratified swept-area biomass (mt) of Atlantic halibut from NEFSC spring and autumn surveys (offshore strata 13-30, 36-40) and exploitation rate indices calculated as annual landings divided by the 5-year moving average of swept-area biomass indices.

Year	5-Year Average		5-Year Average			
	Spring Swept- Area Index (mt)	Spring Swept- Area Index (mt)	Spring Exploitation Rate Index	Fall Swept- Area Index (mt)	Fall Swept- Area Index (mt)	Autumn Exploitation Rate Index
1963				282	282	0.65
1964				222	252	0.94
1965				106	204	1.47
1966				13	156	1.81
1967				30	131	3.93
1968	428	428	0.63	0	74	3.63
1969	783	606	0.28	1640	358	0.47
1970	349	520	0.27	0	337	0.41
1971	110	417	0.29	302	394	0.30
1972	17	337	0.32	60	400	0.27
1973	375	327	0.27	435	487	0.18
1974	372	244	0.31	46	169	0.45
1975	0	175	0.61	315	232	0.46
1976	2138	580	0.16	1255	422	0.22
1977	471	671	0.12	196	449	0.18
1978	541	704	0.19	976	558	0.24
1979	1185	867	0.18	133	575	0.27
1980	1869	1241	0.14	33	518	0.32
1981	219	857	0.23	1065	481	0.41
1982	272	817	0.25	382	518	0.39
1983	2028	1115	0.18	0	323	0.63
1984	73	892	0.15	412	378	0.36
1985	209	560	0.21	352	442	0.27
1986	0	516	0.15	1039	437	0.17
1987	953	653	0.08	110	382	0.13
1988	76	262	0.49	13	385	0.33
1989	0	248	0.32	219	347	0.23
1990	212	248	0.30	199	316	0.23
1991	206	289	0.30	807	270	0.33
1992	123	123	0.56	667	381	0.18
1993	20	112	0.58	153	409	0.16
1994	56	123	0.37	0	365	0.13
1995	17	84	0.23	219	369	0.05
1996	43	52	0.48	176	243	0.10
1997	209	69	0.41	578	225	0.12
1998	56	76	0.22	342	263	0.06
1999	793	224	0.09	50	273	0.07
2000	0	220	0.08	70	243	0.07
2001	544	321	0.07	823	372	0.06
2002	425	364	0.05	13	260	0.08
2003	176	388	0.08	163	224	0.14
2004	554	340	0.07	372	288	0.09
2005	83	356				

Figure S1. Atlantic halibut landings from the Gulf of Maine-Georges Bank region during 1893-2004.

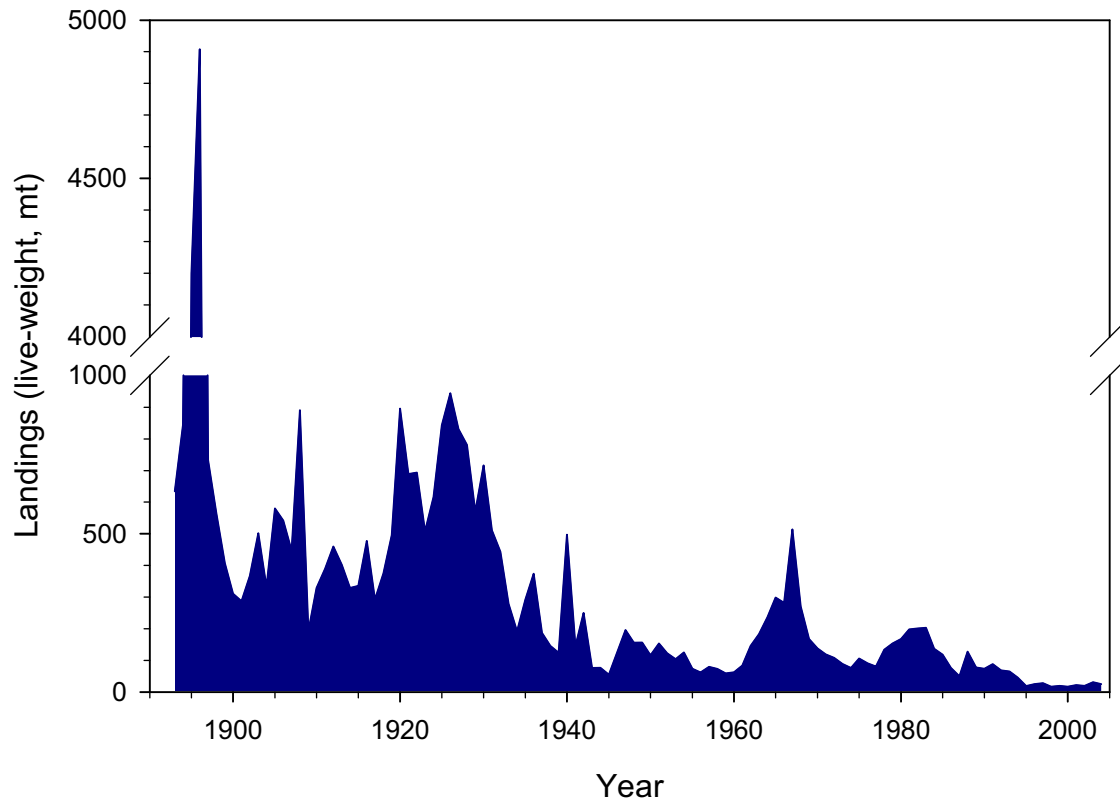


Figure S2. Trends in Atlantic halibut landings from the Gulf of Maine and Georges Bank in comparison to 5-year moving averages of spring and autumn survey indices, 1967-2005.

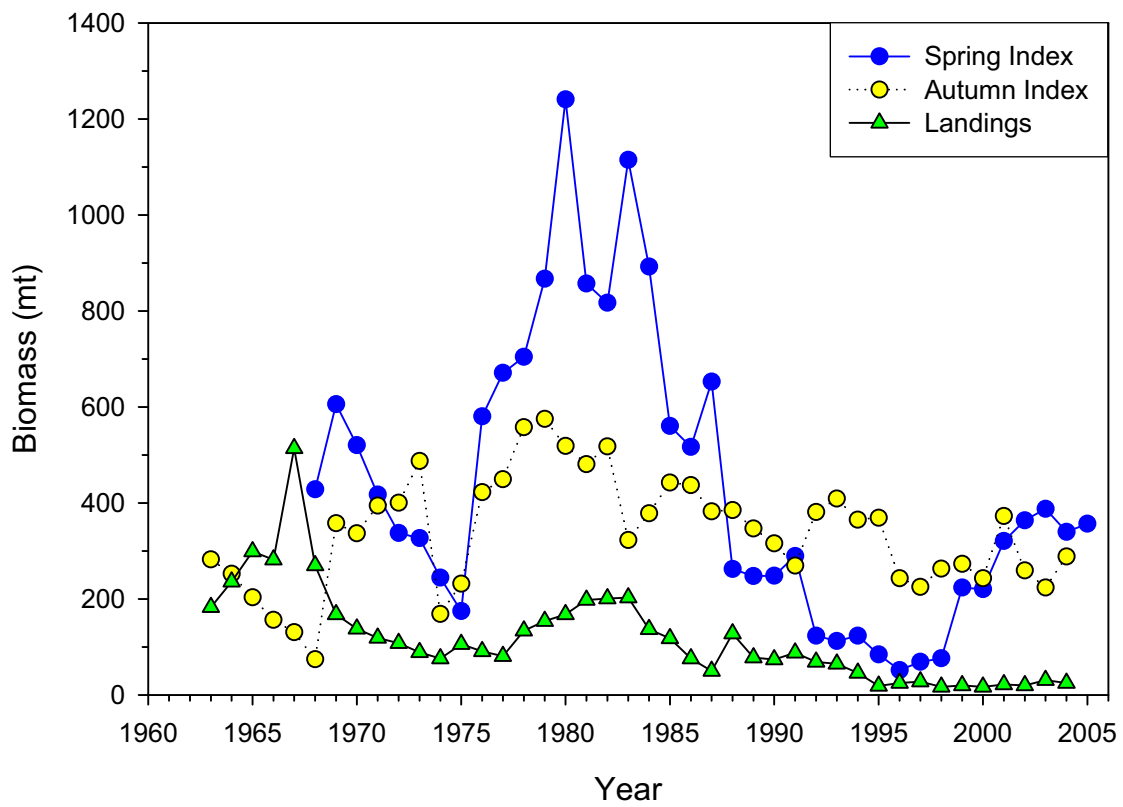


Figure S3. Trends in swept-area biomass indices (mt) of Atlantic halibut from NEFSC autumn bottom trawl surveys.

