

H. Gulf of Maine-Georges Bank American Plaice by L. O'Brien

1.0 Background

This stock was last assessed in 1998 (O'Brien *et al.* 1999) and reviewed by the 28th Northeast Regional SAW (NEFSC 1999). Fully recruited F (ages 5-8, u) in 1997 was estimated to be 0.47, a decrease of 10% from 1996. Spawning stock biomass was 13,500 mt in 1997, an increase of 11% from 1996. Recruitment since 1993 has been near record low and the 1996 year class (age 1 fish) was estimated to be the lowest in the time series (1980-1997) with a less than average recruit/SSB survival ratio.

The NEFSC spring and autumn bottom trawl survey indices indicated a decline in abundance and biomass each year from spring of 1995 to the spring of 1998. Similarly, the MADMF abundance indices declined each year during 1994 -1998. Recruitment indices were below average for the 1994-1996 year classes.

2.0 2000 Assessment Update

The Fishery

Total commercial landings of Gulf of Maine-Georges Bank American plaice in 1999 were 3,257 mt, a 12 % decline from 1998 and a 19% decline from 1997 (Table H1, Figure H1). Discards were not estimated. Canadian fisheries landed 123 mt in 1999, about 4% of the total landings.

Research Survey Indices

The NEFSC indices of abundance and biomass indicate an increase in the spring 2000 indices and in the autumn 1998 and 1999 indices (Table H2, Figure H2 and H3). Recruitment indices of age 1 fish from NEFSC autumn surveys indicate that both the 1997 and 1998 year classes are above average and similar in size to the 1992 year class (Table H3, Figure H4). The same year classes are just below the time series average in the Massachusetts autumn survey (Table H4).

Mortality and Stock Size

Landings have been gradually declining since 1992 and fishing mortality declined during 1995 to 1997. A projection analysis based on 1998 and 1999 landings and an empirical resampling model predicted that fishing mortality declined from 1997 to 1999 (Table H5, Figure H5). Spawning stock biomass was predicted to remain relatively stable during 1998 and 1999 and similar to the 1997 estimate (13,500 mt) (Figure H6).

Comparison of these results to the projection analyses conducted in 1999 (Northern Demersal Working Group 2000) indicate very similar results. Fishing mortality in 1999 had previously been assumed to be 0.32, equivalent to the 1998 F. The assumed 1999 F was only slightly higher

than the projected 1999 $F = 0.27$ and within the projected 80% confidence limits. The 1999 SSB had previously been predicted to be about 13,755 mt compared to the current projection of 13,837 mt and was within the projected 80% confidence limits.

3.0 SFA Control Rule

The SFA control rule for Gulf of Maine-Georges Bank American plaice is based on SSB_{MSY} which is currently estimated at 24,200 mt (Figure H7). The rule states that $F_{0.1}$ will be the maximum fishing mortality threshold when the stock is above SSB_{MSY} then decrease linearly to zero at $1/4 SSB_{MSY}$ (6,050 mt). The target F will be 60% of $F_{0.1}$ when the stock is above SSB_{MSY} and would decrease linearly to zero at $1/2$ of SSB_{MSY} (12,100 mt). F in 1999 was projected to be 0.27 and SSB in 1999 was projected to be 13,837 mt.

4.0 Sources of Uncertainty

- No estimation of discards for the 1998 and 1999 fishery.
- Assessment is based on projection analysis of landings instead of a calibrated VPA.

From the previous update (Northern Demersal Working Group 2000) :

- VPA estimates of 1998 calibrated age 1 stock size were not available. The derived estimates may be optimistic.
- Projections of SSB are likely to be optimistic if recruits are overestimated.

5.0 References

- O'Brien, L., R.K. Mayo, and C. Esteves. 1999. Assessment of American plaice in the Gulf of Maine-Georges Bank Region for 1998. *Northeast Fish. Sci. Cent. Ref. Doc.* 99-09, 96 p.
- NDWG (Northern Demersal Working Group, Northeast Regional Stock Assessment Workshop). 2000. Assessment of 11 Northeast groundfish stocks through 1999: a report to the New England Fishery Management Council's Multi-Species Monitoring Committee. *Northeast Fish. Sci. Cent. Ref. Doc.* 00-05, 175 p.
- NEFSC. 1999. Report of the 28th Northeast Regional Stock Assessment Workshop (28th SAW): Stock Assessment Review Committee (SARC) consensus summary of assessments. *Northeast Fish. Sci. Cent. Ref. Doc.* 99-08, 304 p.

Table H1. Commerical landings (metric tons, live weight) of American plaice from the Gulf of Maine, Georges Bank, Southern New England and the Mid-Atlantic, 1960-1999.

Year	Gulf of Maine			Georges Bank				Southern New England				Mid - Atlantic			Grand Total			
	USA	Can	Total	USA	Can	USSR	Other	Total	USA	USSR	Other	Total	USA	Other	Total	USA	Other	Total
1960	620	1	621	689	-	-	-	689	-	-	-	0	-	-	0	1309	1	1310
1961	692	-	692	830	-	-	-	830	-	-	-	0	-	-	0	1522	0	1522
1962	694	-	694	1233	44	-	-	1277	-	-	-	0	-	-	0	1927	44	1971
1963	693	-	693	1489	127	24	-	1640	-	-	-	0	-	-	0	2182	151	2333
1964	811	-	811	2800	177	-	11	2988	-	-	-	0	-	-	0	3611	188	3799
1965	967	-	967	2376	180	112	-	2668	-	-	-	0	-	-	0	3343	292	3635
1966	955	2	957	2388	242	279	1	2910	-	-	-	0	-	-	0	3343	524	3867
1967	1066	6	1072	2166	203	1018	10	3397	-	-	-	0	4	-	4	3236	1237	4473
1968	904	5	909	1695	173	193	5	2066	637	145	-	782	18	2	20	3254	523	3777
1969	1059	7	1066	1738	71	63	17	1889	505	349	-	854	130	-	130	3432	507	3939
1970	895	-	895	1603	92	927	658	3280	88	18	40	146	8	-	8	2594	1735	4329
1971	648	5	653	1511	38	228	296	2071	11	112	206	329	6	2	8	2176	887	3063
1972	569	-	569	1222	22	358	-	1602	3	71	-	74	-	-	0	1794	451	2245
1973	687	-	687	910	38	289	-	1237	5	158	-	163	-	-	0	1602	485	2087
1974	945	2	947	1039	27	16	2	1084	92	4	-	96	-	-	0	2076	51	2127
1975	1507	-	1507	913	25	148	-	1086	3	-	-	3	-	-	0	2423	173	2596
1976	2550	-	2550	948	24	3	-	975	10	-	-	10	1	-	1	3509	27	3536
1977	5647	-	5647	1408	35	50	-	1493	6	78	-	84	7	-	7	7068	163	7231
1978	7287	30	7317	2193	77	-	-	2270	15	-	-	15	8	-	8	9503	107	9610
1979	8835	-	8835	2478	23	-	-	2501	13	-	7	20	4	-	4	11330	30	11360
1980	11139	-	11139	2399	43	-	5	2447	10	-	-	10	1	-	1	13549	48	13597
1981	10327	1	10328	2482	15	-	2	2499	26	-	2	28	46	-	46	12881	20	12901
1982	11147	-	11147	3935	27	-	1	3963	35	-	2	37	9	-	9	15126	30	15156
1983	9142	7	9149	3955	30	-	-	3985	40	-	-	40	4	-	4	13141	37	13178
1984	6833	2	6835	3277	6	-	-	3283	17	-	-	17	7	-	7	10134	8	10142
1985	4766	1	4767	2249	40	-	-	2289	12	-	-	12	2	-	2	7029	41	7070
1986	3319	-	3319	1146	34	-	-	1180	4	-	-	4	3	-	3	4472	34	4506
1987	2766	-	2766	1032	48	-	-	1080	2	-	-	2	1	-	1	3801	48	3849
1988	2271	-	2271	1097	108	-	-	1205	13	-	-	13	1	-	1	3382	108	3490
1989	1646	-	1646	703	68	-	-	771	1	-	-	1	3	-	3	2353	68	2421
1990	1802	-	1802	639	52	-	-	690	2	-	-	2	2	-	2	2445	52	2497
1991	2936	-	2936	1310	26	-	-	1310	15	-	-	15	0	-	0	4261	26	4287
1992	4564	-	4566	1838	3	-	-	1838	10	-	-	10	4	-	4	6416	3	6419
1993	3865	-	3865	1838	-	-	-	1838	11	-	-	11	4	-	4	5718	-	5718
1994	3357	-	3431	1683	30	-	-	1562	22	-	-	22	4	-	4	5066	30	5096
1995	3105	-	3126	1505	2	-	-	1486	15	-	-	15	20	-	20	4645	2	4647
1996	2912	-	2922	1430	2	-	-	1423	40	-	-	40	15	-	15	4396	2	4398
1997	2312	-	2396	1576	65	-	-	1560	23	-	-	23	26	-	26	3937	65	4002
1998	2234	-	2234	1385	20	-	-	1405	23	-	-	23	20	-	20	3663	20	3683
1999	1718	-	1718	1384	123	-	-	1507	11	-	-	11	21	-	21	3134	123	3257

** 1994-1999 data are provisional and spatially distributed based on proportions of landings recorded by area in the VTR database

Table H2. Standardized stratified mean number and mean weight per tow (kg) of American plaice in NEFSC spring and autumn bottom trawl surveys in the Gulf of Maine - Georges Bank area, 1963-1999.

	SPRING		AUTUMN	
	Number	Weight	Number	Weight
1963	—	—	14.17	5.87
1964	—	—	8.20	2.84
1965	—	—	11.95	3.80
1966	—	—	17.78	4.90
1967	—	—	11.05	2.69
1968	11.36	3.40	8.61	2.91
1969	8.59	2.68	7.51	2.36
1970	5.43	1.81	6.46	2.01
1971	3.80	1.26	7.47	1.96
1972	4.28	1.32	7.44	1.60
1973	7.18	1.85	6.19	1.94
1974	8.34	1.94	6.89	1.42
1975	5.78	1.72	8.12	2.43
1976	11.85	3.37	9.98	2.99
1977	14.57	5.11	11.80	3.52
1978	10.61	3.82	15.13	4.66
1979	9.23	3.62	9.96	4.00
1980	18.34	4.78	4.24	5.12
1981	18.75	5.88	13.04	5.62
1982	11.61	3.80	5.88	2.49
1983	16.94	4.60	9.34	3.45
1984	4.10	1.42	7.12	2.02
1985	4.94	1.88	6.95	2.00
1986	3.09	0.92	5.61	1.56
1987	3.50	0.81	4.38	1.09
1988	3.58	0.84	9.69	1.46
1989	4.81	0.75	9.21	1.17
1990	5.09	0.75	15.46	2.90
1991	5.91	1.05	7.71	1.56
1992	4.11	1.36	6.31	1.78
1993	5.29	1.39	11.89	2.39
1994	4.89	0.85	18.07	2.67
1995	9.43	1.94	11.84	2.58
1996	7.83	1.69	7.58	2.23
1997	7.62	1.62	6.27	1.94
1998	4.52	1.11	9.29	2.22
1999	4.18	1.20	11.03	2.57
2000	9.96	2.30		
Average	7.86	2.21	9.72	2.72

Table H3. Standardized stratified mean number per tow by age and mean weight per tow (kg) of American plaice in NEFSC spring and autumn bottom trawl surveys in the Gulf of Maine - Georges Bank¹ area, 1980-2000.

YEAR	AGE GROUP														#/tow	kg/tow	
	0	1	2	3	4	5	6	7	8	9	10	11	12	13			14
Spring																	
1980	0.00	0.45	3.69	4.55	3.05	2.93	1.61	1.14	0.26	0.31	0.23	0.04	0.04	0.03	0.01	18.34	4.78
1981	0.00	0.13	3.43	4.21	3.46	2.61	1.69	1.41	0.77	0.40	0.32	0.07	0.09	0.07	0.09	18.75	5.88
1982	0.00	0.03	1.05	1.79	3.17	2.13	1.33	0.92	0.50	0.35	0.19	0.07	0.02	0.05	0.01	11.61	3.80
1983	0.00	0.20	3.68	3.33	4.48	2.64	1.18	0.58	0.32	0.15	0.15	0.11	0.05	0.02	0.04	16.94	4.60
1984	0.00	0.02	0.35	0.56	0.90	1.29	0.58	0.22	0.10	0.01	0.02	0.01	0.01	0.00	0.04	4.10	1.42
1985	0.00	0.03	0.32	0.98	0.86	0.73	0.86	0.46	0.42	0.12	0.07	0.04	0.02	0.02	0.02	4.94	1.88
1986	0.00	0.01	0.46	0.34	1.01	0.59	0.29	0.21	0.10	0.04	0.04	0.00	0.00	0.00	0.00	3.09	0.92
1987	0.00	0.09	0.61	0.99	0.69	0.51	0.25	0.17	0.07	0.03	0.03	0.03	0.01	0.00	0.00	3.50	0.81
1988	0.00	0.20	0.99	0.84	0.76	0.31	0.23	0.12	0.01	0.09	0.01	0.01	0.00	0.00	0.00	3.58	0.84
1989	0.00	0.05	1.59	1.27	0.86	0.49	0.29	0.16	0.03	0.07	0.01	0.01	0.00	0.00	0.00	4.81	0.75
1990	0.00	0.00	0.57	2.65	1.02	0.54	0.17	0.06	0.04	0.05	0.00	0.00	0.00	0.00	0.00	5.09	0.75
1991	0.00	0.03	0.71	1.63	2.33	0.92	0.15	0.07	0.04	0.02	0.00	0.02	0.00	0.00	0.01	5.91	1.05
1992	0.00	0.06	0.34	1.15	0.88	1.07	0.43	0.11	0.04	0.02	0.01	0.00	0.01	0.00	0.00	4.11	1.36
1993	0.00	0.33	0.84	1.16	1.58	0.61	0.45	0.17	0.08	0.02	0.01	0.02	0.03	0.00	0.00	5.29	1.39
1994	0.00	0.03	1.43	1.14	1.12	0.75	0.23	0.10	0.03	0.01	0.00	0.01	0.01	0.01	0.01	4.89	0.85
1995	0.00	0.03	1.97	3.21	2.30	1.11	0.44	0.22	0.03	0.04	0.03	0.01	0.02	0.01	0.01	9.43	1.94
1996	0.00	0.02	0.47	1.94	3.30	1.31	0.53	0.20	0.05	0.02	0.00	0.00	0.00	0.00	0.00	7.83	1.69
1997	0.00	0.01	0.85	1.66	2.52	2.05	0.39	0.09	0.01	0.00	0.01	0.00	0.02	0.00	0.00	7.62	1.62
1998	0.00	0.06	0.19	1.02	1.12	1.22	0.68	0.16	0.06	0.01	0.01	0.003	0.01	0.00	0.00	4.52	1.11
1999	0.00	0.08	0.41	0.52	1.13	0.79	0.64	0.41	0.17	0.02	0.02	0.00	0.00	0.00	0.00	4.18	1.20
2000	0.00	0.03	1.91	2.48	2.22	1.60	0.86	0.60	0.15	0.07	0.02	0.003	0.01	0.00	0.00	9.96	2.30

Table H3 (continued). Standardized stratified mean number per tow by age and mean weight per tow (kg) of American plaice in NEFSC spring and autumn bottom trawl surveys in the Gulf of Maine - Georges Bank¹ area, 1980-2000.

YEAR	AGE GROUP														#/tow	kg/tow	
	0	1	2	3	4	5	6	7	8	9	10	11	12	13			14
Autumn																	
1980	0.00	1.58	2.23	2.72	2.84	1.53	1.02	0.93	0.57	0.30	0.19	0.11	0.04	0.09	0.09	14.24	5.12
1981	0.003	0.44	2.64	2.16	2.48	2.16	1.44	0.59	0.53	0.06	0.16	0.15	0.02	0.02	0.16	13.04	5.62
1982	0.00	0.20	0.91	1.65	1.27	0.57	0.48	0.30	0.17	0.19	0.08	0.03	0.00	0.00	0.02	5.88	2.49
1983	0.06	0.50	1.01	2.02	2.92	1.36	0.68	0.34	0.17	0.10	0.03	0.05	0.06	0.01	0.03	9.34	3.45
1984	0.02	0.22	2.24	1.56	1.21	1.07	0.51	0.12	0.10	0.00	0.03	0.01	0.02	0.00	0.01	7.12	2.02
1985	0.02	0.91	0.83	2.64	1.05	0.79	0.41	0.19	0.05	0.03	0.02	0.00	0.00	0.01	0.00	6.95	2.00
1986	0.10	0.51	1.46	0.87	1.43	0.47	0.42	0.16	0.11	0.04	0.01	0.02	0.01	0.00	0.00	5.61	1.56
1987	0.01	0.53	1.27	0.99	0.43	0.69	0.25	0.10	0.04	0.04	0.01	0.02	0.00	0.00	0.00	4.38	1.09
1988	0.00	2.84	2.97	2.39	0.78	0.47	0.10	0.07	0.00	0.03	0.00	0.02	0.00	0.00	0.00	9.69	1.46
1989	0.05	0.48	4.45	2.86	0.98	0.19	0.10	0.02	0.02	0.02	0.02	0.00	0.01	0.02	0.00	9.21	1.17
1990	0.01	1.71	2.26	7.49	2.89	0.59	0.25	0.12	0.07	0.02	0.02	0.01	0.01	0.01	0.01	15.46	2.90
1991	0.01	0.47	2.47	2.02	1.59	0.73	0.29	0.04	0.06	0.00	0.01	0.00	0.00	0.00	0.01	7.71	1.56
1992	0.02	0.65	1.23	1.85	1.28	0.78	0.30	0.07	0.05	0.03	0.02	0.00	0.02	0.00	0.00	6.31	1.78
1993	0.01	1.70	2.34	3.47	2.28	1.05	0.80	0.11	0.04	0.04	0.04	0.00	0.00	0.00	0.00	11.89	2.39
1994	0.04	3.83	7.53	2.81	1.71	1.30	0.40	0.25	0.13	0.01	0.03	0.02	0.00	0.00	0.00	18.07	2.67
1995	0.01	0.50	3.80	3.82	2.50	0.90	0.22	0.04	0.03	0.00	0.00	0.00	0.02	0.00	0.00	11.84	2.58
1996	0.01	0.54	0.81	2.00	2.74	0.93	0.39	0.07	0.04	0.03	0.00	0.00	0.02	0.00	0.02	7.58	2.23
1997	0.01	0.36	1.06	1.55	1.86	1.04	0.32	0.04	0.01	0.01	0.00	0.00	0.00	0.00	0.02	6.27	1.94
1998	0.01	1.73	0.60	1.88	2.01	1.78	1.08	0.12	0.05	0.01	0.01	0.00	0.01	0.00	0.00	9.29	2.22
1999	0.02	2.00	2.20	2.05	2.13	1.60	0.81	0.20	0.03	0.00	0.00	0.00	0.00	0.00	0.00	11.03	2.57

¹ Offshore strata 13-30, 36-40

Table H4. Stratified mean number per tow by age of American plaice in Massachusetts State spring and autumn bottom trawl surveys in Massachusetts Bay and Cape Cod Bay (Regions 4+5), 1982-2000.

Year	Age											# / tow	
	0	1	2	3	4	5	6	7	8	9	10		11
Spring													
1982	0.00	7.18	49.25	33.35	17.14	5.00	2.42	1.12	0.26	0.15	0.03	0.07	115.97
1983	0.00	1.93	18.76	22.42	21.46	10.22	2.37	0.73	0.20	0.19	0.06	0.10	78.44
1984	0.00	2.15	27.44	21.32	10.57	4.64	1.21	0.18	0.09	0.01	0.03	0.07	67.71
1985	0.00	21.56	17.16	24.22	9.50	3.77	2.24	0.65	0.76	0.12	0.04	0.03	80.05
1986	0.00	27.06	110.27	26.91	14.43	2.84	0.61	0.05	0.08	0.06	0.00	0.16	182.47
1987	0.00	34.36	17.26	15.79	3.90	1.76	0.51	0.10	0.02	0.00	0.00	0.00	73.70
1988	0.00	81.47	63.57	17.85	8.72	1.54	0.47	0.09	0.00	0.00	0.00	0.00	173.71
1989	0.00	8.07	127.26	44.97	11.99	3.03	1.31	0.20	0.03	0.03	0.00	0.05	196.94
1990	0.00	7.73	25.37	56.71	16.48	3.43	0.53	0.11	0.10	0.13	0.00	0.00	110.59
1991	0.00	2.10	19.98	34.77	18.98	3.24	0.18	0.07	0.01	0.00	0.00	0.00	79.33
1992	0.00	8.20	11.06	33.98	14.99	7.42	1.11	0.45	0.00	0.00	0.00	0.00	77.21
1993	0.00	11.60	18.98	16.08	9.16	3.45	0.81	0.04	0.02	0.00	0.00	0.00	60.14
1994	0.00	11.60	52.57	22.12	7.13	3.88	1.03	0.31	0.00	0.00	0.00	0.00	98.64
1995	0.00	0.54	34.65	49.64	10.32	3.16	0.62	0.17	0.03	0.05	0.02	0.00	99.20
1996	0.00	2.29	4.14	14.92	31.39	6.33	1.01	0.77	0.01	0.00	0.00	0.00	60.86
1997	0.00	1.55	7.96	13.95	17.24	12.21	2.41	0.21	0.00	0.00	0.00	0.00	55.52
1998	0.00	2.83	4.33	11.45	7.53	8.93	3.95	0.49	0.00	0.03	0.00	0.00	39.54
1999	0.00	1.35	11.65	11.65	15.11	7.57	3.96	1.62	0.35	0.01	0.00	0.00	53.27
2000													
Autumn													
1982	0.17	13.24	15.46	10.22	5.11	1.14	0.56	0.14	0.05	0.05	0.01	0.08	46.23
1983	1.29	52.17	18.98	10.02	8.30	1.39	0.32	0.15	0.05	0.06	0.00	0.01	92.74
1984	0.11	3.14	13.24	4.27	1.83	0.77	0.24	0.04	0.05	0.00	0.00	0.00	23.69
1985	0.00	60.97	9.45	14.21	1.56	0.14	0.03	0.02	0.00	0.00	0.00	0.00	86.38
1986	0.23	41.27	40.08	12.07	5.30	0.39	0.13	0.01	0.00	0.00	0.00	0.00	99.48
1987	0.24	46.36	14.60	3.00	0.52	0.23	0.07	0.01	0.04	0.00	0.00	0.00	65.07
1988	0.00	85.63	41.28	13.98	1.34	0.45	0.08	0.00	0.00	0.00	0.00	0.00	142.76
1989	0.03	57.56	122.25	31.03	2.33	0.13	0.01	0.01	0.00	0.00	0.00	0.00	213.35
1990	0.08	31.99	14.20	20.12	3.93	0.21	0.03	0.00	0.00	0.00	0.00	0.00	70.56
1991	0.04	24.07	90.36	40.05	11.51	1.17	0.14	0.00	0.00	0.00	0.00	0.00	167.34
1992	0.00	46.33	12.99	29.79	11.04	1.38	0.00	0.00	0.12	0.00	0.00	0.00	101.66
1993	0.00	76.21	36.80	17.59	6.85	1.71	0.69	0.00	0.00	0.00	0.00	0.00	139.84
1994	0.00	36.71	79.31	10.76	2.91	1.56	0.23	0.14	0.00	0.00	0.00	0.00	131.62
1995	0.00	11.84	44.22	24.93	4.21	0.91	0.08	0.00	0.00	0.00	0.00	0.00	86.19
1996	0.09	16.25	19.25	27.55	13.96	1.39	0.28	0.00	0.08	0.00	0.00	0.00	78.86
1997	0.00	13.61	28.08	17.91	10.29	1.46	0.19	0.01	0.00	0.00	0.00	0.00	71.55
1998	0.16	34.56	6.12	13.80	7.10	3.76	0.62	0.01	0.00	0.00	0.00	0.00	66.13
1999	0.00	29.23	32.57	20.61	10.58	2.85	1.20	0.04	0.00	0.00	0.00	0.00	97.08
2000													

Table H5. Input parameters and results of stochastic projection analysis using an empirical resampling model for Gulf of Maine-Georges Bank American plaice for 1998-1999.

INPUT						
Age	Fish Mort	Nat Mort	Proportion	Average Weights		
	Pattern	Pattern	Mature	Catch	Stock	Discards
1	0.0200	1.000	0.0000	0.0160	0.0100	0.0160
2	0.0500	1.000	0.0400	0.0520	0.0290	0.0470
3	0.0800	1.000	0.2400	0.1600	0.0920	0.1260
4	0.4200	1.000	0.7200	0.3050	0.2210	0.2060
5	1.0000	1.000	0.9500	0.4490	0.3660	0.2580
6	1.0000	1.000	1.0000	0.6320	0.5340	0.2930
7	1.0000	1.000	1.0000	0.8660	0.7420	0.3280
8	1.0000	1.000	1.0000	1.1070	0.9800	0.3020
9	1.0000	1.000	1.0000	1.5640	1.5640	0.3430

RESULTS

Projection analysis based on 1998 and 1999 landings of Gulf of Maine-Georges Bank American plaice.

PROJECTION RUN: GM-GB AP 1998:ap_9899_base.in
 INPUT FILE: ap_9899_base.in
 OUTPUT FILE: ap_9899_base3.out
 RECRUITMENT MODEL: 3
 NUMBER OF SIMULATIONS: 100

QUOTA-BASED PROJECTIONS

TIME-VARYING QUOTA

YEAR	QUOTA (000 MT)
1998	3.683
1999	3.257

SPAWNING STOCK BIOMASS (THOUSAND MT)

YEAR	AVG SSB (000 MT)	STD
1998	14.519	1.736
1999	13.984	2.064

PERCENTILES OF SPAWNING STOCK BIOMASS (000 MT)

YEAR	1%	5%	10%	25%	50%	75%	90%	95%	99%
1998	10.712	11.855	12.321	13.318	14.424	15.634	16.807	17.409	19.022
1999	9.361	10.801	11.334	12.564	13.837	15.334	16.650	17.298	19.133

ANNUAL PROBABILITY THAT SSB EXCEEDS THRESHOLD: 24.200 THOUSAND MT

YEAR	Pr(SSB > Threshold Value)
1998	0.000
1999	0.000

MEAN BIOMASS (THOUSAND MT) FOR AGES:1 TO 9

YEAR	AVG MEAN B (000 MT)	STD
1998	18.088	2.069
1999	17.819	2.450

Table H5 Continued.

PERCENTILES OF MEAN STOCK BIOMASS (000 MT)									
YEAR	1%	5%	10%	25%	50%	75%	90%	95%	99%
1998	13.341	14.921	15.430	16.667	17.970	19.470	20.763	21.521	23.170
1999	12.382	14.053	14.713	16.119	17.720	19.469	20.886	21.959	24.093

ANNUAL PROBABILITY THAT MEAN BIOMASS EXCEEDS THRESHOLD: 0.000 THOUSAND MT

YEAR	Pr(MEAN B > Threshold Value)
1998	1.000
1999	1.000

F WEIGHTED BY MEAN BIOMASS FOR AGES:1 TO 9

YEAR	AVG F_WT_B	STD
1998	0.270	0.033
1999	0.222	0.034

PERCENTILES OF F WEIGHTED BY MEAN BIOMASS FOR AGES:1 TO 9

YEAR	1%	5%	10%	25%	50%	75%	90%	95%	99%
1998	0.203	0.222	0.230	0.246	0.269	0.290	0.313	0.326	0.363
1999	0.158	0.175	0.183	0.198	0.219	0.241	0.267	0.280	0.321

ANNUAL PROBABILITY THAT F WEIGHTED BY MEAN BIOMASS EXCEEDS THRESHOLD: 0.000

YEAR	Pr(F_WT_B > Threshold Value)
1998	1.000
1999	1.000

RECRUITMENT UNITS ARE:1000. FISH

BIRTH	AVG	STD
YEAR	RECRUITMENT	STD
1998	28330.191	14160.592
1999	28231.297	14137.658

PERCENTILES OF RECRUITMENT UNITS ARE:1000. FISH

BIRTH	1%	5%	10%	25%	50%	75%	90%	95%	99%
YEAR									
1998	7870.000	7870.000	12305.000	6667.000	26390.000	36417.000	52580.000	56601.000	56601.000
1999	7870.000	7870.000	12305.000	16667.000	26390.000	36417.000	52580.000	56601.000	56601.000

DISCARDS FOR F-BASED PROJECTIONS

YEAR	AVG DISCARDS (000 MT)	STD
1998	0.645	0.059
1999	0.350	0.043

PERCENTILES OF DISCARDS (000 MT)

YEAR	1%	5%	10%	25%	50%	75%	90%	95%	99%
1998	0.516	0.554	0.568	0.602	0.644	0.685	0.721	0.744	0.783
1999	0.263	0.284	0.298	0.321	0.348	0.376	0.406	0.427	0.460

REALIZED F SERIES FOR QUOTA-BASED PROJECTIONS

YEAR	AVG F	STD
1998	0.327	0.046
1999	0.278	0.049

PERCENTILES OF REALIZED F SERIES

YEAR	1%	5%	10%	25%	50%	75%	90%	95%	99%
1998	0.234	0.260	0.271	0.295	0.324	0.356	0.386	0.407	0.453
1999	0.186	0.211	0.221	0.244	0.273	0.306	0.343	0.364	0.425

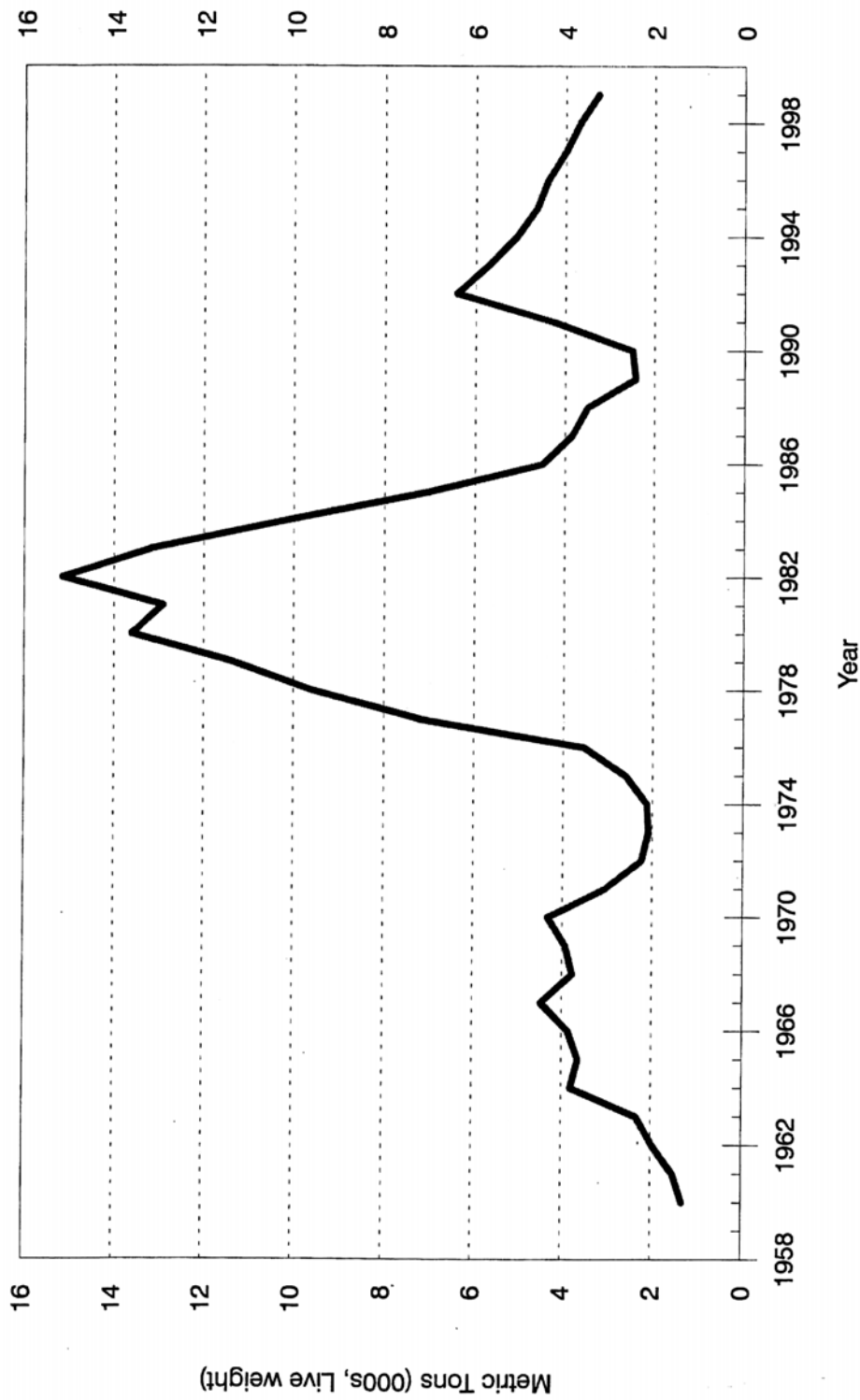


Figure H1. Total commercial landings of Gulf of Maine-Georges Bank American plaice (Division 5Zand 6), 1960-1999.

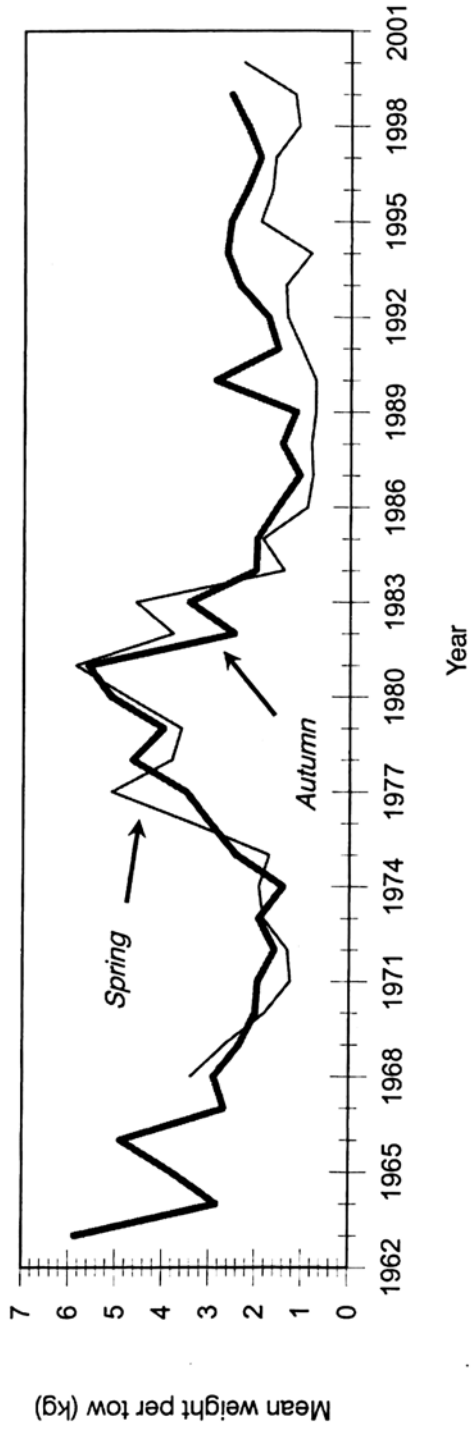


Figure H2. Standardized stratified mean weight per tow (kg) of American plaice in NEFSC spring and autumn research vessel bottom trawl surveys in the Gulf of Maine-Georges Bank region, 1963-2000.

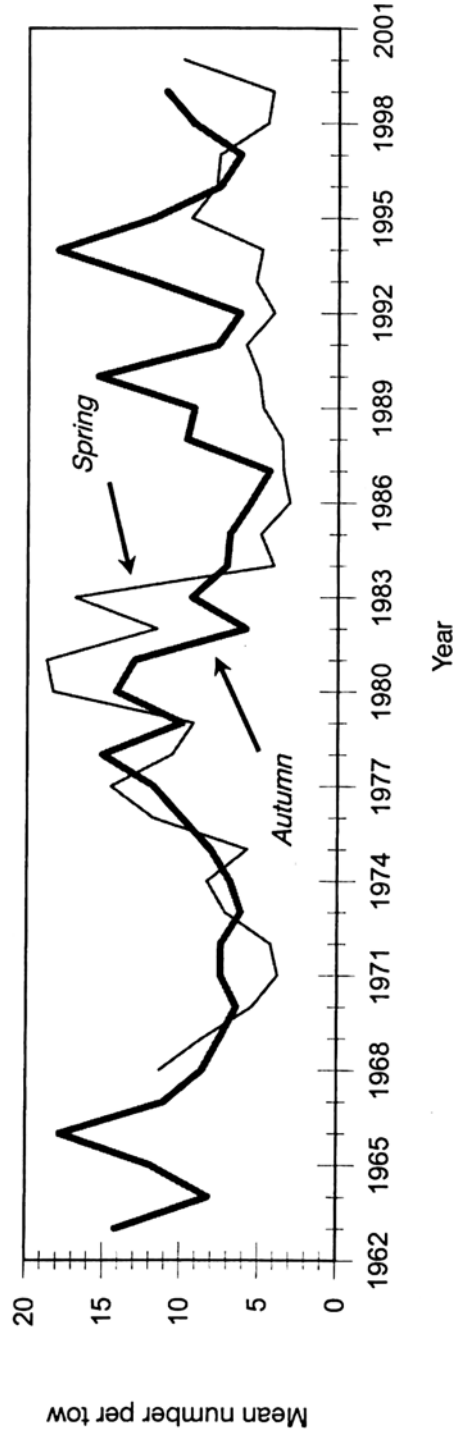


Figure H3. Standardized stratified mean number per tow of American plaice in NEFSC spring and autumn research vessel bottom trawl surveys in the Gulf of Maine-Georges Bank region, 1963 -2000.

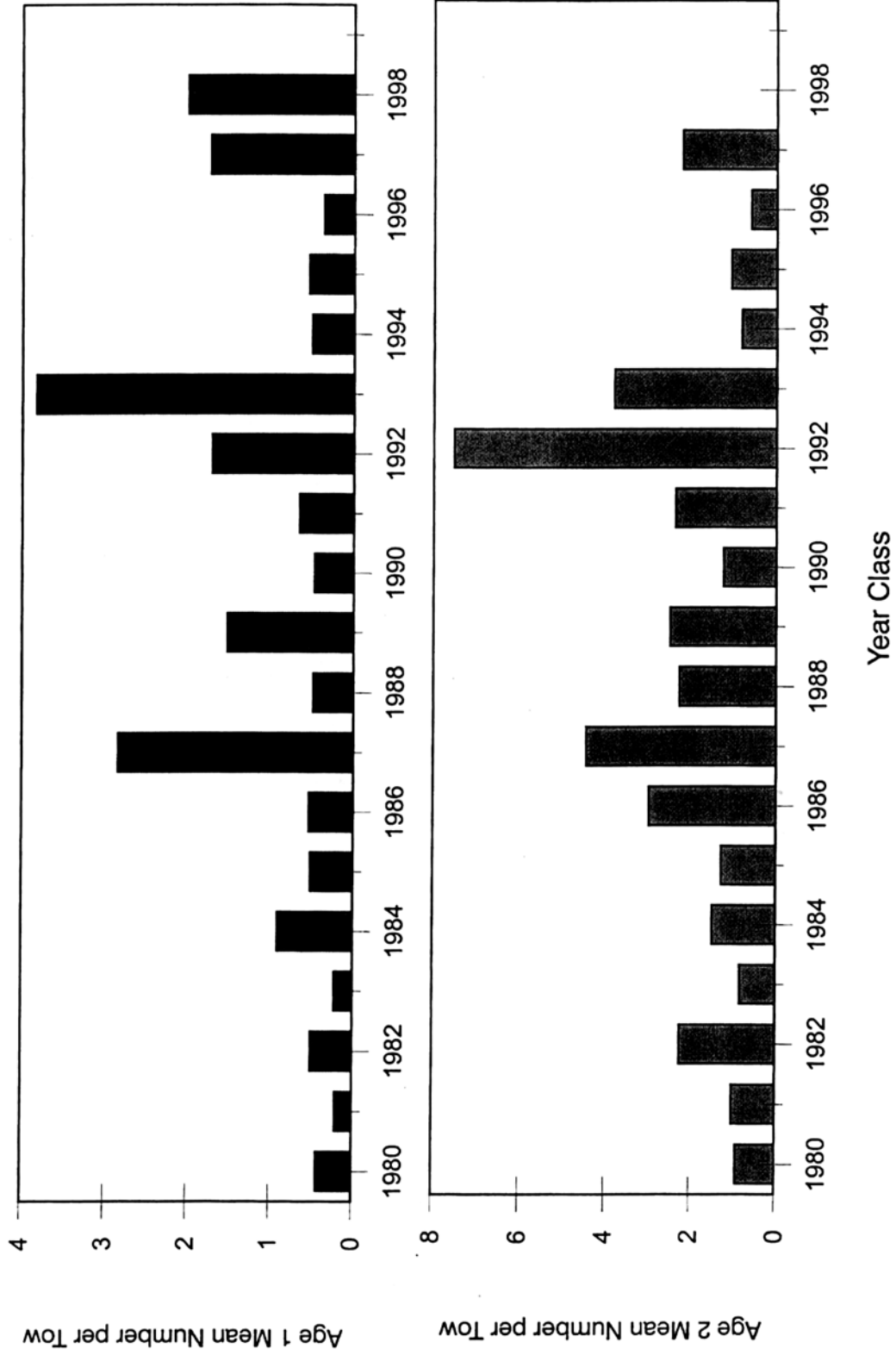


Figure H4. Relative year class strengths of age 1 and age 2 Gulf of Maine-Georges Bank American plaice based on standardized catch(number) per tow from NEFSC autumn reserach vessel bottom trawl surveys, 1980-1999.

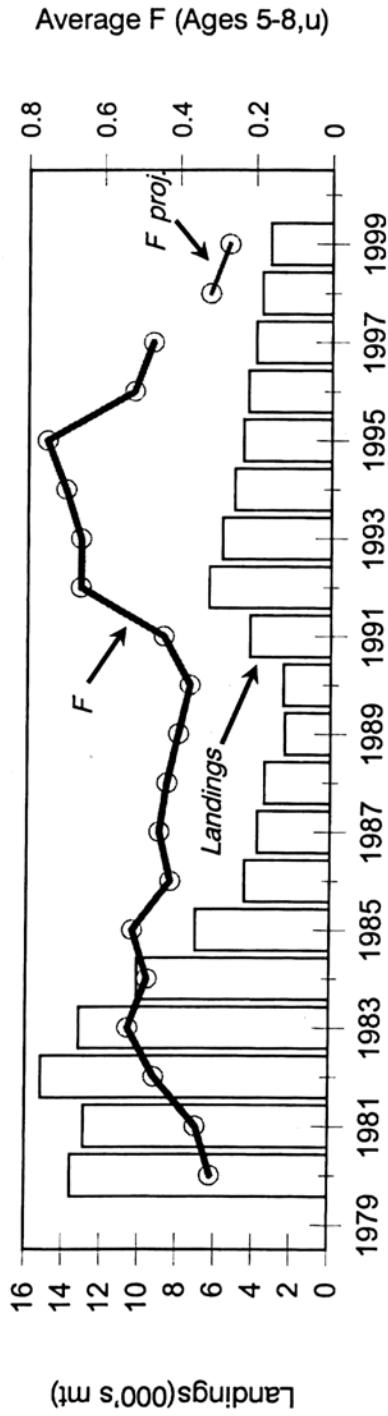


Figure H5. Trends in total commercial landings and fishing mortality for Gulf of Maine-Georges Bank American plaice, 1980 - 1999.

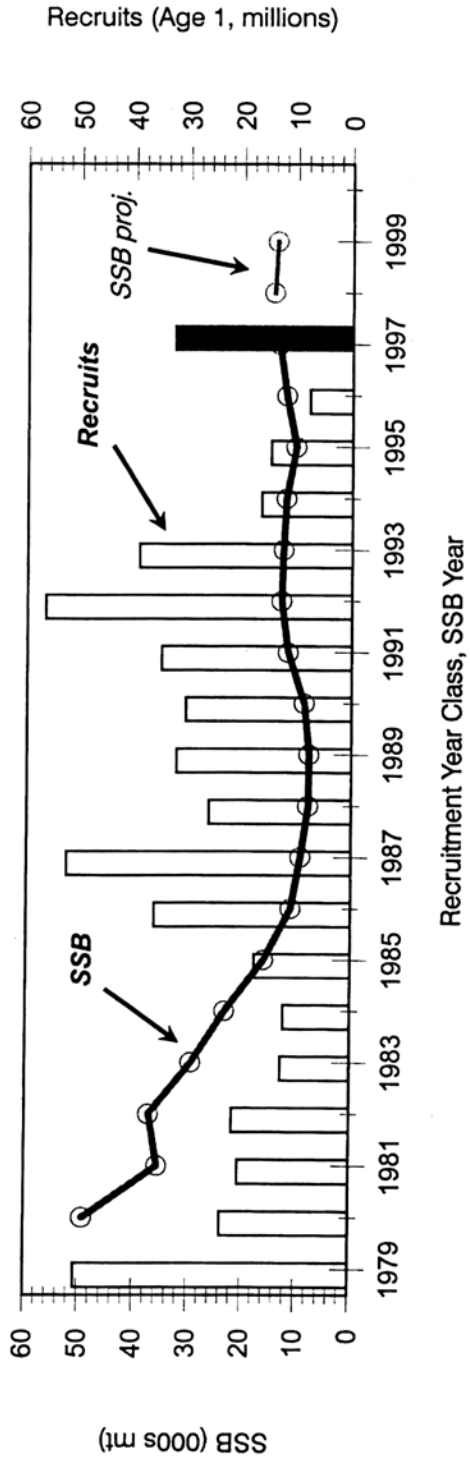


Figure H6. Trends in spawning stock biomass and recruitment for Gulf of Maine-Georges Bank American plaice, 1980-1999.

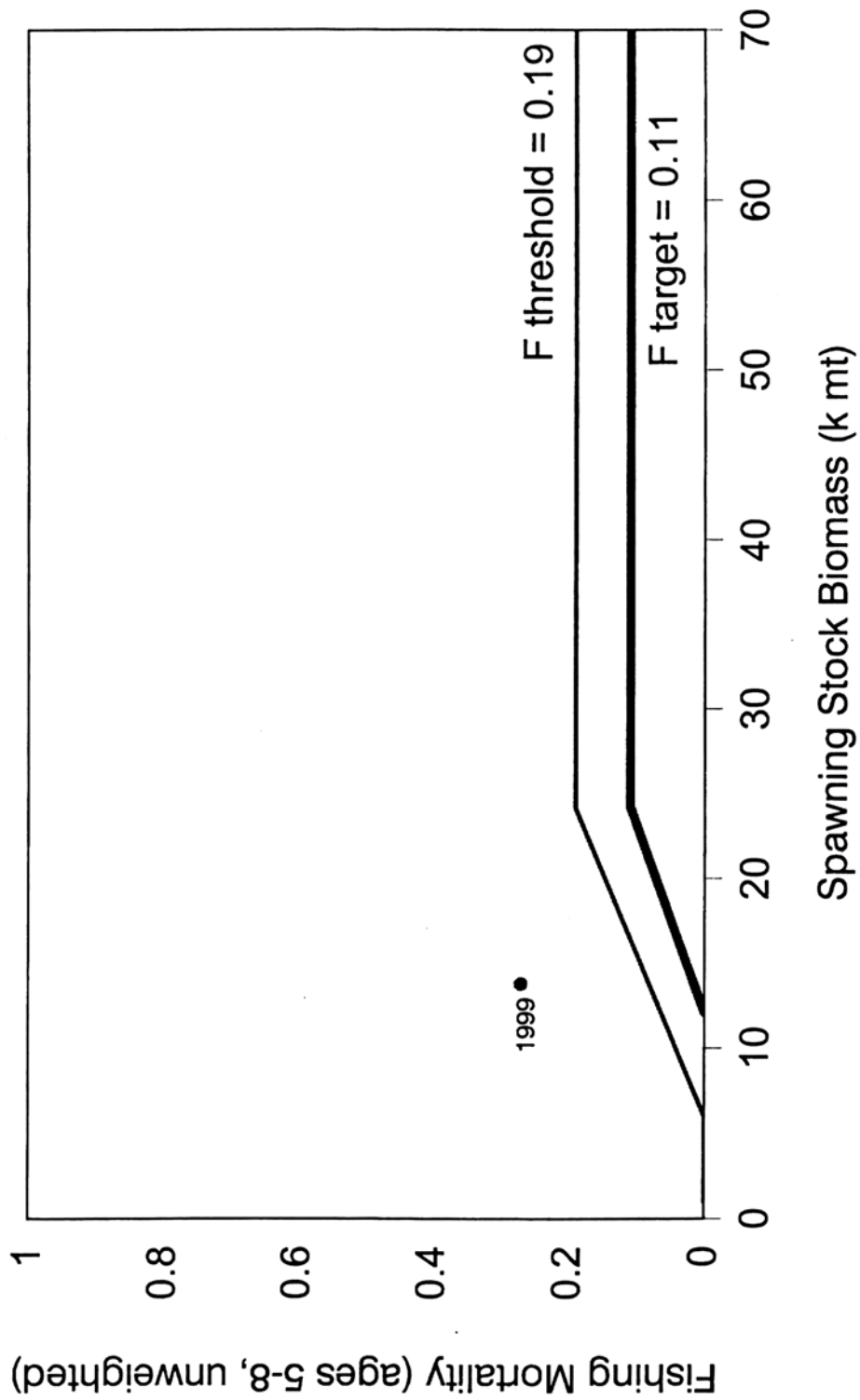


Figure H7. Control rule and projected 1999 stock status for Gulf of Maine-Georges Bank American plaice.