

## Atlantic wolffish: Tables

Table 1. Summary table of total catch, commercial landings, recreational catch, discards and NEFSC survey indices.

YEAR	MRFSS (mt)	CFDBS (mt) US Only	Discard OT LL GN (mt) US Only	Total Catch (mt) US Only	Total Catch (1000 mt) US Only	Spring Biomass Index (kg/tow) US Only	Spring	Fall Biomass Index (kg/tow) US Only	Fall	Spring Abundance Index US Only	Fall Abundance Index US Only
							Exploitation Index US Only		Exploitation Index US Only		
1963	--	--	--	--	--	--	--	0.003	--	--	0.03
1964	--	114.32	--	114.32	0.114	--	--	0.18	0.62	--	0.09
1965	--	166.51	--	166.51	0.167	--	--	0.30	0.56	--	0.31
1966	--	174.42	--	174.42	0.174	--	--	0.17	1.03	--	0.33
1967	--	149.58	--	149.58	0.150	--	--	0.23	0.64	--	0.09
1968	--	116.22	--	116.22	0.116	0.38	0.31	0.41	0.29	0.07	0.15
1969	--	163.28	--	163.28	0.163	1.11	0.15	0.03	4.83	0.15	0.01
1970	--	154.83	--	154.83	0.155	1.12	0.14	0.36	0.43	0.18	0.08
1971	--	172.80	--	172.80	0.173	0.60	0.29	0.16	1.07	0.14	0.12
1972	--	243.94	--	243.94	0.244	0.51	0.48	0.16	1.51	0.34	0.13
1973	--	242.63	--	242.63	0.243	0.87	0.28	0.13	1.83	0.14	0.34
1974	--	352.79	--	352.79	0.353	1.11	0.32	0.10	3.67	0.53	0.23
1975	--	313.12	--	313.12	0.313	0.92	0.34	0.03	9.68	0.14	0.04
1976	--	401.93	--	401.93	0.402	0.53	0.76	0.05	8.68	0.10	0.07
1977	--	393.76	--	393.76	0.394	0.62	0.64	0.08	4.64	0.22	0.04
1978	--	605.24	--	605.24	0.605	1.17	0.52	0.54	1.13	0.30	0.47
1979	--	656.49	--	656.49	0.656	0.71	0.92	0.10	6.41	0.21	0.05
1980	--	826.46	--	826.46	0.826	0.70	1.19	0.18	4.59	0.30	0.14
1981	0.81	671.61	--	672.42	0.672	0.63	1.07	1.14	0.59	0.31	0.26
1982	23.12	760.40	--	783.52	0.784	0.68	1.15	0.19	4.08	0.19	0.05
1983	11.90	1099.92	--	1111.83	1.112	0.74	1.51	0.33	3.33	0.13	0.25
1984	13.18	935.31	--	948.50	0.948	0.47	2.00	0.07	13.30	0.12	0.04
1985	15.95	879.96	--	895.91	0.896	0.74	1.21	0.32	2.81	0.28	0.19
1986	7.24	789.79	--	797.03	0.797	1.44	0.55	0.37	2.16	0.24	0.10
1987	37.71	665.13	--	702.83	0.703	0.91	0.77	0.06	11.10	0.25	0.04
1988	9.03	505.59	--	514.62	0.515	0.54	0.95	0.10	5.12	0.20	0.11
1989	20.49	466.84	26.98	514.31	0.514	0.40	1.27	0.11	4.83	0.27	0.14
1990	29.17	378.16	2.63	409.95	0.410	0.17	2.46	0.21	1.91	0.06	0.11
1991	16.86	446.56	1.95	465.37	0.465	0.36	1.29	0.30	1.58	0.05	0.13
1992	10.73	430.92	19.18	460.83	0.461	0.11	4.02	0.18	2.51	0.14	0.13
1993	20.11	467.22	13.38	500.71	0.501	0.42	1.19	0.41	1.22	0.13	0.19
1994	18.54	455.39	0.11	474.04	0.474	0.14	3.41	0.28	1.69	0.21	0.11
1995	20.45	449.81	5.77	476.02	0.476	0.20	2.42	0.27	1.79	0.12	0.15
1996	12.33	347.98	4.53	364.84	0.365	0.17	2.18	0.01	25.90	0.11	0.01
1997	20.21	301.77	7.82	329.79	0.330	0.04	8.02	0.21	1.59	0.05	0.07
1998	16.84	286.84	2.25	305.92	0.306	0.10	2.92	0.01	42.64	0.04	0.01
1999	8.54	242.75	0.35	251.64	0.252	0.06	4.23	0.19	1.35	0.04	0.05
2000	12.40	191.34	0.54	204.29	0.204	0.21	0.98	0.03	8.17	0.03	0.01
2001	16.67	236.00	6.47	259.14	0.259	0.06	4.11	0.12	2.11	0.03	0.04
2002	9.82	145.58	13.10	168.50	0.169	0.08	2.01	0.07	2.35	0.06	0.03
2003	24.23	123.05	3.82	151.11	0.151	0.18	0.83	0.08	1.79	0.09	0.08
2004	12.45	116.95	1.58	130.98	0.131	0.00003	4169.42	0.02	6.36	0.02	0.01
2005	10.73	114.04	1.31	126.08	0.126	0.00	0.00	0.02	6.48	0.00	0.05
2006	17.86	80.05	1.45	99.36	0.099	0.00	0.00	0.002	62.94	0.00	0.04
2007	12.87	63.32	0.84	77.03	0.077	0.01	8.32	0.00	0.00	0.02	0.00
2008	--	--	--	--	--	--	--	--	--	--	--

Table 2. Percent US Commercial Landings of Atlantic wolffish by Statistical Area and Year

YEAR	512	513	514	515	521	522	525	526	537	Grand Total
1964	3.12	4.04	37.04	3.23	27.92	19.68	4.20	0.76	0.00	100.00
1965	8.06	3.35	29.81	0.92	29.43	25.04	0.72	2.64	0.04	100.00
1966	1.04	5.00	40.12	0.98	30.95	16.79	1.47	3.60	0.05	100.00
1967	1.45	17.26	35.79	1.27	29.84	13.21	0.49	0.70	0.00	100.00
1968	1.72	10.96	32.65	0.55	37.79	12.71	2.55	0.97	0.10	100.00
1969	0.86	12.90	43.91	1.74	24.19	14.83	1.31	0.26	0.01	100.00
1970	1.12	11.05	41.51	1.25	31.19	13.03	0.19	0.63	0.03	100.00
1971	1.85	8.22	42.60	1.63	26.38	16.63	0.85	1.11	0.73	100.00
1972	1.07	8.43	33.74	0.31	32.11	17.62	2.50	3.95	0.28	100.00
1973	0.74	10.16	42.75	0.80	33.97	8.85	1.32	1.41	0.00	100.00
1974	0.74	8.16	37.03	0.21	37.61	12.80	1.21	2.21	0.02	100.00
1975	1.36	10.36	41.55	2.50	33.34	9.56	0.60	0.50	0.23	100.00
1976	1.70	12.99	34.29	1.53	32.27	13.75	1.06	2.40	0.00	100.00
1977	1.34	10.35	37.32	2.02	41.23	6.41	0.58	0.69	0.06	100.00
1978	3.71	14.34	35.40	2.37	34.21	8.93	0.36	0.53	0.15	100.00
1979	3.10	17.30	28.31	3.09	36.66	10.77	0.16	0.61	0.00	100.00
1980	2.94	21.78	21.63	7.24	33.58	11.75	0.49	0.57	0.00	100.00
1981	3.99	22.82	24.83	6.61	28.63	11.73	0.39	0.80	0.21	100.00
1982	7.88	22.65	23.83	10.27	26.92	7.67	0.35	0.19	0.24	100.00
1983	4.65	25.89	28.51	13.92	19.84	6.35	0.22	0.57	0.06	100.00
1984	4.46	28.29	16.08	16.53	23.95	9.41	0.70	0.49	0.09	100.00
1985	6.17	25.18	14.83	19.47	26.63	7.09	0.21	0.35	0.05	100.00
1986	8.92	25.29	14.59	18.43	24.31	7.10	0.78	0.52	0.06	100.00
1987	5.90	25.25	17.55	18.22	25.56	6.91	0.18	0.42	0.01	100.00
1988	5.82	26.08	15.75	9.69	32.96	8.31	0.26	1.11	0.00	100.00
1989	6.39	22.29	11.78	8.76	41.19	8.01	0.10	1.37	0.13	100.00
1990	7.90	29.96	15.65	8.59	29.71	5.05	0.83	2.02	0.30	100.00
1991	6.08	24.30	16.41	16.68	25.59	9.10	0.33	1.22	0.29	100.00
1992	5.74	24.38	15.56	18.10	23.29	10.64	0.49	1.25	0.55	100.00
1993	3.73	20.35	15.56	20.61	19.51	17.49	0.83	1.49	0.42	100.00
1994	4.32	18.85	15.44	15.27	28.65	15.68	0.39	1.20	0.19	100.00
1995	2.26	14.92	20.65	17.80	28.26	14.39	0.29	1.04	0.39	100.00
1996	2.16	15.06	25.96	13.82	28.98	12.18	0.63	0.97	0.24	100.00
1997	1.82	13.48	24.10	11.09	33.59	13.72	0.54	0.43	1.23	100.00
1998	1.87	9.25	35.34	10.08	29.92	11.24	0.44	1.58	0.28	100.00
1999	1.18	9.34	18.35	7.91	41.27	17.39	0.83	2.66	1.06	100.00
2000	1.53	13.68	29.21	8.72	29.39	14.38	0.90	0.59	1.61	100.00
2001	0.96	9.84	18.99	5.81	34.47	26.30	0.83	0.60	2.21	100.00
2002	1.36	11.77	28.52	6.17	35.49	14.24	1.05	0.28	1.13	100.00
2003	1.91	14.05	35.62	5.81	29.78	7.93	1.18	0.25	3.47	100.00
2004	3.91	16.86	39.49	6.92	24.22	5.78	0.18	0.18	2.46	100.00
2005	2.58	20.06	40.80	12.93	16.14	6.22	0.61	0.64	0.03	100.00
2006	2.56	16.84	42.28	8.33	20.32	8.85	0.31	0.10	0.41	100.00
2007	3.29	14.39	39.78	10.08	23.84	7.30	0.85	0.34	0.12	100.00
Grand Total	4.11	19.26	24.64	10.28	29.20	10.70	0.59	0.94	0.27	100.00

Table 3. Commercial Discard Estimates for Atlantic wolffish US waters only

YEAR	Metric Tons			Grand Total	Percent		
	LL	OT	GN		LL	OT	GN
1989	0.00	26.98	0.00	26.98	0.00	100.00	0.00
1990	0.00	2.63	0.00	2.63	0.00	100.00	0.00
1991	0.00	1.95	0.00	1.95	0.00	100.00	0.00
1992	0.51	18.67	0.00	19.18	2.66	97.34	0.00
1993	0.00	13.38	0.00	13.38	0.00	100.00	0.00
1994	0.00	0.11	0.00	0.11	0.00	100.00	0.00
1995	0.00	5.77	0.00	5.77	0.00	100.00	0.00
1996	0.00	4.53	0.00	4.53	0.00	100.00	0.00
1997	0.00	7.11	0.71	7.82	0.00	90.91	9.09
1998	0.00	2.25	0.00	2.25	0.00	100.00	0.00
1999	0.00	0.35	0.00	0.35	0.00	100.00	0.00
2000	0.00	0.49	0.06	0.54	0.00	89.28	10.72
2001	0.00	6.47	0.00	6.47	0.00	100.00	0.00
2002	0.00	13.10	0.00	13.10	0.00	100.00	0.00
2003	0.00	3.67	0.15	3.82	0.00	96.01	3.99
2004	0.00	1.34	0.23	1.58	0.00	85.28	14.72
2005	0.00	1.22	0.09	1.31	0.00	93.37	6.63
2006	0.03	1.42	0.00	1.45	1.90	98.10	0.00
2007	0.01	0.69	0.14	0.84	0.65	82.16	17.19
Grand Total	0.54	112.13	1.39	114.06	0.48	98.31	1.21

Table 4. Atlantic wolffish recreational catch summary from MRFSS database, 1981-2007.

Year	Landed # (A + B1)	Discarded # (live) (B2)	Landed kg (A + B1)	Landed MT	Ave Wt kg	Adjusted Landed kg	Adj Landed MT
1981	334	0	unk	unk		806.38	0.81
1982	9,576	2,789	4,952	4.952	0.52	23,119.43	23.12
1983	4,930	88	16,776	16.776	3.40	11,902.54	11.90
1984	5,461	366	12,740	12.74	2.33	13,184.54	13.18
1985	6,607	0	14,428	14.428	2.18	15,951.34	15.95
1986	3,000	0	unk	unk		7,242.93	7.24
1987	15,618	691	31,733	31.733	2.03	37,706.68	37.71
1988	3,740	574	3,748	3.748	1.00	9,029.52	9.03
1989	8,486	6,956	21,415	21.415	2.52	20,487.83	20.49
1990	12,081	386	9,628	9.628	0.80	29,167.27	29.17
1991	6,984	7,180	14,250	14.25	2.04	16,861.54	16.86
1992	4,446	213	4,985	4.985	1.12	10,734.02	10.73
1993	8,329	1,544	11,969	11.969	1.44	20,108.78	20.11
1994	7,681	820	10,526	10.526	1.37	18,544.31	18.54
1995	8,470	2,027	32,287	32.287	3.81	20,449.20	20.45
1996	5,105	5,841	10,391	10.391	2.04	12,325.05	12.33
1997	8,369	833	37,474	37.474	4.48	20,205.35	20.21
1998	6,974	5,029	19,760	19.76	2.83	16,837.39	16.84
1999	3,538	2,389	4,741	4.741	1.34	8,541.83	8.54
2000	5,138	4,463	11,592	11.592	2.26	12,404.72	12.40
2001	6,905	4,841	15,628	15.628	2.26	16,670.81	16.67
2002	4,069	1,953	17,996	17.996	4.42	9,823.82	9.82
2003	10,035	1,204	42,207	42.207	4.21	24,227.59	24.23
2004	5,158	6,237	9,573	9.573	1.86	12,453.01	12.45
2005	4,445	481	14,955	14.955	3.36	10,731.60	10.73
2006	7,397	9,513	28,614	28.614	3.87	17,858.65	17.86
2007	5,329	8,678	15,253	15.253	2.86	12,865.85	12.87
2008							

Grand Mean Average Weight (kg) =

**2.41**

Table 5. Summary Statistics of Commercial Observer Length Samples by Year, 1989-2007.

YEAR	Median Length (cm)	Mean Length (cm)	Std Dev.	Total N	Min-Max Range (cm)
1989	72	74.25	5.91	4	70 - 83
1991	77	81.89	13.25	9	70 - 114
1992	45.5	49.14	10.93	70	39 - 80
1993	61.5	64.58	11.01	24	49 - 86
1994	73	72.80	10.36	25	45 - 95
1995	62.5	62.00	18.08	20	21 - 102
1996	75	72.76	10.96	25	42 - 94
1997	81	78.38	12.52	13	47 - 92
1998	89	85.58	9.89	19	67 - 99
1999	83	82.14	11.28	7	65 - 94
2000	77	77.30	7.19	50	60 - 89
2001	76	75.69	10.86	74	52 - 96
2002	82	81.75	10.64	53	63 - 110
2003	77	73.78	13.41	186	31 - 113
2004	75	74.35	12.40	253	41 - 115
2005	81	80.23	11.38	264	29 - 107
2006	82	82.34	12.04	163	54 - 111
2007	83	81.59	12.48	129	44 - 105

Table 6. Summary Statistics of Commercial Observer Length Samples by major gear type.

Gear Type	Gear Code	Median Length (cm)	Mean Length (cm)	Std Dev.	Total N	Min-Max Range (cm)
Longline Bottom	10	73.5	71.91	14.04	22	71-96
Otter Trawl Fish	50	78.0	76.21	14.75	1000	21-115
Gillnet Fixed	100	77.0	76.32	11.82	335	36-114
Gillnet Drift	117	78.5	77.71	9.90	14	64-99
Scallop Dredge	132	69.0	67.64	14.66	11	46-94
Offshore Lobster	200	71	66.17	13.83	6	42-79

Table 7. Commercial Port Sample Summary Statistics by Year, 1982-1985 and 2001-2007.

YEAR	Median Length (cm)	Mean Length (cm)	Std Dev.	Total N	Min-Max Range (cm)
1982	69	71.71	15.35	354	45-114
1983	78	78.25	14.46	1349	42-128
1984	76	76.10	12.76	445	51-130
1985	77	76.98	11.86	729	47-119
2001	75	76.59	10.11	176	59-110
2002	76	76.34	10.30	297	38-104
2003	76	76.88	11.07	473	52-109
2004	81	80.83	10.72	1159	48-115
2005	82	81.40	9.95	500	54-110
2006	83	83.03	10.36	894	37-111
2007	84	83.55	10.01	800	51-108

Table 8. Commercial Port Samples Summary Statistics by Gear Type

Gear Type	Median Length (cm)	Mean Length (cm)	Std Dev.	Total N	Min-Max Range (cm)
Longline	71	71.08	8.84	134	45-92
Handline	80	79.41	10.90	29	62-99
Otter Trawl Fish	80	80.04	12.63	7041	37-130
Gill Net	76	76.36	11.68	211	51-109

Table 9. Commercial Port Samples Summary Statistics by Fishery Statistical Areas

Statistical Area	Median Length (cm)	Mean Length (cm)	Std Dev.	Total N	Min-Max Range (cm)
0	83	83.27	6.13	11	75 - 95
512	83	82.16	10.76	421	37 - 108
513	80	79.70	10.99	1745	46 - 110
514	77	77.69	12.04	1357	42 - 130
515	79	78.50	11.67	1956	44 - 112
521	78	79.19	12.53	894	38 - 119
522	77	77.88	12.39	478	50 - 115
525	82	82.70	9.30	47	57 - 102
526	112	110.72	9.67	79	79 - 128
537	68	68.00	15.43	10	48 - 101

Table 10. Observer based CPUE (sum of kept wolffish per year / sum of days fished per year) for Atlantic wolffish, 1989-2007.

<b>YEAR</b>	<b>LLB</b>	<b>OTF</b>	<b>GNF</b>
1989		19.51	5.79
1990		9.47	28.84
1991	52.25	19.64	14.72
1992	54.43	39.68	17.56
1993	262.50	43.05	21.25
1994		54.08	25.77
1995		19.57	62.17
1996		18.94	50.92
1997		30.09	17.75
1998		21.58	19.86
1999		20.47	14.52
2000		19.12	19.37
2001		24.45	18.70
2002	86.70	10.69	18.90
2003	29.60	12.91	32.67
2004	9.36	9.69	17.48
2005	18.98	5.45	19.87
2006	9.91	5.83	16.16
2007	8.20	5.72	8.03

Table 11. Party and Charter Boat CPUE (number of wolffish / million angler days fished) from VTR data for Atlantic wolffish, 1994-2007.

<b>YEAR</b>	<b>CPUE Charter Boats</b>	<b>CPUE Party Boats</b>
1994	71.828	15.080
1995	76.796	9.000
1996	67.966	10.945
1997	82.408	12.949
1998	138.833	12.639
1999	39.482	7.561
2000	16.524	4.559
2001	17.532	3.078
2002	6.906	3.687
2003	8.919	4.477
2004	6.603	3.593
2005	6.737	3.356
2006	5.147	3.430
2007	4.910	2.238





Table 13. Survey area coverage, estimated average survey tow coverage, total area divided by the survey footprint and the survey efficiency q estimates for run 1 and 2.

Wolffish	NEFSC			MDMF
	Spr Age 1	Spr 40+	Fall 40+	40+
survey area (nm <sup>2</sup> )	25,911	25,911	25,911	1,833
Avg tow area swept	0.0112	0.0112	0.0112	0.003846
Tow duration	30 min	30 min	30 min	20 min
total area / tow area swept	2,313,482	2,313,482	2,313,482	476,573
Q L50 = 90	0.145	0.195	0.099	0.011
Q Slope = 0.15	0.147	0.188	0.095	0.011

Table 14. Wolffish working group SCALE runs. Run 1 was allowed to hit the L-50 bound on selectivity and run 2 hit the selectivity slope bound of 0.15. Run 3 parameters were identical to Run 2 and were used to develop F50 BRPs.

Run	1			2		
	L <sub>50</sub> = 90			slope = 0.15		
	weight	qs	Residuals or parameters	weight	qs	Residuals or parameters
total objective function			250.75			254.12
total catch	10		0.22	10		0.22
catch len freq 1+	500		10.14	500		9.92
Variation in recruit penalty (Vrec)	2		14.33	2		15.02
NEFSC Spr 1 Age-1 1968-2007	2	0.145	8.86	2	0.147	9.03
NEFSC Spr 40+ 1968-2007	12	0.195	5.86	12	0.188	5.99
MDMF Spr 40+ 1978-2007	3	0.011	9.64	3	0.011	9.56
NEFSC Fall 40+ 1968-2007	3	0.099	26.67	3	0.095	26.82
NEFSC Spr 40+ len freq	5		12.85	5		12.84
Fstart			0.012			0.001
recruitment year 1 (1968, 000s)			355			361
Selectivity Alpha (L50) 1982-1984			90.00			73.16
Selectivity Beta (slope) 1982-1984			0.09			0.15

Table 15. Estimated biological reference points based on F40 and F50 for three wolffish SCALE runs. A range of knife edge maturity cutoffs were used (40, 65, and 75 cm).

SCALE run Selectivity Length of maturity	1 L50 = 90			2 slope = 0.15			3 slope = 0.15		
	40cm	65cm	75cm	40cm	65cm	75cm	40cm	65cm	75cm
F <sub>MSY</sub> proxy	F40%	F40%	F40%	F40%	F40%	F40%	F50%	F50%	F50%
F <sub>MSY</sub>	0.686	0.486	0.374	0.319	0.233	0.185	0.197	0.156	0.129
YPR	0.872	0.839	0.799	0.861	0.817	0.771	0.784	0.728	0.679
SSB per Recruit	6.098	5.432	4.846	6.098	5.430	4.838	7.627	6.796	6.050
Initial Recruits (000s)	355	355	355	361	361	361	361	361	361
MSY (mt)	310	298	284	311	295	278	283	264	245
SSB <sub>MSY</sub> (mt)	2,167	1,931	1,722	2,202	1,961	1,747	2,754	2,448	2,184
SSB <sub>07</sub> (mt)	890	656	475	998	753	562	998	753	562
F <sub>07</sub>	0.413	0.413	0.413	0.158	0.158	0.158	0.158	0.158	0.158
SSB <sub>07</sub> /SSB <sub>MSY</sub>	41%	34%	28%	45%	38%	32%	36%	31%	26%
F <sub>07</sub> /F <sub>MSY</sub>	60%	85%	111%	50%	68%	86%	80%	102%	123%

Table 16. Sensitivity analysis of the delta depletion parameter in the Depletion-Corrected Average Catch model (DCAC) over time.

**DCAC model - DCAC Average Catch (mt)**  
**Sensitivity Analysis of % reduction on Several Time Periods**

Base Years	Delta Depletion Ratio								Total Catch	Uncorrected Catch	N Years
	50% DD		75% DD		90% DD		95% DD				
	mean	median	mean	median	mean	median	mean	median			
<b>1970-1990</b>	378.0	384.7	328.1	332.1	304.5	307.1	297.4	299.4	11714.9	557.9	21
<b>1970-2000</b>	367.3	374.9	328.7	334.8	309.6	314.9	303.8	308.6	15137.3	488.3	31
<b>1970-2005</b>	353.9	361.0	320.1	326.3	303.1	308.7	297.9	303.1	16384.2	455.1	36
	Confidence Intervals										
	5%	95%	5%	95%	5%	95%	5%	95%			
<b>1970-1990</b>	254.3	476.2	202.0	439.6	180.0	420.8	174.0	414.6			
<b>1970-2000</b>	271.5	436.9	225.5	411.7	204.2	398.1	198.1	393.9			
<b>1970-2005</b>	269.6	413.3	227.1	392.3	207.1	380.8	201.3	377.3			

assumptions:  
M = 0.15 std dev = 0.5  
F<sub>msy</sub> to M = 1.0 std dev = 0.2  
delta depl std dev = 0.1