

**Table 1. Butterfish landings (mt), historic discards (mt), estimated discards (mt), foreign catch (mt), and total catch (mt), 1965–2021. See NEFSC (2014) for further details of historic data.**

Year	Landings	Historic Discards	Discards	Foreign Catch	Total Catch
1965	2944		11474	749	15167
1966	2461		10997	3865	17323
1967	2245		10174	2316	14735
1968	1585		9856	5437	16878
1969	2198		9421	15378	26997
1970	1731		8760	12450	22941
1971	1566		7977	8913	18456
1972	704		6653	12221	19578
1973	1521		6696	31679	39896
1974	1778		6197	15465	23440
1975	1973		5658	12764	20395
1976	1376	152	6193	14437	22006
1977	1296	152	7255	3312	11863
1978	3615	61	8675	1699	13989
1979	2646	185	9193	1107	12946
1980	5172	184	9956	1392	16520
1981	4855	0	9531	1400	15786
1982	8837	68	11098	1578	21513
1983	4743	162	10911	630	16284
1984	11715	257	10257	429	22401
1985	4633	106	8328	804	13765
1986	4418		7936	164	12518
1987	4578		7351		11929
1988	2107		7352		9459
1989	3203		1432		4635
1990	2298		1116		3414
1991	2189		2308		4496
1992	2754		4916		7671
1993	4608		5370		9978
1994	3634		4680		8315
1995	2067		1611		3678
1996	3555		1395		4949
1997	2795		788		3582
1998	1966		4502		6468
1999	2110		10178		12288
2000	1449		3575		5024
2001	4404		3309		7713
2002	872		2936		3808
2003	536		2616		3152

**Table 1, continued. Butterfish landings (mt), historic discards (mt), estimated discards (mt), foreign catch (mt), and total catch (mt), 1965–2021. See NEFSC (2014) for further details of historic data.**

Year	Landings	Historic Discards	Discards	Foreign Catch	Total Catch
2004	520		1507		2027
2005	437		781		1218
2006	554		893		1447
2007	678		205		883
2008	451		976		1428
2009	435		850		1285
2010	576		742		1317
2011	664		1482		2146
2012	640		996		1636
2013	1091		441		1532
2014	3135		1054		4189
2015	2104		830		2934
2016	1194		1537		2731
2017	3681		948		4629
2018	1673		1388		3061
2019	3431		1655		5085
2020	2547		2430		4977
2021	1566		1755		3321

**Table 2. Estimated butterfish discards (mt) and total catch (mt) from Table 1, and respective coefficients of variation (CV), 1989–2021.**

Year	Discards	CV	Year	Catch	CV
1989	1432	0.36	1989	4635	0.11
1990	1116	0.42	1990	3414	0.14
1991	2308	0.22	1991	4496	0.11
1992	4916	0.27	1992	7671	0.17
1993	5370	0.39	1993	9978	0.21
1994	4680	0.73	1994	8315	0.41
1995	1611	0.91	1995	3678	0.40
1996	1395	0.75	1996	4949	0.21
1997	788	1.07	1997	3582	0.24
1998	4502	1.87	1998	6468	1.30
1999	10178	0.36	1999	12288	0.30
2000	3575	0.52	2000	5024	0.37
2001	3309	0.57	2001	7713	0.24
2002	2936	0.70	2002	3808	0.54
2003	2616	1.52	2003	3152	1.26
2004	1507	0.30	2004	2027	0.22
2005	781	0.22	2005	1218	0.14
2006	893	0.84	2006	1447	0.52
2007	205	0.70	2007	883	0.16
2008	976	0.63	2008	1428	0.43
2009	850	0.35	2009	1285	0.23
2010	742	0.20	2010	1317	0.11
2011	1482	0.16	2011	2146	0.11
2012	996	0.36	2012	1636	0.22
2013	441	0.20	2013	1532	0.06
2014	1054	0.20	2014	4189	0.05
2015	830	0.19	2015	2934	0.05
2016	1537	0.17	2016	2731	0.10
2017	948	0.16	2017	4629	0.03
2018	1388	0.14	2018	3061	0.06
2019	1655	0.16	2019	5085	0.05
2020	2430	0.30	2020	4977	0.145
2021	1755	0.49	2021	3321	0.260

**Table 3. Butterfish total catch mean weight at age (kg). The age 4+ values for 1996 & 1997 were interpolated as the previous year's age 3 value plus the time series average change from age 3 to age 4+. The age 0 value for 2017 was interpolated as the 2018 age 1 value minus the time series average change from age 0 to age 1.**

Year	Age 0	Age 1	Age 2	Age 3	Age 4+
1989	0.02	0.05	0.07	0.10	0.11
1990	0.02	0.06	0.09	0.11	0.11
1991	0.03	0.04	0.08	0.11	0.15
1992	0.03	0.05	0.08	0.11	0.13
1993	0.04	0.06	0.09	0.11	0.14
1994	0.03	0.05	0.08	0.11	0.17
1995	0.02	0.05	0.08	0.11	0.37
1996	0.04	0.06	0.08	0.10	0.17
1997	0.03	0.06	0.08	0.11	0.16
1998	0.04	0.05	0.07	0.09	0.17
1999	0.03	0.04	0.07	0.11	0.28
2000	0.02	0.05	0.08	0.13	0.20
2001	0.02	0.05	0.08	0.11	0.18
2002	0.01	0.05	0.07	0.11	0.22
2003	0.03	0.05	0.08	0.11	0.14
2004	0.03	0.04	0.08	0.11	0.19
2005	0.04	0.05	0.07	0.11	0.17
2006	0.03	0.05	0.07	0.11	0.20
2007	0.04	0.06	0.08	0.11	0.14
2008	0.03	0.05	0.07	0.09	0.12
2009	0.03	0.04	0.07	0.10	0.17
2010	0.03	0.06	0.07	0.10	0.13
2011	0.02	0.05	0.07	0.10	0.13
2012	0.03	0.05	0.07	0.11	0.14
2013	0.03	0.05	0.07	0.09	0.12
2014	0.03	0.06	0.09	0.11	0.12
2015	0.04	0.06	0.08	0.10	0.12
2016	0.03	0.05	0.07	0.09	0.15
2017	0.03	0.05	0.07	0.09	0.11
2018	0.03	0.05	0.09	0.10	0.14
2019	0.03	0.05	0.08	0.10	0.12
2020	0.03	0.04	0.06	0.10	0.15
2021	0.04	0.06	0.07	0.09	0.12

**Table 4. Butterfish total catch proportion weight at age.**

Year	Age 0	Age 1	Age 2	Age 3	Age 4+
1989	0.07	0.36	0.43	0.13	0.01
1990	0.07	0.51	0.33	0.09	0.01
1991	0.15	0.38	0.32	0.13	0.02
1992	0.13	0.31	0.44	0.12	0.004
1993	0.12	0.43	0.30	0.14	0.02
1994	0.09	0.43	0.32	0.14	0.02
1995	0.14	0.26	0.37	0.12	0.11
1996	0.12	0.21	0.51	0.16	0
1997	0.05	0.36	0.46	0.13	0
1998	0.10	0.42	0.35	0.11	0.02
1999	0.14	0.42	0.28	0.10	0.06
2000	0.17	0.31	0.29	0.18	0.06
2001	0.12	0.21	0.38	0.22	0.06
2002	0.11	0.37	0.35	0.13	0.04
2003	0.17	0.30	0.32	0.17	0.03
2004	0.10	0.38	0.31	0.16	0.04
2005	0.07	0.43	0.32	0.15	0.03
2006	0.15	0.39	0.30	0.12	0.04
2007	0.03	0.32	0.40	0.21	0.04
2008	0.15	0.36	0.36	0.12	0.01
2009	0.12	0.44	0.29	0.13	0.03
2010	0.09	0.39	0.36	0.14	0.02
2011	0.13	0.40	0.33	0.13	0.02
2012	0.08	0.43	0.33	0.14	0.02
2013	0.11	0.50	0.31	0.07	0.01
2014	0.05	0.42	0.34	0.17	0.03
2015	0.10	0.28	0.41	0.19	0.03
2016	0.04	0.45	0.25	0.25	0.01
2017	0	0.22	0.51	0.21	0.07
2018	0.11	0.30	0.32	0.24	0.03
2019	0.01	0.23	0.40	0.28	0.08
2020	0.03	0.21	0.51	0.19	0.05
2021	0.11	0.20	0.33	0.29	0.08

**Table 5. Butterfish stratified mean number per tow and coefficients of variation (CV) from Northeast Fisheries Science Center spring and fall bottom trawl surveys. Strata for Albatross (1989–2008) and Bigelow (2009–2021) years are shown in Figure 4. The fall 2017 index is NA because only 29 of 77 strata were sampled. No surveys were conducted in 2020 due to COVID-19.**

Year	Spring		Fall	
	Number	CV	Number	CV
1989	18.24	0.80	252.79	0.35
1990	5.13	0.44	231.80	0.22
1991	18.25	0.59	122.07	0.40
1992	10.14	0.21	153.77	0.26
1993	14.78	0.39	163.47	0.23
1994	19.85	0.27	321.77	0.44
1995	22.98	0.59	72.51	0.25
1996	6.39	0.39	55.17	0.19
1997	61.68	0.38	162.57	0.11
1998	22.40	0.61	134.95	0.31
1999	42.39	0.59	158.41	0.35
2000	20.13	0.36	137.59	0.25
2001	33.39	0.37	56.48	0.22
2002	25.74	0.44	66.51	0.19
2003	26.00	0.60	125.37	0.14
2004	69.00	0.32	59.55	0.23
2005	20.79	0.38	34.57	0.20
2006	39.32	0.39	128.41	0.22
2007	76.94	0.54	35.85	0.17
2008	73.71	0.70	85.90	0.21
2009	88.81	0.39	241.93	0.24
2010	73.52	0.27	167.02	0.24
2011	39.41	0.20	353.00	0.29
2012	139.06	0.21	95.10	0.31
2013	28.14	0.21	85.90	0.22
2014	111.31	0.72	127.50	0.21
2015	53.03	0.34	362.31	0.32
2016	125.18	0.20	159.12	0.35
2017	40.03	0.28	NA	NA
2018	105.02	0.28	588.54	0.31
2019	84.65	0.55	71.48	0.19
2020	NA	NA	NA	NA
2021	72.37	0.52	431.21	0.33

**Table 6. Butterfish stratified mean number per tow at age from Northeast Fisheries Science Center spring surveys. Strata for Albatross (1989–2008) and Bigelow (2009–2021) years are shown in Figure 4. No survey was conducted in 2020 due to COVID-19.**

Year	Age 0	Age 1	Age 2	Age 3	Age 4+
1989	0	14.76	2.88	0.53	0.00
1990	0	4.12	0.74	0.16	0.02
1991	0	16.53	1.17	0.49	0.01
1992	0	8.85	1.15	0.12	0.01
1993	0	12.93	1.56	0.29	0.00
1994	0	16.28	2.92	0.62	0.02
1995	0	14.64	7.03	1.31	0
1996	0	4.25	1.43	0.67	0.03
1997	0	58.65	2.67	0.36	0.00
1998	0	9.87	11.92	0.61	0
1999	0	35.18	6.11	1.10	0
2000	0	19.03	0.93	0.15	0.02
2001	0	26.85	6.12	0.41	0
2002	0	20.83	3.57	1.20	0.14
2003	0	21.57	2.96	1.38	0.09
2004	0	68.33	0.62	0.04	0.01
2005	0	15.49	4.48	0.56	0.25
2006	0	36.45	2.02	0.68	0.18
2007	0	65.95	9.18	1.69	0.12
2008	0	67.34	5.92	0.39	0.06
2009	0	85.15	2.95	0.58	0.13
2010	0	63.24	8.27	1.93	0.08
2011	0	32.42	4.95	1.46	0.58
2012	0	125.55	9.85	3.04	0.57
2013	0	22.62	3.73	1.59	0.19
2014	0	106.32	3.96	0.84	0.19
2015	0	42.65	8.24	1.95	0.19
2016	0	98.97	21.37	4.76	0.08
2017	0	28.18	8.51	2.99	0.35
2018	0	74.32	19.24	10.82	0.64
2019	0	78.51	4.61	1.27	0.16
2020	NA	NA	NA	NA	NA
2021	0	65.94	4.31	1.69	0.44

**Table 7. Butterfish stratified mean number per tow at age from Northeast Fisheries Science Center fall surveys. Strata for Albatross (1989–2008) and Bigelow (2009–2021) years are shown in Figure 4. The fall 2017 indices are NA because only 29 of 77 strata were sampled and no ages were collected. No survey was conducted in 2020 due to COVID-19.**

Year	Age 0	Age 1	Age 2	Age 3	Age 4+
1989	213.96	28.92	9.32	0.59	0
1990	209.20	19.50	2.47	0.59	0
1991	106.19	13.35	2.31	0.20	0
1992	144.71	6.09	2.91	0.06	0
1993	124.85	31.89	6.23	0.50	0
1994	301.33	13.57	5.95	0.91	0.01
1995	29.35	27.60	15.48	0.08	0
1996	41.38	11.04	2.58	0.18	0
1997	149.94	10.90	1.64	0.09	0
1998	98.21	31.40	4.99	0.34	0
1999	147.35	9.68	1.37	0.02	0
2000	107.18	27.18	3.00	0.21	0
2001	41.27	9.60	5.46	0.15	0
2002	57.68	6.73	1.97	0.14	0
2003	115.70	8.16	1.07	0.25	0.14
2004	43.05	10.49	5.25	0.44	0.32
2005	29.55	3.38	1.11	0.51	0.01
2006	110.28	13.89	3.60	0.59	0.05
2007	25.36	9.23	1.20	0.06	0
2008	80.31	4.85	0.70	0.04	0
2009	214.00	23.28	4.39	0.25	0.01
2010	116.52	41.49	7.67	1.34	0
2011	310.20	35.57	6.53	0.61	0.08
2012	41.35	38.99	13.39	1.27	0.09
2013	76.79	6.85	1.97	0.28	0.02
2014	102.59	20.33	3.89	0.69	0
2015	311.46	40.43	9.98	0.40	0.03
2016	106.00	39.89	10.94	2.09	0.18
2017	NA	NA	NA	NA	NA
2018	569.87	13.68	4.17	0.79	0.03
2019	38.56	28.11	4.17	0.61	0.01
2020	NA	NA	NA	NA	NA
2021	380.14	40.56	8.71	1.65	0.14



**Table 8. Butterfish arithmetic stratified mean number per tow from Northeast Area Monitoring and Assessment Program spring and fall surveys, and corresponding coefficients of variation (CV). The 2017 index is NA because only 63 of 150 stations were sampled. No spring survey was conducted in 2020 due to COVID-19.**

Year	Spring		Fall	
	Number	CV	Number	CV
2007			942.77	0.34
2008	329.14	0.20	1060.86	0.17
2009	223.14	0.15	3481.74	0.15
2010	487.06	0.48	1040.9	0.11
2011	421.04	0.15	1593.7	0.15
2012	470.42	0.16	650.42	0.19
2013	65.92	0.14	3136.37	0.46
2014	252.39	0.26	3429.52	0.25
2015	125.82	0.23	1213.15	0.23
2016	340.65	0.17	380.24	0.19
2017	NA	NA	934.44	0.29
2018	407.36	0.51	840.98	0.21
2019	871.00	0.41	319.13	0.34
2020	NA	NA	1147.5	0.14
2021	506.09	0.19	1049.63	0.17

**Table 9. Butterfish arithmetic stratified mean number per tow at age from Northeast Area Monitoring and Assessment Program spring surveys. The 2017 indices are NA because only 63 of 150 stations were sampled. No survey was conducted in 2020 due to COVID-19.**

Year	Age 0	Age 1	Age 2	Age 3	Age 4+
2008	101.60	85.01	130.32	8.34	3.81
2009	14.91	179.51	14.04	11.31	3.36
2010	4.39	217.56	198.04	56.15	10.89
2011	249.16	101.48	57.51	10.41	2.47
2012	6.56	313.60	131.52	18.56	0.19
2013	0.95	43.56	15.33	3.54	2.53
2014	0.00	196.32	48.22	7.85	0.00
2015	0.56	108.95	16.29	0.02	0.00
2016	0.04	313.73	26.88	0.00	0.00
2017	NA	NA	NA	NA	NA
2018	14.87	289.24	102.98	0.27	0.00
2019	18.55	833.90	17.90	0.66	0.00
2020	NA	NA	NA	NA	NA
2021	217.23	282.27	6.59	0.00	0.00

**Table 10. Butterfish arithmetic stratified mean number per tow at age from Northeast Area Monitoring and Assessment Program fall surveys.**

Year	Age 0	Age 1	Age 2	Age 3	Age 4+
2007	782.28	142.17	15.15	2.92	0.26
2008	804.44	216.90	34.68	4.16	0.69
2009	2073.59	1273.70	102.33	29.04	3.07
2010	382.16	476.84	149.49	30.00	2.40
2011	1244.00	301.46	36.25	10.32	1.67
2012	389.97	196.54	60.43	3.48	0
2013	2781.97	328.77	21.86	3.77	0
2014	3361.35	62.90	4.45	0.82	0
2015	199.70	974.96	35.95	2.53	0
2016	235.40	144.23	0.60	0	0
2017	563.55	361.49	9.40	0	0
2018	715.14	125.70	0.14	0	0
2019	294.60	22.80	1.73	0.01	0
2020	1058.17	89.33	0	0	0
2021	990.14	58.13	1.35	0.01	0

**Table 11. Model estimates of spawning stock biomass (mt), fully selected fishing mortality (age 3), recruitment (millions), and respective coefficients of variation (CV).**

Year	SSB	CV	F	CV	Recruits	CV
1989	47,325	0.38	0.133	0.42	8,722	0.36
1990	94,664	0.32	0.079	0.38	9,412	0.24
1991	67,617	0.27	0.109	0.34	10,865	0.27
1992	102,749	0.25	0.132	0.33	11,501	0.25
1993	108,210	0.25	0.140	0.35	10,456	0.25
1994	91,853	0.24	0.130	0.45	9,670	0.24
1995	108,701	0.23	0.063	0.47	7,979	0.23
1996	74,245	0.22	0.095	0.32	7,746	0.21
1997	89,613	0.21	0.065	0.33	9,830	0.19
1998	68,426	0.20	0.129	0.83	9,607	0.23
1999	78,441	0.21	0.243	0.37	9,623	0.24
2000	79,802	0.21	0.101	0.42	8,293	0.23
2001	65,221	0.22	0.177	0.34	6,690	0.23
2002	65,482	0.22	0.106	0.54	6,864	0.22
2003	57,429	0.21	0.101	0.87	7,884	0.19
2004	56,236	0.21	0.058	0.32	5,781	0.23
2005	55,475	0.21	0.035	0.27	5,941	0.21
2006	56,864	0.21	0.050	0.54	6,774	0.23
2007	57,337	0.21	0.026	0.29	5,025	0.21
2008	46,989	0.21	0.050	0.48	9,247	0.20
2009	62,379	0.21	0.038	0.33	11,208	0.22
2010	77,087	0.21	0.031	0.26	6,393	0.22
2011	53,069	0.21	0.066	0.27	9,554	0.23
2012	72,450	0.23	0.051	0.33	5,483	0.23
2013	49,417	0.23	0.059	0.26	7,907	0.23
2014	79,537	0.25	0.224	0.32	7,967	0.23
2015	79,274	0.24	0.142	0.34	9,207	0.23
2016	95,457	0.24	0.117	0.33	5,616	0.24
2017	57,722	0.25	0.218	0.33	8,301	0.24
2018	84,363	0.23	0.121	0.31	10,299	0.24
2019	87,645	0.24	0.195	0.32	4,489	0.25
2020	50,304	0.26	0.234	0.34	7,006	0.25
2021	66,566	0.27	0.191	0.43	9,813	0.24