

Myers, H.J. and M.J. Moore. Reducing effort in the U.S. American lobster (*Homarus americanus*) fishery to prevent North Atlantic right whale (*Eubalaena glacialis*) entanglements may support higher profits and long-term sustainability. Supplemental data.

Figure 5: Estimated North Atlantic right whale population, number of calves, observed mortalities and serious injuries, and diagnosed cause of death or serious injury. Diagnosed entanglements have increased significantly since the population has been in decline. Data from Waring et al. 1997, Kraus et al. 2001, Waring et al. 2002, Moore et al. 2004, Waring et al. 2015, Pace et al. 2017, Pettis et al. 2018, Hayes et al. 2018b, and NOAA Northeast Fisheries Science Center (unpublished).

Year	Population	Calves	Diagnosed vessel strikes	Diagnosed entanglements	Observed mortalities and serious injuries
1990	270	13	0	0	1
1991	272	17	2	0	2
1992	282	12	1	0	1
1993	281	8	2	0	3
1994	288	9	0	3	3
1995	293	7	2	1	3
1996	308	22	2	1	3
1997	315	20	1	2	3
1998	314	6	0	0	2
1999	311	4	1	1	2
2000	314	1	0	2.75	3.75
2001	332	31	2	2	8
2002	355	21	1	3	5
2003	363	19	1	3.75	5.75
2004	375	17	2	1	5
2005	396	28	2	1.75	5.75
2006	404	19	5	1.75	7.75
2007	419	23	0	2	4
2008	443	23	0	1	4
2009	466	39	0	2.5	6.75
2010	482	19	1	4	5
2011	481	22	3	5.5	10.5
2012	479	7	0.52	4	5.52
2013	476	20	0	0.75	1.75
2014	468	11	0.52	8	9.52
2015	458	17	0	3.5	6.5
2016	435	14	1	9.5	10.5
2017	428	5	5	6	19
2018	411	0	0.52	3	3.52

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Figure 15: Maine and Nova Scotia (NS) Maritimes lobster landings and landings per trap from 1990 to 2017. While NS Maritimes landings per trap mirrored landings growth, Maine landings per trap remained relatively stagnant for the majority of this period. Data from DFO Seafisheries Landings, DFO Atlantic Region Licences, DFO Integrated Fisheries Management Plan for LFAs 27-38 (2011), NMFS Annual Commercial Landings Statistics, and Maine Department of Marine Resources Historical Maine Lobster Landings.

Figure 16: Maine lobster landings per trap, number of traps (an upper bound indicated by the number of trap tags sold), and total landings weight from 1986 to 2017. Landings per trap were relatively stagnant except from 2007 to 2013, when landings per trap increased substantially year on year, correlating with a decrease in the number of traps and faster rate of growth in total landings. Data from National Marine Fisheries Service Annual Commercial Landings and Maine Department of Marine Resources Historical Maine Lobster Landings.

Year	NS (Maritimes) landings, metric tons	NS (Maritimes) number of traps	NS (Maritimes) landings per trap (lbs)	ME landings, metric tons	ME number of traps	ME landings per trap (lbs)
1990	18,557	916,440	44.64	12,731.70	2,130,000	13.18
1991	19,554	919,114	46.90	13,965.60	2,015,000	15.28
1992	14,502	918,780	34.80	12,170.20	2,012,000	13.34
1993	14,465	910,756	35.01	13,574.60	1,806,000	16.57
1994	16,689	890,361	41.32	17,667.10	2,785,000	13.99
1995	15,955	894,373	39.33	16,877.60	2,408,000	15.45
1996	15,257	902,062	37.29	16,367.30	2,445,000	14.76
1997	16,699	896,045	41.09	21,329.60	2,587,000	18.18
1998	16,414	902,732	40.09	21,335.80	2,837,000	16.58
1999	20,390	899,054	50.00	24,264.90	3,051,000	17.53
2000	20,601	904,738	50.20	25,952.70	2,773,000	20.63
2001	26,191	900,725	64.11	22,052.80	2,961,000	16.42
2002	23,566	948,537	54.77	28,860.40	3,085,000	20.62
2003	24,536	952,548	56.79	24,934.70	3,197,000	17.19
2004	23,062	953,886	53.30	32,465.90	3,227,000	22.18
2005	26,787	958,567	61.61	31,175.60	3,276,000	20.98
2006	28,541	963,248	65.32	34,176.70	3,283,000	22.95
2007	23,188	962,579	53.11	29,011.80	3,264,000	19.60
2008	30,388	964,585	69.45	31,689.80	3,176,000	22.00
2009	28,475	966,590	64.95	36,822.60	3,096,000	26.22
2010	34,852	967,929	79.38	43,656.20	3,022,000	31.85
2011	36,447	880,330	91.27	47,606.80	2,985,000	35.16
2012	39,427	876,987	99.11	57,816.20	2,976,000	42.83
2013	35,326	880,330	88.47	58,067.90	2,937,000	43.59
2014	47,235	876,318	118.83	56,678.10	2,915,000	42.87
2015	45,355	897,382	111.42	55,650	2,898,000	42.34
2016	45,874	882,671	114.58	60,174.90	2,901,000*	45.73*
2017	45,378	882,671	113.34	48,983.10	2,868,000*	37.65*

*These numbers differ from those used in Tables 1 and 2 because the Maine Department of Marine Resources Historical Maine Lobster Landings resource was subsequently updated to indicate a higher number of traps.

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Figure 18: Annual lobster landings weight, in millions of pounds, for Massachusetts Statistical Reporting Areas (SRAs) 5, 6, 7, 8, and 9 from 1990 to 2017. Vertical line indicates the start of the Massachusetts Restricted Area Trap/Pot Closure in 2015. The Massachusetts Restricted Area Trap/Pot Closure includes all of SRAs 6, 7, 8, and 9, as well as most of SRA 5 and small portions of SRAs 18 and 19. Data from the Massachusetts Division of Marine Fisheries (unpublished).

Figure 20: American lobster commercial landings weight standardized to 1990 in the primary Statistical Reporting Areas (SRAs) covered by the Massachusetts Restricted Area (SRAs 5, 6, 7, 8, and 9) and the rest of the state of Massachusetts. The Massachusetts Restricted Area seasonal trap/pot fishery closure took place on February 1st, 2015. Data from Massachusetts Division of Marine Fisheries (unpublished) and National Marine Fisheries Service Annual Commercial Landings Statistics.

American lobster landings (lbs) by Massachusetts SRA and year

Year	SRA 5	SRA 6	SRA 7	SRA 8	SRA 9	Massachusetts
1990	1,289,263	959,271	283,391	232,970	287,030	17,054,434
1991	1,091,031	881,336	378,059	329,955	302,918	16,528,168
1992	1,095,002	778,746	361,121	368,951	282,329	15,823,077
1993	1,051,750	818,425	414,188	380,581	306,748	14,336,032
1994	1,170,936	960,081	559,456	605,241	237,048	16,094,226
1995	1,043,214	882,887	700,924	902,874	259,218	15,755,840
1996	980,644	722,304	650,463	1,111,285	303,044	15,323,277
1997	921,823	671,891	482,358	956,354	356,527	15,087,096
1998	726,195	592,363	401,106	835,414	287,113	13,277,409
1999	921,703	724,721	520,785	995,896	323,795	15,533,654
2000	980,376	711,098	613,865	1,070,673	295,651	15,802,888
2001	637,759	595,361	495,113	860,543	276,567	12,132,807
2002	793,310	537,329	461,159	752,634	330,182	12,853,380
2003	699,756	458,605	449,017	668,664	366,018	11,385,049
2004	672,233	549,519	406,499	601,556	485,915	11,675,853
2005	602,811	446,728	377,435	508,439	449,510	11,291,146
2006	763,718	558,559	405,187	436,958	429,027	12,099,744
2007	692,286	513,650	470,611	454,757	520,864	10,144,761
2008	793,562	571,900	442,675	557,149	525,165	10,600,333
2009	865,725	579,946	478,190	574,182	628,406	11,782,110
2010	813,286	665,574	450,949	399,671	497,578	12,772,217
2011	791,847	574,535	624,567	586,338	500,640	13,385,446
2012	706,962	639,935	675,485	565,221	459,841	14,486,395
2013	823,060	708,032	871,725	685,608	591,441	15,158,558
2014	840,816	650,298	743,570	797,455	670,714	15,322,892
2015	922,521	736,097	850,109	740,670	624,733	16,450,462
2016	1,054,060	934,443	734,082	784,972	600,955	17,787,478
2017	955,454	1,003,735	908,678	760,954	582,078	16,495,767

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Figure 21: Lobster landings weight in the Statistical Reporting Areas (SRAs) covered by the Massachusetts Restricted Area (5-9) and to the north (1-4) and south (10-14) from 1990 to 2017. Relative growth in landings in SRAs 5 to 9 was stronger than in neighboring areas since the closure was implemented. Vertical line indicates the start of the three-month closure in 2015. Data from Massachusetts Division of Marine Fisheries (unpublished).

American lobster landings (lbs) by Massachusetts SRA and year

Year	SRA 1	SRA 2	SRA 3	SRA 4	SRA 10	SRA 11	SRA 12	SRA 13	SRA 14
1990	144,817	1,347,770	1,884,030	5,246,050	8,709	20,109	160,442	136,138	327,694
1991	144,186	1,237,729	1,534,474	4,522,592	13,268	686	155,262	126,997	290,860
1992	133,255	1,154,476	1,339,759	3,717,614	24,841	6,724	104,862	106,707	195,188
1993	134,834	1,080,497	1,237,995	3,160,299	53,302	0	97,554	118,490	270,259
1994	138,656	1,348,550	1,506,444	3,279,632	41,715	184	78,300	185,327	390,400
1995	133,123	1,414,018	1,204,563	2,807,627	29,542	501	98,085	184,384	437,197
1996	138,736	1,384,759	1,053,469	1,966,262	44,368	558	166,911	186,389	397,992
1997	161,597	1,398,264	965,852	1,780,815	42,028	1,530	104,069	238,597	375,938
1998	166,323	1,256,922	883,831	1,506,212	49,002	0	113,033	297,657	408,408
1999	178,117	1,642,542	1,261,182	2,309,065	37,958	607	140,940	273,920	276,414
2000	362,402	2,056,372	1,235,620	2,083,450	18,363	0	176,717	145,858	109,070
2001	218,742	1,407,860	886,673	1,353,488	23,828	0	137,749	176,524	112,279
2002	410,644	1,807,234	997,346	1,533,997	41,741	1,120	175,253	213,898	133,519
2003	166,751	1,530,326	885,574	1,361,958	23,862	577	74,338	110,424	89,014
2004	198,494	1,569,939	915,002	1,382,189	27,796	0	74,163	102,627	116,083
2005	145,964	1,492,552	774,556	1,301,287	30,200	0	101,498	108,257	132,321
2006	245,687	1,634,692	845,714	1,476,591	21,699	0	98,055	119,614	147,722
2007	127,460	1,351,371	992,465	1,357,934	18,037	6,708	113,197	92,095	116,968
2008	153,192	1,423,579	1,086,897	1,646,964	17,725	4,737	103,011	74,795	81,385
2009	152,609	1,470,411	1,243,442	1,758,428	9,244	10	81,204	44,694	70,918
2010	159,563	1,382,632	1,357,598	1,699,427	22,168	345	65,640	49,044	70,409
2011	197,789	1,642,500	1,318,715	1,742,104	29,537	50	62,213	44,624	65,376
2012	201,057	1,767,982	1,496,063	1,672,310	21,163	0	86,571	52,118	69,471
2013	237,453	1,791,297	1,449,911	1,732,451	23,689	0	99,966	55,849	47,368
2014	169,636	1,939,530	1,551,253	1,761,130	16,087	0	65,630	46,767	65,156
2015	228,457	1,957,157	1,778,084	1,890,610	5,983	52	109,772	88,951	89,733
2016	299,802	2,197,080	1,908,028	2,026,136	8,267	0	150,408	98,622	160,234
2017	393,562	1,683,574	1,608,122	1,790,809	10,804	0	87,743	106,449	83,838

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7	Mar	*	*	0	*	*	638	0	*	0	0	0	0	0	0
7	Apr	1,526	522	885	1,038	2,562	589	763	553	1,557	128	0	185	0	0
7	May	6,608	8,029	4,156	7,400	11,187	7,761	7,106	8,041	12,861	9,943	10,865	6,073	10,079	8,883
7	Jun	33,210	29,006	27,533	26,039	37,572	42,595	36,416	62,300	39,989	43,658	35,423	40,962	28,564	42,393
7	Jul	67,446	58,739	70,335	66,823	104,765	99,653	123,626	209,917	193,726	105,716	171,530	150,032	86,893	111,302
7	Aug	69,247	91,742	102,557	103,975	107,665	89,866	180,553	176,753	247,130	164,729	208,373	229,610	257,364	244,909
7	Sep	83,480	99,291	131,500	118,426	94,989	100,238	149,866	95,214	160,607	181,185	209,556	160,144	224,386	285,345
7	Oct	63,942	63,389	79,067	74,548	75,112	65,657	71,395	59,839	131,847	161,225	146,806	116,976	245,608	203,295
7	Nov	40,657	43,461	43,643	34,987	35,204	36,616	46,839	48,777	73,844	69,292	57,024	24,758	45,814	41,252
7	Dec	11,106	10,813	10,562	8,935	8,348	6,406	7,602	13,896	9,765	7,502	10,029	5,055	8,807	6,520
8	Jan	3,540	7,266	3,650	5,492	3,694	2,271	3,670	2,120	5,734	4,695	2,897	2,264	4,653	4,121
8	Feb	1,207	1,053	508	1,063	672	332	1,433	306	878	971	405	577	119	0
8	Mar	693	942	215	924	621	372	1,106	545	183	224	63	0	0	0
8	Apr	1,476	1,233	251	1,182	1,327	921	1,762	266	387	281	0	0	0	0
8	May	12,246	10,523	11,170	25,162	20,416	17,737	25,028	23,587	23,481	19,851	20,349	12,861	10,090	3,218
8	Jun	49,761	33,471	37,197	45,243	48,099	44,233	46,458	47,886	47,177	71,953	67,699	50,889	32,027	28,241
8	Jul	73,502	59,585	54,355	65,317	65,386	61,907	70,218	117,185	100,297	103,662	95,697	112,325	82,583	80,166
8	Aug	70,274	86,695	73,991	79,561	87,874	62,252	103,497	144,292	157,417	134,912	111,882	203,142	198,456	142,032
8	Sep	63,756	72,546	78,020	68,790	96,757	62,192	98,537	90,210	124,922	144,440	136,941	125,169	166,855	133,722
8	Oct	71,823	53,480	69,247	90,871	97,316	54,866	102,404	61,796	108,688	164,846	180,828	156,753	162,692	149,684
8	Nov	108,168	81,390	85,080	124,612	117,288	73,468	106,290	49,705	88,958	149,648	117,412	102,821	102,297	90,145
8	Dec	51,995	28,773	41,072	48,932	34,735	19,122	27,020	27,324	27,921	53,005	36,888	18,296	33,482	28,780
9	Jan	391	*	*	0	*	*	*	0	0	*	*	0	0	0
9	Feb	*	0	0	*	*	0	*	0	0	0	0	0	0	0
9	Mar	*	0	*	*	701	0	*	0	0	0	0	0	0	*
9	Apr	2,873	1,395	711	1,436	1,064	1,878	2,635	1,978	689	0	0	*	0	0
9	May	22,598	12,572	12,039	26,233	19,390	30,821	22,826	12,261	14,074	12,386	20,007	13,812	6,342	7,100
9	Jun	77,060	54,865	55,248	63,106	75,634	65,629	66,477	57,375	51,817	99,976	94,498	65,554	44,094	57,796
9	Jul	135,530	104,777	125,609	144,279	178,752	135,734	135,852	136,903	169,067	181,668	177,836	159,941	115,189	164,088
9	Aug	114,289	109,154	159,425	155,130	182,194	119,389	112,223	151,547	188,252	195,776	147,116	173,600	189,889	201,352
9	Sep	52,556	82,929	98,214	75,722	101,133	83,662	87,025	56,215	108,690	122,265	104,928	114,978	121,718	119,395
9	Oct	28,133	41,946	49,275	45,532	47,446	45,459	58,116	36,668	50,289	49,678	54,669	55,501	92,876	65,757
9	Nov	13,232	17,182	15,527	10,653	17,245	13,174	12,660	6,394	7,646	8,235	21,494	14,158	10,930	11,281

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9	Dec	2,776	3,823	4,251	2,512	4,322	1,752	1,491	500	916	*	3,658	3,217	561	762
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*Confidential data

Any data with fewer than three harvesters, three dealers, or three vessels is deemed confidential.

Data sources: Massachusetts annual catch and trip level reports, NMFS Vessel Trip Reports

Massachusetts lobster average monthly price per pound (USD)

Month	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Jan	\$4.79	\$5.02	\$4.34	\$5.69	\$4.68	\$3.80	\$4.35	\$3.80	\$3.97	\$4.78	\$4.84	\$4.45	\$5.55	\$5.63
Feb	\$5.37	\$5.57	\$5.21	\$6.02	\$4.96	\$4.02	\$4.32	\$4.59	\$4.61	\$5.48	\$5.02	\$5.32	\$5.88	\$6.21
Mar	\$6.10	\$5.97	\$6.87	\$6.10	\$5.53	\$4.25	\$4.51	\$5.33	\$6.96	\$5.58	\$6.80	\$5.40	\$6.48	\$8.08
Apr	\$5.76	\$5.42	\$8.34	\$5.19	\$4.74	\$4.31	\$4.89	\$5.40	\$6.07	\$6.20	\$7.74	\$6.43	\$7.67	\$8.03
May	\$5.28	\$5.44	\$6.20	\$5.28	\$4.12	\$4.27	\$4.92	\$5.03	\$4.69	\$4.83	\$6.09	\$5.37	\$6.02	\$6.01
Jun	\$5.31	\$5.38	\$5.71	\$5.14	\$4.05	\$4.17	\$5.03	\$3.96	\$4.02	\$4.37	\$5.34	\$5.43	\$5.66	\$5.58
Jul	\$5.14	\$4.84	\$5.40	\$4.85	\$3.76	\$3.94	\$4.67	\$3.54	\$3.80	\$4.63	\$4.74	\$4.77	\$5.37	\$5.02
Aug	\$5.00	\$4.76	\$5.01	\$4.69	\$3.59	\$3.83	\$4.20	\$3.47	\$3.66	\$4.55	\$4.53	\$4.59	\$4.73	\$4.77
Sep	\$4.95	\$4.73	\$4.76	\$4.35	\$3.46	\$3.81	\$3.73	\$3.65	\$3.59	\$4.38	\$4.52	\$4.70	\$4.48	\$4.64
Oct	\$4.87	\$4.54	\$4.59	\$3.57	\$3.29	\$3.90	\$3.64	\$3.62	\$3.75	\$4.36	\$4.62	\$4.41	\$4.42	\$4.67
Nov	\$4.51	\$4.42	\$4.49	\$3.02	\$3.22	\$3.87	\$3.29	\$3.40	\$3.87	\$3.88	\$4.56	\$4.17	\$4.44	\$4.73
Dec	\$4.67	\$4.26	\$5.00	\$2.99	\$3.41	\$4.00	\$3.45	\$3.24	\$4.20	\$4.16	\$4.38	\$4.33	\$4.68	\$5.33

Data source: SAFIS Dealer Database