

Contributions of a conservation measure that protects the spawning stock to drastic increases in the Gulf of Maine American lobster fishery

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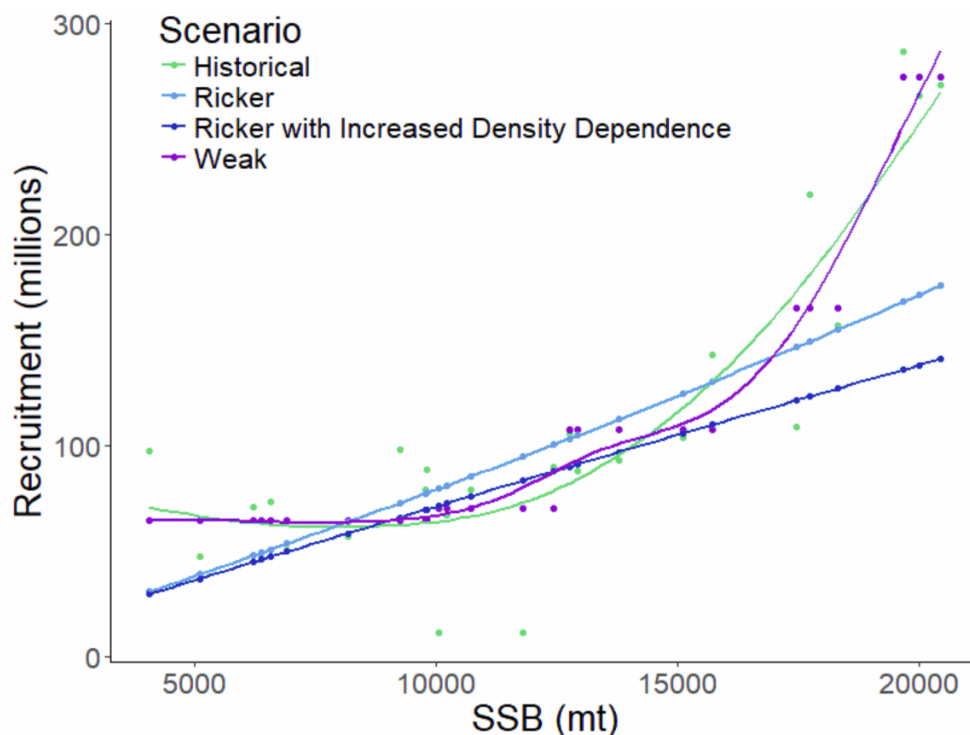


Figure S1. Estimated recruitment (dots) from the 4 different recruitment dynamics scenarios versus spawning stock biomass (SSB) lagged by 6 years. Historical represents the historical recruitment (recruitment estimated from the stock assessment), Ricker represents the recruitment estimated with the Ricker stock-recruitment model, Ricker with Increased Density Dependence represents recruitment estimated with the Ricker stock-recruitment model with an increased density-dependence effect, and Weak represents the recruitment estimated from randomly selecting a recruitment value from normal distributions of recruitment values that correspond to 5 different levels of SSB (hence the 5 levels of recruitment values; weak stock-recruitment relationship). The curves are estimated with a generalized additive model.

Table S1. The results of the independent samples t-tests for the final spawning stock biomasses of each of the v-notching compliance and v-notch definition scenarios with historical recruitment. In the Group column, 0, 50 or 100 represents 0, 50, or 100 % compliance. S represents a strict definition, and L represents a less strict definition. R represents the reference or historical scenario.

Group	M	df	t	p
100-S	47296	97.7	1.16	0.248
R	46898			
100-S	47296	97.9	11.7	<2.2e-16***
50-S	43140			
100-S	47296	98	15.4	<2.2e-16***
100-L	41899			
100-S	47296	97.2	25	<2.2e-16***
50-L	38874			
100-S	47296	98	33.8	<2.2e-16***
0	35505			
50-S	43140	97.4	-10.8	<2.2e-16***
R	46898			
50-S	43140	97.9	-3.5	0.0007***
100-L	41899			
50-S	43140	96.7	12.5	<2.2e-16***
50-L	388874			
50-S	43140	97.8	21.6	<2.2e-16***
0	35505			
100-L	41899	97.8	-14.6	<2.2e-16***
R	46898			
100-L	41899	97.3	9.02	1.68e-14***
50-L	38874			
100-L	41899	98	18.4	<2.2e-16***
0	35505			
50-L	38874	97.8	-24.5	<2.2e-16***
R	46898			
100-L	41899	98	18.4	<2.2e-16***
0	35505			
0	35505	97.9	-33.5	<2.2e-16***
R	46898			

Table S2. The results of the independent samples t-tests for the final spawning stock biomasses of each of the v-notching compliance and v-notch definition scenarios with a weak stock-recruitment relationship. In the Group column, 0, 50 or 100 represents 0, 50, or 100 % compliance. S represents a strict definition, and L represents a less strict definition. R represents the reference or historical scenario.

Group	M	df	t	p
100-S	47636	9.12	0.27	0.79
R	46785			
100-S	47636	9.35	7.20	4.16e-5***
50-S	24960			
100-S	47636	9.22	7.97	1.99e-5***
100-L	22640			
100-S	47636	9.22	9.39	5.05e-6***
50-L	18163			
100-S	47636	9.10	10.9	1.60e-6***
0	13568			
50-S	24960	78.3	-43.4	<2.2e-16***
R	46785			
50-S	24960	92.7	4.19	6.30e-5***
100-L	22640			
50-S	24960	93.4	12.2	<2.2e-16***
50-L	18163			
50-S	24960	74.1	23.2	<2.2e-16***
0	13568			
100-L	22640	90.0	-57.0	<2.2e-16***
R	46785			
100-L	22640	98.0	9.19	6.85e-15***
50-L	18163			
100-L	22640	85.6	22.1	<2.2e-16***
0	13568			
50-L	18163	89.1	-66.8	<2.2e-16***
R	46785			
50-L	18163	84.7	11.0	<2.2e-16***
0	13567			
0	13567	97.2	-97.9	<2.2e-16***
R	46785			

Table S3. The results of the independent samples t-tests for the final spawning stock biomasses of each of the v-notching compliance and v-notch definition scenarios with recruitment from a Ricker model. In the Group column, 0, 50 or 100 represents 0, 50, or 100 % compliance. S represents a strict definition, and L represents a less strict definition. R represents the reference or historical scenario.

Group	M	df	t	p
100-S	30054	85.0	-36.8	<2.2e-16***
R	46785			
100-S	30054	89.1	23.4	<2.2e-16***
50-S	19145			
100-S	30054	79.5	31.6	<2.2e-16***
100-L	16144			
100-S	30054	68.7	46.0	<2.2e-16***
50-L	10883			
100-S	30054	53.4	65.5	<2.2e-16***
0	4698			
50-S	19145	97.3	-74.6	<2.2e-16***
R	46785			
50-S	19145	94.4	8.50	2.70e-13***
100-L	16144			
50-S	19145	83.0	25.6	<2.2e-16***
50-L	10883			
50-S	19145	57.3	50.8	<2.2e-16***
0	4698			
100-L	16144	96.8	-91.2	<2.2e-16***
R	46785			
100-L	16144	92.3	18.6	<2.2e-16***
50-L	10883			
100-L	16144	61.3	48.2	<2.2e-16***
0	4698			
50-L	10883	87.1	-117.8	<2.2e-16***
R	46785			
50-L	10883	68.9	32.4	<2.2e-16***
0	4698			
0	4698	58.9	-159.9	<2.2e-16***
R	46785			

Table S4. The results of the independent samples t-tests for the final spawning stock biomasses of each of the v-notching compliance and v-notch definition scenarios with recruitment from a Ricker model with an increased density-dependence effect. In the Group column, 0, 50 or 100 represents 0, 50, or 100 % compliance. S represents a strict definition, and L represents a less strict definition. R represents the reference or historical scenario.

Group	M	df	t	p
100-S	24839	96.8	-58.3	<2.2e-16***
R	46785			
100-S	24839	82.7	25.4	<2.2e-16***
50-S	16407			
100-S	24839	76.2	33.4	<2.2e-16***
100-L	14126			
100-S	24839	71.2	48.1	<2.2e-16***
50-L	9795			
100-S	24839	56.7	70.0	<2.2e-16***
0	4408			
50-S	16407	88.2	-98.9	<2.2e-16***
R	46785			
50-S	16407	96.2	9.70	6.42e-16***
100-L	14126			
50-S	16407	92.3	29.5	<2.2e-16***
50-L	9795			
50-S	16407	67.6	61.9	<2.2e-16***
0	4408			
100-L	14126	81.6	-110.9	<2.2e-16***
R	46785			
100-L	14126	96.7	20.9	<2.2e-16***
50-L	9795			
100-L	14126	72.8	56.0	<2.2e-16***
0	4408			
50-L	9795	76.0	-129.4	<2.2e-16***
R	46785			
50-L	9795	78.0	34.0	<2.2e-16***
0	4408			
0	4408	58.6	-161.2	<2.2e-16***
R	46785			

Table S5. The results of the independent samples t-tests for the cumulative landings of each of the v-notching compliance and v-notch definition scenarios with historical recruitment. In the Group column, 0, 50 or 100 represents 0, 50, or 100 % compliance. S represents a strict definition, and L represents a less strict definition. R represents the reference or historical scenario.

Group	M	df	t	p
100-S	885432	98	-0.22	0.828
R	886042			
100-S	885432	98	-2.2	0.03*
50-S	891573			
100-S	885432	98	-3.4	0.001***
100-L	894999			
100-S	885432	98	-4.4	3.33e-05***
50-L	897690			
100-S	885432	97.8	-5.8	7.71e-08***
0	901968			
50-S	891573	98	2	0.0524
R	886043			
50-S	891573	98	-1.22	0.228
100-L	894999			
50-S	891573	98	-2.2	0.0329*
50-L	897690			
50-S	891573	98	-3.6	0.000436***
0	901968			
100-L	894999	98	3.1	0.00217**
R	886043			
100-L	894999	98	-0.94	0.348
50-L	897690			
100-L	894999	98	-2.4	0.0175*
0	901968			
50-L	897690	98	4.1	8.77e-05***
R	886043			
100-L	894999	98	-2.4	0.0175*
0	901968			
0	901968	98	5.5	2.52e-07***
R	886043			

Table S6. The results of the independent samples t-tests for the cumulative landings of each of the v-notching compliance and v-notch definition scenarios with a weak stock-recruitment relationship. In the Group column, 0, 50 or 100 represents 0, 50, or 100 % compliance. S represents a strict definition, and L represents a less strict definition. R represents the reference or historical scenario.

Group	M	df	t	p
100-S	898319	9.06	0.35	0.74
R	886043			
100-S	898319	9.88	4.23	0.002**
50-S	745655			
100-S	898319	9.91	4.53	0.001**
100-L	734893			
100-S	898319	9.87	5.20	0.0004***
50-L	710888			
100-S	898319	9.49	5.72	0.0002***
0	694142			
50-S	745655	55.6	-17.6	<2.2e-16***
R	886043			
50-S	745655	98.0	0.98	0.33
100-L	734893			
50-S	745655	98.0	3.20	0.002**
50-L	710888			
50-S	745655	90.8	5.34	6.69e-7***
0	694142			
100-L	734893	55.3	-18.6	<2.2e-16***
R	886043			
100-L	734893	97.9	2.19	0.03*
50-L	710888			
100-L	734893	90.0	4.17	6.88e-5***
0	694142			
50-L	710888	55.7	-22.1	<2.2e-16***
R	886043			
50-L	710888	91.2	1.75	0.08
0	694142			
0	694142	60.6	-31.4	<2.2e-16***
R	886043			

Table S7. The results of the independent samples t-tests for the cumulative landings of each of the v-notching compliance and v-notch definition scenarios with recruitment from a Ricker model. In the Group column, 0, 50 or 100 represents 0, 50, or 100 % compliance. S represents a strict definition, and L represents a less strict definition. R represents the reference or historical scenario.

Group	M	df	t	p
100-S	635638	68.0	-50.3	<2.2e-16***
R	886199			
100-S	635638	93.1	18.5	<2.2e-16***
50-S	528043			
100-S	638638	92.7	23.8	<2.2e-16***
100-L	497869			
100-S	635638	83.9	35.9	<2.2e-16***
50-L	440726			
100-S	635638	66.2	57.9	<2.2e-16***
0	348924			
50-S	528043	77.6	-86.5	<2.2e-16***
R	886199			
50-S	528043	98.0	5.94	4.09e-8***
100-L	497869			
50-S	528043	94.3	18.8	<2.2e-16***
50-L	440726			
50-S	528043	75.1	43.8	<2.2e-16***
0	348924			
100-L	497869	78.1	-94.5	<2.2e-16***
R	886199			
100-L	497869	94.6	12.4	<2.2e-16***
50-L	440726			
100-L	497869	75.6	36.7	<2.2e-16***
0	348942			
50-L	440726	87.4	-124.2	<2.2e-16***
R	886199			
50-L	440726	84.7	26.0	<2.2e-16***
0	348942			
0	348942	97.7	-190.7	<2.2e-16***
R	886199			

Table S8. The results of the independent samples t-tests for the cumulative landings of each of the v-notching compliance and v-notch definition scenarios with recruitment from a Ricker model with an increased density-dependence effect. In the Group column, 0, 50 or 100 represents 0, 50, or 100 % compliance. S represents a strict definition, and L represents a less strict definition. R represents the reference or historical scenario.

Group	M	df	t	p
100-S	517335	78.9	-76.2	<2.2e-16***
R	826237			
100-S	517335	93.0	19.2	<2.2e-16***
50-S	431650			
100-S	517335	90.8	25.4	<2.2e-16***
100-L	406539			
100-S	517335	83.6	37.7	<2.2e-16***
50-L	360492			
100-S	517335	70.1	61.6	<2.2e-16***
0	278753			
50-S	431650	90.3	-114.9	<2.2e-16***
R	826237			
50-S	431650	97.7	6.60	2.13e-9***
100-L	406539			
50-S	431650	94.2	20.0	<2.2e-16**
50-L	360492			
50-S	431650	90.5	47.4	<2.2e-16***
0	278753			
100-L	406539	92.5	-126.4	<2.2e-16***
R	826237			
100-L	406539	95.8	13.3	<2.2e-16***
50-L	360492			
100-L	406539	83.1	41.2	<2.2e-16***
0	278753			
50-L	360492	97.7	-153.3	<2.2e-16***
R	826237			
50-L	360492	90.4	29.2	<2.2e-16***
0	278723			
0	278753	94.2	-207.7	<2.2e-16***
R	826237			