Contents

1.0 ENVIRONMENTAL IMPACTS OF ALTERNATIVES

This action evaluates the potential impacts using the criteria in Table 1.

Table 1. General definitions for impacts and qualifiers relative to resource condition (i.e., baseline).

General Definitions				
VEC	**Resource Condition**	**Impact of Action**		
		Positive (+)	Negative (-)	No Impact (0)
Target and Non-target Species	Overfished status defined by the MSA	Alternatives that would maintain or are projected to result in a stock status above an overfished condition*	Alternatives that would maintain or are projected to result in a stock status below an overfished condition*	Alternatives that do not impact stock / populations
ESA-listed Protected Species (endangered or threatened)	Populations at risk of extinction (endangered) or endangerment (threatened)	Alternatives that contain specific measures to ensure no interactions with protected species (e.g., no take)	Alternatives that result in interactions/take of listed resources, including actions that reduce interactions	Alternatives that do not impact ESA listed species
MMPA Protected Species (not also ESA listed)	Stock health may vary but populations remain impacted	Alternatives that will maintain takes below PBR and approaching the Zero Mortality Rate Goal	Alternatives that result in interactions with/take of marine mammal species that could result in takes above PBR	Alternatives that do not impact MMPA Protected Species
Physical Environment / Habitat / EFH	Many habitats degraded from historical effort (see condition of the resources table for details)	Alternatives that improve the quality or quantity of habitat	Alternatives that degrade the quality, quantity or increase disturbance of habitat	Alternatives that do not impact habitat quality
Human Communities (Socioeconomic)	Highly variable but generally stable in recent years (see condition of the resources table for details)	Alternatives that increase revenue and social well-being of fishermen and/or communities	Alternatives that decrease revenue and social well-being of fishermen and/or communities	Alternatives that do not impact revenue and social well-being of fishermen and/or communities
	Impact Qualifiers			
A range of impact qualifiers is used to indicate any existing uncertainty	Negligible	To such a small degree to be indistinguishable from no impact		
	Slight (sl), as in slight positive or slight negative)	To a lesser degree / minor		
	Moderately (M) positive or negative	To an average degree (i.e., more than “slight”, but not “high”)		
	High (H), as in high positive or high negative	To a substantial degree (not significant unless stated)		
	Significant (in the case of an EIS)	Affecting the resource condition to a great degree, see 40 CFR 1508.27.		
	Likely	Some degree of uncertainty associated with the impact		

*Actions that will substantially increase or decrease stock size, but do not change a stock status may have different impacts depending on the particular action and stock. Meaningful differences between alternatives may be illustrated by using another resource attribute aside from the MSA status, but this must be justified within the impact analysis.

1.1 IMPACTS ON TARGET SPECIES (A. HERRING)

1.1.1 OFL/ABC Alternatives

The biological impacts of the alternatives for the 2021-2023 Atlantic herring fishery specifications were primarily assessed using three-year projections of SSB, fishing mortality, and probability of overfishing/overfished in each year. In the projections, fishing mortality is derived from the estimate of $F_{MSY\ PROXY}$ in the 2020 Atlantic herring management track assessment, and the terminal year estimates of F and SSB for 2019 and the projections assume that the ABC allocated in 2020 will be the catch for that year, a typical assumption for a bridge year like this. A simulation of 1,000 projections was then run to capture possible outcomes of SSB and F for 2021-2023. The projection results are in Table 2 and Table 3. The major focus of these analyses is on FY2021 and FY2022 since another management track assessment is scheduled for 2022. Therefore, a subsequent action is planned for FY2023-2025. In the near term, Atlantic herring management track assessments are on a two-year cycle. Fishery specifications will still be set for three years at a time, but the third year is a place holder until more updated information is available.

Table 2 is projection results for Alternative 1 (No Action) OFL/ABC allocations, if the 2020 OFL/ABC values were maintained for 2021-2023. The estimates of fishing mortality and probability of overfishing under No Action specifications are higher compared to Alternative 2. No Action has increased risks of overfishing, 7% in 2021 and 10% in 2022, compared to 0% for Alternative 2 in both years. The probability of the stock remaining overfished is still very high, almost 100% because the stock is at such low biomass, under 20% for the ratio of SSB to SSB_{MSY}. Fishing mortality estimates increase under No Action to about 0.30 in 2021 and 2022, much higher than fishing limits allowed under the ABC control rule used in Alternative 2, which are closer to 0.10 for 2021-2022.

Table 3 is the projection completed for the 2020 management track assessment in June 2020, and the same projection discussed by the PDT and reviewed by the SSC in July 2020. The SSC did not have confidence in the projected increase in biomass in 2023 and was concerned about setting ABC based on this uncertain value. The SSC had similar concerns in 2018 when they reviewed the previous specifications for 2019-2021. The SSC came to the same conclusion that ABC recommendations for 2021 and 2022 should be based on the ABC control rule but recommended keeping ABC in 2023 the same as 2022 due to the uncertainty in the projections. The estimate of F and P(overfishing) are both lower for Alternative 2 relative to No Action (Alternative 1), but the differences are small. Therefore, the probability of overfishing under Alternative 2 is less than Alternative 1, thus positive biological impacts on the resource are expected under Alternative 2 compared to Alternative 1 OFL/ABC values, but the differences are relatively small.

Overall, the projections show that under both of the OFL/ABC alternatives, Atlantic herring SSB and F resulting from fully utilizing ABC fall within a similar range, Alternative 1 has lower SSB and higher F compared to Alternatives 2, but the differences are relatively minor. Both alternatives have relatively high probabilities of the stock remaining overfished if the full ABC is harvested (over 90% in 2021-2022 for both alternatives). Therefore, it will be helpful to have an updated assessment in 2022 and another opportunity to adjust specifications in 2023 if updated biomass estimates are lower when updated data are incorporated.

Both alternatives have very low probabilities of overfishing (7% for Alternative 1, 0% for Alternative 2). Therefore, both alternatives under consideration are expected to have a slightly positive impacts on the Atlantic herring resource, because the probability of overfishing from these fishing levels is relatively low. The differential impacts between the alternatives relate to the size of the buffer between OFL/ABC and the specification of the stock-wide Atlantic herring ACL/OY, i.e., the maximum amount of total annual removals from the U.S. fishery under each of the alternatives. Lower OFL/ABC values likely translates into lower potential impacts on herring biomass from fishing, but the difference between these alternatives is not very large. Therefore, there are likely negligible differences between the OFL/ABC alternatives with respect to potential impacts on herring biomass since ABC values differ by about 6,000 mt (Alternative 1 ABC for 2021 is about 16,000, and Alternative 2 2021 ABC is about 9,500 mt).

The Atlantic herring ABC specifications under consideration in this action are substantially lower than in 2016-2018 (over 100,000 mt), as well as the NMFS in-season 2018 and 2019 actions (2018 ACL of 49,900 mt and 2019 ABC of 21,266 mt). The reductions considered in this action are expected to prevent overfishing and help the stock recover compared to maintaining recent fishing levels.

When Amendment 8 considered implementing an ABC control rule it was discussed what should happen in terms of applying the ABC control rule if the fishery is declared overfished. When a fishery is declared overfished the Council must develop a rebuilding plan and, "specify a time period for rebuilding...that shall be as short as possible…and not exceed ten years."[1] Amendment 8 stated that if the fishery enters a rebuilding plan, the linear decline in F between the upper and lower biomass parameters of the ABC control rule may be insufficient to meet rebuilding requirements. In such cases, deviations from the linear decline in F will be required, and projections will have to be completed to determine the ABC that will achieve rebuilding (equivalent to what is now done to specify ABC in rebuilding plans). The Amendment went on further to state that if the linear decline in F between the upper and lower biomass parameters is enough to meet rebuilding requirements, then the control rule should be adhered to and the F produced by the linear decline should be used to specify ABC. If the herring fishery is declared overfished, a framework action will be initiated to develop a rebuilding plan and these analyses will be included in that action. Based on the analyses completed to date, if recruitment improves the fishing levels allowed under the current ABC control rule are estimated to increase SSB to almost 50% of SSBmsy by 2023.

Table 2. 2021-2023 projections for No Action OFL/ABC alternative (Alt. 1) assuming 2020 catch = 2020 ABC of 16,131 mt. Projections include assumption of fixed gear catch from Canada of 4,560 mt and 30 mt for US fixed gear catch.

	Mobile Fleet F	SSB (mt)	P(overfishing)	P(overfished)	SSB/SSB_{MSY}
2020	0.243	56,375	0.002	0.999	0.210
2021	0.311	43,407	0.071	0.927	0.161
2022	0.300	36,356	0.105	0.902	0.135
2023	0.159	117,807	0.014	0.592	0.438

Table 3. 2021-2023 projections for Alternative 2 OFL and ABC, reviewed by the SSC in July 2020, assuming 2020 catch = 2020 ABC of 16,131 mt. Projections include assumption of fixed gear catch from Canada of 4,560 mt and 30 mt for US fixed gear catch.

	Mobile Fleet F	SSB	P(overfishing)	P(overfished)	OFL	ABC	SSB/SSBmsy
2020	0.243	56375	0.002	0.999	–	–	0.210
2021	0.119	48841	0.000	0.932	23423	9483	0.182
2022	0.089	45921	0.000	0.903	26292	8767	0.171
2023	0.077	130616	0.000	0.525	44600	11025	0.486

The PDT recommended a confidence bound be included for the estimate of SSB for SSC consideration to help illustrate the uncertainty around the projections. Table 4 presents the 95% confidence bounds for SSB. For 2020, there is <5% chance of the stock biomass being below 10% SSB_{MSY}, the level where ABC would be set to zero based on the approved ABC control rule from Amendment 8.

[1] MSA § 304 (e)(4)(A)(1)-(ii).

Table 4. Confidence bounds for SSB projections (95%) for OFL/ABC Alternative 2 for 2020-2023 (in mt).

	SSB	2.5%	97.5%
2020	56,375	32,491	95,686
2021	48,841	24,479	223,528
2022	45,921	21,619	265,820
2023	130,616	47,883	345,095

There are several specifications in this action that will remain at status quo levels, many of which stem directly from the ACL or are based on applying status quo methods used in previous specification, specifically DAH, DAP, USAP, sub-ACL allocations by herring management area, seasonal sub-ACL allocations, RSA, FGSA, and RH/S catch caps (See Section **Error! Reference source not found.**). These measures are expected to have no impact individually on the herring resource, and for the most part have had generally low positive impacts on the herring resource to date in terms of helping to prevent overfishing and support goals and objective in the FMP. The potential impacts of these specifications have been analyzed in previous actions and no additional impacts are expected.

1.1.2 Management Uncertainty Buffer Alternatives

The range of alternatives under consideration for management uncertainty in this specification package is between 4,560 mt (No Action) to 6,244 mt (Option 2). This buffer reduces the risk of exceeding the ABC from sources of uncertainty within the management plan (i.e., uncertain NB weir or state water catch). Section 3.1.2 includes updated information on the sources of management uncertainty in this fishery: Canadian catch from the New Brunswick weir fishery, state water catch, and estimates of mortality from herring discards.

In general, the larger the buffer the lower the risk for potentially negative impacts on the resource if ABC is exceeded. Because total catch is expected to decrease substantially in this action compared to status quo levels, this buffer is now a larger percentage of total catch. NB weir catch was relatively high in 2018, over 11,000 mt; therefore, a buffer of 4,000-6,000 mt would not be enough to account for that mortality. However, NB weir catch was lower in 2019, and is relatively low to date for FY2020. Overall, NB weir catch has been highly variable and uncertain. The range of options under consideration are expected to have low positive impacts on the resource, because they all help reduce the risk of exceeding the ABC. Lower herring fishing levels likely translates into lower potential impacts on herring biomass, but the difference between these alternatives is not very large. Therefore, there are likely negligible differences between the management uncertainty alternatives with respect to potential impacts on herring biomass since the management uncertainty buffer alternatives differ by about 2,000 mt.

Table 5. 2021-2023 projections for Alternative 2 OFL and ABC, combined with the management uncertainty (MU) buffer options under consideration.

Note: Each run assumes a different value for NB weir catch as well as US fixed gear catch.

OFL/ABC Alt. 2 with No Action MU (Option 1 - 4,560 MT for CA catch)

	Mobile Fleet F	SSB	P(overfishing)	P(overfished)	OFL	ABC	SSB/ SSBmsy
2020	0.243	56450	0.002	0.999	–	–	0.21
2021	0.119	49012	0	0.932	23292	9309	0.182
2022	0.089	46208	0	0.903	26193	8595	0.172
2023	0.078	131159	0	0.522	44560	10941	0.488

OFL/ABC Alt. 2 with 3-year average for MU (Option 2 - 6,244 MT for CA catch)

	Mobile Fleet F	SSB	P(overfishing)	P(overfished)	OFL	ABC	SSB/ SSBmsy
2020	0.243	56375	0.002	0.999	–	–	0.21
2021	0.119	48540	0	0.934	24830	10956	0.18
2022	0.087	44942	0	0.905	27426	10114	0.167
2023	0.073	127294	0	0.545	45301	12085	0.473

OFL/ABC Alternative 2 with 5-year average for MU (Option 3 - 4,587 MT for CA catch)

	Mobile Fleet F	SSB	P(overfishing)	P(overfished)	OFL	ABC	SSB/ SSBmsy
2020	0.243	56375	0.002	0.999	–	–	0.21
2021	0.119	48874	0	0.932	23266	9319	0.182
2022	0.089	46037	0	0.903	26153	8606	0.171
2023	0.077	130981	0	0.521	44576	10880	0.487

OFL/ABC Alternative 2 with 10-year average for MU (Option 4 - 4,669 MT for CA catch)

	Mobile Fleet F	SSB	P(overfishing)	P(overfished)	OFL	ABC	SSB/ SSBmsy
2020	0.243	56375	0.002	0.999	–	–	0.21
2021	0.119	48841	0	0.932	23423	9483	0.182
2022	0.089	45921	0	0.903	26292	8767	0.171
2023	0.077	130616	0	0.525	44600	11025	0.486

1.1.3 Border Transfer Alternatives

This action is considering a range of 100 mt (No Action) to a range of 0mt to up to 250 mt (Alternative 2) for border transfer, fish allowed to be harvested by U.S. vessels and transferred to Canadian vessels at sea to be used for human consumption (cannery fish). These alternatives have no direct impact on the herring resource; this catch is accounted for in the overall ABC, whether this fish is transferred at sea or landed and later transferred by truck has no direct impact on the resource.

1.1.4 Research Set-Aside

This action includes two alternatives for allocation of an RSA: 1) No Action that would set-aside 3% of each sub-ACL for FY2021-2023; and 2) a 3% set-aside for FY2021 and 0% for FY2022 and 2023. Overall, the RSA program has indirect, low positive impacts on the herring resource stemming from improved science and monitoring of the herring resource and fishery. If RSA projects are completed there can be indirect beneficial impacts on the herring resource from increased data collection and collaboration of scientists and the fishing industry. However, quota reductions limit the amount of research that can be collected, and if allocations are low enough the program may not be able to function, thus reducing potential benefits on the resource.

Table 6 highlights the potential RSA allocations under consideration in this action. There are many sub-options when combined with various OFL/ABC and management uncertainty buffer options, but this table illustrates the range of possible allocations under consideration when the lowest management uncertainty buffer is used (No Action) and the highest buffer (Option 2). For these sub-options highlighted the range of possible RSA set-aside at 3% is 97 mt to 347 mt annually for all areas combined. For reference, RSA was over 450 mt in 2019 and over 2,000 mt each year in 2016-2018. The RSA set-aside is not typically fully harvested in the Herring RSA program, and has become even more challenging in recent years (Table ???). Therefore, while there could be indirect low positive impacts on the herring resource from the RSA program, it may be difficult for these programs to function under such low quotas, potentially compromising the success of the projects.

Table 6. Potential range of RSA allocations by area for both of the OFL/ABC alternatives combined with two of the management uncertainty buffers

	2021 - RSA at 3%				
	1A	**1B**	**2**	**3**	**Total RSA**
Alt. 1 OFL/ABC + No Action MU	100	15	97	135	347
Alt. 1 OFL/ABC + Option 2 MU	86	13	82	116	297
Alt. 2 OFL/ABC + No Action MU	43	6	41	58	148
Alt. 2 OFL/ABC + Option 2 MU	28	4	27	38	97

1.1.5 Carryover Provisions

This action is considering three alternatives for carryover of unharvested herring catch from one fishing year to a future fishing year. No Action (Alternative 1) is an automatic rollover of up to 10% of each sub-ACL, Alternative 2 would prohibit any rollover of unused sub-ACL from FY2019 or 2020 to FY 2021 and 2022, respectively. Finally, Alternative 3 would allow up to 5% of each sub-ACL to rollover from 2019 and/or 2020 to 2021 and/or 2022, respectively.

The 2019 catch estimates are not officially final yet but will likely be very close to estimates currently available on the GARFO monitoring website (Table ???). Area 2 is the only area that was fully harvested in FY2019, in fact the sub-ACL was likely exceeded, and overages from 2019 would be deducted from the Area 2 sub-ACL for FY2021. Table ??? shows that about 1,100 mt may be available for carryover from FY2019 to FY2021. Because the total ACL would not increase by carryover there are no direct impacts on the herring resource expected from No Action (Alternative 1).

There may be low negative impacts on some sub-components of the stock if higher fishing levels are concentrated in fewer areas, and not as spread out as normal fishing patters in all four herring management areas. For example, there may be about 500mt of unharvested 2019 Area 3 quota that could carryover to the 2021 Area 3 sub-ACL. It is possible that the Area 3 sub-ACL is fully harvested (including 2019 carryover) before Area 1A opens to the herring fishery, typically on June 1 or later. If all the carryover is harvested in Areas 1B and 3, and not Area 1A, there may be differential biological impacts on the sub-components of this overall stock. Specifically, if more of the total allocation is harvested on GB, there may be low negative impacts on those sub-components, and low positive impacts on the GOM sub-component if that area is closed to fishing due to a closure of the entire directed herring fishery when 95% of the total 2021 ACL is projected to be harvested. However, because carryover is limited to 10% under No Action, or 5% under Alternative 3, any potential impacts are minimal in nature and not expected to have measurable impacts on the herring resource overall.

Alternative 2, temporary prohibition of carryover, is expected to have low positive to neutral impacts on the resource compared to No Action, and Alternative 3 to a lesser extent, because if carryover is prohibited any impacts on the herring resource will be spatially distributed based on proportions developed in previous actions that were intended to prevent overfishing on one sub-component of the overall herring stock. Any potential impacts are low because carryover is limited to 5%-10%, and it is uncertain if the fishery will ultimately fish more in one area than another, or fishing patterns could end up being like overall spatial proportions by herring management area. Therefore, any potential impacts are minimal in nature and not expected to have measures impacts on the herring resource overall.

1.1.6 Measures that potentially inhibit mackerel fishery from achieving OY

1.1.6.1 Increase the herring incidental possession limit

This action is considering five alternatives for this section. Options A, B and C are for Areas 1B, 2 and 3, Option D is for Area 2 only, and Option E would apply to both Areas 2 and 3 if selected. More than one option can be selected in this section meaning different incidental herring possession limits could be adopted for different areas. None of the alternatives under consideration include Area 1A, the herring incidental catch limits for that area would remain as is, 2,000 pounds when 92% of the sub-ACL is estimated to be caught, or 95% of the total herring ACL. Table ??? summarizes the options under consideration.

Overall, these measures should have no direct impacts on the herring resource because all catch will still be applied against the appropriate sub-ACL and total ACL. The current monitoring system in place has been relatively successful in keeping the fishery under sub-ACLs and the total ACL. Table 7 summarizes the number of times in-season possession limits have been implemented in either the herring or mackerel fishery. In most year, NMFS has implemented in-season measures to slow directed herring catch in a particular area. Since ACLs have been in place the herring fishery has exceeded several sub-ACLs, but the total ACL has never been exceeded. Herring vessels also work collaboratively to voluntarily slow fishing in an area to prevent overages and implementation of incidental catch limits.

There will be additional monitoring needs under Options B-E compared to No Action since they include additional trigger levels, which could be more challenging to monitor under lower herring quotas. If lower possession limits are not imposed early enough there could be increased risks of exceeding sub-ACLs or the total ACL. In addition, under lower quotas it may be challenging to get a notice out to the fishery to implement step 1 under some of these options. If the sub-ACL is getting fished quickly the Agency may need to jump to step 2 and skip step 1 entirely. Vessels are still required to report daily through VMS, so that requirement should help provide adequate monitoring of any additional measures approved in this action. But when quotas are relatively small and multiple vessels are fishing in the same area there are inherent challenges with real-time monitoring in a high-volume fishery.

This action is considering the ability to implement different possession limits and triggers by area. In general, more complexity can increase risks overall that the system will not run smoothly. Provided these measures do not change fishing behavior and incentivize some vessels to fish more under lower possession limits, there should be neutral impacts on the herring resource overall from these alternatives.

Table 8, Figure 1 and Figure 2 below compare the allocated herring and mackerel ACLs and actual catches as well as the in-season actions implemented by area for 2008-2019. It is possible that these in-season actions had a role in preventing one fishery or the other from harvesting the full ACL; however, each fishing year is unique with different circumstances influencing fishing effort levels including factors not related to management such as market demand, weather, effort in other fisheries, resource availability, etc. These analyses have been provided as background, and not to suggest that in-season accountability measures alone are the only reason a fishery has not been able to harvest ACLs. In some cases, both fisheries have been very close to harvesting the full ACL, particularly in more recent years as ACLs have declined.

Table 7. Summary of in-season actions implemented in the herring and mackerel (in gray) plans

Year	Month	FMP	AM triggered
2012	February	Herring	Herring Management Area 2 sub-ACL reached – herring incidental limit of 2,000 lb. in that area.
	October	Herring	Herring Management Area 3 sub-ACL reached – herring incidental limit of 2,000 lb. in that area.
	November	Herring	Herring Management Area 1A sub-ACL reached – herring incidental limit of 2,000 lb. in that area.
2013	April	Herring	Herring Management Area 2 sub-ACL reached – herring incidental limit of 2,000 lb. in that area.
	October	Herring	Herring Management Area 1A sub-ACL reached – herring incidental limit of 2,000 lb. in that area.
	October	Herring	Herring Management Area 3 sub-ACL reached – herring incidental limit of 2,000 lb. in that area.
2014	May	Herring	Herring Management Area 1B sub-ACL reached – herring incidental limit of 2,000 lb. in that area.
	September	Herring	Herring Management Area 3 sub-ACL reached – herring incidental limit of 2,000 lb. in that area.
	October	Herring	Herring Management Area 1A sub-ACL reached – herring incidental limit of 2,000 lb. in that area.
2015	October	Herring	GB Haddock AM triggered – closure to MWT gear in GB Haddock stock area
	October	Herring	Herring Management Area 1A sub-ACL reached – herring incidental limit of 2,000 lb. in that area.
2016	November	Herring	Herring Management Area 1B sub-ACL reached – herring incidental limit of 2,000 lb. in that area.
2018	February	Mackerel	RH/S catch cap reached for mackerel fishery – mackerel incidental limit at 20,000 pounds.

	March	Herring	RH/S catch cap reached for MWT vessels in MA/SNE catch cap area – herring incidental limit at 2,000 lb. in that area.
	October	Herring	Herring Management Area 1B sub-ACL reached – herring incidental limit of 2,000 lb. in that area.
	December	Herring	RH/S catch cap reached for MWT vessels in MA/SNE catch cap area – herring incidental limit at 2,000 lb. in that area.
2019	March	Herring	Herring Management Area 2 sub-ACL reached – herring incidental limit of 2,000 lb. in that area.
	March	Mackerel	RH/S catch cap reached for mackerel fishery – mackerel incidental limit at 20,000 pounds.

Table 8. Summary of herring and mackerel ACL and final catches (2008-2019) as well as in-season actions implemented each year including date of implementation

FY	Herring ACL	Herring Catch	Usage (%)	Mackerel ACL	Mackerel Catch	Usage (%)	*In-season actions that were implemented (with date)*
2008	143,350	83,240	58.1%	156,000	25,212	16.2%	
2009	143,350	103,943	72.5%	156,000	24,529	15.7%	
2010	91,200	72,851	79.9%	47,395	14,261	30.1%	
2011	93,905	86,245	91.8%	43,781	4,610	10.5%	
2012	90,683	90,561	99.9%	43,781	8,037	18.4%	*Herring Area 2 (2/17), Area 3 (10/3) and Area 1A (11/2) closed early*
2013	106,375	95,764	90.0%	43,781	6,799	15.5%	*Herring Area 2 (4/14), Area 1A 10/11) and Area 3 (10/21) closed early*
2014	104,088	93,247	89.6%	43,781	8,252	18.8%	*Herring 1B (5/22), Area 3 (9/18) and Area 1A (10/23) closed early*
2015	104,566	80,011	76.5%	25,039	9,905	39.6%	*GB haddock catch cap in-season AM (10/20), Herring Area 1A closed early (10/29)*
2016	107,360	63,581	59.2%	11,009	10,277	93.4%	*Herring Area 1B closed early (11/15)*
2017	102,656	49,072	47.8%	11,009	11,230	102.0 %	
2018	49,900	43,878	87.9%	11,009	11,261	112.9 %	*RHS:Mack Closure (2/23); RHS:Herr SNE MW closure (3/12), Herring 1B closure (10/22) and RHS:Herr CC MW closure (12/19)*
2019	15,065	13,066	86.7%	19,184	*	*	*Herring Area 2 closure (3/6) and RHS:Mack closure (3/8)*

* Data not available yet
Source: APSD end of year catch accounting and Atlantic mackerel 2020 data update (https://static1.squarespace.com/static/511cdc7fe4b00307a2628ac6/t/5cc08e47e79c70bda68f0e71/1556123208481/1_Mackerel_Update_For_2020_Specs_final.pdf)

Figure 1. Herring (in blue) and Mackerel (in orange) ACL compared to final catch (2008-2019)

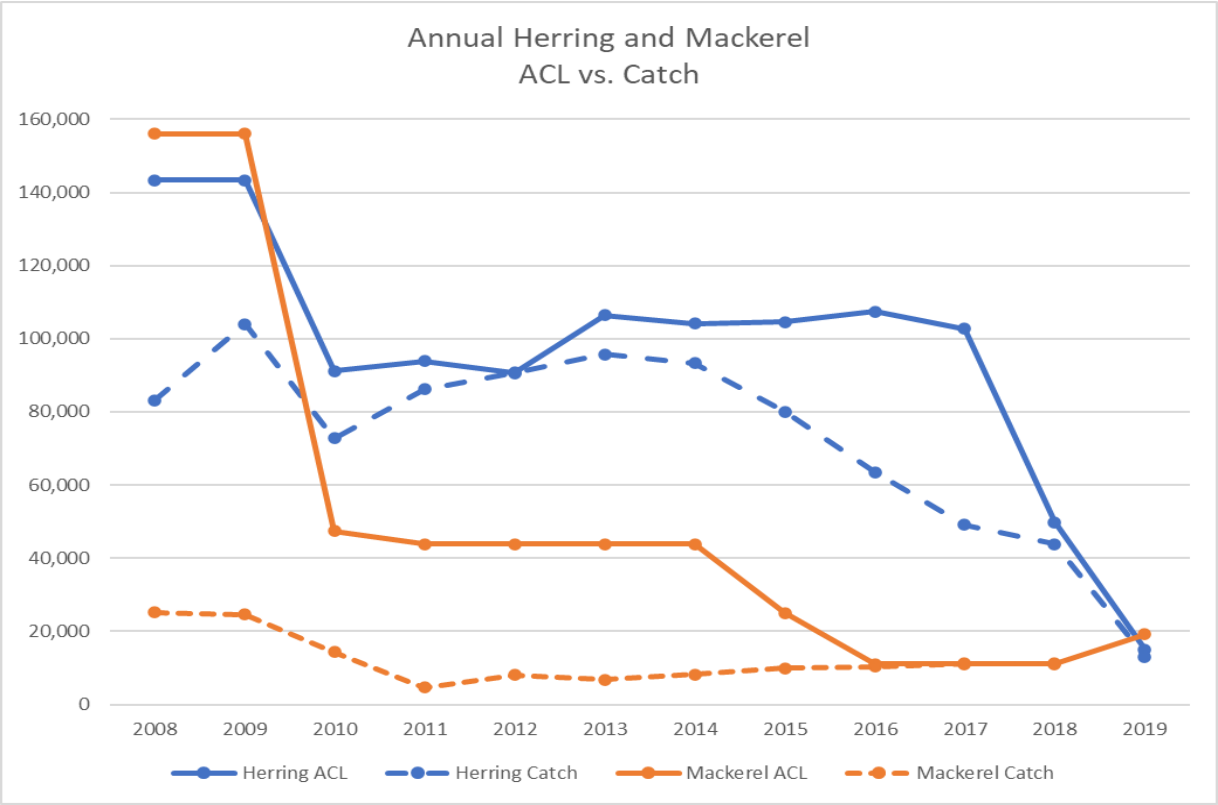
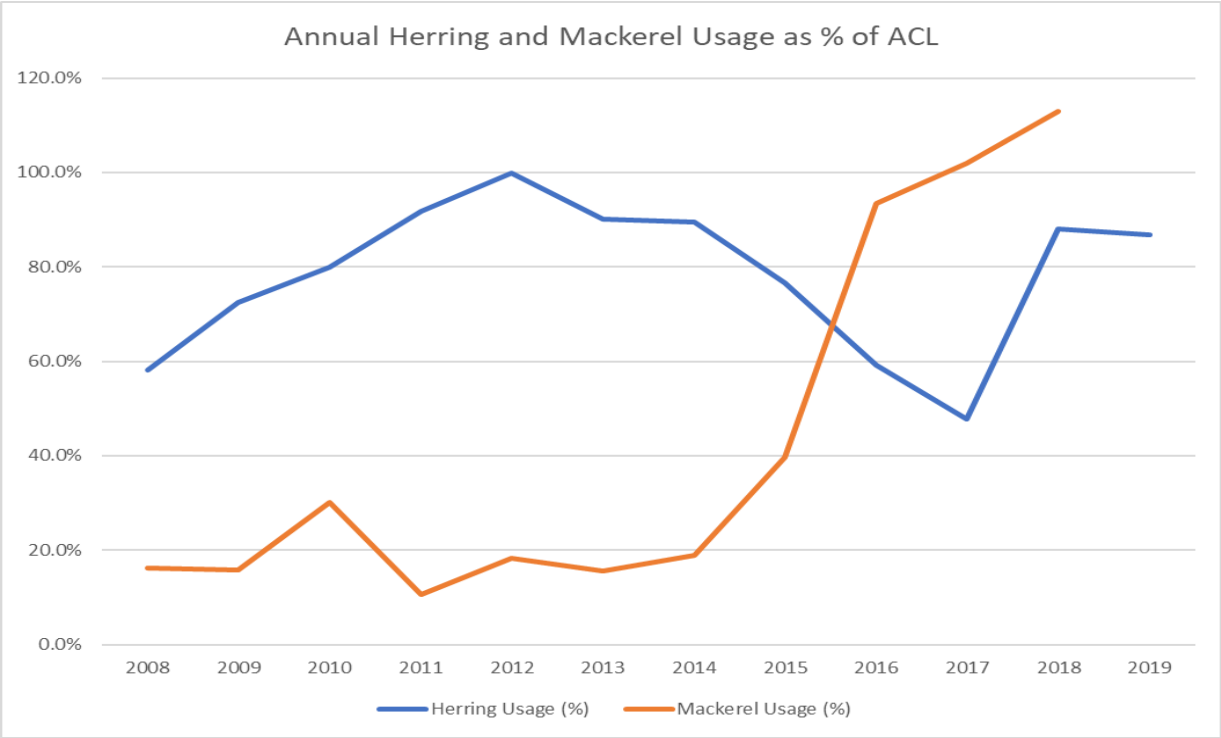


Figure 2. Herring (in blue) and Mackerel (in orange) catch as percent of ACL (2008-2019)



1.1.6.2 Modify the seasonal closure of Area 1B

Area 1B has been closed January through April for over five years since Framework 2 (2014). This action is considering two alternatives for this issue: No Action to maintain the current seasonal closure of Jan-April, and an alternative to eliminate the seasonal closure all together. Generally, when herring are in Area 1B there is a mixture of inshore and offshore fish moving. If the existing seasonal closure was removed and vessels could fish that area earlier in the year it is possible effort would shift. Atlantic herring are typically in that area in the winter and fishing used to take place in Area 1B during those months. The PDT has prepared monthly effort maps for herring and mackerel for years before the seasonal closure of Area 1B, as well as several years after (Appendix III).

It should be noted that the current seasonal closures was not put in place for herring resource or biological reasons, it was primarily an allocation issue. The primary rationale for the seasonal closure was to boost herring landings when the bait market needed it most, right before the summer lobster fishery. In addition, the Area 1B sub-ACL is relatively small, and overages were observed in several of the years before the area was closed Jan-April (Table 7). Delaying the fishery in 1B until May allowed more time for overage or carryover determinations. Another reason mentioned was to reduce impacts on river herring bycatch, which is generally higher in the winter months in this area.

Whether the area is open or closed during these months, there would still be a sub-ACL for the area that would control direct impacts on the herring resource; therefore, no direct biological impacts on the herring resource are expected from these alternatives since the TAC is what controls mortality. Furthermore, Area 1B is not an important area for spawning, so timing of fishing activity is not a factor in terms of potential impacts on spawning activity.

1.2 Impacts on Non-target Species (Bycatch)

Non-target species refers to species other than Atlantic herring which are caught/landed by federally permitted vessels while fishing for herring. Most catch by herring vessels on directed trips is Atlantic herring, with extremely low percentages of bycatch (discards). Atlantic mackerel is targeted in combination with Atlantic herring during part of the year in the southern New England and Mid-Atlantic areas and is therefore not considered a non-target species. The primary non-target species in the directed Atlantic herring fishery are groundfish (particularly haddock) and the river herring/shad (RH/S) species. There are accountability measures in place for both haddock and river herring/shad if area and gear specific catch cap is exceeded. Dogfish, squid, butterfish and Atlantic mackerel are also common species encountered in the directed Atlantic herring fishery. However, in some cases (especially Atlantic mackerel), while herring is often the target species, mackerel is also landed and some trips are quite mixed in terms of mackerel and herring landings. Therefore, Atlantic mackerel is not considered a non-target species since there can be substantial landings of that species for various segments of the fishery during certain seasons and in certain areas, Section **Error! Reference source not found.** has more information about non-target species in the herring fishery.

Different gear types and seasonal fishing activity have different potential impacts on non-target species. This section focuses on the biological impacts on species caught incidentally in the herring fishery; these analyses are largely qualitative and based on whether alternatives under consideration are expected to shift effort to areas that may have increased interactions or change gear types that can have differential impacts on bycatch rates.

See separate document – not ready for mailing

1.3 IMPACTS ON PROTECTED RESOURCES

Protected species are those afforded protections under the Endangered Species Act (ESA; species listed as threatened or endangered under the ESA) and/or the Marine Mammal Protection Act (MMPA). Section **Error! Reference source not found.** lists protected species that occur in the affected environment of the Atlantic herring FMP and the potential for the fishery to impact the species, specifically via interactions with fishing gear predominantly used in the Atlantic herring fishery (i.e. midwater trawl and purse seine gear). Some species of seabirds are protected under the ESA, and others are not but are predator species of Atlantic herring. The protected species potentially affected by this action are sea turtles, small cetaceans, pinnipeds, Atlantic sturgeon, and some species of seabirds.

The most predominant gear types used in the herring fishery are purse seines and midwater trawls. To evaluate the impacts on protected species and seabirds, it is important to note that most landings is by the midwater trawl fishery, but most activity in terms of trips and permits is to purse seine vessels. Section **Error! Reference source not found.** characterizes the fishing days, number of trips, and pounds landed by area and gear type. Although herring fishing is a year-round activity, takes of protected species and seabirds are more likely to occur in specific seasons, not throughout the year. In addition to the potential impacts from incidental takes, this section also assesses the potential impacts on protected species and seabirds in terms of forage impacts. Some protected species and seabirds in this region prey on Atlantic herring.

NMFS, relatively recently, concluded that the Atlantic Herring FMP will not adversely affect or jeopardize the continued existence of any ESA listed species of cetacean, sea turtle, or fish (NMFS 2014). With respect to this action, there will not be major changes in the amount or areas that herring vessels fish from most of the alternatives under consideration. The alternatives under consideration that may impact herring fishing patterns directly are identified, and potential impacts are described. Discussions regarding potential interactions with protected species and seabirds as well as impacts on prey availability are largely qualitative. The alternatives under consideration are evaluated below in terms of whether they are expected to greatly change the availability of herring as prey, as well as whether they will change fishing effort in time and space, such that, relative to current operating conditions, interaction risks to protected species change.

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1.4 IMPACTS ON PHYSICAL ENVIRONMENT

Since 1996, the MSA has included a requirement to evaluate the potential adverse effects of fisheries, including the Atlantic herring fishery, on the essential fish habitat (EFH) of Atlantic herring and other species. A general description of the physical environment and EFH is in the Affected Environment (Section 6.4). The EFH regulations specify that measures to minimize impacts should be enacted when adverse effects that are “more than minimal” and “not temporary in nature” are anticipated.

The magnitude of adverse effects resulting from fishing operations is generally related to (1) the location of fishing effort, because habitat vulnerability is spatially heterogeneous, and (2) the amount of fishing effort, specifically the amount of seabed area swept or bottom time. To the extent that adoption of a management alternative would shift fishing to more vulnerable habitats, and/or increase seabed area swept, adoption would be expected to cause an increase in habitat impacts as compared to no action. If adoption of an alternative is expected to reduce seabed area swept or cause fishing effort to shift away from more vulnerable into less vulnerable habitats, a decrease in habitat impacts would be expected. The magnitude of an increase or decrease in adverse effects relates to the proportion of total fishing effort affected by an alternative.

Bearing in mind that both the direction and magnitude of changes are difficult to predict, because changes in fishing behavior in response to management actions can be difficult to predict, potential shifts in adverse

effects are described for each alternative under consideration. However, changes in the magnitude of fishing effort resulting from individual measures should be viewed in the context of the overall impacts that the herring fishery is estimated to have on seabed habitats. Specifically, previous analyses (described below) have concluded that adverse effect to EFH that result from operation of the herring fishery do not exceed the more than minimal or temporary thresholds.

An assessment of the potential effects of the directed Atlantic herring commercial fishery on EFH for Atlantic herring and other federally managed species in the Northeastern U.S. was conducted as part of an EIS that evaluated impacts of the Atlantic herring fishery on EFH (NMFS 2005). This analysis was included in Appendix VI, Volume II of the FEIS for Amendment 1 to the Atlantic Herring FMP. It found that midwater trawls and purse seines do occasionally contact the seafloor and may adversely impact benthic habitats used by federally managed species, including EFH for Atlantic herring eggs. However, after reviewing all the available information, the conclusion was reached that if the quality of EFH is reduced due to this contact, the impacts are minimal and/or temporary and, pursuant to MSA, do not need to be minimized, i.e., that there was no need to take specific action at that time to minimize the adverse effects of the herring fishery on benthic EFH. This conclusion also applied to pelagic EFH for Atlantic herring larvae, juveniles, and adults, and to pelagic EFH for any other federally managed species in the region.

Atlantic herring vessels primarily use purse seines, single midwater trawls or midwater pair trawls, and bottom trawls to direct on herring, with the MWT fleet harvesting most landings since 2008. Bottom trawls are the only gear in this fishery that has adverse impacts on EFH, and those vessels have only represented about 5% of total herring landings since 2008 and are primarily concentrated in SNE (See Table ??? for more details). There are also smaller scale operations that land herring with bottom trawls under a Category C permit, mostly in the GOM.

1.4.1 OFL/ABC Alternatives

This action is considering two alternatives for the OFL/ABC specifications: No Action, which is 2020 values rolling over for 2021-2023 (Alternative 1), and Alternative 2, which is setting OFL and ABC using the ABC control rule approved in Amendment 8. The OFL and ABC values associated with either alternative, but particularly Alternative 2, are quite low relative to those set prior to Framework 6, which set specifications for fishing years 2019, 2020, and 2021. Thus, effort in the herring fishery will remain similar to (Alternative 1) or be less than (Alternative 2) effort in recent years, resulting in lower impacts to habitat.

The EFH impacts assessment described in the introductory section above found that the impacts of the fishery on EFH are minimal and/or temporary and, pursuant to MSA, do not need to be minimized. While in general herring fishing gear has the potential to occasionally contact the seafloor and have negative impacts on EFH (bottom trawl gear in particular), as noted above, bottom trawl gear use is very limited. Furthermore, this action considers alternatives with the same (Alternative 1) or lower (Alternative 2) catch levels than those presently in effect, so any potential impacts would be at or below status quo levels; therefore, *neutral* impacts on the physical environment and EFH are expected relative to No Action alternative. With either of the Framework 8 OFL/ABC alternatives in place, the impacts of the herring fishery on EFH are expected to be at worst low negative, not exceeding minimal and temporary thresholds.

The gears used to prosecute the herring fishery and the general locations fished have not changed since the 2005 assessment was completed, nor has our understanding of how herring fishing gear might interact with seafloor habitats. We continue to assume that midwater herring gear does not have substantial contact with the seafloor while fishing. Furthermore, the specifications evaluated in Framework 8 will result in similar (Alternative 1) or a smaller magnitude of effort (Alternative 2) compared to previous years, which further reduces the likelihood of adverse effects resulting from the fishery. Gear switching could occur under the localized depletion midwater trawl closures recommended in Amendment 8 to the fishery management plan, altering the magnitude of the fishery's impacts to EFH, but it is not certain that this would occur.

There are small, but likely negligible differences between the OFL/ABC alternatives with respect to potential impacts on EFH since ABC values differ by less than 10,000 mt (Alternative 1 ABC for 2021 is 16,131 mt,

and Alternative 2 2021 ABC is 9,483 mt). Despite possible variations in fishing effort between the OFL/ABC alternatives, given the minimal and temporary nature of adverse effects on EFH in the Atlantic herring fishery, these alternatives are expected to have neutral impacts relative to one another on the physical environment and EFH.

There are several specifications in this action that will remain at status quo levels, many of which stem directly from the ACL or are based on applying status quo methods used in previous specification, specifically DAH, DAP, USAP, sub-ACL allocations by herring management area, seasonal sub-ACL allocations, RSA, FGSA, and RH/S catch caps. Overall, these measures are primarily administrative and are not expected to have any measurable impacts on EFH. Overall, the potential impacts of these specifications have been analyzed in previous specification packages and no additional impacts are expected. Given this, these measures are expected to result in no direct or indirect impact on EFH.

1.4.2 Management Uncertainty Buffer Alternatives

The alternatives under consideration for management uncertainty in this specification package are 4,560 mt (No Action), 6,244 mt (Option 1, 3-year average). This buffer reduces the risk of exceeding the ABC from sources of uncertainty within the management plan (i.e., uncertain New Brunswick weir or state waters catch).

These alternatives are all similar to one another, with No Action resulting in the largest fishery ACL, and thus the greatest potential for effort in the fishery, Option 1 leading to a lower ACL, and Options 2 and 3 intermediate, very similar to each other and No Action. For reasons described in the previous section, none of these alternatives are expected to have impacts to EFH.

1.4.3 Border Transfer Alternatives

This action is considering two options for border transfer allocation, either 100 mt (No Action), or a range of 0-250 mt (Alternative 2). Border transfer is fish allowed to be harvested by U.S. vessels and transferred to Canadian vessels at sea to be used for human consumption (cannery fish). These values are very small relative to the overall ACL for the fishery. Whether catch is transferred at sea or landed domestically has no bearing on the fishery's effects on EFH. Therefore, these alternatives have no impacts to EFH, positive or negative.

1.4.4 Research Set-Aside

This action includes two alternatives for allocation of an RSA: 1) No Action that would set-aside 3% of each sub-ACL for FY2021-2023; and Alternative 2) a 3% set-aside for FY2021 and 0% for FY2022 and 2023.

Whether herring are set aside as RSA allocations, or kept as part of the sub-ACL, they can still be harvested. Thus, setting aside herring for RSA or not doesn't necessarily change effort in the fishery, and therefore the effects of the fishery on habitat. While there is some uncertainty as to whether RSA set aside would be harvested, there is also uncertainty as to whether the regular sub-ACLs will be harvested. In general, the effects of the fishery on EFH are minimal, and at 3% the RSA allocations are only a small proportion of the annual quotas. Considering these factors, both RSA alternatives are expected to have negligible impacts to habitat.

1.4.5 Carryover Provisions

This action is considering three alternatives for carryover of unharvested herring catch from one fishing year to a future fishing year. No Action (Alternative 1) is an automatic rollover of up to 10% of each sub-ACL, Alternative 2 would prohibit any rollover of unused sub-ACL from FY2019 or 2020 to FY 2021 and 2022, respectively, although carryover from 2021 to 2023 would be allowed, unless modified by a future action.

Finally, Alternative 3 would allow up to 5% of each sub-ACL to rollover from 2019 and/or 2020 to 2021 and/or 2022, respectively.

The carryover provisions in the FMP allow for up to 10% of unused quota to be rolled over to a subsequent fishing year (year 1 quota is rolled into year 3, by the time catch accounting is completed). This potentially allows for some additional effort during the period covered by these specifications. Given the 2019 sub-ACLs and 2019 catches, 10% carryover this could lead to around 1,100 mt of rollover quota to be fished in 2021, about half in Area 1A and half in Area 3. Alternative 1 would allow for this rollover, while Alternative 2 would prohibit rollover from 2019 to 2021 and from 2020 to 2022. Alternative 3 would allow for half the rollover amount, or less, compared to Alternative 1 (5% or less vs. 10%). There are small, likely negligible differences between No Action, Alternative 2, and Alternative 3 in terms of impacts to EFH, given the overall impacts of the fishery to habitat and the size of the carryover. Alternative 1 which allows carryover as normal and would increase the sub-ACLs during 2021 would have at most slight negative effects on EFH relative to Alternatives 2 and 3.

1.4.6 Measures that potentially inhibit mackerel fishery from achieving OY

These measures are intended to increase the ability to prosecute the mackerel fishery, which is subject to incidental herring possession limits as well as seasonal closures in Area 1B.

1.4.6.1 Increase the herring incidental possession limit

This action is considering five alternatives for this section. Option A is no action, which is a 2000 pound limit that applies to all areas at 92% of the sub-ACL or 95% of the total ACL. Options B and C are for Areas 1B, 2 and 3, Option D is for Area 2 only, and Option E would apply to both Areas 2 and 3 if selected. More than one option can be selected in this section meaning different incidental herring possession limits could be adopted for different areas. None of the options except no action include Area 1A, where the herring incidental catch limits for that area would remain as is, i.e. 2,000 pounds when 92% of the sub-ACL is estimated to be caught, or at 95% of the total herring ACL. See Table ??? for a summary of the options under consideration.

Options B-E would increase incidental possession limits for herring, which could in turn allow for additional fishing effort for mackerel. Mackerel are caught mostly in Area 2, using a combination of mid-water trawls and bottom trawls. While mid-water trawls have minimal and temporary effects on EFH, as previously discussed, bottom trawls can have adverse effects on EFH. Thus, increased effort using bottom trawls would lead to increased impacts on habitat. In this context, the magnitude of habitat impacts associated with the mackerel fishery will be limited by both the overall mackerel catch limits, and by the herring ACLs which trigger the lower incidental limits as they are approached. In other words, while increased impacts are likely under Options B-D relative to Option A, the magnitude of such an increase is constrained. The magnitude will depend on the relative proportion of effort with mid-water vs. bottom trawls.

The habitat impacts of No Action (Option A) would likely be low positive. The 2,000 lb incidental herring possession limit would remain, which is too small for taking trips that target mackerel, such that there would be no additional impacts to EFH associated with mackerel fishing.

The habitat impacts of Option B would likely be low negative compared to Option A. It would allow a few trips to direct on mackerel during the Step 1 incidental possession limit. The habitat impacts of Option C would also likely be low negative, but less negative that Option B because the incidental limit would be only 5,000-20,000 vs. 40,000 lb. Similarly, the habitat impacts of Option D would likely be low negative, but less negative than either Option B or Option C because it would only apply to Area 2. It may allow a few trips in Area 2 to direct on mackerel during the Step 1 incidental possession limit. A 5,000 lb limit in Step 2 would be of little benefit to the mackerel fishery. Finally, the habitat impacts of Option E would likely be low negative, less negative than Options B and C, and more negative than Option D because it would apply to

Areas 2 and 3. It may allow a few trips in Areas 2 and 3 to direct on mackerel during the Step 1 incidental possession limit. A 5,000 lb limit in Step 2 would be of little benefit to the mackerel fishery.

1.4.6.2 Modify the seasonal closure of Area 1B

Area 1B has been closed January through April for over five years since Framework 2 (2014). This action is considering two alternatives for this issue: No Action to maintain the current seasonal closure of Jan-April, and Alternative 2, which would eliminate the seasonal closure all together. Given prior fishery use of the area, both herring and mackerel effort would likely shift into 1B if the seasonal closure is lifted. However, the Area 1B quota is very small relative to other herring management areas, so any effort shifts are likely to be minimal. Given this assumption, combined with the effects of the herring and mackerel fisheries on EFH in general, impacts to habitat from Alternative 2 are expected to be neutral.

1.5 Impacts on Human Communities

The analysis of impacts on human communities characterizes the magnitude and extent of the economic and social impacts likely to result from the alternatives considered, individually and in relation to each other. Management regulations influence the direction and magnitude of economic and social change, but attribution is difficult, because communities are constantly evolving in response to many external factors (e.g., market conditions, technology, alternate uses of waterfront) that contribute to community vulnerability and adaptability to changing regulations.

Economic impacts. The economic effects of regulations can be categorized by changes in costs (including transactions costs such as search, information, bargaining, and enforcement costs) or revenues (by changing market prices or by changing the quantities supplied). These economic effects may be felt by the directly regulated entities and related industries. For the herring fishery, this would include participants in the mackerel and lobster fisheries.

Social impacts. The social effects of regulations relate to changes factors such as demographics, employment fishery dependence, safety, attitudes towards management, equity, cultural values, and the well-being of persons, families, and fishing communities (e.g., Burdge 1998; NMFS 2007).

It is important to consider impacts on the following: the fishing fleet (vessels grouped by fishery, primary gear type, and/or size); vessel owners and employees (captains and crew); dealers and processors; consumers; community cooperatives; fishing industry associations; cultural components of the community; and fishing families. While some management measures may have a short-term negative impact on some communities, this should be weighed against potential long-term benefits to all communities which can be derived from a sustainable fishery. Amendment 8 further describes approaches to the analysis of impacts on human communities.

General impacts of Atlantic herring fishery specifications on human communities

Human communities are impacted by Atlantic herring fishery specifications as they set harvest levels for the fishery. Lowering the Atlantic herring ABC (and associated catch limits) could result in short-term revenue reductions, which may, in turn, have negative impacts on employment and the size of the Atlantic herring fishery within fishing communities, with ripple effects on the communities involved in the Atlantic mackerel and American lobster fisheries. Likewise, increasing allowable harvests would likely have positive short-term impacts on fishing communities. In the long term, ensuring continued, sustainable harvest of the resource not only benefits the directed herring fishery and its communities, but indirect fisheries that rely on herring as prey in the ecosystem.

The specific communities that may be impacted by this action are identified in Section ??? (Alternatives & AE document). This includes 17 primary ports in the Atlantic herring fishery (e.g., Gloucester, Portland, New Bedford, Rockland; ???) within a list of about 140 key communities from Maine to New Jersey that are important to the Atlantic herring, Atlantic mackerel, American lobster, bluefin tuna, groundfish, and recreational fisheries, and to ecotourism (NEFMC 2018, Section 3.6.3.2.2). Many of these fisheries and

ecotourism coexist within a given port. The communities more involved in the Atlantic herring fishery are likely to experience more direct impacts of this action, though indirect impacts may be experienced across all the key communities. As these specifications largely affect stock-wide harvest levels, impacts would likely occur across the communities that participate in the Atlantic herring and other potentially affected fisheries, proportional to their degree of participation in the fisheries.

This analysis assumes that the directed Atlantic herring fishery will not get shut down by the RH/S catch caps (Section ???), the negative consequences of which are described in the 2016-2018 specifications document (NEFMC 2016, Section 7.5.2).

1.5.1 OFL/ABC Alternatives

Under No Action (Alternative 1), the 2020 Atlantic herring OFL and ABC values would be rolled over into 2021-2013. Atlantic herring ABC would be 16,131mt for 2021-2023, which is higher than the SSC recommendation. Under Alternative 2, Atlantic herring ABC would be set for 2021-2023 based on the ABC control rule that the Council recommended through Amendment 8 (9,483 mt in 2021, 8,767 in 2022-2023. ABC for 2022 and 2032 would be the same to account for the uncertainty in the projections, rather than the higher value that would be set using the control rule alone (11,025 mt).

Overall impacts. Both alternatives would continue the period of substantially reduced catch limits implemented in 2019, but the three-year specifications process would provide a degree of predictability for fishing industry operations. The social and economic impacts of Alternative 1 on herring fishery-related businesses and communities are likely negative. With no change in the ABC from what was already implemented in 2020, there would be a degree of constancy and predictability for fishing industry operations and a steady supply to the market. While it is possible that the size and demographic characteristics of the fishery-related workforce would remain unchanged, as would the dependence on and participation in the fishery – relative to the conditions currently expected for 2020.

The social and economic impacts of Alternative 2 on herring fishery-related businesses and communities are likely negative relative to Alternative 1. The ABC for 2021-2023 would be 55-59% lower relative to Alternative 1. Increasing the vast reductions implemented in 2019 for additional years would result in more negative economic consequences, including further reductions to the size of the herring fishing fleet/industry.

Short term. The predicted short-term revenue impact (Table 9) depends on the management uncertainty (MU) buffer selected (Section 1.5.2). The predicted revenue ranges from $20.17M (OFL/ABC Alternative 1, MU Option 1) down to $4.81M (OFL/ABC Alternative 2, MU Option 2). In the short term, both alternatives may prevent a viable herring fishery such that businesses may fail. Each business's dependence on herring as a percentage of total entity revenue varies. A decrease in ABC, under Alternative 2, may adversely affect permitted entities with larger percentages of annual revenue from herring.

Over the past three years (2017-2019), herring prices have averaged $567/metric ton in nominal USD ($581/mt in real 2019 USD[2]). In 2019, herring prices were $748/mt and landings were 13,000 mt. Deroba et al. (2019) contains a model of herring prices; it suggests that if landings were 4,923 mt in 2021, prices would be $694/mt. This is implausible; we therefore construct revenues and changes in revenues using the 2017-2019 average.

In the short term, the OFL/ABC Alternative 2 may cause firms to exit the herring industry (Table 9). Firms that depend heavily on herring are likely to cease fishing while firms that have a more diverse set of activities may be able to shift into those while catch limits are low. It is difficult to forecast the market price for herring; however, the ACLs implied by the OFL/ABC Alternative 2 are substantially lower than catch in 2019. Therefore, it is reasonable to expect higher prices.

[2] GDP Implicit Price Deflator https://fred.stlouisfed.org/series/GDPDEF extracted on August 17, 2020.

Table 9. Expected 3-year gross revenue, revenue change relative to the baseline, and percentage reduction from baseline.

Alternatives		Revenue ($M)	Relative to the Baseline (1,1)	Percentage Reduction from the Baseline (1,1)
OFL/ABC	MU			
1	1	$20.17	--	--
	2	$17.23	$-2.94	-14.6%
	3	$20.12	$-0.05	-0.2%
	4	$19.98	$-0.19	-0.9%
2	1	$7.75	$-12.42	-61.6%
	2	$4.81	$-15.35	-76.1%
	3	$7.70	$-12.47	-61.8%
	4	$7.56	$-12.61	-62.5%

Long term. In the long term, the impacts of both alternatives are likely *mixed*. Because the ABC (and ACL) would be substantially below the overfishing limit, they would likely result in greater herring biomass available for future years and contribute to rebounding of the stock. Alternative 1 has more long-term risk relative to Alternative 2, because the OFL and ABC would exceed the SSC recommendations. Just ten years ago, in 2010, the total ACL for herring was 143,350 mt and total catch was just under 104,000 mt. The 2021 ACLs proposed in this action range from 3,3239 to 11,571 mt. At the lower end, this represents a reduction of nearly 98%; even at the higher end, this is a reduction of nearly 92%. If businesses fail in the short term, they will receive no long-term benefit from these restrictions and the benefits would accrue to the businesses that remain viable. Note that the firms that get the benefits of higher stock levels and catch limits in the future are those that continue to operate. These are likely to be part of larger, diversified firms.

In 2014, catch caps were implemented for River herring and Shad that vary by gear and area. The RH/S catch caps were exceeded in 2015 (for SNE bottom trawl) and 2018 (for CC midwater trawl and SNE midwater trawl). RH/S catch caps were also exceeded in 2018 and 2019 in the closely related mackerel fishery. Amendment 8 enacted a control rule that explicitly considered the role of herring as forage in the ecosystem; for a given biomass of herring, use of the Amendment 8 control rule leads to lower catch limits than the previous control rule. The Industry Funded Monitoring Amendment, implemented in 2020, will require additional costs to be borne by the herring industry. These regulatory actions either reduce revenues or increase costs (either indirectly through costly averting behavior or directly). The past actions have combined to produce substantial negative impacts on fishing communities that are closely intertwined with the directed herring fishery. The reduced catch limits would likely increase stock levels and therefore catch limits in the future; they are also calibrated to produce benefits to portions of the marine economy that depend on herring indirectly.

Status Quo measures. There are several specifications in Framework 8 that would remain at status quo levels, many of which stem directly from the ACL or are based on applying status quo methods used in previous specifications (e.g., DAH, DAP, USAP, sub-ACL allocations by herring management area, seasonal sub-ACL allocations, RH/S catch caps). The formulas for many of these specifications would remain unchanged from 2019-2020 specifications. Thus, the impacts of these specifications are unlikely to differ from what was considered in prior actions. For example, the impacts of the FGSA on the herring fishery-related businesses and communities would likely be negligible. There is a historic fixed gear fishery in eastern Maine that would be allowed to continue, albeit at a reduced level.

1.5.2 Management Uncertainty Buffer Alternatives

The range of alternatives under consideration for management uncertainty in this specification package is between 4,560 mt (No Action) to 6,244 mt (Option 1). This buffer reduces the risk of exceeding the ABC from sources of uncertainty within the management plan (i.e., uncertain NB weir or state water catch). There is no overage deduction in future years for U.S. vessels if the Canadian harvest exceeds the management uncertainty buffer. However, exceeding the ABC may have negative biological impacts, which may lead to negative social and economic impacts in the future if lower catch limits are required to ensure sustainable harvests.

Since the New Brunswick weir fishery caught about 5,054 mt in 2019 alone (Table 31 in Alternatives and AE document), there is a chance that each alternative may result in exceeding the ABC, which would have long-term negative consequences for the U.S. fishery if lower catch levels are necessary in the future. The NB weir catch is very variable with no apparent trends; thus, impacts are somewhat uncertain.

No Action/Option 1. The social and economic impacts of No Action on herring fishery-related businesses and communities would likely be uncertain (catches from state and Canadian weir fishery vary) but generally low positive because this this buffer would help prevent the fishery from exceeding the ABC.

Option 2. The social and economic impacts of Option 2 on herring fishery-related businesses and communities would likely be uncertain but potentially low positive, as above. Impacts would be low negative relative to No Action, as 1,684 mt less herring would be available to the U.S. fishery (lower ACL). Impacts would be slightly low negative relative to Options 3 and 4.

Option 3. The social and economic impacts of Option 3 on herring fishery-related businesses and communities would likely be uncertain but potentially low positive, as above. Impacts would be essentially negligible relative to No Action, as just 27 mt less herring would be available to the U.S. fishery (a slightly lower ACL). Impacts would be slightly low positive relative to Options 2 and 4.

Option 4. The social and economic impacts of Option 4 on herring fishery-related businesses and communities would likely be uncertain but potentially low positive, as above. Impacts would be slightly low negative relative to No Action, as 109 less herring would be available to the fishery (a slightly lower ACL). Impacts would be slightly low negative relative to Option 2 and slightly low positive relative to Option 3.

1.5.3 Border Transfer Alternatives

This action is considering a range of 100 mt (No Action) to a range of 0 mt to up to 250 mt (Alternative 2) for border transfer (BT), fish allowed to be harvested by U.S. vessels and transferred to Canadian vessels at sea. If permitted, vessels would be subject to additional reporting requirements for border transfer and the herring could only be used for human consumption (processed in Canadian canneries).

The impacts on the Atlantic herring fishery of setting BT at 0 mt would likely be negligible to low negative. Border transfer amounts are relatively small, and Alternative 2 would likely have minimal impacts on fishing communities. Setting BT at a value above 0, possible under No Action or Alternative 2, would have low positive impacts. Given that the ABCs for 2021-2023 will be much lower than in recent years (prior to 2019), the demand for the use of herring as bait will likely be high. It is expected that the revenue to herring vessels for selling herring as bait would be higher than if the catch was transferred to Canadian vessels and ultimately sold for human consumption. Thus, it is likely that even if border transfer is set at 250 mt, it would not be used due to economics. However, there are close and long-standing trading partnerships between U.S. and Canadian fisheries, importing or exporting bait for lobster fisheries as supply and demand necessitate. If border transfer is set at 0 mt, business relationships with Canadian partners may sour if Canadians perceived this as an effort to tamp down on trade.

Herring vessels based in Maine have traditionally been most involved in border transfer activity, so the ports therein would likely benefit the most from any transfer activity. However, should trade relations with Canada

deteriorate, negative impacts may be felt by ports throughout the herring fishery (export declines) as well as by the lobster fishery (bait import declines).

Impacts on the U.S. American lobster fishery would likely be negligible under No Action and Alternative 2. If border transfer is set at 0 mt, herring could still be sold to Canadian buyers via terrestrial shipment (i.e., on trucks), however, even if some amount of at-sea border transfer was allowed, it is most likely that it would not be used due to the high demand for bait in the U.S. lobster fishery.

1.5.4 Research Set-Aside

This action includes two alternatives for allocation of an RSA: 1) No Action that would set-aside 3% of each sub-ACL for FY 2021-2023; and 2) a 3% set-aside for FY 2021 and 0% for FY 2022 and 2023.

The social and economic impacts of Alternative 1 on herring fishery-related businesses and communities are likely low negative. The RSA program can have long-term positive impacts on the fishery by providing useful and important information about the herring resource and monitoring of this fishery that can improve the management of the herring resource. With low sub-ACLs in recent past, RSA has not been fully utilized; this represents a cost to the directed fishery. However, given the currently low quotas, a 3% RSA allocation would provide very little allocation to fund research. The social and economic impacts of Alternative 2 on herring fishery-related businesses and communities are likely more positive than Alternative 1, by increasing the amount of quota available to the directed herring fishery in those years. There would be negative impacts on researchers examining some of the long-run concerns in the herring fishery because this research would not be accomplished. The opportunity costs of this foregone research are highly variable and difficult to quantify.

1.5.5 Carryover Provisions

This action includes three alternatives for carryover of unharvested herring catch from one fishing year to a future fishing year. No Action (Alternative 1) is an automatic rollover of up to 10% of each sub-ACL. Alternative 2 would prohibit any rollover of unused sub-ACL from FY 2019 or 2020 to FY 2021 and 2022, respectively. Alternative 3 would allow up to 5% of each sub-ACL to rollover from 2019 and/or 2020 to 2021 and/or 2022, respectively.

The social and economic impacts of Alternative 1 on herring fishery-related businesses and communities would likely be low positive, as the fishery could benefit from harvesting a portion of unused catch in a future year. The impacts of Alternative 2 would likely be low negative relative to Alternative 1, as the fishery would not be able to harvest unused catch in a future year. The industry may feel more pressure to "use or lose" the available catch within a given year, which could result in a race to fish towards the end of the year or catch overages. The impacts of Alternative 3 would likely be low negative relative to Alternative 1 but low positive relative to Alternative 2, as some carryover would be allowed, but a smaller portion than under Alternative 1.

1.5.6 Measures that potentially inhibit mackerel fishery from achieving OY

1.5.6.1 Increase the herring incidental possession limit

This action includes five alternatives regarding the herring incidental possession limit. Options A (No Action), B and C are for Areas 1B, 2 and 3, Option D is for Area 2 only, and Option E would apply to both Areas 2 and 3. More than one option can be selected in this section, so different incidental herring possession limits could be adopted for different areas. None of the alternatives under consideration include Area 1A; the herring incidental catch limits for that area would remain at 2,000 lb when 92% of the sub-ACL is estimated to be caught, or 95% of the total herring ACL.

Overall, it is very difficult to evaluate the potential economic impacts of these measures quantitatively because vessels participate in the herring fishery at different levels; some direct more heavily on herring, while others focus on other species and only direct on herring under certain conditions. The Herring PDT prepared several supporting tables and figures to summarize fishing activity (primarily 2016-2019 data) by species, gear type and year, located in the Affected Environment, this section and Appendix III. However, the comparison of options is primarily qualitative since the impacts will be different across the fishery and it is relatively uncertain how vessels will operate under the various scenarios. The herring and mackerel fisheries are highly migratory, following the fish. It should not be assumed that certain trips (i.e., large, directed mackerel trips) can and will occur in certain areas and times after a herring possession limit is reached; the fish may no longer be in the area. Also, due to the recent, dramatic drop in ACLs, past years should be used with caution to evaluate potential future behavior.

Within the herring fishery, vessels participate in the mackerel fishery differently depending on gear type (Figure 3, Figure 4). To help characterize the fishing activity that could be impacted by these measures, herring and mackerel landings have been summarized for trips that landed at least one pound of mackerel by gear type and year. For midwater trawl trips that landed at least one pound of mackerel, herring made up 52-73% of total landings on those trips in recent years (Table 11???). For small-mesh bottom trawl trips that landed at least one pound of mackerel, herring was only 6-19% of total landings from trips that landed at least one pound of mackerel (Table 12). It is generally more difficult for the midwater trawl fishery to target just herring or just mackerel compared to SMBT. In addition, the average landings of herring and mackerel per trip are much higher for MWT vessels compared to SMBT vessels. Therefore, it can be even more challenging for MWT vessels to target mackerel under very low herring possession limits. As purse seine vessels, the other major gear type that catches herring, largely operate in just Area 1A, an area not impacted by these options, potential impacts on purse seine vessels are not discussed here.

Option A. The social and economic impacts of No Action (Option A) on fishery-related businesses and communities would likely be low negative. The 2,000 lb incidental herring possession limit would remain. Under a hypothetical ACL of 4,373 mt (alternatives range from 3,239-4,923 mt (Table 5 in Alternatives), there would theoretically be 385 trips (all areas) left to catch herring at a 2,000 lb incidental limit after 92% of the sub-ACLs are reached (Appendix III, Table 9). However, in 2016-2020, trips landing herring rarely land under 40,000 lb, except for in Area 2 and trips landing under 2,000 lb of herring generally had under $20,000 total trip revenue (Appendix III, Figure 3). A 2,000 lb incidental herring limit is likely too small for taking trips that target mackerel, but potentially more so for SMBT vessels, which have averaged under 2,000 lb per trip in 2017-2019 (Table 12). In 2016-2019, most trips landing both over 100,000 lb and 20,000 lb of mackerel landed over 40,000 lb herring (Appendix III, Figures 6 and 7). Negative impacts would be more felt by those vessels that would otherwise be able to target mackerel.

Option B. The social and economic impacts of Option B on fishery-related businesses and communities would likely be more positive than Option A. Having a two-step incidental limit would be like the mackerel regulations, bringing more consistency to two sets of regulations that govern largely the same vessels. This would help simplify regulations and fishing operations, with positive social effects. Option 2 would allow a few trips to direct on mackerel and other species during the Step 1 incidental possession limit of 40,000 lb, an amount that would likely allow for fishing for other species, especially in Area 2 (Figure 5). Under a hypothetical ACL of 4,373 mt (alternatives range from 3,239-4,923 mt (Table 5 in Alternatives), there would theoretically be 13 trips left to catch herring at a 40,000 lb incidental limit after 92% of the sub-ACLs are reached in Areas 1B, 2 and 3 (Table 10; Appendix III, Table 9). These trips would likely be precluded under Option A.

Option C. The social and economic impacts of Option C on fishery-related businesses and communities would likely be more positive than Option A but less positive than Option B. Having a two-step incidental limit would be like the mackerel regulations, bringing more consistency to two sets of regulations that govern largely the same vessels. This would help simplify regulations and fishing operations, with positive social effects. Option C may allow a few trips to direct on mackerel and other species during the Step 1 incidental possession limit, though these trips would be more difficult than under Options B due to the lower

limit value. Under a hypothetical ACL of 4,373 mt (alternatives range from 3,239-4,923 mt (Table 5 in Alternatives), there would theoretically be 137-34 trips left to catch herring at a 5,000-20,000 lb incidental limit after 90% of the sub-ACLs are reached in Areas 1B, 2 and 3 (Table 10; Appendix III, Table 8). These trips would likely be precluded under Option A. However, a 5,000 lb incidental herring limit is likely too small for taking trips that target mackerel, and even 20,000 would be difficult for most MWT vessels. Since most SMBT trips in recent years with over 20,000 lb of mackerel landings had under 40,000 lb of herring, and SBMT average herring landings per trip in 2012-2019 were 5,116 lb (Table 12), Option C may be more feasible for the SMBT vessels (Figure 1).

Option D. The social and economic impacts of Option D on fishery-related businesses and communities would likely be more positive than Option A, less positive than Options B and C because it would only increase the incidental limit in Area 2. Having a two-step incidental limit would be like the mackerel regulations, bringing more consistency to two sets of regulations that govern largely the same vessels. Overall, Option D is most consistent with the mackerel plan, because it uses the same triggers and possession limits, and this has some positive social impacts on the fishery by reducing management complexity compared to some of the other options under consideration. Option D may allow additional trips in Area 2 to direct on mackerel and other species during the Step 1 incidental possession limit (40,000). Under a hypothetical ACL of 4,373 mt (alternatives range from 3,239-4,923 mt (Table 5 in Alternatives), there would theoretically be seven trips left to catch herring at a 40,000 lb incidental limit after 90% of the sub-ACLs are reached in Area 2 (Table 10; Appendix III, Table 8). These trips would likely be precluded under Option A. A 5,000 lb limit in Step 2 would be of little benefit to the mackerel fishery. This option closes the directed herring fishery sooner than some of the options, at 90% of the sub-ACL of Area 2; therefore, more trips that direct on other species could potentially occur than under higher triggers of 92%.

Option E. The social and economic impacts of Option E on fishery-related businesses and communities would likely be more positive than Option A, less positive than Options B and C, and more positive than Option D because it would apply to Areas 2 and 3. It may allow additional trips in Areas 2 and 3 to direct on mackerel during the Step 1 incidental possession limit. Having a two-step incidental limit would be like the mackerel regulations, bringing more consistency to two sets of regulations that govern largely the same vessels. This would help simplify regulations and fishing operations, with positive social effects. Option E may allow additional trips in Areas 2 and 3 to direct on mackerel and other species during the Step 1 incidental possession limit of 40,000, an amount that would likely allow for fishing for other species, especially in Area 2 (Figure 5). Under a hypothetical ACL of 4,373 mt (alternatives range from 3,239-4,923 mt (Table 5 in Alternatives), there would theoretically be 24 trips left to catch herring at a 40,000 lb incidental limit after 85% of the sub-ACLs are reached in Areas 2 and 3 (Table 10; Appendix III, Table 7). These trips would likely be precluded under Option A. A 5,000 lb limit in Step 2 would be of little benefit to the mackerel fishery. Option E closes the directed herring fishery sooner than all the other options under consideration, at 85% of the sub-ACL of Area 2 and Area 3; therefore, more trips that direct on other species could potentially occur than under higher triggers of 90% or 92%.

Combined Options. If Option D is combined with Option B or C (Area 2 would have the Option D approach and Areas 1B and 3 would have the Option B or C approach), there would be additional positive benefits to vessels that target other species, because there would be more flexibility to use herring while targeting other species in more areas. However, if this option is combined with other options such as Option B or C, the overall complexity across the fishery would increase, and that could have some negative social impacts in terms of compliance with complex fisheries management programs.

If Option E is combined with Option B or C (Areas 2 and 3 would have the Option d approach and Area 1B would have the Option B or C approach), there would be additional positive benefits to vessels that target other species because there would be more flexibility to use herring while targeting other species in more areas. However, closing the directed herring fishery at 85% of a sub-ACL can have negative economic impacts as well. There could be foregone revenue to the herring fishery if the remaining 15% of the sub-ACL is not used to target other fisheries successfully. This is also the case under the other alternatives, but to a lesser degree.

It should be noted that there is a carryover provision in this fishery; up to 10% of each sub-ACL can be carried forward. Therefore, the options that close the directed fishery at 92% or 90% have less risk of leaving allocated herring unharvested, that this option that closes the directed herring fishery at 85% of the sub-ACL for Areas 2 and 3. While it is assumed that additional herring would be landed after step 1 while vessels target other species, that is not a guarantee. Mackerel are particularly migratory and may not remain in a certain area for very long.

If Option E is combined with other options, such as Option B or C, the overall complexity across the fishery would increase, and that could have some negative social impacts in terms of compliance with overly complex fisheries management programs. Considering all these factors, the overall social and economic impacts of this measure likely range from low positive to low negative.

The PDT evaluated the potential number of trips available in an area after the closure of directed herring fishing under different herring incidental trip limits and closure targets of 75%, 80%, 85%, 90%, and 92% (individual tables available in Appendix II). Table 10 summarizes the same information for closure targets and possession limits under consideration in this action under both high herring quota scenarios (using 2017 as an example) and low herring quotas (2021 values). It is important to remember that these estimates assume each area would be accurately closed at the specified closure target.

Under low quota scenarios, having a two-step in-season possession limit for herring will be very challenging, since the difference in total quota between the closure targets is relatively small. In practice, the closure notices would likely be very close together, or NMFS may need to go straight to step 2 if catch is projected to be landed quickly. A two-step process may work better for Areas 2 and 3 under low quota situations, but even then, notices may be very close together if multiple vessels are fishing in the same management area. If herring quotas return to more typical levels (e.g., 2017 quotas), many options are more practical.

Table 10 – Estimated remaining trips for different herring possession limit options by area under both lower herring quotas (2021) compared to higher herring quotas (2017)

Closure Target	Area	5,000	20,000	40,000
85%	2017 (HIGH)			
	1B	319	80	40
	2	2,065	516	258
	3	2,902	725	363
	2021 (LOW)			
	1B	12	3	2
	2	80	20	10
	3	113	28	14
90%	2017 (HIGH)			
	1B	213	53	27
	2	1,377	344	172
	3	1,934	484	242
	2021 (LOW)			
	1B	8	2	1
	2	54	13	7
	3	75	19	9
92%	2017 (HIGH)			
	1B	170	43	21
	2	1,101	275	138
	3	1,548	387	193
	2021 (LOW)			
	1B	7	2	1
	2	43	11	5
	3	60	15	7

Background Information

Herring and mackerel are often caught together, and many trips that land herring also land mackerel. This is true for both MWT and SMBT vessels, and purse seines for the most part do not participate in mackerel fishing. The overall scale and size of the MWT and SMBT fisheries are quite different, and at times the seasonal and spatial fishing patterns are different as well. Overall, about a dozen MWT vessels are active in these fisheries and the average percent of herring per trip has varied over time but is generally greater than 50%. About half of MWT herring trips had over 90% herring, and only a small fraction, about 10%, had over 90% mackerel landings. Many trips had more mixed trips of herring and mackerel (Table 11???).

In comparison, there are well over 100 SMBT vessels that are active in these fisheries that take over 1,500 trips per year in 2017-2019. However, much fewer SMBT trips land herring (Table 12). Closer to 10% of all SMBT trips land herring per year, compared to almost all MWT trips. Even fewer SMBT trips have trip landings greater than 90% herring (under 5% in 2018 and 2019), but for most years about 90% of SMBT trips that landed any mackerel were dominated by mackerel (trips landings with ≥90% mackerel).

These differences in fishing behavior for these gear types is further illustrated in Figure 3, the proportion of herring landed on each trip when mackerel is also landed. For MWT gears (top panel) the ratio of herring to mackerel landed is more diverse, some trips are primarily herring, some primarily mackerel, and many trips are quite mixed. On the other hand, SMBT trips are primarily mostly mackerel. There are some SMBT trips that seem to target herring, over 90% herring landed per trip, but much fewer compared to targeted mackerel trips.

Table 11 – Midwater trawl trips landing Atlantic mackerel, 2012-2019

Year	Permits	Trips	Trips landing herring	Trips landing ≥90% herring	Trips landing ≥90% Mackerel	Herring Live Pounds	Mackerel live Pounds	Avg. Herring Percent/Trip*	Avg. Herring Pounds/Trip	Avg. Mackerel Pounds/Trip
2012	12	41	36	15	11	9,145,718	5,877,851	52%	223,066	143,362
2013	16	58	57	33	6	13,853,901	8,118,382	74%	238,860	139,972
2014	11	55	52	15	12	18,979,555	11,790,823	54%	345,083	214,379
2015	11	67	59	29	19	15,811,332	8,445,115	57%	235,990	126,046
2016	12	91	85	41	23	20,629,936	9,550,446	65%	229,222	106,116
2017	13	83	77	23	9	19,443,277	12,530,608	58%	234,256	150,971
2018	10	62	51	17	14	11,051,743	14,022,232	54%	178,254	226,165
2019	10	38	35	8	7	7,523,581	8,265,476	53%	197,989	217,513

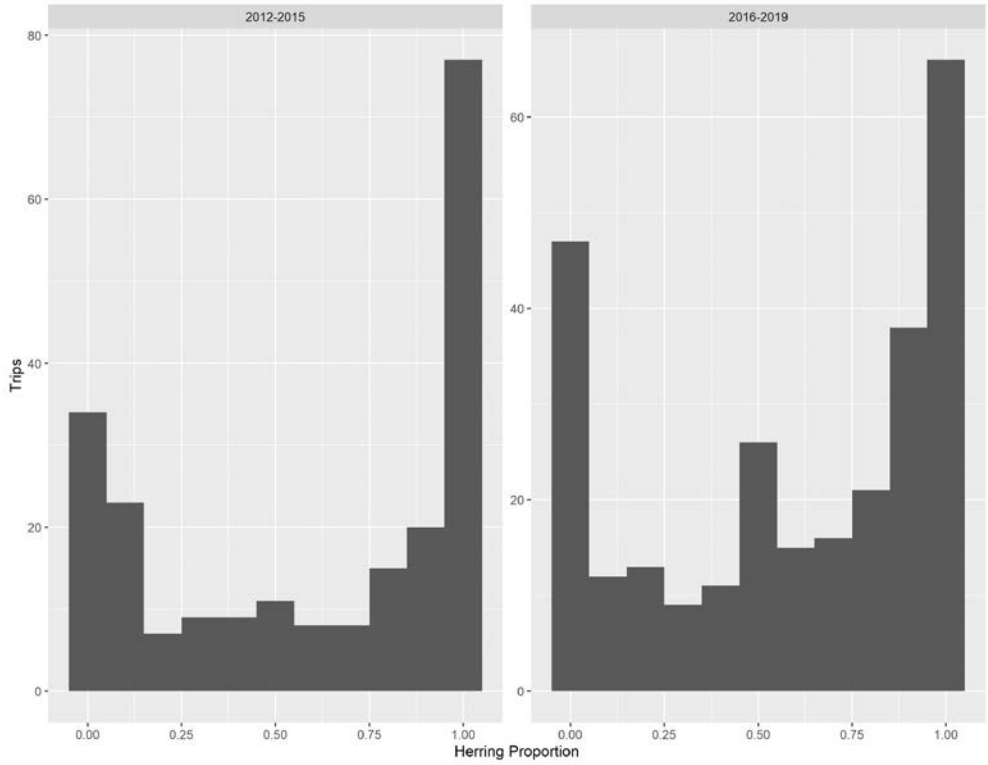
Source: GARFO DMIS Database as of May 6, 2020.
Note: Includes all midwater trips landing >0 pounds of Atlantic mackerel that filed a VTR. Excludes carrier and party/charter trips.
*Average percentage of herring from combined Atlantic mackerel and Atlantic herring landings for each trip. This is calculated for each trip first, and then the average percent for all trips in a given year is presented.

Table 12 – Small mesh bottom trawl (SMBT) trips landing Atlantic mackerel, 2012-2019

Year	Permits	Trips	Trips landing herring	Trips landing ≥90% herring	Trips landing ≥90% Mackerel	Herring Live Pounds	Mackerel live Pounds	Avg. Herring Percent/Trip*	Avg. Herring Pounds/Trip	Avg. Mackerel Pounds/Trip
2012	102	806	147	88	666	4,441,465	6,218,318	15%	5,504	7,705
2013	100	487	109	69	381	10,511,152	789,522	19%	21,583	1,621
2014	108	804	64	48	741	3,750,545	714,638	7%	4,659	888
2015	109	1,002	136	92	869	3,364,800	2,272,018	11%	3,358	2,267
2016	134	1,444	199	106	1,246	3,990,560	1,245,561	11%	2,764	863
2017	140	1,532	252	131	1,286	2,226,210	929,871	13%	1,452	607
2018	145	1,718	166	32	1,569	1,647,379	4,409,251	6%	958	2,565
2019	134	1,648	156	61	1,513	1,078,241	1,486,896	6%	653	901

Source: GARFO DMIS Database as of 2020-09-10
Small Mesh Bottom Trawl: Includes bottom trawl gear with mesh size less then 5.5" excluding bottom otter twin trawl, scallop, and shrimp trawl trips. Includes all small mesh bottom trawl trips landing > 0 pounds of Atlantic mackerel that filed a VTR. Excludes CARRIER and PARTY/CHARTER trips.
* Average percentage of herring from combined Atlantic mackerel and Atlantic herring landings for each trip. This is calculated for each trip first, and then the average percent for all trips in a given year is presented.

Figure 3 – Proportion of herring landed on MWT trips (TOP) and SMBT trips (BOTTOM) landing Atlantic mackerel, 2012-2015, and 2016-2019



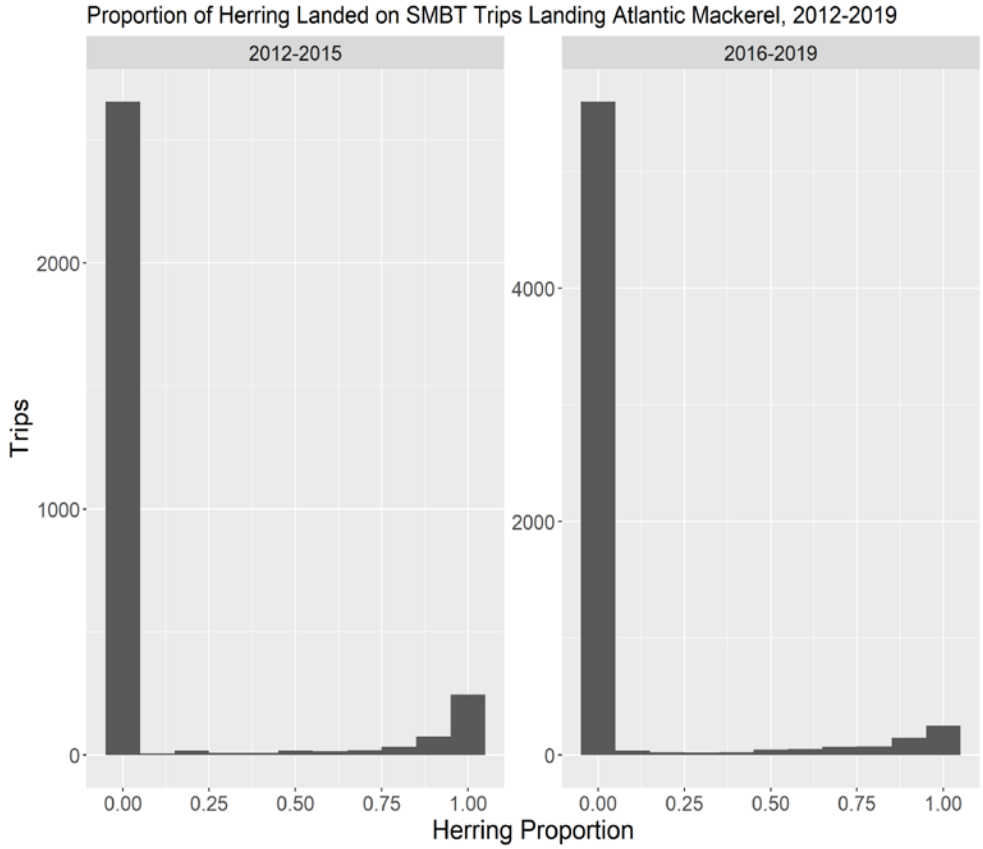
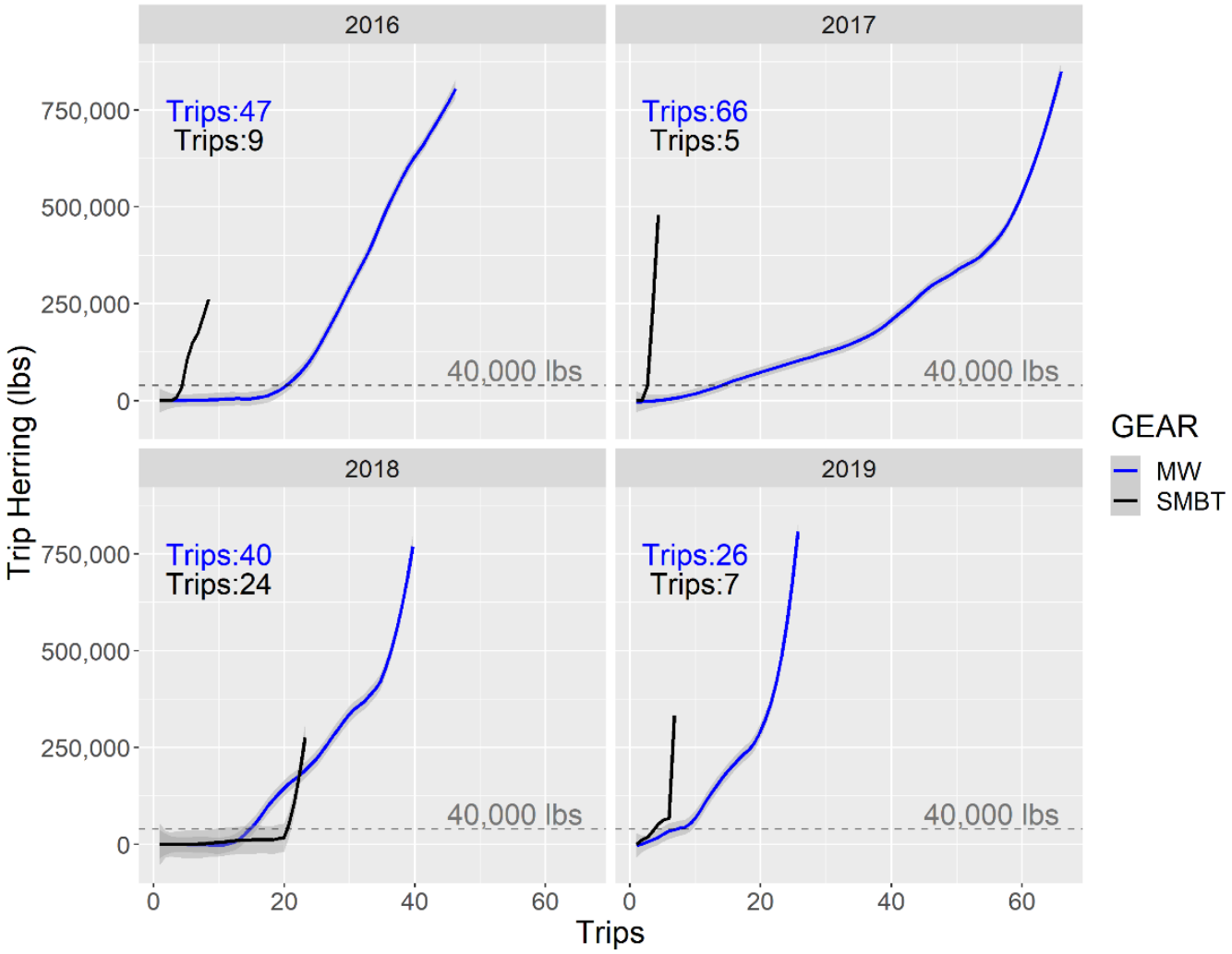


Figure 4 plots herring landings per trip for all trips that landed 20,000 pounds or more of mackerel. This value was used to remove more incidental mackerel trips to focus on trips that are considered more directed mackerel or mixed herring/mackerel trips. For most years, very few SMBT trips landed over 20,000 pounds of mackerel, except for 2018. Most of the SMBT trips with over 20,000 pounds of mackerel had less than 40,000 pounds of herring. For MWT, the patterns are quite different by year. In 2016 and 2018, there were trips with more than 20,000 pounds of mackerel that had under 40,000 pounds of herring, but many of these trips had much higher amounts of herring. In summary, fishing behavior would need to adjust if in-season herring possession limits were revised, even on trips that focus primarily on mackerel, based on this definition of over 20,000 pounds of mackerel landings.

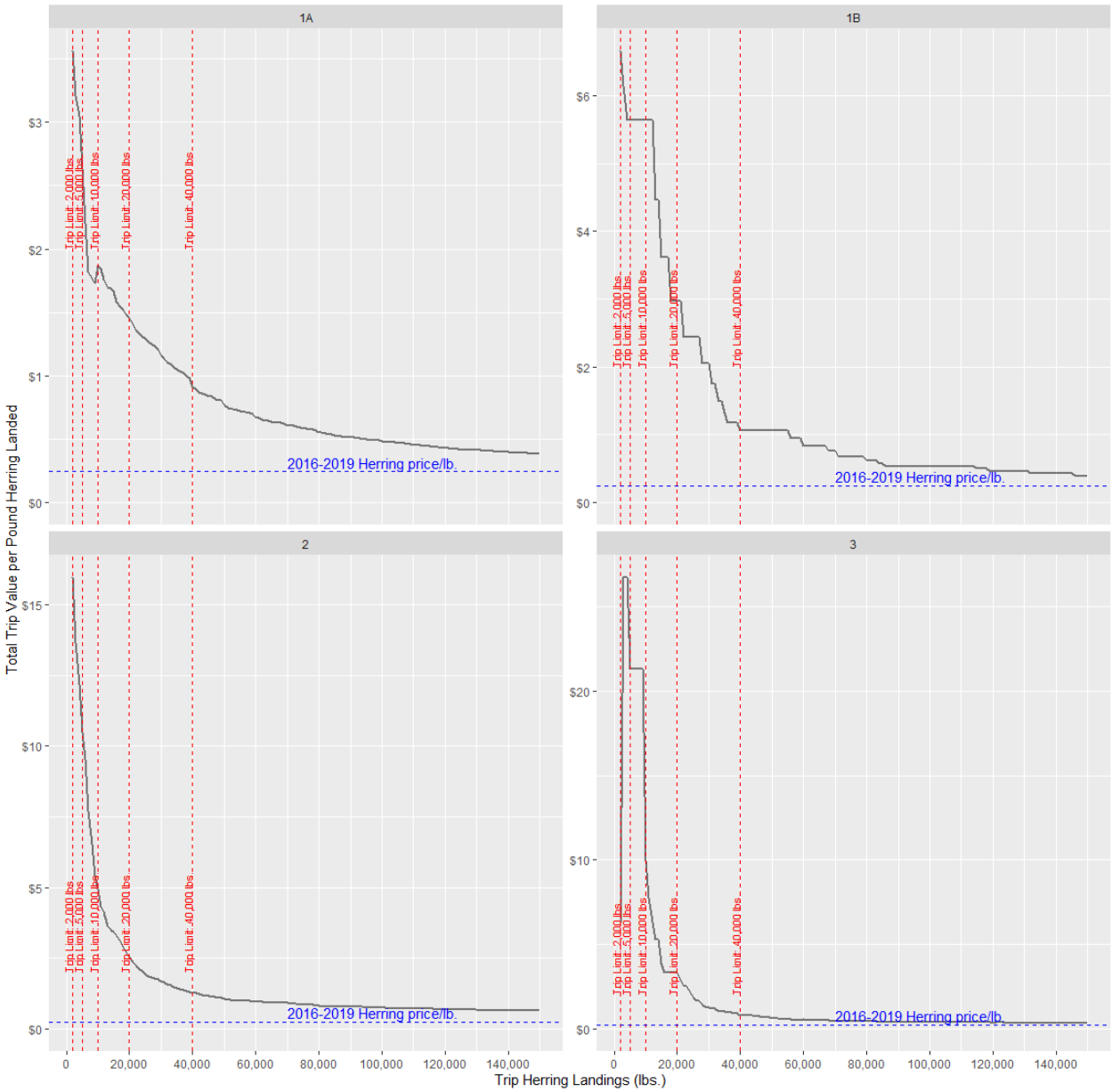
Figure 4 – Herring landings on trips with more than 20,000 lb of mackerel, with 40,000 pound line for reference (2016-2019).



There are differences to consider by area as well. To further distill the relationship between herring landings and trip value, total trip value per pound of herring was calculated from all trips under a given herring incidental trip limit (Figure 5). Incidental trip limits that yield total trip value per pound of herring well above the 2016-2019 price per herring ($0.24/lbs) generally capture trips where more value is coming from sources other than herring. Conversely, incidental trip limits with total trip value per pound of herring that is closer to the 2016-2019 herring price are more likely directed herring trips that generate most of their value from herring. By iterating through the range of incidental herring limits, a threshold that captures the steepest drop in total trip value per pound of herring may be a good candidate that maximizes total trip value and minimizes herring landings.

Figure 5 helped identify that 40,000 pounds of herring would be a level that would accommodate fishing for other species for most areas, especially Area 2. The total value per pound of herring is highest for Area 2, indicating that vessels in that area are fishing for other species more than in other areas.

Figure 5 – Total value per pound of herring caught from all trips landings 2,000 to 150,000 pounds.



1.5.6.2 Modify the seasonal closure of Area 1B

Area 1B has been closed January through April for over six years since Framework 2 (2014). This action is considering two alternatives for this issue: No Action to maintain the current seasonal closure of Jan-April, and Alternative 2 to eliminate the seasonal closure all together.

Impacts on Atlantic herring fishery

The impacts on the Atlantic herring fishery of Alternative 2 would likely be low negative relative to Alternative 1. Generally, herring prices are lower in winter, with reduced demand from the lobster fishery (Figure in AE). Under Alternative 2, it is more likely that herring fishermen would fish early in the year in Area 1B, rather than wait for more favorable prices, due to a preference for some share of the resource before the sub-ACL being fully harvested. There would be some benefits to increased flexibility, but negative impacts on fishery revenue are expected.

From 2007 to 2011, 21% or less of the Area 1B sub-ACL had been caught by the end of April each year (Figure in AE). However, in 2012, the sub-ACL was fully harvested before the end of January. It is likely that due to a 1B overage in 2010, the industry maximized 1B quota in 2012 before an overage deduction would have been implemented. Removing the delay of the opening of Area 1B may not allow enough time for overage or carryover determinations, so it may be more difficult to harvest within the sub-ACL.

Impacts on Atlantic mackerel fishery

The impacts on the Atlantic mackerel fishery of Alternative 2 would likely be low positive relative to Alternative 1, as this would enable landings in the fishery earlier in the year, when the mackerel fishery tends to be more active. In 2008-2013, prior to the Area 1B closure, January – April was the primary season for mackerel fishing (Table 13). In 2014-2018, the primary months for mackerel landings shifted back, with increased mackerel landings in November and December as well as January and February. Average monthly landings of mackerel were reduced in March and April compared to the earlier period. Throughout the time series, herring landings are more stable than mackerel throughout the year.

Table 13 – Herring and Mackerel average monthly landings (in mt) before Area 1B closed seasonally from January 1 – April 30 (2008-2013) and after the areas closed (2014-2018).

Month	Herring		Mackerel	
	2008-2013	2014-2018	2008-2013	2014-2018
January	9,433	5,637	4,502	1,798
February	4,949	3,242	2,687	1,367
March	3,388	2,330	1,175	361
April	1,513	445	995	142
May	2,892	4,335	27	238
June	6,289	6,128	9	38
July	11,235	8,056	8	50
August	11,910	8,486	10	77
September	11,001	9,191	14	71
October	11,370	8,312	12	175
November	5,403	3,171	6	1,625
December	3,921	4,031	299	639
Total	**83,304**	**63,364**	**9,744**	**6,581**

Impacts on other fisheries and users

The impacts on the American lobster fishery of Alternative 2 would likely be low positive relative to Alternative 1. Generally, herring prices are lower in winter, with reduced demand from the lobster fishery. Under Alternative 2, the lobster fishery would benefit from increased access to herring at lower cost.

The impacts on predator fisheries and ecotourism of Alternative 2 would likely be uncertain, but potentially low positive relative to Alternative 1. With this seasonal closure removed, Atlantic herring fishing in Area 1B would likely shift earlier in the year when user overlaps would likely be less. In fact, the 2013-2015 specifications predicted that the seasonal closure of Area 1B may result in user group conflicts, particularly between the midwater trawl herring vessels and recreational striped bass anglers, which use Area 1B in June. Except for 2011 and 2012, Area 1B had been open year-round to the herring fishery (only in 2012 was it closed in June) without significant conflict with other user groups. Some herring fishermen have attributed this closure to heightened conflicts with other user groups. Removal of the seasonal split would likely decrease herring vessel activity in Area 1B in May.

The impacts on fishing communities of Alternative 2 would likely be low negative to low positive relative to Alternative 1. While the Atlantic herring fishery may have low negative impacts, impacts on other users may be low positive. To the degree that Alternative 2 reduces user conflicts in Area 1B in the summer, positive impacts on human communities are expected. The herring fishing communities that would be more impacted by Alternative 2 are primarily located in Maine and Massachusetts. Alternative 2 could impact other users of Atlantic herring and their associated communities, many of which coexist (with each other and with the herring fishery) within communities (Table 79 in NEFMC 2018).

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