Framework 3 to the Atlantic Herring FMP
DRAFT Appendix III:
Predicting the Potential Impacts of RH/S Catch Caps on Atlantic Herring Fishery Participants

Prepared by the NEFMC Herring Plan Development Team, September 2013

Introduction

This analysis quantifies the probability that a RH/S catch cap would be reached in each of RH/S areas under the options proposed for 2014-2015 catch caps and the 2013-2015 Atlantic herring fishery specifications. Because a consequence of reaching the RH/S is the closure of the directed herring fishery in the catch cap area, this analysis also provides insight into the impacts of the options under consideration on the directed herring fishery.

Methods Overview

The general approach is a simulation/bootstrap inspired method. The underlying assumption is that the under a RH/S catch cap, the directed herring fishery will operate in a similar fashion as it did recently without a RH/S catch cap (the shortcomings of this assumption are discussed in the *Caveats* section). Therefore, the VTR records of for the directed herring fishery are representative of herring (and total) catch and the observer records are representative of RH/S catch rates. The VTR data is therefore used to simulate catch (total kept and herring kept) in the directed herring fishery. NEFOP data, supplemented by the Herring PDT with ME DMR and MA DMF sampling data (see Appendix II), is used to construct RH/S catch ratios (RH/S caught/total kept) at the trip level.

To perform the projections in this analysis, a set of trips, representing catch and effort, is randomly drawn from the VTR data. This is matched to RH/S catch ratios from the appropriate area and gear from the NEFOP data. The model then checks the appropriate herring sub-ACLs and RH/S catch caps, and the herring fishery is closed in areas where either is exceeded. Many (1,000) fishing years are simulated to provide managers insight into the "good," "bad," and "likely" outcomes in each herring management area and each proposed RH/S catch cap area.

Methods Details and Data

2008-2012 haul-level observer data are extracted to construct a population of RH/S catch ratios at the "sub-trip" level. Because a trip can occur in multiple statistical areas (and therefore in multiple RH/S areas) a "sub-trip" is used. In order to be included, a trip must have kept at least 6,601 lbs of Atlantic herring. The RH/S ratio (RH/S caught/total kept) can then be computed. In addition to catch information, location data and gear used are also extracted and retained. Midwater and paired midwater trawl gears are grouped together.

The 2008-2012 VTR data are used to simulate fishing trips. Data fields used were weights and species, gear, year, month, day, statistical area, and reported latitude and longitude. The VTR data was augmented with permit data. In order to be included, a trip must have kept at least 6,601 lbs of Atlantic herring and have been taken by a limited access (A, B, or C vessels). Because a trip can occur in multiple statistical areas (and therefore in multiple RH/S cap areas), a "sub-trip" is used as the basis for simulating effort and catch. VTR sub-trips were classified into RH/S areas based on the reported statistical area. VTR sub-trips were classified into Herring Management Areas when the statistical area was wholly contained within an Atlantic Herring Management Area (HMA). If the statistical area was not wholly contained in a HMA (for example 521), the reported location (latitude and longitude) was used to assign the VTR point to a HMA.

The 2013-2015 specifications for the Atlantic herring fishery will set an ACL of 107,800 mt. This is approximately 18% higher than the ACL in effect for 2010-2012 and approximately 25% lower than the combined TACs that were in effect in 2008-2009. It is reasonable to believe that fishing effort and catch may be higher than in 2010-2012, so a 20% expansion of effort from these levels is included in the simulation by drawing 20% more trips (881 trips) than the average that occurred during this time period (734 trips). Each trip by a category A or B vessels has a 35% chance of being observed; each trip by a category C vessel has a 20% chance of being observed. For simulated trips that are observed, a simulated RH/S catch ratio is randomly assigned based on the observer data. Simulated trips that are not observed are assigned the aggregate RH/S catch ratio (which is constructed for each by RH/S area and gear combination). The running totals of both RH/S (observed plus assumed caught) and Atlantic herring can then be tracked. Area closures are implemented when the either the RH/S catch cap or the herring sub-ACLs are reached.

The simulation is repeated 1,000 times. Variability in results is driven by different draws of trips, different trips being observed, and different RH/S ratios being assigned to RH/S trips.

Caveats

This analysis assumes that trips that would have occurred after a RH/S catch cap is exceeded do not occur. For some gear-area combinations, like the Purse Seine-GOM and the Bottom Trawl-SNE combinations, this is a reasonable assumption. For midwater trawlers, this may be less reasonable because midwater trawl gear is active in all four of the RH/S areas and all of the herring management areas. Depending on the time of year that a RH/S catch cap is reached, a trawl vessel may be able to use other areas to catch herring.

In addition, the analysis assumes that fishing under a RH/S catch cap is similar to fishing in 2008-2012. This analysis does not account for costs of "averting behavior." Economically rational agents should undertake costly behavior to avoid experiencing bad events, this is known as "averting behavior." Exceeding the RH/S catch caps and the resultant closure of the directed herring fishery is a bad event; therefore, it is expected that fishing vessels may undertake steps to reduce the probability that the directed fishery would close. This imposes costs on participants in the directed herring fishery; however, these costs are difficult to quantify at this time. In addition, to the extent that avoiding RH/S is possible, the analysis overestimates the probability of the RH/S catch cap being exceeded.

Results

The simulation model is run for the four sets of options for each area, described in Appendix II and in the Draft Framework 3 Discussion Document.

Catch trajectory graphs provide information about the timing of catch and the frequency that herring or RH/S limits are reached (Figure 1 – Figure 7). Steep areas indicate times when fish are being caught quickly, flat areas indicate times when little or no fish is being caught. Results for the 25th, 50th (median), 75th, and 90th percentiles for river herring catch are presented for each RH/S catch cap area. One way to interpret the 25th percentile line is that in 25% of the simulations, the RH/S catch trajectory was lower than this line. The 25th percentile line represents a good outcome for RH/S and the 90th percentile line represents a poor outcome for RH/S catch.

The results suggest that:

- RH/S catch in the Gulf of Maine could be reduced by the "low" catch cap. However, this option is likely to result in lower herring catch in Area 1A. The other three catch caps are unlikely to affect herring catch in Area 1A during 2014 and 2015.
- There is a large amount of variability for RH/S catch rates in the Cape Cod region. This means that there is large variability in the total catch of RH/S in that region when there is no RH/S catch cap. Under the "high catch cap" (Figure 2, panel b) there is also a large amount of variability in RH/S catch. Under the "median" and "low" catch caps (Figure 2, panels c and d) there is less variability, because the directed herring fishery is likely to reach the RH/S catch cap. This could lead to lower catch in Areas 1A, 1B, and 3 for 2014 and 2015.
- There is a moderate amount of variability for RH/S catch rates in the SNE/MA region. Note that in panels (c) and (d) of Figure 3, the RH/S catch cap is frequently reached during the "early" season (January – April) in the model, which could preclude a directed herring fishery during the winter season. This would correspond directly to lower catch in Area 2 (Figure 7).

Figure 1 Projected Gulf of Maine RH/S Catch Under Four Cap Options for 2014-2015

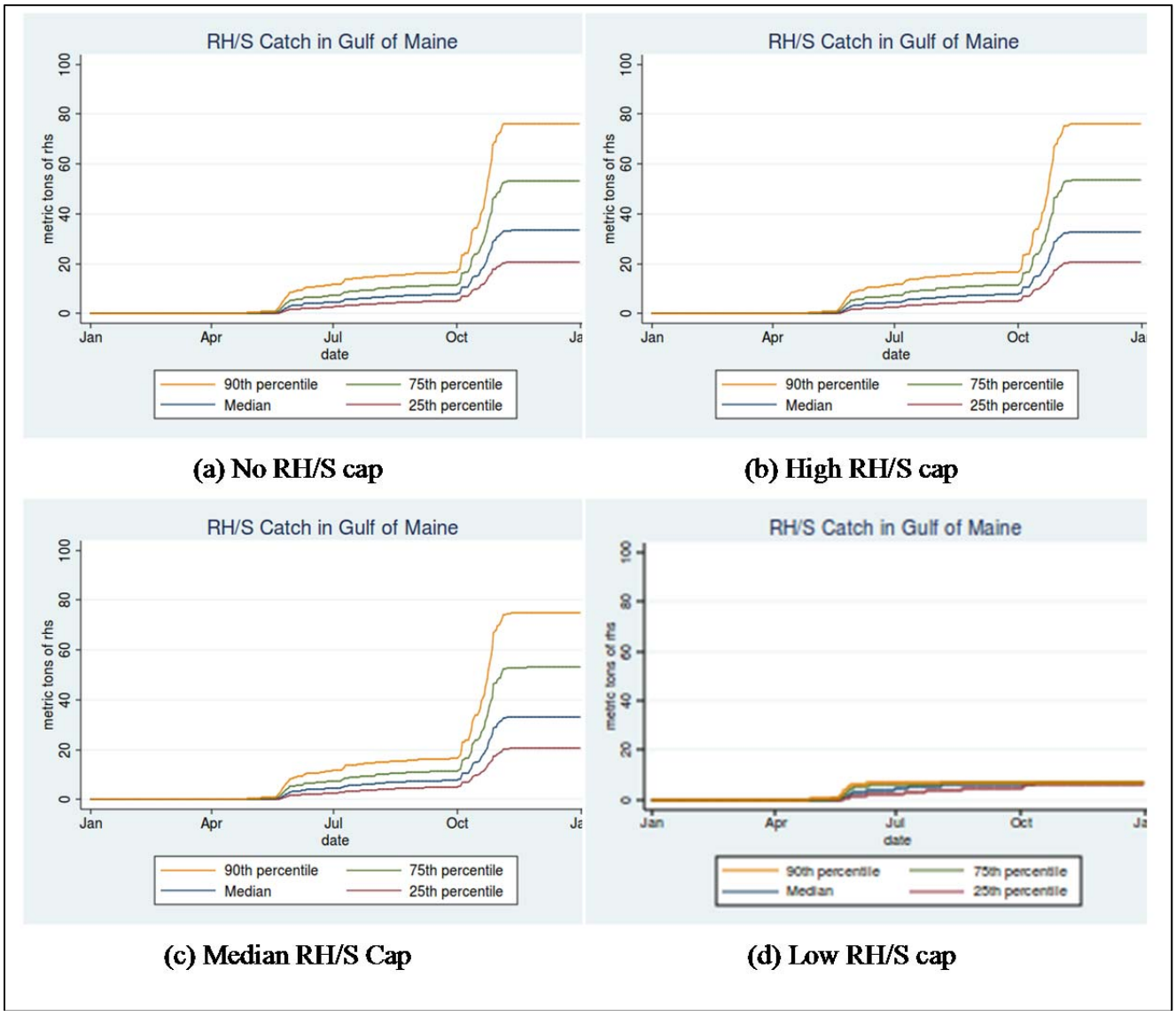
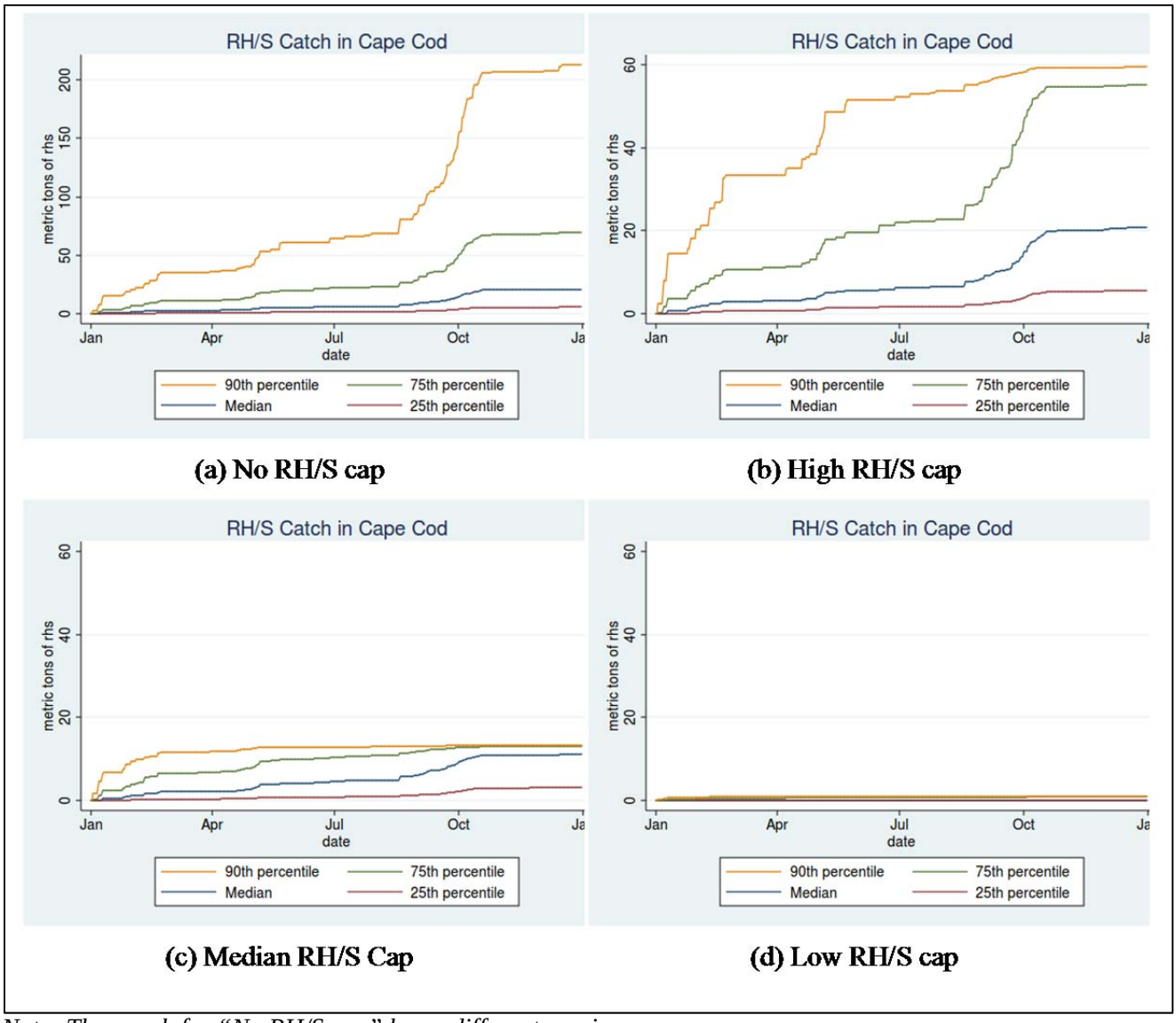


Figure 2 Projected Cape Cod RH/S Catch Under Four Cap Options for 2014-2015



Note: The graph for "No RH/S cap" has a different y-axis.

Figure 3 Projected Southern New England/Mid-Atlantic RH/S Catch Under Four Cap Options for 2014-2015

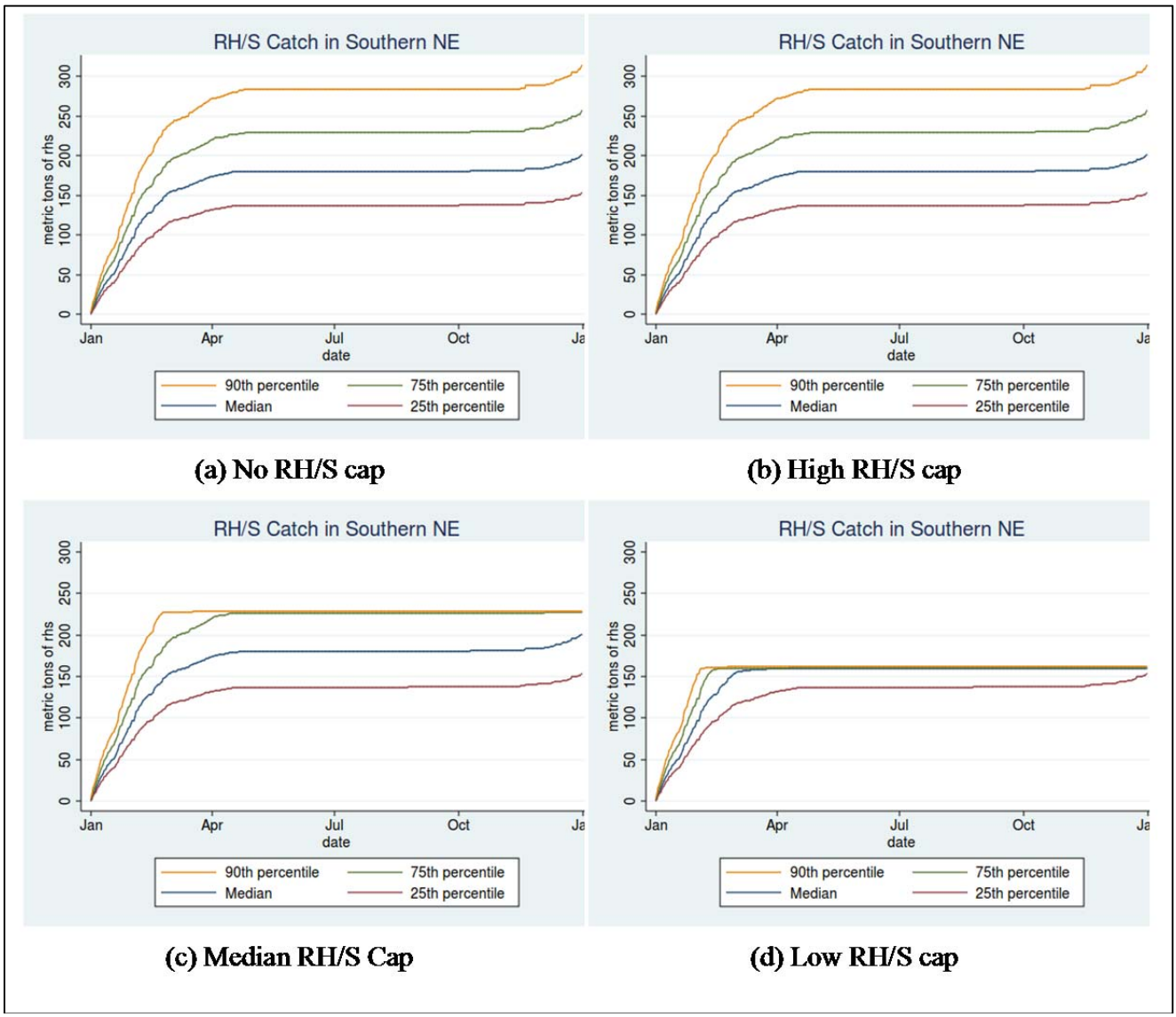
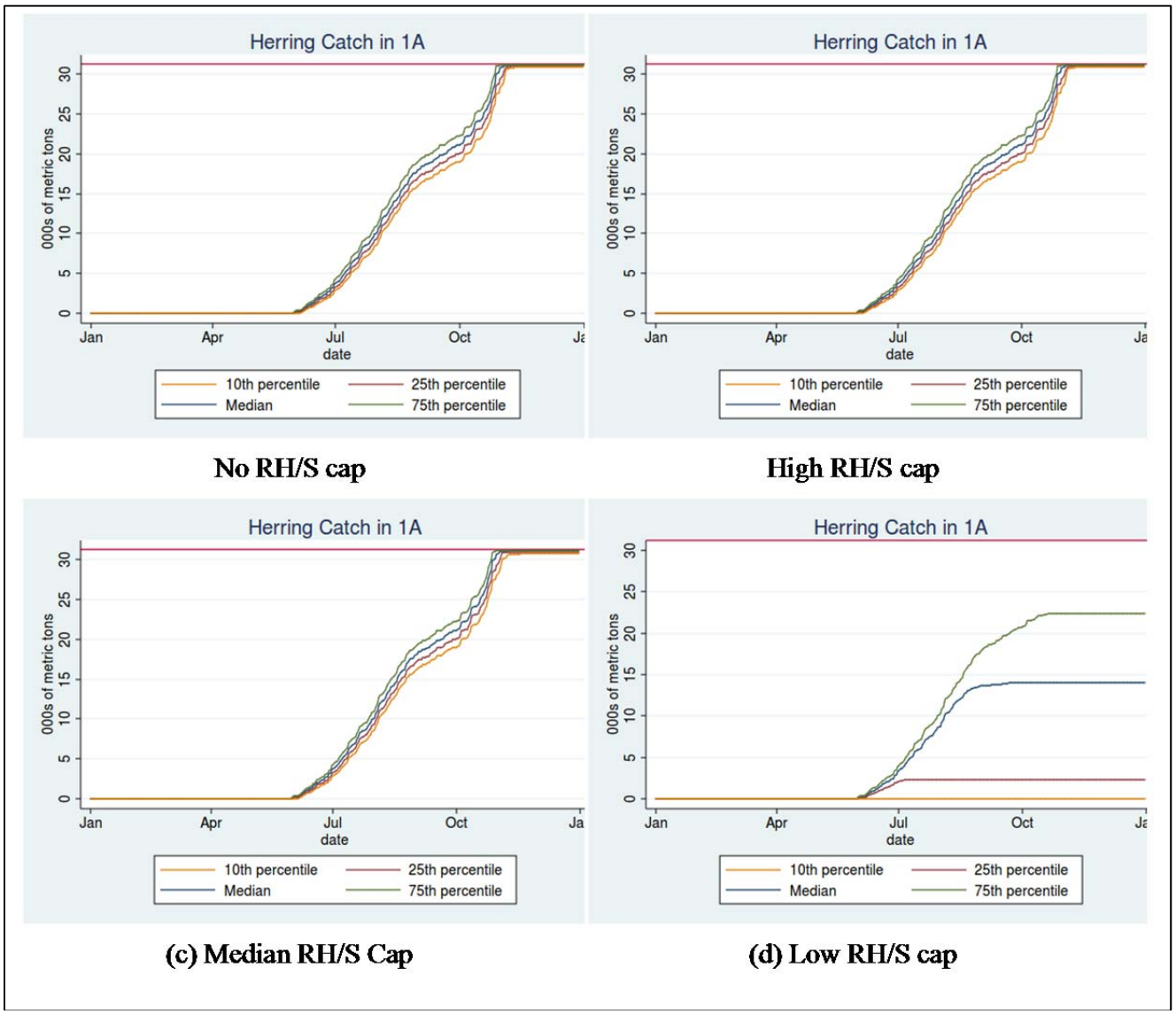
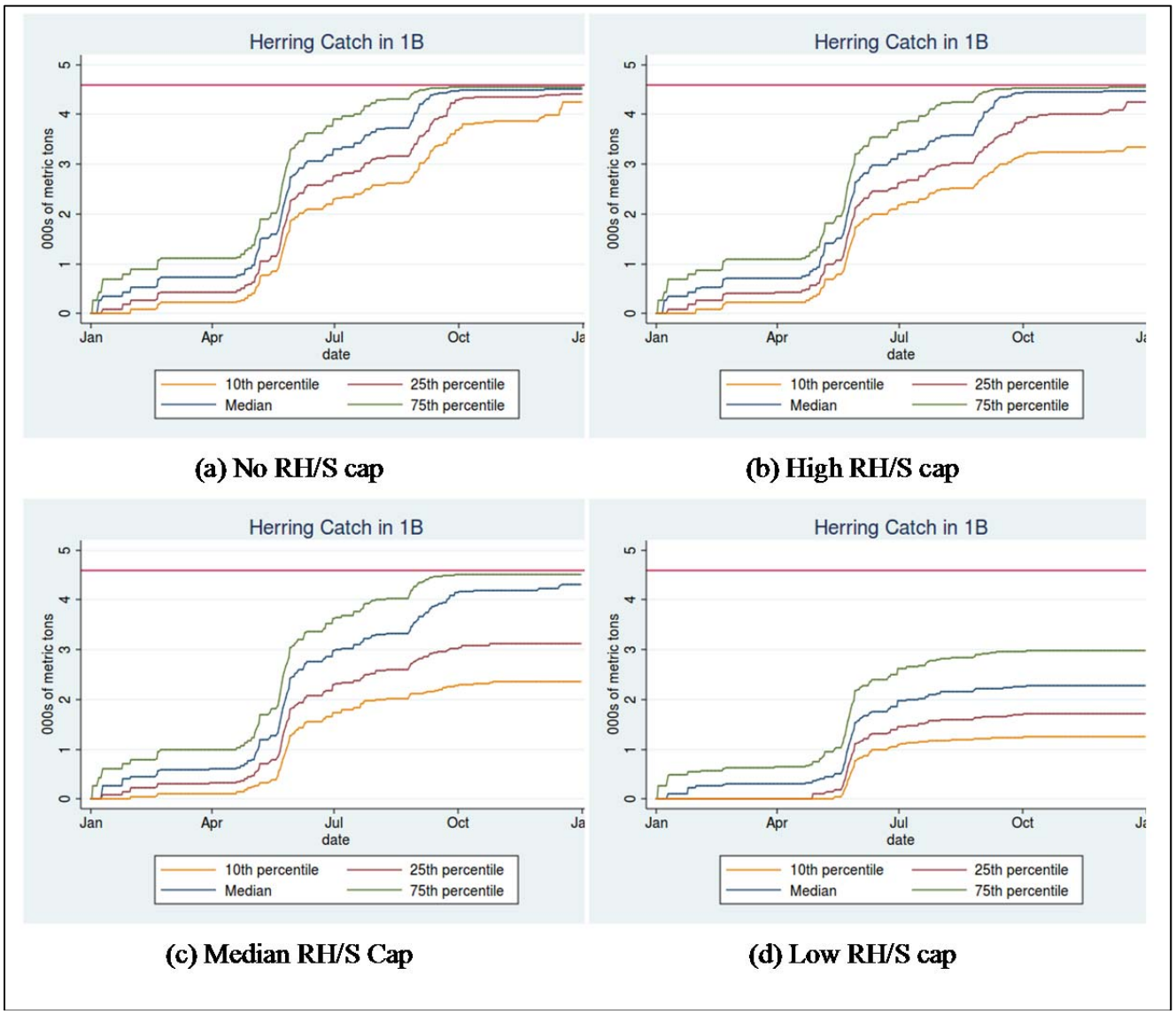


Figure 4 Projected Atlantic Herring Catch in Area 1A Under Four Cap Options for 2014-2015



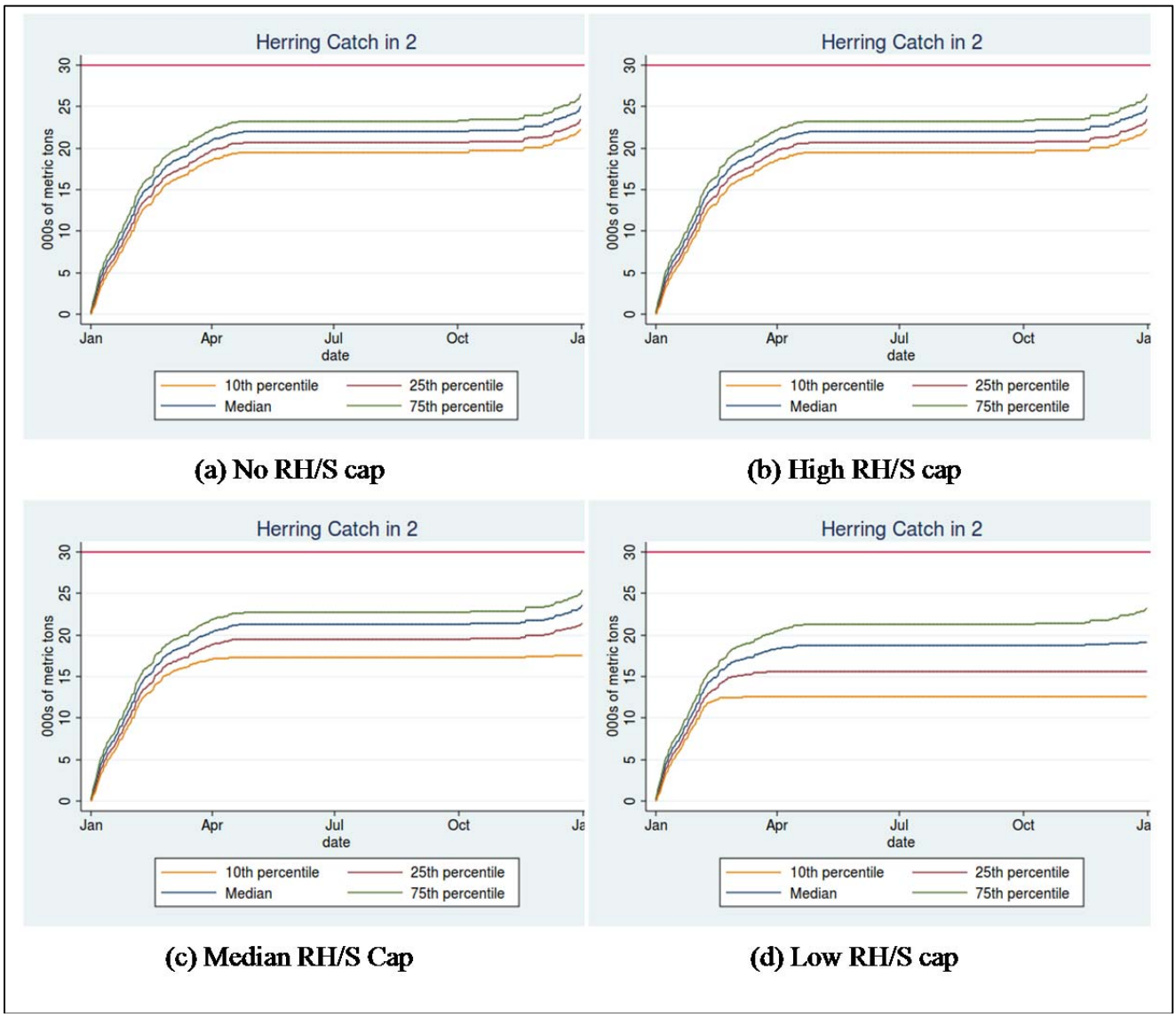
Note: Red line is the sub-ACL for Atlantic herring in Area 1A for 2013-2015.

Figure 5 Projected Atlantic Herring Catch in Area 1B Under Four Cap Options for 2014-2015



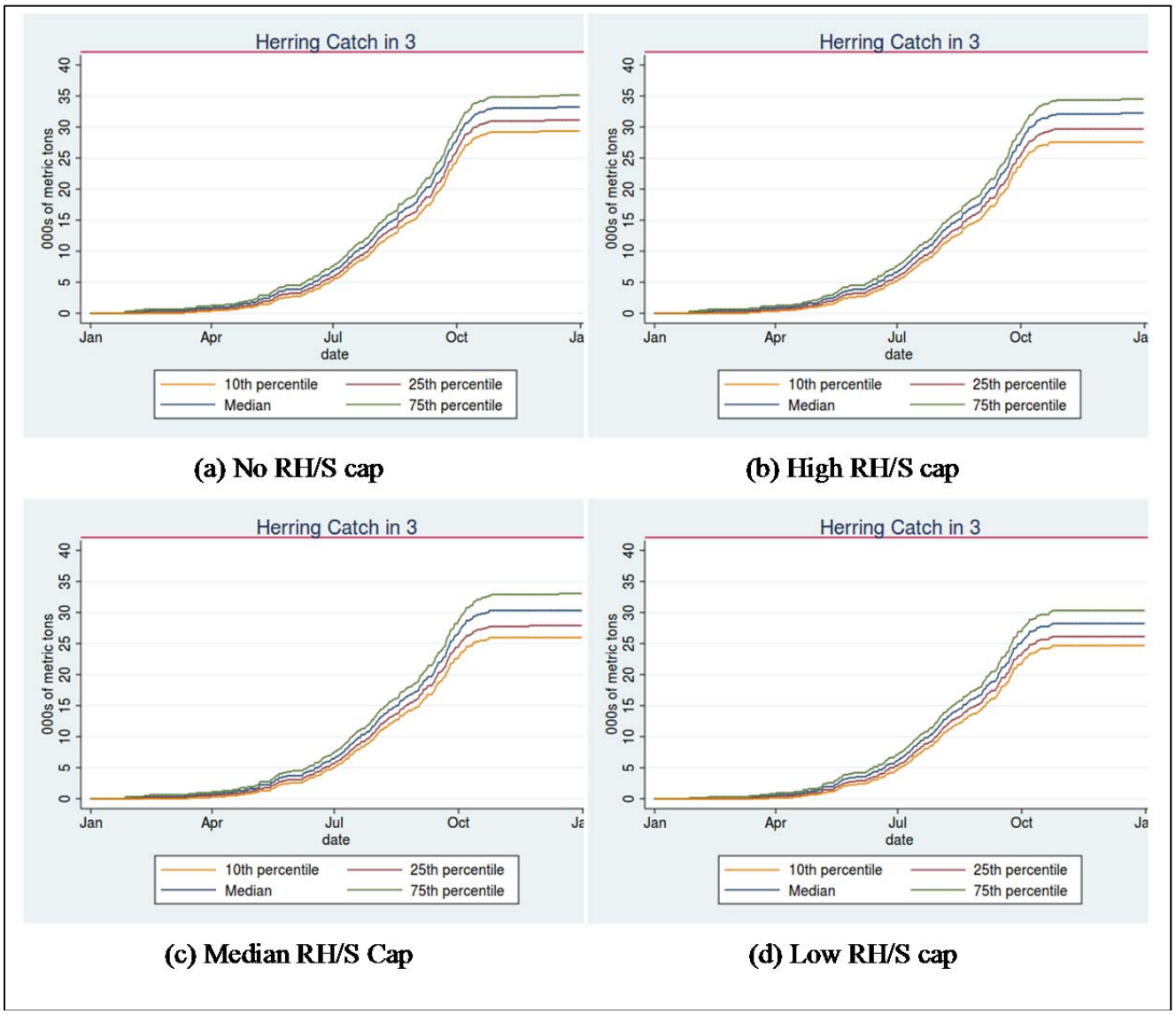
Note: Red line is the sub-ACL for Atlantic herring in Area 1B for 2013-2015.

Figure 6 Projected Atlantic Herring Catch in Area 2 Under Four Cap Options for 2014-2015



Note: Red line is the sub-ACL for Atlantic herring in Area 2 for 2013-2015.

Figure 7 Projected Atlantic Herring Catch in Area 3 Under Four Cap Options for 2014-2015



Note: Red line is the sub-ACL for Atlantic herring in Area 3 for 2013-2015.