Atlantic States Marine Fisheries Commission

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MEMORANDUM

October 2, 2020

To: **Atlantic Striped Bass Management Board**

From: **Atlantic Striped Bass Technical Committee**

RE: **Factors Limiting Recreational Release Mortality Calculations for Stock Assessment**

In August, the Atlantic Striped Bass Board (Board) initiated development of Draft Amendment 7 to the Atlantic Striped Bass Fishery Management Plan (FMP). During its deliberations, Board members discussed the importance of addressing release mortality in recreational striped bass fisheries, given it contributes significantly to total fishing mortality for the species. As a result, the Board tasked the Technical Committee (TC) to review factors limiting the accuracy of release mortality estimates for stock assessment purposes, and to identify potential actions that could improve understanding or help reduce release mortality in the fishery.

The TC met on September 17th to address the Board task. This memo summarizes the current methods used to estimate release mortality, reviews the current and historical levels of live releases across the coast, and identifies ways to improve the estimates of release mortality and reduce the mortality associated with fish that are released alive.

Estimates of Release Mortality in Striped Bass

The stock assessment currently uses an estimate of 9% for recreational hooking mortality; that is, 9% of striped bass that are caught recreationally and released alive die afterwards as a result of that fishing interaction. This estimate is from the work of Diodati and Richards (1996), which was based on a study conducted in a saltwater impoundment in Massachusetts. They found that depth and location of hooking, gear type, and angler experience were the most significant factors in determining the rate of hooking mortality. Their estimates ranged from 3% under the best conditions to 26% under the worst conditions. These estimates are consistent with other studies on striped bass hooking mortality. Caruso (2000) conducted a study in Massachusetts waters where estimates ranged from 3% to 15%. Millard et al. (2005) conducted a study in the Hudson River and estimated that 14% of striped bass released alive died. RMC (1990) and Lukacovic and Uphoff (2007) conducted studies in Chesapeake Bay under a range of salinity, temperature, and gear conditions. RMC (1990) estimates ranged from 1.87% under moderate salinity in the mid-Bay area to 70% mortality in the freshwater conditions in the Susquehanna Flats in the upper Bay. Lukacovic and Uphoff's (2007) estimates for the upper Bay ranged from 2.8% to 26.7%, with the highest mortality occurring during June and July. It's difficult to compare across studies because of differences in design. However, the range of estimates in

brackish to saltwater are fairly consistent, from 2-3% at the lower limit to 26-27% at the higher limit; RMC's (1990) estimates from freshwater were extreme outliers. These studies identified a number of different factors that affected release mortality, including temperature, salinity, fish length, hook type, hooking location, and angler experience. The TC elected to use the Diodati and Richards (1996) overall estimate of 9% because it was conducted in saltwater, as opposed to estuarine conditions, and the majority of releases occur in saltwater. In addition, Diodati and Richards (1996) used anglers with a wide range of experience levels and was more representative of the general angling population, unlike some of other studies that used only experienced anglers. The use of the 9% rate does not mean that every time a fish is released it has a 9% chance of dying. Under some conditions, the fish has a higher or lower probability of dying, but overall, coastwide, it is assumed that 9% of all striped bass released alive die.

For the 2013 benchmark assessment, the TC explored using different mortality rates under different conditions. The main challenge with this approach is the mismatch of scale; these studies collect data on a finer scale than the Marine Recreational Information Program (MRIP) estimates for live releases. These studies record the temperature and salinity of the location where the study fish were caught, whereas MRIP estimates are aggregated into total numbers by state and two-month periods (waves). In addition, many of the factors that influence hooking mortality are not captured by MRIP at all, such as hook type, hooking location, and angler experience. The TC developed a regression tree from the studies described above to identify thresholds of temperature and salinity beyond which mortality would increase. The highest mortality condition occurred at low salinity (<7.9 ppt); above 7.9 ppt, water temperature under 25.65^{o}C (78.2^{o} F) was associated with the lowest mortality, while mortality was higher above that temperature threshold (Figure 1). Average water temperature by state and wave, and average salinity by wave for the middle of Chesapeake Bay, was calculated in order to apply the regression tree to the MRIP estimates. The average water temperature for all states was only greater than the temperature threshold in Chesapeake Bay and North Carolina during Wave 4, and the average salinity never declined below the 7.9 ppt (Figure 2). As a result, the coastwide estimate of release mortality calculated with this method was not significantly different from the 9% estimated by Diodati and Richards (1996).

Live Releases in the Striped Bass Fishery

Since the stock was rebuilt in 1995, approximately 90% of striped bass that are caught recreationally are released alive; although the MRIP calibration increased the magnitude of striped bass catch (due to changes in estimates of fishing effort), it did not affect the percent of striped bass that were released alive (Figure 3). The percentage declined from 2005 – 2010, to a low of about 77%, during a period of low recruitment when fewer small fish were available to the fishery. With the appearance of the strong 2011, 2014, and 2015 year classes, the percent of striped bass released alive coastwide increased again to 93% for 2017-2019.

There are some differences in the percent of fish released alive by region, although all regions release the majority of their catch (approximately 90% in recent years). The north Atlantic region (CT-ME) generally released a higher percent of striped bass in the fishery, while the mid-Atlantic region (NY-DE, ocean waters of MD, VA, and NC) and the Chesapeake Bay (MD and VA)

released a lower percentage of their total catch. Over the last five years, the **total number** of releases was highest in Massachusetts, Maryland, New York, and Connecticut, while New Jersey, New York, and Maryland released the lowest **percentage of their total catch** (Figure 5). Note, however, that the lowest release rate of any state in this time period was 81%.

Although there is some variability across regions, the majority of the striped bass catch in all states and for all years since 1995 has been released alive.

Next Steps to Improve Estimates of Release Mortality

The TC discussed several options to improve estimates of release mortality used in the stock assessment, including short- to long-term methods.

1. Short-term (next 1-2 Board meetings): the TC could conduct sensitivity runs of the current model using different estimates of release mortality based on incorporating seasonality, salinity, and regionally specific release mortality rates to examine changes in total removals and effects on model results. This would allow the Board and TC to examine the potential impacts of more refined release mortality estimates on the stock assessment with the current model.
2. Medium-term (next benchmark assessment): the TC will continue to refine the regression tree approach described above to produce estimates of release mortality rates at a finer scale for incorporating into the assessment.
3. Long-term (next benchmark or beyond): the TC discussed the benefit of a comprehensive and strategically designed striped bass release mortality study along the coast. Details of the design of such a study that could provide these release mortality estimates, whether it would be carried out by state/federal agencies coast wide or by universities and research institutions, and how the funding would be allocated and awarded were beyond the scope of this initial task. However, the TC agreed that one of the key design elements would be ensuring that the factors considered (e.g., temperature, salinity, angler experience, hook type) be linked to data collected through MRIP or ancillary surveys so that the estimated release mortality rates could be applied to the MRIP estimates for use in the assessment.

Next Steps to Reduce Total Removals Due to Release Mortality

The mortality due to recreational releases can be reduced in two ways: (1) reduce the percent of fish that die as a result of being released, through angler education on best handling practices and/or regulations that mandate the best practices (e.g., circle hook regulations), and (2) reduce the number striped bass that are caught and released through effort controls. A more accurate release mortality rate or regional/seasonal mortality rates, applied to released fish in future assessments is important to provide the best data going into the model, but it does not address the fact that 90% of striped bass caught in the recreational fishery are released alive. Reducing releases would require the consideration of management measures to reduce fishing effort in the striped bass fishery, including seasonal closures, as well as angler education and outreach efforts to reduce effort in seasons and regions that may be associated with higher release mortality rates.

The TC also commented that the level of concern warranted when considering the proportion of total removals accounted for by release mortality as opposed to harvested fish depends on the management objectives for this fishery. While there are local fisheries with relatively higher harvest rates, the striped bass fishery in many regions can be characterized as an intentional catch-and-release fishery. In these regions, anglers take trips and direct effort towards striped bass with no intention of harvesting, regardless of size. The approach of converting discards into harvest may not be desired or beneficial to the fishery.

Literature Cited

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Diodati, P.J. and R.A. Richards. 1996. Mortality of Striped Bass Hooked and Released in Salt Water. Transactions of the American Fisheries Society 125:300-307.

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RMC, Inc. 1990. An evaluation of angler induced mortality of striped bass in Maryland. Completion Report (P.L. 89-304, AFC-18-1) to National Marine Fisheries Service, Gloucester, Massachusetts.

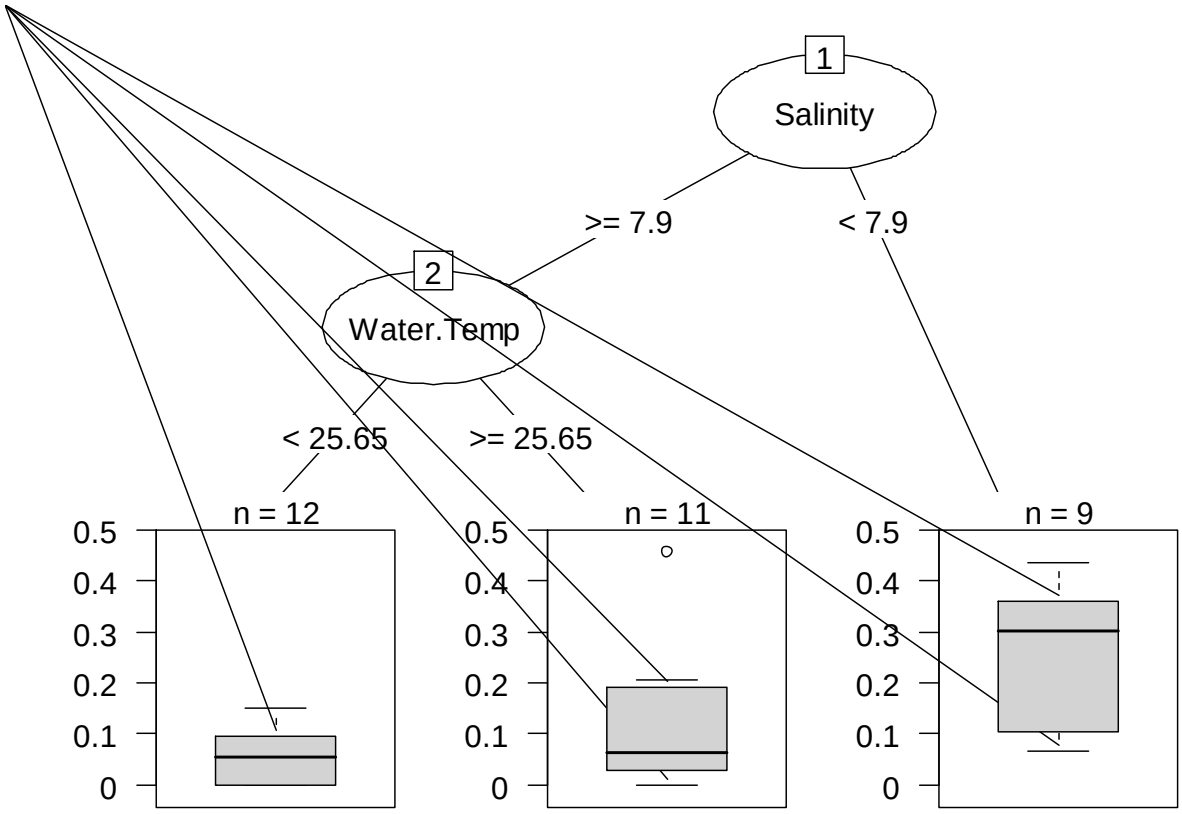

Figure 1: Regression tree to predict hooking mortality by temperature and salinity. Source: developed by the Striped Bass TC during the 2013 benchmark assessment.

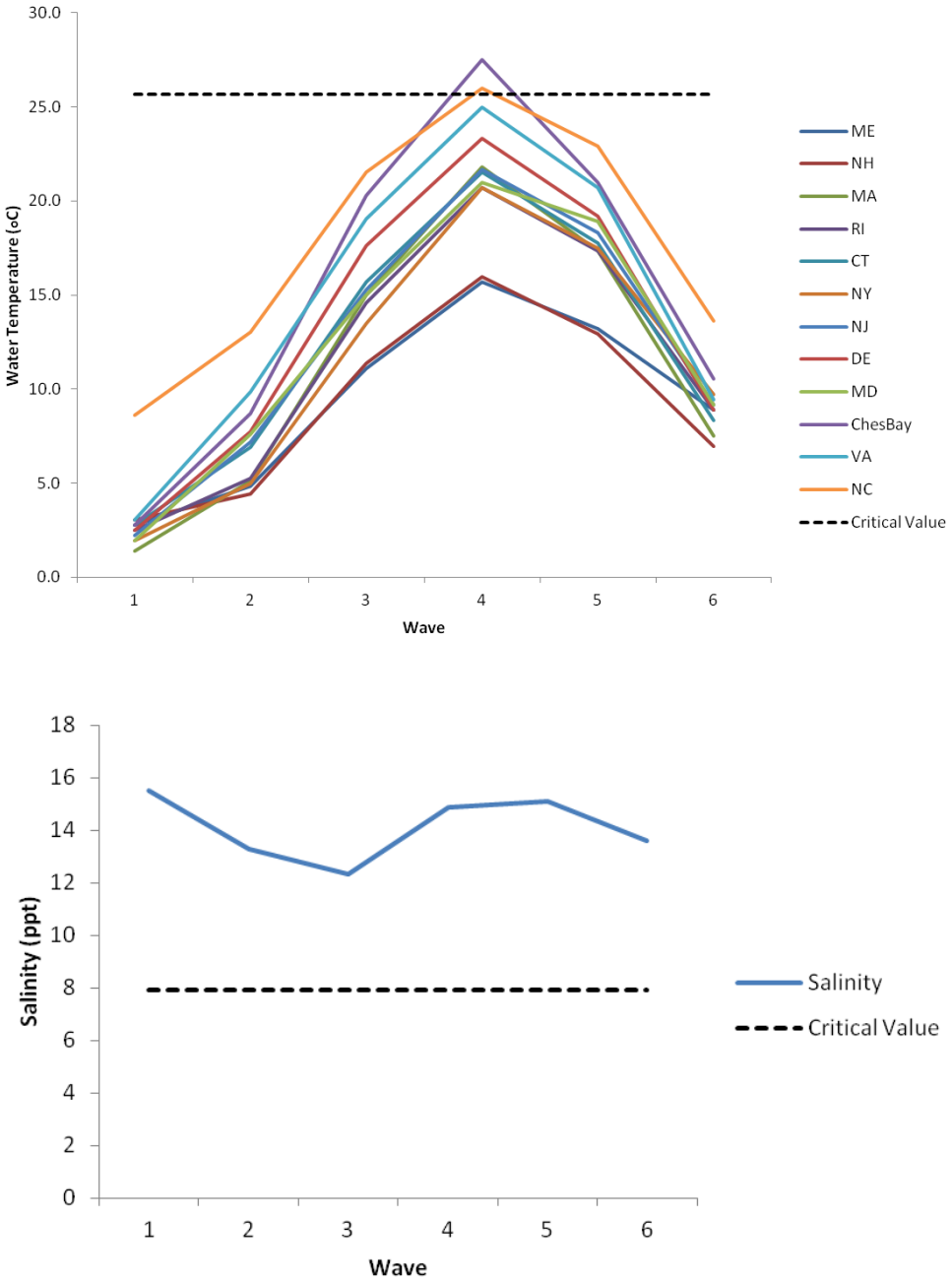

Figure 2: Long-term mean coastal water temperature by state and wave (top) and mean mid-Chesapeake Bay salinity by wave (bottom) with critical values from regression tree analysis. Source: developed by the Striped Bass TC during the 2013 benchmark assessment.

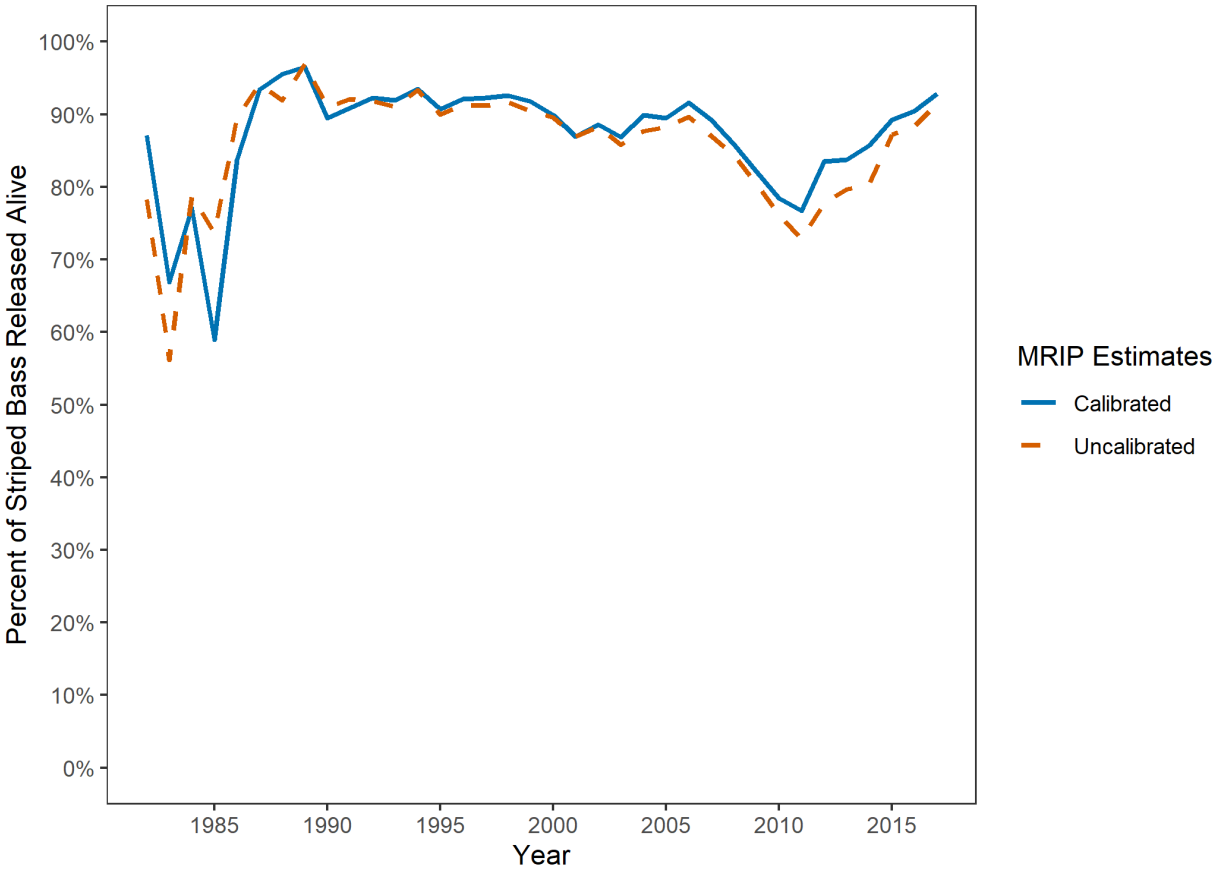

Figure 3. Comparison of the percent of striped bass released alive, 1982-2017, from Marine Recreational Information Program (MRIP) estimates before and after calibration for revised fishing effort estimates.

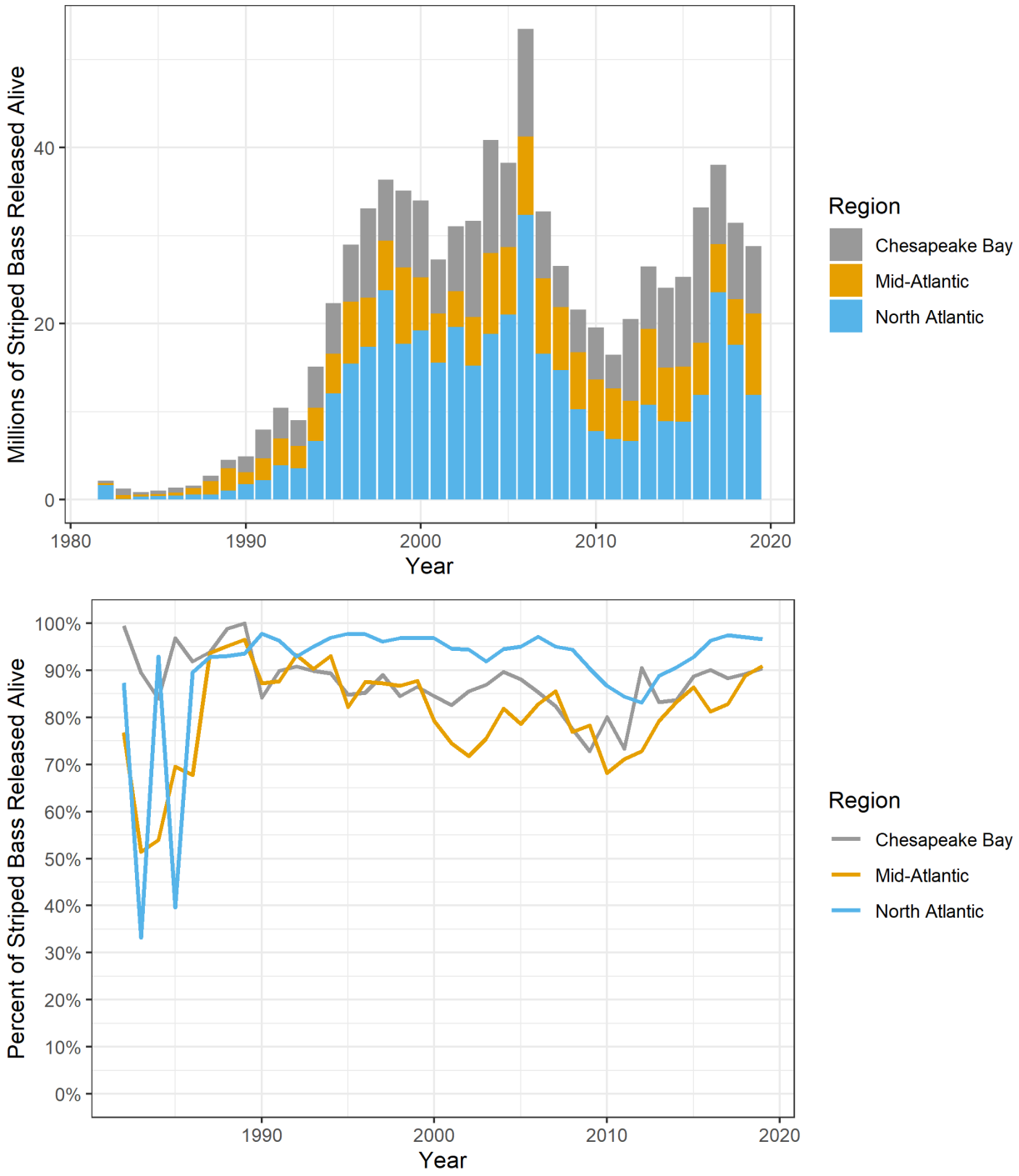

Figure 4. Total striped bass released alive (top) and percent of total striped bass catch released alive (bottom) by region, 1982-2019.

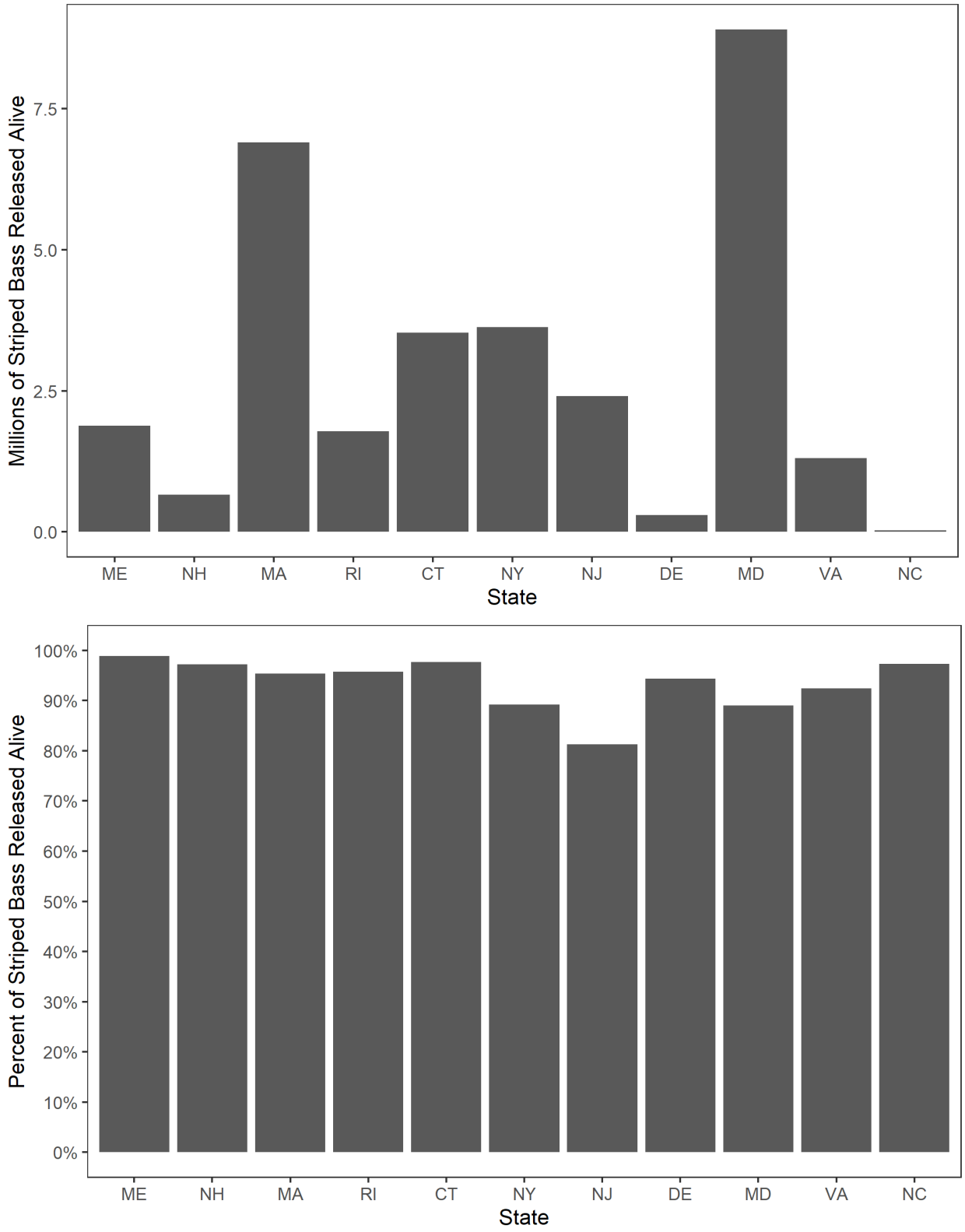

Figure 5. Average number of striped bass released alive (top) and average percent of striped bass released alive (bottom) by state, 2015-2019.