



# NOAA FISHERIES SERVICE



NOAA Fisheries Service is an agency within the Commerce Department's National Oceanic and Atmospheric Administration (NOAA). NOAA's mission is to understand and predict changes in the earth's environment and conserve and manage coastal and marine resources to meet our nation's economic, social and environmental needs.

The NOAA Fisheries Service provides world class science and stewardship.

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# New Method Improves Catch Estimates

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## WHAT IS NOAA'S NEW METHOD AND WHY WAS IT DEVELOPED?

As part of the Marine Recreational Information Program (MRIP) team's work to improve the accuracy of and confidence in recreational fishing statistics, NOAA Fisheries Service has implemented a new method for calculating recreational catch estimates using data from our existing shoreside angler surveys. The new methodology addresses a major concern of the National Research Council's evaluation of the Marine Recreational Fisheries Statistics Survey, or MRFSS. The NRC noted that the MRFSS catch estimation method was not correctly matched with the catch survey design, leading to potential bias in the estimates.

Congress called upon NOAA to address the recommendations of the NRC when it reauthorized the Magnuson-Stevens Act in 2007. Following through on these recommendations has been a primary focus of MRIP since inception. By addressing this fundamental challenge, we have built the scientific and statistical foundation necessary to implement significant improvements – such as enhanced angler intercept surveys, improved precision, and more frequent reporting – to better serve the needs of fishermen, stock assessors, managers, and others.

*"Identifying and eliminating the sources of bias is a fundamental requirement for the provision of reliable estimates."*

National Research Council  
Review of MRFSS

## WHAT'S THE DIFFERENCE BETWEEN THE OLD AND NEW NUMBERS?

There are no consistent trends either in size or direction of change between the MRIP estimates and what has been previously reported. On a species-by-species basis, some estimates go up, some go down, and some remain about the same. However, in all cases, the numbers are better. That's because we have addressed the NRC's chief concern about the mismatch between how we collected data and how we built estimates based on that data.

Each estimate is made up of two parts: The **point estimate** and the **percent standard error (PSE)**. The point estimate is the estimated number of fish caught for any given reporting period and geographic area. Point estimates calculated by using the new method are different than those calculated by using the old method. Numerous sources of potential bias have been removed from each point estimate simultaneously, with the type and degree of each corrected source of potential bias having a different effect on each estimate. Therefore, the amount of difference between any given point estimate using the old method versus the new method varies. *Case studies of that variance in play are included on pages 2 and 3.*

Even the best survey cannot provide results that are perfectly precise. One way to express this concept is "margin of error," which is frequently used in public opinion surveys. NOAA Fisheries uses a similar calculation called PSE to denote this concept, which we include as a part of all our catch estimates. The PSE tells us the statistical precision of that estimate. The lower the PSE, the more precise the estimate. PSE's produced using the new estimation method are higher than those calculated under the old method. Our recalculations have shown that the old PSEs overestimated precision. The new PSEs are more scientifically sound measures of the actual precision of our estimates. Correctly calculating PSEs is important because a full understanding of what we don't know and how we can better fill gaps in our knowledge is an essential component of making prudent, sustainable fisheries management decisions.

# Re-Estimation Case Studies

In reviewing the differences between MRIP and MRFSS point estimates, no consistent trends emerge with respect to the size or magnitude of the changes. Some numbers go up, some go down, and some remain about the same. This is due to the numerous variables at play, the multiple potential sources of bias corrected in each estimate, and the fact that each potential source of bias can have a different impact on each estimate. The two case studies below demonstrate the interplay between these factors in a sampling of species of particular interest. For complete analysis, visit [www.countmyfish.noaa.gov](http://www.countmyfish.noaa.gov)

## Glossary

**Type A catch:** Fish brought back to the dock that can be observed in whole form (landings).

**Type B1:** Fish that were caught and filleted, released dead, given away, or disposed of in some way other than Types A or B2.

**Type B2:** Fish that are released alive (releases).

**Total Catch** = Type A + B1 + B2

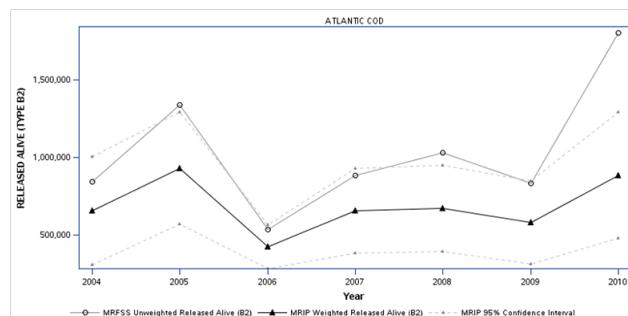
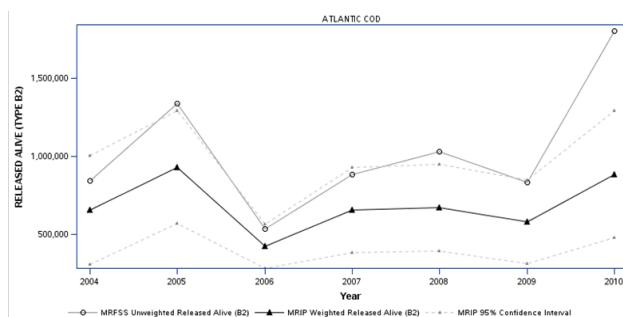
**Harvest** = Type A + B1

## Case 1 – Lower Point Estimates in North Atlantic Cod

### Removing bias from private access estimates

#### The difference

As seen in the charts below, according to MRFSS estimates there was a dramatic increase in the estimates of B1 and B2 catch in 2010. Such a significant increase in this estimate of catch could potentially trigger dramatic management actions. However, according to MRIP, this change was far less pronounced.



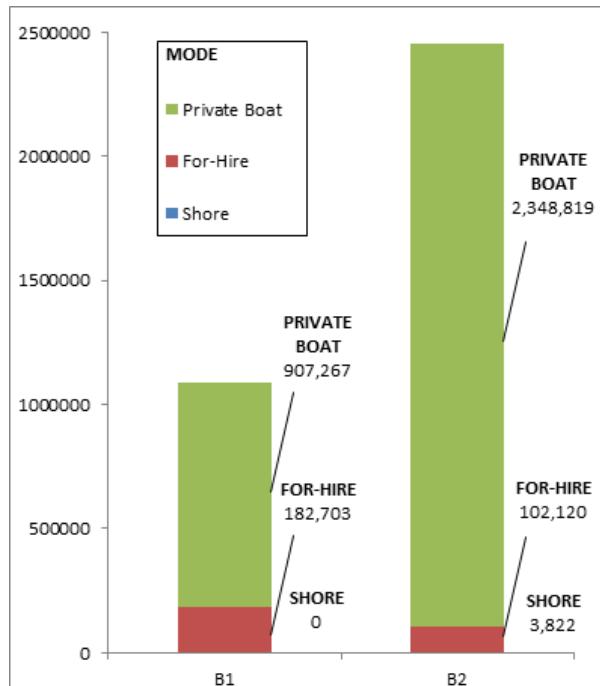
#### The bias

The total combined difference in B1 and B2 catch between MRFSS and MRIP 2004-2010 estimates was nearly 3.5 million fish. As indicated by the bar chart, private boat fishing mode accounted for over 80% of the difference in B1 and almost 96% of the difference in B2-catch estimates.

The difference is a result of the underlying assumptions in the MRFSS sampling design which aimed to gather as much data as efficiently and effectively as possible. Under MRFSS, we assumed that catch rates at high-activity sites and low-activity sites would be the same, introducing the potential for bias into the estimation process. However, what we found is that in some places, the catch rates actually were not the same. This meant that under MRFSS, some high-activity fishing sites were effectively oversampled. By correctly down-weighting the catch data from high activity sites, we've eliminated this potential bias. Due to the specific nature of the Massachusetts cod fishery, this particular assumption greatly impacted final estimates.

#### The bottom line

The MRIP point estimates show accurate catch rates that are the result of the design-unbiased estimation method.

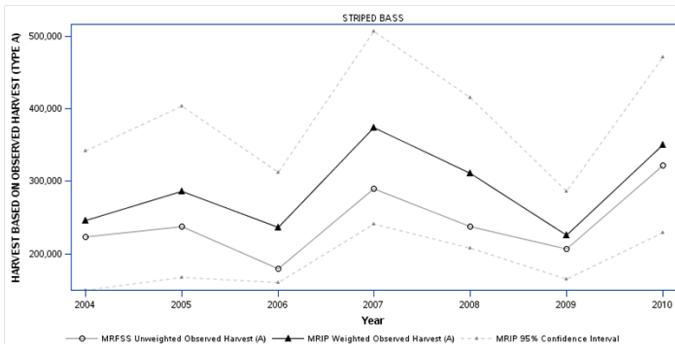


## Case 2 – Higher Point Estimates in New York Striped Bass

*Addressing inter-related sources of bias*

### The change

In the Mid Atlantic region, revised MRIP estimates of striped bass A-catch were systematically larger than the original MRFSS estimates in New York from 2004-2010. As seen in the chart below, while the differences varied between years, the total change in A-catch between MRFSS and MRIP 2004-2010 estimates was nearly 335 thousand fish.



### The bias

In this case, the changes between the MRFSS and MRIP estimates were attributable to an interplay between biases in three modes of fishing: Private boat, which accounted for about half the difference, and charter boat and shore fishing, which accounted for about one-fourth each.

#### Private boat

As with Case 1, high-pressure sites were effectively oversampled as a means to collect more data more efficiently. However, catch rates at high-pressure sites for striped bass – in this location and during this time series – were actually higher in low-pressure sites than they were at high-pressure sites. Therefore, when the low-pressure sites



were appropriately weighted through the MRIP method, the overall catch increased for the private boat mode.

#### Charter boat

Changes in charter boat mode estimates were also related to the treatment of high-pressure sites and low-pressure sites, but the underlying reason was significantly different. In this case, it was because vessels that were not listed in the For-Hire Survey vessel directory – and therefore not sampled – were more likely to cast off from low-pressure sites. This meant that we were undercounting the number of charter trips that were being taken, or effort. By using the correct, larger, number of trips, the total catch increased as well.

#### Shore mode

As with the private boat mode, higher catch data from the low-pressure sites were underrepresented under MRFSS. Properly weighting the catch rates led to an increase in A-catch estimates.

#### The bottom line

In a complex, multi-mode fishery like Mid Atlantic striped bass, multiple sources of potential bias must be addressed to produce an accurate estimate.

## Key Takeaways

- **MRIP estimates are more accurate**, even if some are similar to the original MRFSS numbers. That's because potential sources of bias from the original estimates have been removed through a rigorous, peer-reviewed, scientifically sound process.
- **Each estimate is impacted by multiple potential sources of bias.** Removing bias therefore creates no specific trends in direction or size of changes. Some estimates go up, some go down, and some stay about the same.
- **The re-estimation fixes a fundamental design issue.** This sets the stage to invest resources in future improvements to meet customer and stakeholder needs.
- **The re-estimation is a beginning, not an end.** Over the coming months and years, MRIP will continue to evolve to address the existing and emerging issues facing our nation's fisheries, and provide the tools necessary to manage them effectively, sustainably and for the benefit of all whose lives and livelihoods they impact.



## Transition strategy

The transition from the MRFSS data to the improved MRIP re-estimates – which will date back to 2004 – will have implications for managers, scientists and stock assessors alike. To ensure that NOAA Fisheries can fulfill its comprehensive mission as the steward of our nation's fisheries resources, the transition to the use of the new numbers is taking place in a coordinated, collaborative effort among departments within NOAA; alongside our state, council and commission management partners; and in partnership with fishermen and other stakeholders. These implications will vary depending on the agency responsible for the affected fish stocks, and will likely be addressed on a case-by-case basis.

For NOAA Fisheries, the key areas of interest to be addressed are:

- 1. Annual Catch Limits (ACLs).** It is likely that some of the ACLs will need to be recalculated using the new MRIP data. This is especially true in data-poor situations where ACLs are totally or partially based upon average landings over the 2004–2010 time period.
- 2. Annual Catch Targets (ACTs).** It is likely that many of the ACTs set for recreational fisheries will need to be recalculated using the new MRIP data because the uncertainty in catch (i.e., management uncertainty) has changed.
- 3. State catch allocations.** In a few fisheries, allocations of catch are divided up among the participating states; therefore, it is likely that some states will want to re-estimate catch allocations. NMFS involvement in resolving this issue may be limited if the allocation process or management of the stock is determined by the states.
- 4. Recreational sector catch allocations.** In several fisheries, allocations of catch are divided up among the recreational and commercial sectors of the fishery. Therefore, it is likely that some fisheries will want to re-estimate the allocation of catch among the recreational and commercial sectors.
- 5. Stock status change.** In a few cases, it is possible that the status of a stock may change as a result of the new MRIP data. This will probably only occur in fisheries that are near the threshold of overfishing or becoming overfished. Therefore, some managers may decide it is reasonable to re-assess the status of these stocks using the new MRIP data sooner than originally planned.

### What's Next?

In early 2012, an expert working group will convene to discuss these issues, including how the re-estimated recreational catch statistics for 2004–2010 will likely affect the conclusions of recent stock assessments and ACLs that are totally or partially based upon average landings. The group will propose a methodology or methodologies that could hind-cast MRIP-based estimates prior to 2004 and develop a process for incorporating MRIP-based estimates into stock assessments. The results of the expert working group will be independently peer-reviewed. Once the new MRIP-based estimates are incorporated into stock assessments or other methods for data-poor stocks, Councils and their Science and Statistical Committees (SSCs) can begin revising their ACLs through regulatory amendments, which take 6–9 months, or plan amendments, which take 18–24 months. During the interim, NOAA Fisheries will coordinate with the Council SSCs to review all available information and, on a case-specific basis, recommend action on how in-season or post-season Accountability Measures will be triggered for stocks in 2012 and in the future.

**Stay informed. Visit [www.countmyfish.noaa.gov](http://www.countmyfish.noaa.gov) for details and updates.**

