New Method Improves Catch Estimates

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

The Marine Recreational Information Program, or MRIP, is the new way NOAA Fisheries is collecting, analyzing and reporting recreational fishing data. The program brings scientists and stakeholders together to evaluate the way we've done things in the past and constantly work toward ever more reliable and trusted data. In January of 2011, the MRIP team finalized an ambitious overhaul of the way NOAA calculates recreational catch: We have corrected assumptions about how different factors might affect catch rates, and developed a new method to produce more accurate estimates. This method is being used to recalculate previous estimates dating back to 2004, and will be the basis for all new estimates moving forward. In the coming months, pre-2004 estimates will also be recalculated.

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

National Research Council Review of MRFSS

In implementing this fundamental change, we have built the scientific and statistical foundation necessary to make other significant improvements – like enhanced angler surveys, more precise estimates, and more frequent reporting – to meet the needs of fishermen, stock assessors, managers, and others. We've also acted on a major recommendation by the National Research Council – the nation's premier independent evaluator of scientific practices – from its review of the Marine Recreational Fishing Statistical Survey (MRFSS). Congress called upon NOAA to address this and other NRC findings in the 2007 Magnuson-Stevens Reauthorization Act.

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

There are no across-the-board trends either in size or direction of change in the MRIP estimates. On a species-by-species basis, some estimates go up, some go down, and some remain about the same. (Visit **www.countymyfish.noaa.gov** for estimation and comparison tools). However, in all cases, the **numbers are more accurate**. That's because we are now taking into consideration things like possible differences in catch rates at high-activity and low-activity fishing sites, or the amount of fishing occurring at different parts of the day. In statistics, variables like these are called **potential biases**, and can skew the actual numbers if they're not fully accounted for.

WHAT'S THE IMPACT ON THE ESTIMATES?

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 at a given place over a specified period of time. MRIP point estimates will generally be different than those previously reported. However, because we removed numerous sources of potential bias from each estimate, and those sources can each have a different effect, there are no general trends to those changes. It's similar to when a teacher decides to score a test on a "curve"; any given final score may, or may not, be affected, depending on what all the other scores are. *Case studies are included on pages 2 and 3.*

The PSE is similar to the "margin of error" that is frequently used in public opinion surveys. It is the measure of how **precise** an estimate is. The lower the PSE, the greater the precision. The MRIP PSEs are higher than those calculated previously. But according to our analysis, that's primarily because the old PSEs were incorrect. Accurately 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 in making prudent, sustainable fisheries management decisions.

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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Case Studies

In reviewing the differences between MRIP and MRFSS point estimates, no trends emerge in the size or direction of the changes. Some numbers go up, some go down, and some remain about the same. This is due to the fact that we corrected different sets of assumptions, and each correction can have a different impact on the size or direction of change on the total catch estimates. The summary case studies below demonstrate the interplay among these factors. For a more complete analysis, visit **www.countmyfish.noaa.gov**

Key Terms

Potential for Bias: The result of untested assumptions or unconsidered factors in a survey design that increase the chances that the survey results may be skewed higher or lower than the true value.

Weighting: The standard statistical method of ensuring that the survey results accurately reflect an entire population by correcting for over- or undersampling.

Fishing Site: The location such as a pier, dock, section of beach or boat ramp where a fishing trip ends and an angler intercept survey is conducted; sites are categorized as *high-activity* or *low-activity* based on the amount of fishing or trip returns that occur.

Catch Rate: The average number of fish caught per angler fishing trip. This includes fish that were landed, as well as those released.

Fishing Mode: The particular way an angler fishes. Anglers fishing from charter boats, private boats, or from the shore are considered to be fishing in different modes.

Case Study 1
North Atlantic Cod

Correcting assumptions about catch rates

The change

According to original MRFSS estimates, there was a *dramatic increase* – some 3.5 million fish – in Massachusetts cod catch in 2010. According to the more accurate MRIP numbers, though, the *actual difference* was far less pronounced.

Finding and fixing the bias

In our review of the data, we found the main driver of the higher estimates was *higher average catch rates* for cod at *high-activity sites*.

Historically, we have conducted more sampling at high-activity than low-activity sites as an efficient way to gather more data. When we built estimates based on that information, we assumed that average catch rates would be the same at both types of sites.

Making this assumption introduced the **potential for bias** in the average catch rate estimation. In reality the sampled angler catch rates were *higher* at high-activity sites, causing our estimates to be biased high.

By downweighting the data from high-activity sites, we've accounted for the oversampling and removed this bias.

The bottom line

The improved MRIP estimates are more accurate because our new methodology reflects the reality that catch rates differ at high-activity and low-activity sites.

Case Study 2
Mid Atlantic Striped Bass

Addressing inter-related sources of bias

The change

Revised MRIP estimates of 2004-2011 striped bass landings in New York were *consistently higher* than the original MRFSS estimates by a total of nearly 335,000 fish.

Finding and fixing the bias

In this case, the differences between the MRFSS and MRIP estimates were due to an interplay among different estimation biases in three modes of fishing: private boat, charter boat, and shore fishing.

Private boat

As with Case Study 1, high-activity sites were more heavily sampled, though in this case average angler catch rates were *lower* at these sites.

Charter boat

Because of our intentional focus on high-activity sites, we *undercounted* the total number of charter boat trips from low-activity sites.

Shore mode

As with the private boat mode, angler trips sampled at *low-activity sites* showed *higher* average catch rates than those at low-activity sites, skewing the overall estimate.

The bottom line

In a complex, multi-mode fishery like New York striped bass, multiple sources of potential bias must be addressed to produce an accurate overall estimate of the total catch.

Case Study 3
South Atlantic Black Sea Bass

Properly accounting for zero-catch trips

The change

2004-2010 estimates for black sea bass catch in South Carolina were about 1.4 million fish *lower* using the improved MRIP estimation methodology as opposed to MRFSS.

Finding and fixing the bias

When we analyzed the difference between the two estimates, we found that the changes were again due to the oversampling of angler fishing trips at high-activity sites. In this case, the oversampling led to an effective undercount of "zero-catch" trips for black sea bass.

That's because trips sampled at high-activity sites showed a higher probability of catching black sea bass. Trips with no catch of black sea bass were more common at low-activity sites.

Since we sampled more heavily at high-activity sites, this caused the MRFSS estimator of average angler catch of this species to be biased high. In reality, there were more trips that did not catch black sea bass than the MRFSS estimates showed.

The bottom line

- To produce accurate estimates, once again it was necessary to down-weight the catch data collected at high-activity sites.

Case Study 4
Gulf of Mexico Red Snapper

Addressing higher catch rates at low-activity sites

The change

According to the revised MRIP estimates, there were nearly 3 million *more* red snapper caught on the West Coast of Florida between 2004 and 2010 than previously reported under MRFSS.

Finding and fixing the bias

As in other case studies, the difference between the two estimates resulted from the MRFSS assumption that angler catch rates at high-activity and low-activity sites would be the same.

In Western Florida, we conducted more angler surveys at high-activity sites than we did at low-activity sites. Although this allowed us to gather more fishing data because we were able to talk to more fishermen, we did not account for the fact that catch rates may be different between high-activity and low-activity sites.

In this case, the reality was that angler catch rates were lower on average at high-activity sites, causing the MRFSS estimates of total catch to be biased low.

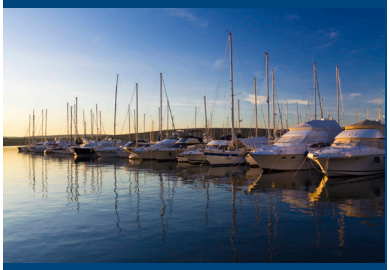
The bottom line

- There are no blanket assumptions that can be made about the relationships between the many estimation components affected by the oversampling of high-activity sites.

Key Takeaways

- **MRIP estimates are more accurate**, even if some are similar to the original MRFSS numbers. That's because untested assumptions – or potential sources of bias – from the original estimates have been removed through a rigorous, peer-reviewed, scientifically sound process.
- **Each estimate of total catch is impacted by multiple potential sources of bias.** Removing bias therefore creates no specific trends in direction or size of changes across fish species, fishing modes, or geographic regions. Some estimates go up, some go down, and some stay about the same.

  This is similar to when a teacher decides to score a test on a "curve"; any given final score may, or may not, be affected, depending on what all the other scores are.
- **The new estimation method fixes a fundamental issue with our estimates**. This sets the stage to invest resources in future improvements to meet customer and stakeholder needs.
- **The new estimation method 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. 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. 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.

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 and other 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 based in part upon average landings. The group will propose a methodology or methodologies that could re-estimate past 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. 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 for details and updates.