An Analysis of Recall Bias Using Extant Head Boat Data from the Atlantic

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Executive Summary

Existing MRFSS data from the Atlantic coast give us one way to look at whether anglers systematically misreport discards. An examination of the data provided no support for this hypothesis. The lack of any apparent systematic bias in these somewhat coarse data suggests that if "recall bias" operates in current surveys of discards, then its effects must be subtle.

Introduction

The NRC in its 2006 report expressed the concern that the present MRFSS methodology may fail to accurately measure discards by recreational anglers. Discards may be a significant source of mortality within some fisheries. To substantively explore the NRC's concerns requires finding an independent source of discard estimates to compare with discard estimates derived from existing intercept surveys. Data on hand from direct observations of anglers on head boats working the Atlantic coast may provide one such independent data source.

Method

As part of ongoing MRFSS collections, we send out survey samplers on head boats working the Atlantic coast. Samplers monitor a group of anglers, usually 5-10, and record their kept and discarded catches. At the end of the boat trip, these same samplers conduct MRFSS intercept surveys on those other anglers aboard who went unobserved.

We presume that anglers on the same boat will have similar luck on average. Thus, any differences between observed catches and MRFSS intercept survey reported catches (that is, angler reported data) would derive from differences in reporting conditions, rather than fishing conditions. While it is possible anglers may change their fishing behavior when watched, the presence of a single crew directing fishing aboard head boats—choosing when and where to fish for all people aboard, and with what gear—will tend to minimize this difference. We believe that any variance between observed discards and angler reported discards most likely would come from a reporting bias, such as "recall bias", when anglers at the end of a trip have difficulty remembering the precise number of fish they caught, and so they round up when asked, or simply make up something that feels right.

Building upon work by Rob Andrews, I have used data from 2006 and 2007 to compare observed and angler-reported numbers of discards per trip, by species, on head boats.

This analysis includes only head boats with observes, excluding any intercept surveys of head boat anglers conducted dock-side. Within this universe, Rob's program creates two statistics: the number of discards per angler trip among observed anglers, and discards per angler trip among unobserved anglers. I created a ratio of these two catch-per-unit-effort measures by species:

$$\text{Ratio} = \frac{\text{Mean(angler reported discards per trip)}}{\text{Mean(observed discards per trip)}}$$

When this figure is near one, then angler reports of discards and observed discards nearly match. Departures away from one signify differences between reports and observations.

Results and Discussion

Of the 88 species reported caught during 2006 and 2007 by head boat anglers, 38 occurred too rarely to include in this analysis. However, the remaining 50 include most species with particularly high value to recreational fisheries on the Atlantic, like summer flounder or striped bass.

On the graphic (next page), the red line indicates the 1:1 axis, the grey lines 0.5 and 1.5. The ratio of reported/observed discards for most species falls between these two arbitrary boundaries. About equal numbers exceed them at both the high and low end. This evenness suggests a random, rather than a biased, distribution of variation. It is very much what we would expect from the interaction of two sets of normally distributed random variables (mean CPUE reported by anglers and mean CPUE observed by samplers) with common central points.

Note that the appearance of a long tail at the high end is merely an artifact of the measure I have used. Since there can be no negative discards, the range for this ratio is from 0 to infinity; values below one are compressed, while those above one telescope out. This will give the appearance of a high-end bias. However, values very close to zero are as much outliers as values approaching infinity. If we were to simply reverse the ratio—switching numerator and denominator—those near zero values would become large, while large values would approach zero.

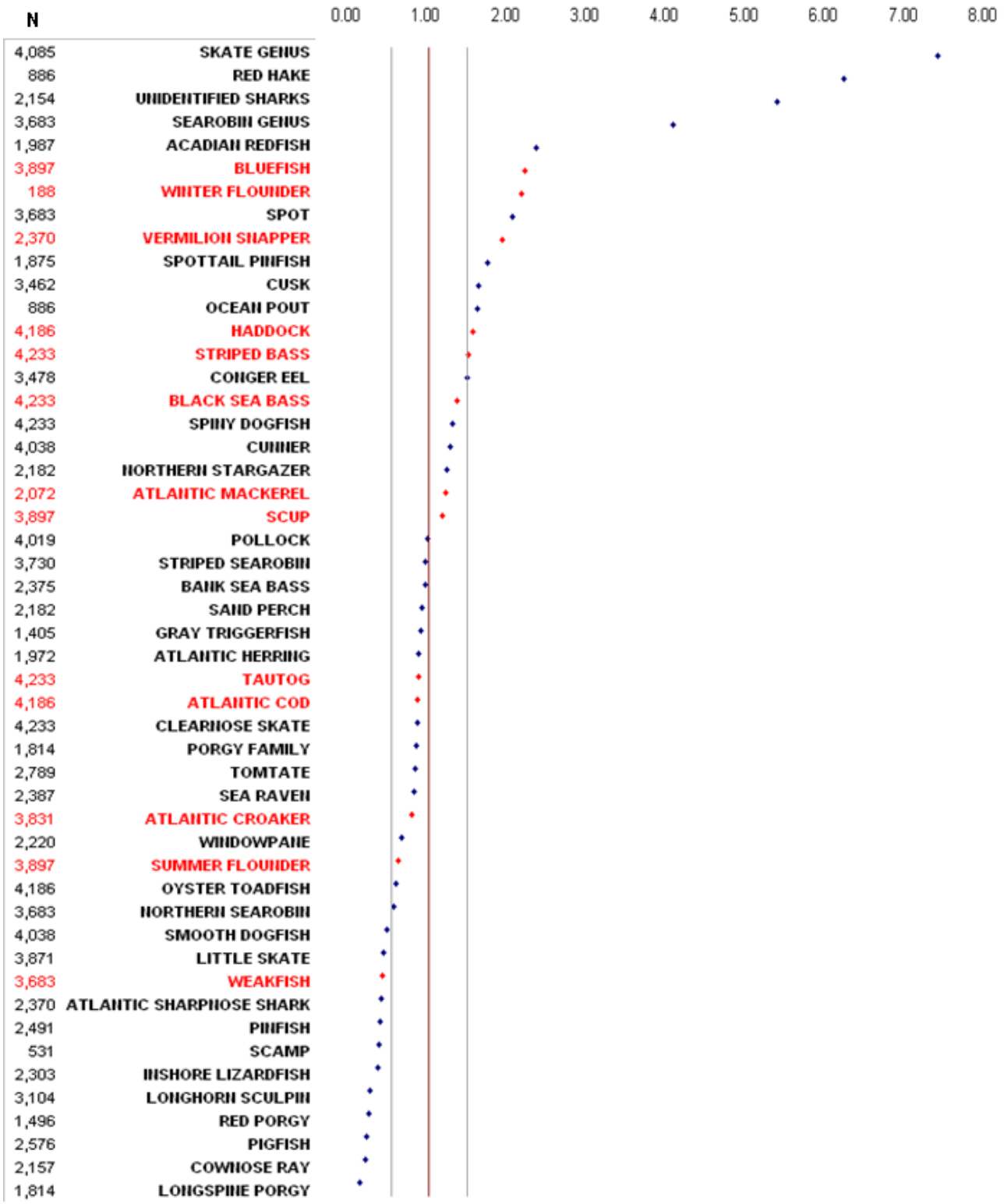
Thus, the distribution in the graphic really is even. I have done the experiment of flipping the ratio, and the picture is much the same, only in reverse order.

Species Specific Analysis

It would still be possible for there to be a recall bias problem if some species tended to fall on one side or other of the distribution depending upon, for example, their size or importance to fisheries.

The species list includes species of similar size both above and below the 1:1 point (summer and winter flounder, or Atlantic cod and haddock, for example).

Ratio of Angler Reported Discards per trip to Observed Discards per trip, by Species, Head Boat mode, 2006 and 2007



Source: MRFS 2006, 2007, internal data, head boat mode.

To consider whether species of particular importance to fisheries might suffer greater recall bias, I asked a handful of people in ST1 to rate each fish species for their, "importance to recreational fisheries." I then consolidated the results into a "top fish" list. There was considerable agreement among people I spoke with on species rankings.

Even so, there was nothing rigorous or complete about this survey, and my limiting the inquiry to the fisheries statistics office may have produced a skewed view. Someone from the management side of NOAA Fisheries, for example, might have a very different opinion about what constitutes importance. However, as a quick and dirty measure to detect bias based on the notability of a species, I believe that it will serve.

Eight species of importance have a ratio above 1:1, and five below. If there is a bias based on importance, it is weak at best. Considering the rough nature of my importance measure, evidence for even a weak bias is equivocal.

Conclusion

I find no strong evidence of a systematic recall bias in the head boat data. While this analysis relies upon rough measures and indirect data, if the effect were strong, I believe this method would have found it. I conclude that the effect of recall or reporting bias is weak or absent from our present MRFSS collections in the head boat mode.

In the future, we should consider expanding this study to include new data now available (2008 data). We also might consider, if we are to make further use of the 'top species list', vetting that list through a more authoritative body of experts. I would also recommend analyzing the larger data set on a wave basis, to see whether some small number of species might suffer from consistent under reporting by anglers, while others are always over reported. The cross sectional analysis above can not dispel this possibility. Neither can these aggregate data inform us about possible geographic differences in reporting, or reporting differences resulting from management practices, both of which future research might consider.

We might also find it valuable to perform a more direct test—where we both observe and collect intercept surveys from the same anglers. Such an experiment would better be able to measure any possible subtle reporting biases. Should it find no such biases, that result would strengthen the conclusion of this small study.

If we have the budget to field a more direct study, we could increase its geographic scope by including the Gulf of Mexico in our collections. This would make its results that much more widely applicable, while adding only slightly to study complexity.

We also might want to consider experiments on whether recall bias or reporting bias plays a role in other modes of fishing (shore side, for example).