



Martin O'Malley, Governor
Anthony G. Brown, Lt. Governor
Joseph P. Gill, Secretary
Frank W. Dawson III, Deputy Secretary

December 1, 2014

The Honorable Martin O'Malley
Governor
Annapolis, Maryland 21401

The Honorable Joan Carter Conway, Chair
Senate Education, Health and Environmental Affairs Committee
2 West, Miller Senate Office Building
Annapolis, Maryland 21401

The Honorable Maggie McIntosh, Chair
House Environmental Matters Committee
251 Lowe House Office Building
Annapolis, Maryland 21401

Re: Submission of Report on Recreational Striped Bass Harvest Data

Agency: Maryland Department of Natural Resources

Report Authority: Chapter 446 (HB 1148) of 2014 (MSAR #10042)

Dear Governor O'Malley, Senator Conway and Delegate McIntosh:

Enclosed is a report on recreational striped bass harvest data, as required by Chapter 446 (HB 1148), which was enacted during the 2014 General Assembly session. The report concludes that the recreational harvest estimates currently provided for the Maryland striped bass fishery are appropriate for management of the fishery.

Should you have any questions or comments regarding this report, please feel free to contact DNR's Legislative Director, Rich Norling, directly at 410-260-8112, or by email at rich.norling@maryland.gov.

Sincerely,

Joseph P. Gill
Secretary

cc: The Honorable Jay A. Jacobs
321 Lowe House Office Building
Annapolis, Maryland 21401



Martin O'Malley, Governor
Anthony G. Brown, Lt. Governor
Joseph P. Gill, Secretary
Frank W. Dawson III, Deputy Secretary

Recreational Striped Bass Fishery Study on Harvest Data

Conducted in Response to House Bill 1148 (MSAR #10042)

Maryland Department of Natural Resources

EXECUTIVE SUMMARY

This report has been completed to meet the study and reporting requirements of House Bill 1148 (Chapter 446, 2014), Recreational Striped Bass Fishery – Study on Harvest Data.

The law directs the Department to conduct a study on methods of obtaining more accurate harvest data for the recreational striped bass fishery. The study is required to:

- (1) Examine the benefits of more accurate harvest data for the recreational striped bass fishery on the scientific and management capabilities of the Department with respect to the entire (recreational and commercial) striped bass fishery;
- (2) Consider the types of information and level of detail that would be most beneficial for the Department to obtain for its scientific and management duties and capabilities;
- (3) Consider the advantages, disadvantages, and feasibility of implementing various methods for obtaining more accurate harvest data for the recreational striped bass fishery;
- (4) Recommend methods for obtaining more accurate harvest data for the recreational striped bass fishery; and
- (5) Recommend any enforcement measures that would need to be implemented to support any methods recommended under paragraph (4) of this subsection.

The recreational harvest estimates currently provided for the Maryland striped bass fishery are appropriate for management. Altering or substantially augmenting current methods would be extremely expensive for the State, and doing so would not guarantee sufficient increased information to impact management strategies. Enhancements to the current survey methods may be beneficial to the State by providing more precise estimates for species other than striped bass that are not encountered as often in the angler intercepts.

(1) Examination of the benefits that more accurate harvest data for the recreational striped bass fishery would have on the scientific and management capabilities of the Department with respect to the entire striped bass fishery.

“The entire striped bass fishery” is interpreted to mean the commercial and recreational sectors of the Maryland’s striped bass harvest.

The benefit of more accurate recreational striped bass harvest information can only be understood in terms of the current information available to the Department and the use of that information. Recreational harvest values are used at the coast-wide level for development of the coastwide stock assessment, determination of the Chesapeake Bay allocation of allowable harvest, and the evaluation of the effectiveness of state management against quotas. Maryland’s annual recreational striped bass harvest estimate is provided by the National Marine Fisheries Service through a set of surveys known as MRIP (the Marine Recreational Information Program). The harvest estimates are accompanied by a measure of precision called the Percent Standard Error (PSE); low PSE values indicate high precision and PSE values less than 25% are generally considered to indicate “excellent” precision.

The precision of the coast-wide recreational striped bass harvest estimates is consistently around 6%, with no value exceeding 8% in the past 10 years. Maryland recreational striped bass harvest estimates are consistently around 13%, with no value exceeding 16% in the past 10 years. Therefore, the values provided by the NMFS are considered excellent estimates of the striped bass recreational harvest for both scientific and management purposes. Harvest estimates of other coastal species are not as precise and the Department is working to enhance the precision of these estimates.

(2) Consideration of the types of information and level of detail most beneficial for the Department to obtain for its scientific and management duties and capabilities.

(a) Types of information currently used to develop management for all striped bass fisheries

The annual Maryland commercial and recreational harvest allocations are the result of a combined scientific and management process that uses information from Maine to North Carolina. This process is a cycle, consisting of:

- **ASSESSMENT** - a coast-wide stock assessment which is a mathematical model used to determine the health of the population along the Atlantic coast and produces safe annual harvest levels for the Atlantic coast (a scientific process),
- **ALLOCATION** – based on results of the stock assessment the annual safe annual harvest is allocated among states/regions (a management process),
- **MANAGEMENT** – management jurisdictions (states/regions) implement their own rules to ensure that harvest is constrained to the assigned allocation (a management process) and,
- **REVIEW** - an annual performance review of each year’s management against the safe harvest levels determined by the stock assessment.

The striped bass stock assessment is repeated every two years, which starts a new cycle.

Both commercial and recreational harvest data are important components in each part of the cycle:

Assessment - More accurate harvest data in the stock assessment improves quality of the stock assessment model thereby increasing confidence that safe harvest levels are appropriately set to sustain the population.

Allocation – accurate harvest data are important because most allocation decisions (which state/region gets to harvest how much) are based on harvest history. States/regions with poor harvest records are often disadvantaged during allocation decisions.

Management and Review – confidence in estimated harvest allows managers to maximize harvest rules because they are more certain they will not exceed prescribed levels.

While harvest data are an important element of the stock assessment, many other data sources are also used. Many of these data sources are independent of the fisheries. These 'fishery-independent' data sources are important to ensure robust stock assessment results because harvest data can be influenced by factors other than population health (e.g. weather, economics, etc.).

Overall, the process of assessment, allocation, management and review is a combination of coastwide, regional and state-specific steps.

The steps are as follows:

1. Harvest information on recreational and commercial harvest and discards is collected by , state management agencies and federal regional surveys (see Part II).
2. Additional (non-harvest) data related to the population (e.g. spawning stock and juvenile abundance) is collected by state management agencies and federal regional surveys.
3. Harvest and non-harvest information is processed into a coastwide stock assessment through the Atlantic States Marine Fisheries Commission (ASMFC) striped bass Technical Committee. Complex models estimate the abundance and age distribution of the coast-wide stock and a time series of the fishing pressure on the stock. The model also produces estimates of safe fishing levels.
4. The ASMFC striped bass Technical Committee reports this information to the ASMFC Management Board, along with recommendations for how to maximize harvest while safely maintaining the coastwide population.
5. The ASMFC Management Board considers the scientific information and determines the annual state or regional allocations of allowable harvest. Maryland's Chesapeake Bay fisheries are part of the Chesapeake Bay region which includes Virginia and the Potomac River Fisheries Commission.
6. Maryland's recreational and commercial harvest of striped bass is managed (and estimated) using different methods for the two sectors.
7. The next year, an evaluation is conducted to review the performance of harvest vs. quota.

The information required for the process outlined above is a combination of harvest, other removals from the fishery (discards, catch-and-release mortality, natural mortality) and age structure of the population. This information is collected through surveys conducted by DNR, surveys conducted by the National Marine Fisheries Service and a comprehensive commercial harvest reporting system administered by DNR. Catch-and-release mortality and natural mortality are estimated from tagging and other studies. A description of the information collected and the use of the information follows.

Harvest information:

1. Recreational harvest
 - a. The federal recreational angler survey (MRIP) estimates the number of angler trips, harvest ^{1,2}, number of discards ¹, and provides lengths of harvested fish from March-December (a more detailed explanation of the MRIP surveys and estimation procedures follows later in this section). ¹
 - b. Mandatory DNR charter boat reporting provides information on angler trips, harvest and number of fish released. ^{1,2}
2. Commercial harvest
 - a. A DNR commercial reporting system provides commercial harvest.

Other fishery removal information:

1. Recreational discards
 - a. The federal recreational angler survey (MRIP) estimates the number of discards¹ from March-December (a more detailed explanation of the MRIP surveys and estimation procedures follows later in this section). ¹
2. Commercial discards

The ASMFC Striped Bass Stock Assessment subcommittee estimates the commercial discards as a proportion of the commercial harvest. ¹

Population age structure:

1. Chesapeake Bay spawning stock
 - a. A DNR fishery-independent gillnet survey to characterize abundance and age-at-length of spawning migrants is conducted each spring (1,687 fish were sexed and measured in 2013, and 624 scales were aged).¹
 - b. A DNR creel survey of private boat anglers from April 21-June 15 collects information on age at length of the migrating spawning stock (In 2013, 207 trips were intercepted for interviews, 182 fish were sampled, and 166 scales were aged).¹
 - c. A voluntary charter captain survey from April 21-June 15 provides (thousands of) lengths of both kept and released striped bass that are used in the development of the age structure of discards (5,235 striped bass lengths were reported in 2013).¹
 - d. A private angler volunteer survey provides hundreds of lengths of kept and released striped bass in Chesapeake Bay (in 2013, 280 lengths were reported in the Spring season - 101 released, 179 kept).¹
2. Chesapeake Bay resident stock
 - a. A DNR beach seine survey characterizes the abundance and age-at-length of the young-of-year stock.¹
 - b. Check station and pound net monitoring provides lengths and weight at age of commercially harvested fish (2,866 lengths and weights and 213 scales aged from Chesapeake Bay check stations, 168 lengths and weights and 147 scales aged from coastal check stations). Since this is the same stock as the recreational harvest, these values are applied to develop weight-at-age of the recreational harvest.
 - c. A private angler volunteer survey provides hundreds of lengths of kept and released striped bass in Chesapeake Bay (in 2013, 280 lengths were reported in the Spring season - 101 released, 179 kept. 716 lengths were reported in the 2013 Summer-Fall-Winter season - 501 released, 215 kept).¹

¹ information used in the coastwide stock assessment

² information used in the management – allocation process

(b) Level of detail most beneficial for the Department to obtain

The most common way to measure the level of detail (accuracy) of a value is “precision”. An example of an estimate with associated precision follows.

Precision can be envisioned as a distance that “flanks” the estimate, creating a range of values.

[PRECISION] [HARVEST] [PRECISION]
[-----]

The most common measure of precision is percent standard error (PSE).

As an example, consider a harvest estimate of 20,000 fish with a PSE of 15%.

The precision of the estimate (the PSE) is equal to 15% of the harvest estimate, or 1,000 fish.

[1,000] [20,000] [1,000]

Therefore, our best understanding of the true number of fish harvested is between 19,000 and 21,000 fish.

There is no official recommended value of PSE for fishery management. However, Dr. John Weidenmann of Rutgers University was contracted by the Atlantic Coastal Cooperative Statistics Program of ASMFC to study the effect of recreational harvest uncertainty (PSE) on fishery management. The executive summary of his report “Evaluation of the Effects of

Uncertainty in Recreational Harvest Estimates on Fisheries Assessment and Management” states:

“Estimates of harvest in many recreational fisheries are often associated with a high degree of uncertainty. Accurate estimates of harvest in recreational fisheries are important for the effective assessment and management of species of recreational importance. For this study, a simulation model was developed to evaluate the effects of uncertainty in recreational harvest estimates on the assessment and management processes, and how these effects depend on the relative size of the recreational harvest for a stock. The model was run for three different species life histories ("fast", "medium", and "slow"), three sizes of the recreational fishery (with landings comprising 30, 60 and 90% of the total, on average), and even levels of uncertainty in recreational landings estimates (PSEs of 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, and 1.0). Results of this work suggest that PSEs above 0.6 produce unreliable estimates of population status, such that inclusion of catch estimates with this level of uncertainty in an assessment may result in a biased estimate from the assessment, which may impact the management process for a stock. In general, model estimates are more reliable (unbiased) for PSEs at or below between 0.4 and 0.6, with the specific upper limit dependent on the scenario being explored. Finally, the selection of a particular threshold PSE based on this study requires having clear objectives and specified levels of risk to effectively interpret the broad range of performance measures calculated.”

In the report summary above, percentages are reflected as decimals, so stated another way, the study examined PSE levels ranging from 20 to 100% and determined that PSEs above a range of 40 to 60% resulted in instability in stock assessment models.

Similar guidance is provided on the National Marine Fisheries Service (NMFS) website that provides recreational harvest estimates:

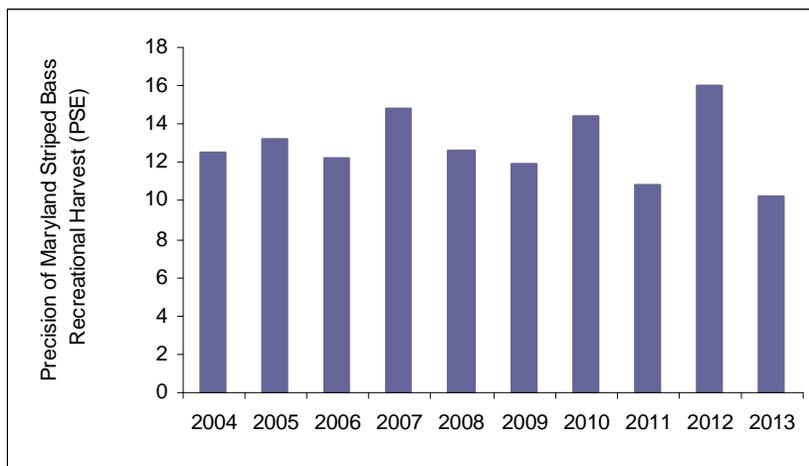
“Estimates should be viewed with increasing caution as PSEs increase beyond 25%. Large PSEs – those above 50% – indicate high variability around the estimate and therefore low precision. Estimates with large PSEs should be viewed cautiously.”

(c) Discussion of the MRIP Recreational Harvest Estimate

Estimates of harvest, discards, and lengths of over twenty marine species are produced by NMFS through a set of surveys known as MRIP (the Marine Recreational Information Program). This program grew out of the Marine Recreational Fisheries Statistics Survey (MRFSS) through a complete overhaul begun in 2007 at the behest of the National Research Council. Over the past 6 years changes have been made to all aspects of the surveys. The estimation procedures were re-designed and new procedures have been in place since 2012. The (fishing) Access-Point Angler Intercept Survey (APAIS), which determines the catch rate per fishing trip, was re-designed and implementation began in 2013. The effort survey, which determines the number of angler trips, has been re-designed and implementation is scheduled for 2015.

The precision of the annual Maryland recreational striped bass harvest estimates produced by MRIP is consistently about 13%. One key reason for the high quality of striped bass estimates is that the angler interviews produce a good representation of the Maryland striped bass fishery - because striped bass are abundant, widespread, and sought after year-round.

Figure 1. Precision of Maryland Striped Bass Recreational Harvest by Year

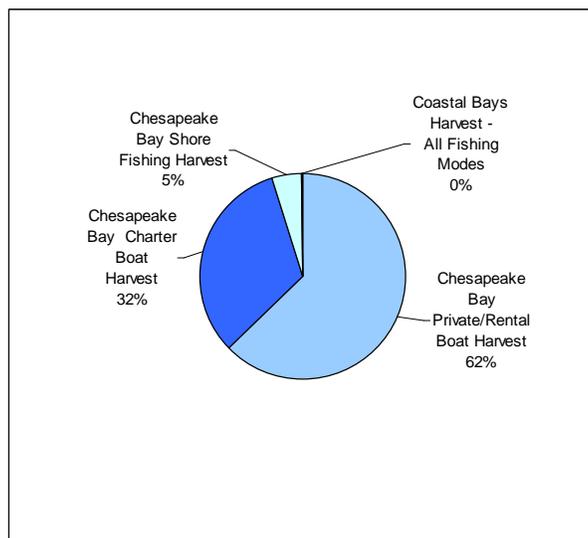


(3) Consideration of the advantages, disadvantages, and feasibility of implementing various methods for obtaining more accurate harvest data for the recreational striped bass fishery

Option 1: Implement a Census Reporting System for recreational striped bass anglers

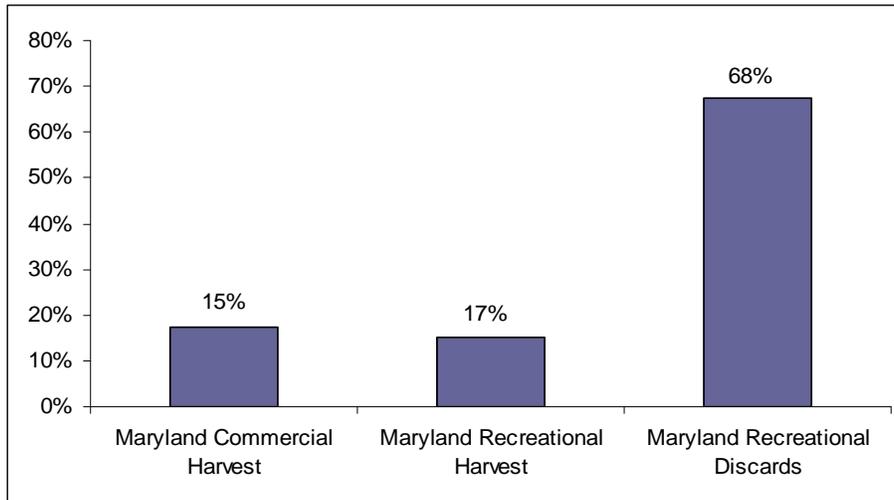
This is not a realistic option due to the scope of the fishery. Whereas the commercial fishery is a single, relatively small group of people, Maryland’s recreational fishery is open access, meaning that the anglers are both state residents and out-of-state visitors and the anglers are different each year. The scale of the recreational and commercial fisheries is completely different. Most of Maryland’s recreational striped bass harvest is by anglers fishing from private or rental boats in Chesapeake Bay. The NMFS estimates that approximately half a million of these trips were made in 2013, with a harvest between 300,000 and 400,000 striped bass. Experience in other states has shown that, even with mandatory reporting, the results would have error (under-reporting). Therefore, a survey would have to be conducted to estimate the error associated with the reported values. The result would be the result of a survey, just as the MRIP estimates are the result of a survey.

Figure 2. Distribution of Maryland Striped Bass Recreational Harvest by Fishing Sector and Area



An additional concern is that the vast majority of striped bass removals from the fishery are not harvested fish, but recreational discards. Approximately 1 million live striped bass are released by recreational anglers in Maryland each year. Any method focused on improved understanding of recreational harvest must provide equal attention to recreational discards or it will not improve management of the fishery.

Figure 3. Distribution of Maryland Striped Bass Removals by Fishing Sector



Option 2: Increase the Accuracy of the MRIP Recreational Harvest Estimate

Two separate surveys are combined to obtain the MRIP estimate of striped bass recreational harvest – the Access-Point Angler Intercept Survey (APAIS), and the Effort Survey. The most common (and guaranteed) method for increasing precision is to increase sample size. An extensive analysis of historical MRIP information was conducted to investigate the effect of increased sampling.

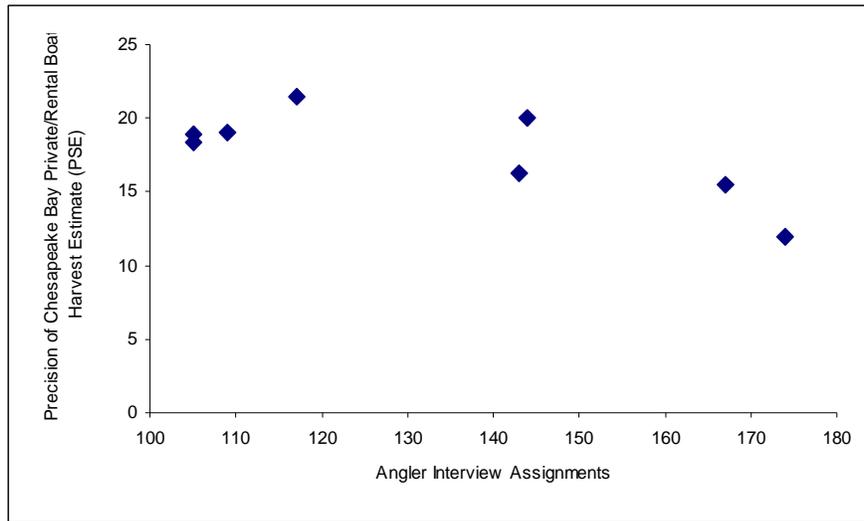
Effect of sampling level in the Effort Survey

Historically, the Potomac River Fisheries Commission has provided financial support for approximately 33% of sampling through the Effort Survey. In 2013, they withdrew that support, so the sample sizes dropped by 33%. There was NO difference in the precision of the 2013 striped bass recreational estimates (see Figure 1). Therefore, increased sampling in the Effort Survey will not likely improve precision.

Effect of sampling level in the Access-Point Angler Intercept Survey

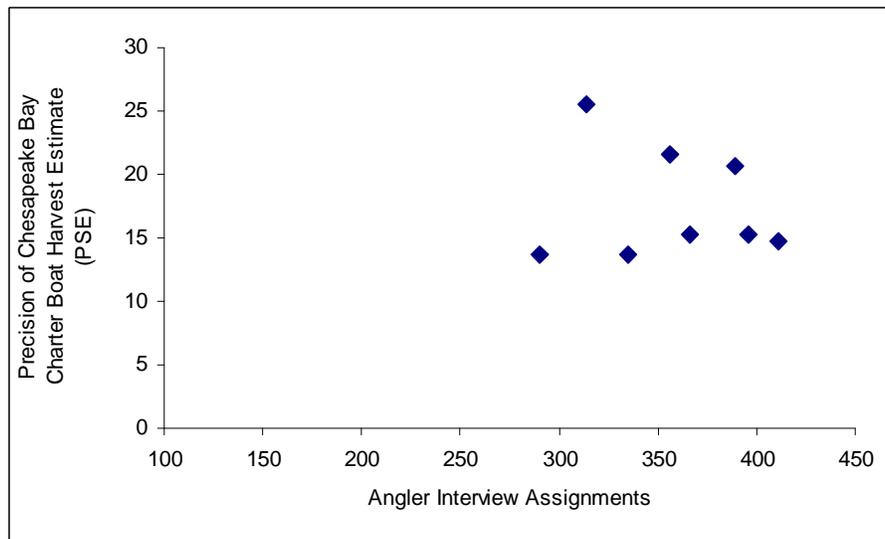
Sampling assignments for the Access-Point Angler Intercept Survey are calculated separately for the fishing modes (shore fishing, private/rental boats, charter and party boats). Analysis of data available through the NMFS website provided the historical relationship between interviewer assignments and recreational harvest PSE for each fishing mode. As was shown in Figure 2, the dominant recreational fishing mode is private/rental boat anglers. Analysis of historical data showed that the precision for this fishing mode is still excellent (consistently less than 25% error) and that there is very little relationship between sample size (number of interview assignments) and error.

Figure 4. Relationship of Precision of Maryland Striped Bass Recreational Harvest and Number of Private and Rental Boat Angler Interviews



There was no relationship between sample size (number of interview assignments) and error in the Charter Boat fishing mode.

Figure 5. Relationship of Precision of Maryland Striped Bass Recreational Harvest and Number of Charter Boat Angler Interviews



Therefore, increasing sample size would not produce a better understanding of Maryland's recreational striped bass harvest.

(4) Recommended methods for obtaining more accurate harvest data for the recreational striped bass fishery.

Because MRIP provides recreational striped bass estimates with good precision, an independently produced count would have to be proven more accurate to be used in scientific analysis and/or management. It is highly doubtful that the results would have better precision than the current MRIP estimates.

Due to the scale of reporting and/or survey work (approximately 1 million fish caught each year, over half a million trips to be reported), a major DNR Fisheries program expansion would be required. All cost of producing independent estimates would be born by the State.

Because of the challenges stated with other methods and the current precision of MRIP harvest estimates for striped bass, a different method to generate an independent harvest estimate would not produce better numbers for scientific or management use.

(5) Recommended enforcement measures that would need to be implemented to support any methods recommended under paragraph (4) of this subsection.

No enforcement recommendations at this time. Enforcement of the current system is not needed, and there are no new methods recommended that would achieve greater precision than the current system.

SUMMARY

Maryland's annual recreational striped bass harvest estimate is provided by the National Marine Fisheries Service through a set of surveys known as MRIP (the Marine Recreational Information Program). Recreational harvest values are used at the coast-wide level for development of the coastwide stock assessment, to determine the Chesapeake Bay allocation of allowable harvest, and to evaluate the effectiveness of state management against quotas. The harvest estimates are accompanied by a measure of precision called the Percent Standard Error (PSE); low PSE values indicate high precision and PSE values less than 25% are generally considered to indicate "excellent" precision.

The precision of the coast-wide recreational striped bass harvest estimates is consistently around 6%, with no value exceeding 8% in the past 10 years. Maryland recreational striped bass harvest estimates are consistently around 13%, with no value exceeding 16% in the past 10 years. One key reason for the high quality of striped bass estimates is that the angler interviews produce a good representation of the Maryland striped bass fishery - because striped bass are abundant, widespread, and sought after year-round.

Therefore, the values provided by the NMFS are considered excellent estimates of the recreational harvest for both scientific and management uses, and any state-generated independent harvest estimate would not produce better numbers for scientific or management use.

**Prepared by Linda S. Barker. PhD
Fisheries Service
Maryland Department of Natural Resources**