

February 13, 2008
Maryland DNR Fisheries Service

Background on the 2008 Female Harvest Reduction

In 2008 Maryland, Virginia and the Potomac River Fisheries Commission implemented a suite of regulations designed to reduce the harvest of female crabs by 34% in order to constrain the fishery to the target annual removal level of 46% of the population. Annual removal levels are calculated by dividing the total crab harvest (in numbers of animals) by the number of crabs estimated to be present in Bay during the preceding Bay-wide winter dredge survey. It has been determined by the Bi-State Blue Crab Advisory Committee and the Chesapeake Bay Stock Assessment Committee that managing the fishery for the 46% removal rate will produce the maximum sustainable harvest over the long term.

The 34% Reduction

The 2008 34% female harvest reduction goal was based on the difference between the projected 2008 female harvest (from the 2007-2008 winter dredge survey), and the female harvest that would limit the 2008 total crab catch to 46% of the total crab abundance.

Maryland currently estimates that the 2008 commercial female harvest was reduced by 25 to 33%. In the absence of regulation, the 2008 Maryland female harvest was projected to be approximately 13 million pounds. With the implementation of the 34% reduction, the female harvest was projected to be 9 million pounds. Based on preliminary analyses of DNR independent surveys, Maryland estimates that 8.5 to 10.5 million pounds of female crabs were landed in 2008.

The presentation of a range of harvest and harvest reduction in the 2008 fishery is due to significant discrepancies that have appeared between 2008 harvest reports and concurrent, independent measures of harvest observed in DNR surveys. A background on the independent harvest measures, and an analysis of the 2008 harvest discrepancy is included below.

Importance of Accurate Harvest Estimates

Annual estimates of harvest allow Chesapeake Bay Stock Assessment scientists to estimate the percentage of crabs removed from the population by the 2008 fishery relative to the 46% removal target. Therefore, it is incumbent upon DNR to fully assess the 2008 reporting bias and develop the most accurate estimate of the 2008 harvest. Adjustments to reported harvest are not unprecedented. In the past, harvest numbers in both Maryland and Virginia have been adjusted to account for changes in commercial harvester reporting systems. Descriptions of previous harvest adjustments are published in the 2005 "Stock Assessment of the Blue Crab in Chesapeake Bay" available online at <http://hjort.cbl.umces.edu/crabs/Assessment05.html>.

Final estimates of the 2008 harvest and the resulting harvest reduction will be subject to review by members of the Chesapeake Bay Stock Assessment Committee (CBSAC).

Background on 2008 Harvest – The Issue

In 2008, Maryland implemented two primary management actions: 1) Beginning September 1, 2008 watermen were assigned daily catch limits of female crabs that were based on the individual watermen's reported catch history. 2) The fishery was closed to the harvest of female crabs on October 23, 2008. On average between 1997 and 2007, 40% of Maryland's female crab harvest occurs after October 1st, and 19% of the female harvest is landed after October 23rd.

Bushel limits were assigned to watermen based on catch history for two primary reasons:

- 1) to prevent crabbers with no history of working on the fall female crab fishery from entering this portion of the fishery in 2008, and 2) to scale the catch reduction according to crabbing history in order to mitigate economic impact to individuals.

When management actions are directly tied to fishing reports, there is precedent for fishermen to alter reporting habits in order to position themselves for future report-based management actions. There are numerous examples of this published in the fisheries science literature.

Validation of Harvest Reports – What Really Happened?

Maryland DNR has several mechanisms in place to monitor the accuracy and veracity of commercial harvest reports. These are as follows:

- 1) Since 2002, Maryland DNR has engaged a reference fleet of approximately 40 commercial crabbers. This fleet collects information on crab catch by market category. The fleet works throughout the crabbing season, is spatially comprehensive, and represents all fishery sectors (hard pot, peeler pot, trotline, etc.).
- 2) Since 2003, Maryland DNR has contracted a commercial crabbing effort study that, through rigorously designed surveys and intensive field work, provides monthly estimates of the number of crab pots deployed in the Maryland portion of Chesapeake Bay.
- 3) Since 2001, Maryland DNR has required crab dealers to submit annual reports detailing the amount of crabs purchased, by market category – thereby providing an alternate gauge of crab harvest.

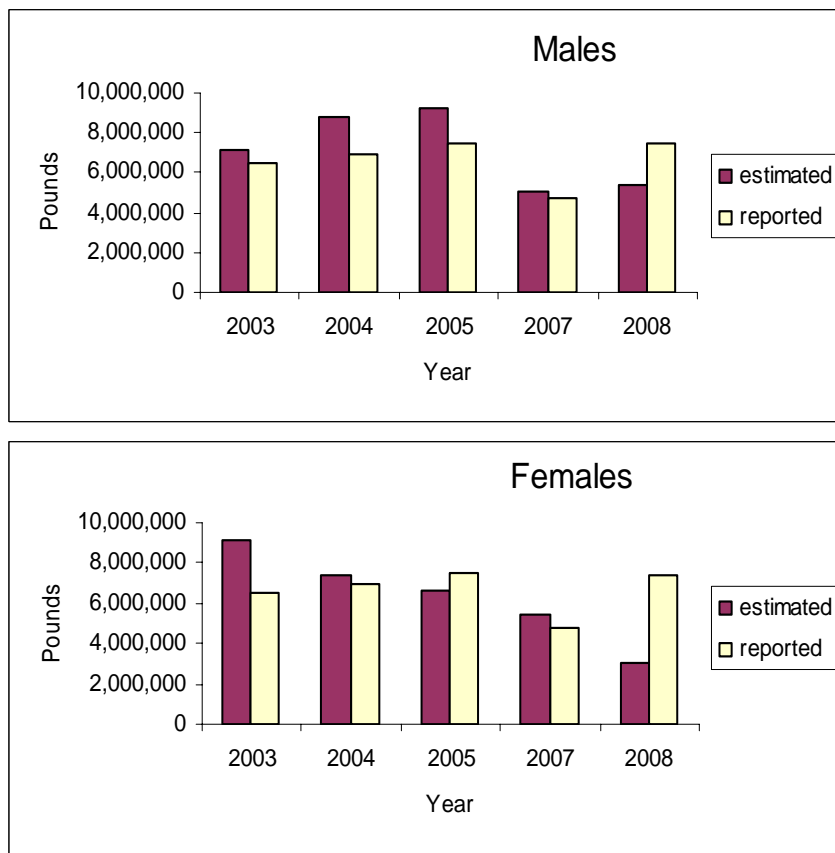
The Reference Fleet and Crab Pot Effort Studies

Data from the reference fleet can be combined with data from the commercial crabbing effort study to derive estimates of harvest that are **INDEPENDENT** from reports filed by commercial harvesters. Essentially, this is done as follows:

$$\text{catch per pot (pounds)} \times \text{number of pots} \times \text{days fished} = \text{pounds harvested.}$$

In all years since 2003, a consistent pattern has emerged: **estimated harvest is slightly higher than reported harvest, and female hard crabs are somewhat better reported than are male hard crabs.** On average between 2003 and 2007, the estimated harvest of male crabs from hard crab pots in the mainstem of the Bay was 18% higher than reported harvest. For female crabs, the difference between estimated and reported harvest averaged 15% over the same time period. In 2008, the reported harvest of male crabs was 30% higher than the estimated harvest. **The reported harvest of female crabs was 60% higher than estimated harvest (Figure 1).**

Figure 1. Estimated and reported hard crab harvest (in pounds) from hard crab pots deployed in the mainstem of the Maryland portion of Chesapeake Bay. The year 2006 is omitted due to missing data in that year.

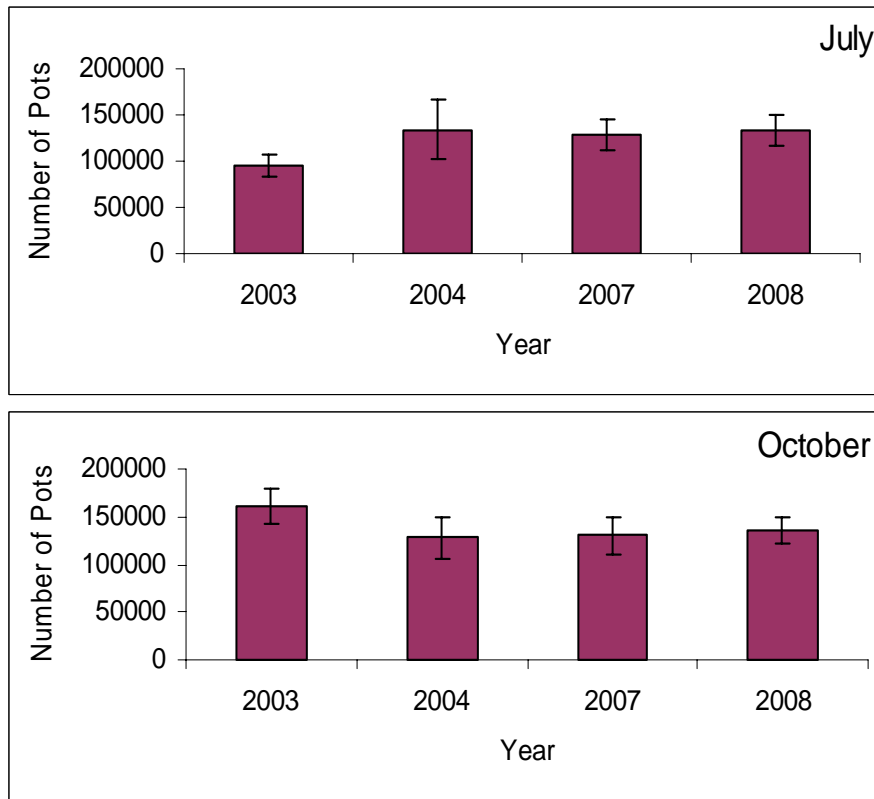


The Commercial Crabbing Effort Survey

Crab pots account for 60% of the annual Maryland crab harvest, and 80% of the annual Maryland female harvest. Therefore, a key question for DNR is whether crab pot effort increased in 2008, causing increased harvest. Based on results from the commercial crab pot survey, there was not a significant increase in crab pot effort. July and October of 2008 represent two months where reported harvest was particularly mis-aligned from estimated harvest. In July, the reported harvest of females from mainstem hard crab pots was 46% higher than the estimated harvest. In October, reported female harvest was 90% over DNR estimates. Despite this, there is no indication that the 2008 crab pot effort increased significantly in either month (Figure 2). Likewise, there is no evidence that crabbers increased their average number of days on the water in 2008.

Therefore, it is unlikely that the increased reported harvest is due simply to an increase in effort.

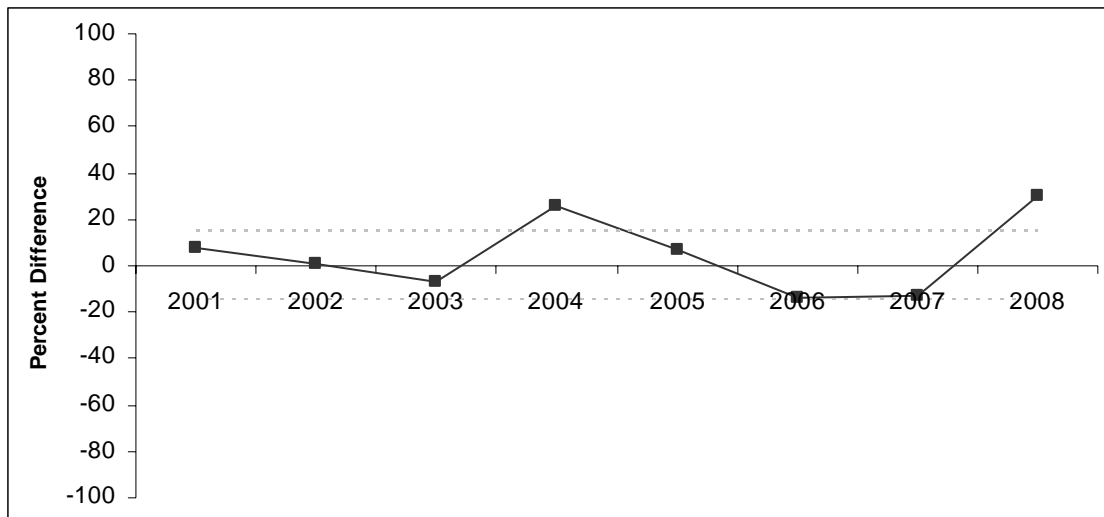
Figure 2. Estimates of the total number of crab pots deployed throughout Maryland waters (including Tangier and Pocomoke Sounds) in four years between 2003 and 2008. The error bars represent the standard error of the estimate.



Commercial Harvester vs. Crab Dealer's Reports

Since 2001, DNR has required seafood dealers to report the quantity of crabs purchased from Maryland waters. This allows DNR to compare two data sources that reflect annual crab harvest from Chesapeake Bay. Since 2001, dealer and watermen's reports have aligned well for female crabs and less well for male crabs. This difference between the market categories is most likely an indication of blue crab market dynamics where the bulk of female crabs are sold to dealers, whereas a large fraction of male crabs is sold directly to the consumer in the basket trade. In most years, dealer and watermen's reports of female crab harvest are within 15% of one another. In 2008, watermen's reports exceeded dealer reports by 30% (Figure 3). The idea that 2008 management action influenced reporting behavior is supported by a similar, but less pronounced, phenomenon in 2004. In the summer of 2003, commercial crabbers with a pre-determined amount of documented crabbing history were issued checks for \$500.00 as part of a federal fisheries assistance program. As a result, it was evident from the reference fleet, the pot study, and the dealer data that commercial harvest reporting increased in 2004. However, in that year, the reported harvest remained well within the range of the independently estimated harvest. In 2008, the reported blue crab harvest in Maryland is outside the range of estimates produced by DNR's independent surveys.

Figure 3. This graph shows the percent difference between commercial harvester and dealer reports. Points above the x-axis represent years when harvester reports exceeded dealer reports. On average, harvester and dealer reports of female harvest are within 15% of one another.



Conclusion

The 2008 Maryland commercial blue crab harvest appears to have been over-reported in response to 2008 management actions that tied allowable catches to harvest history. Maryland DNR does possess adequate information to assess the magnitude of the reporting bias, and is currently working to develop the most accurate estimate of the 2008

blue crab harvest. While annual harvest is an important component of management, the most reliable measure of the health of the blue crab population is the Bay-wide winter dredge survey. The results of the ongoing 2008-2009 dredge survey will be available in April.