

2017 Chesapeake Bay Blue Crab Advisory Report

CBSAC Meeting Dates: May 16 & June 1, 2017

Report Final: June 26, 2017

1. INTRODUCTION

1.1 Background: Science and Management

The Chesapeake Bay Stock Assessment Committee (CBSAC) combines the expertise of state representatives and scientists from the Chesapeake Bay region, as well as federal fisheries scientists from the National Marine Fisheries Service's Northeast and Southeast Fisheries Science Centers. This committee has met each year since 1997 to review the results of annual Chesapeake Bay blue crab surveys and harvest data, and to develop management advice for Chesapeake Bay jurisdictions: the state of Maryland, Commonwealth of Virginia, and the Potomac River Fisheries Commission (PRFC).

Three benchmark stock assessments of the Chesapeake Bay blue crab have been conducted since 1997. The most recent [assessment](#) was completed in 2011¹ with support from the Virginia Marine Resources Commission (VMRC), Maryland Department of Natural Resources (MD DNR), and the NOAA Chesapeake Bay Office (NCBO). The 2011 assessment recommended revision of the former overfishing reference point, which had been based on conserving a fraction of the maximum spawning potential (MSP), to one based on achieving the maximum sustainable yield (MSY; Table 1). The 2011 stock assessment recommended replacing the empirically-estimated overfished age 1+ (both sexes) abundance threshold and target with an MSY-based threshold and target based solely on the abundance of female age 1+ crabs.

Female-specific reference points were formally adopted by all three management jurisdictions in December 2011. Management of the blue crab stock is coordinated among the jurisdictions by the Chesapeake Bay Program's Sustainable Fisheries Goal Implementation Team (SFGIT). Organized by the Chesapeake Bay Program and chaired by NCBO, the SFGIT is led by an Executive Committee of senior fisheries managers from MD DNR, VMRC, PRFC, the Atlantic States Marine Fisheries Commission, and the District Department of the Environment.

CBSAC adopted the Baywide Winter Dredge Survey (WDS) as the primary indicator of blue crab population health in 2006 because it is the most comprehensive and statistically robust of the blue crab surveys conducted in the Bay². The WDS measures the density of crabs (number per 1,000 square meters) at approximately 1,500 sites throughout the Bay. The measured densities of crabs are adjusted to account for the efficiency of the sampling gear and are expanded based on the area of Chesapeake Bay, providing an annual estimate of the number of over-wintering crabs by age and sex². An estimate of the mortality during winter is also obtained from the survey results.

1.2 Background: Stock Status and Current Management Framework

Under the current framework, annual estimates of exploitation fraction are calculated as the annual harvest of female crabs in a given year (not including discards, bycatch, or unreported losses) divided by the total number of female crabs (age 0+) estimated in the population at the start of the season. As part of this calculation, the juvenile component of the total estimated number of crabs is scaled up by a factor of 2.5 so that the empirical estimate of exploitation uses the same assumption about juvenile susceptibility to the survey as the stock assessment that generated the reference points. Thus, the empirical estimates of exploitation rate can be compared with the assessment model derived target and threshold reference points. The 2017 exploitation fraction cannot be calculated until the completion of the 2017 fishery and is therefore listed as TBD (to be determined).

Crab abundance is estimated from the WDS each year. The current framework recommends monitoring the abundance of spawning-age female crabs (age 1+) in comparison to female-specific abundance reference points. Management seeks to control the fishery such that the number of crabs in the population remains above the minimum set by the overfished (depleted) threshold. Ideally, the fishery should operate to meet target values and should never surpass the exploitation fraction threshold value and never go below the abundance threshold value (Table 1).

Table 1. Stock status based on reference points for age 0+ (exploitation fraction) and age 1+ (abundance) female crabs. Recent stock status levels that did not exceed threshold values are shown in green, whereas exploitation values or abundance estimates exceeding thresholds are shown in red.

Control Rule	Reference Points			Stock Status						
	Period	Target	Threshold	2011	2012	2013	2014	2015	2016	2017
Exploitation Fraction (age 0+ female crabs)	Current, Female-specific	25.5%	34% (max)	24%	10%	23%	17%	15%	16%	TBD
Abundance (millions of age 1+ female crabs)	Current, Female-Specific	215	70 (min)	190	97	147	68.5	101	194	254

2. CONTROL RULES

2.1 Control Rule from 2011 Benchmark Assessment

The 2011 benchmark assessment recommended a control rule based on biological reference points for the female component of the population. The application of a control rule to management of the blue crab fisheries was first adopted by the Bi-State Blue Crab Advisory Committee in 2001³. The current female-specific targets and thresholds were developed using an MSY approach. U_{MSY} is defined as the level of fishing (expressed as the percentage of the population harvested) that achieves the largest average catch that can be sustained over time without risking stock collapse. Following precedent adopted by the New England and Mid-Atlantic Fishery Management Councils, the 2011 assessment recommended a target exploitation level that was associated with 75% of the value of U_{MSY} and a threshold exploitation level set equal to U_{MSY} . The female-specific, age-1+ abundance target and threshold were set accordingly at abundance levels associated with $N_{0.75*U_{MSY}}$ (target) and $50\% N_{MSY}$ (threshold).

2.2 Spawning-age Female Crabs: Reference Points

The 2011 benchmark assessment recommended a threshold abundance of 70 million female spawning-age (age 1+) crabs and a target abundance of 215 million spawning-age female crabs. Approximately 254 million female spawning-age crabs were estimated to be present in the Bay at the start of the 2017 crabbing season, a 30% increase from the 2016 estimate of 194 million spawning-age female crabs (Figure 1). The 2017 abundance of spawning-age female crabs is above the threshold and above the target.

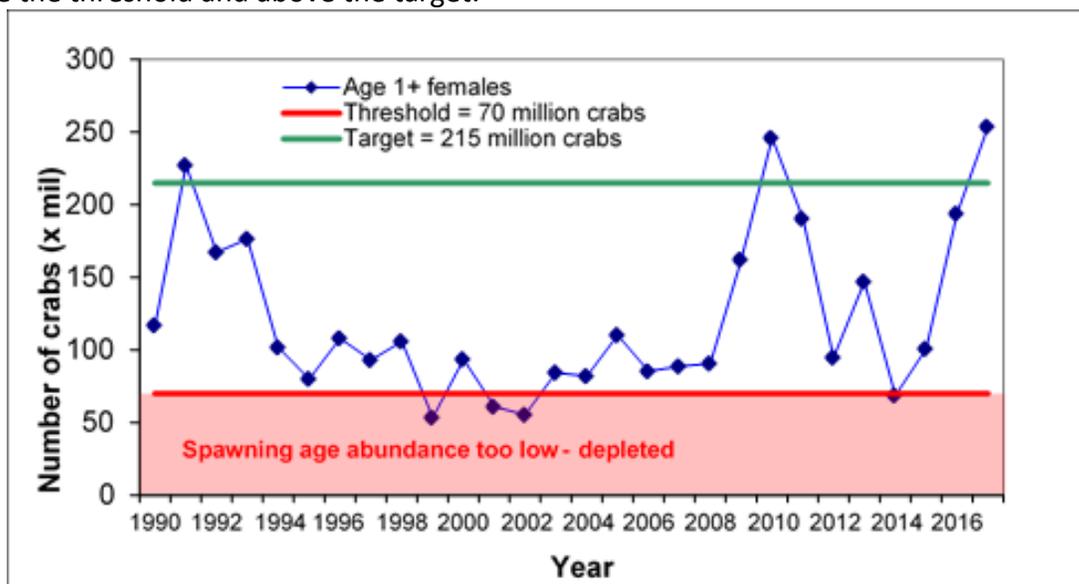


Figure 1. Winter dredge survey estimate of abundance of spawning-age female blue crabs (age 1+) 1990-2017 with female-specific reference points. These are female crabs measuring greater than 60 mm across the carapace and are considered the 'exploitable stock' that could spawn within this year.

2.3 Female Exploitation Fraction: Reference Points

The percentage of all female crabs (ages 0+) removed by fishing (exploitation fraction) in 2016 was approximately 16%. This exploitation fraction is below the target of 25.5% and the threshold of 34% for the ninth consecutive year since 2008, when female-specific management measures were implemented (Figure 2).

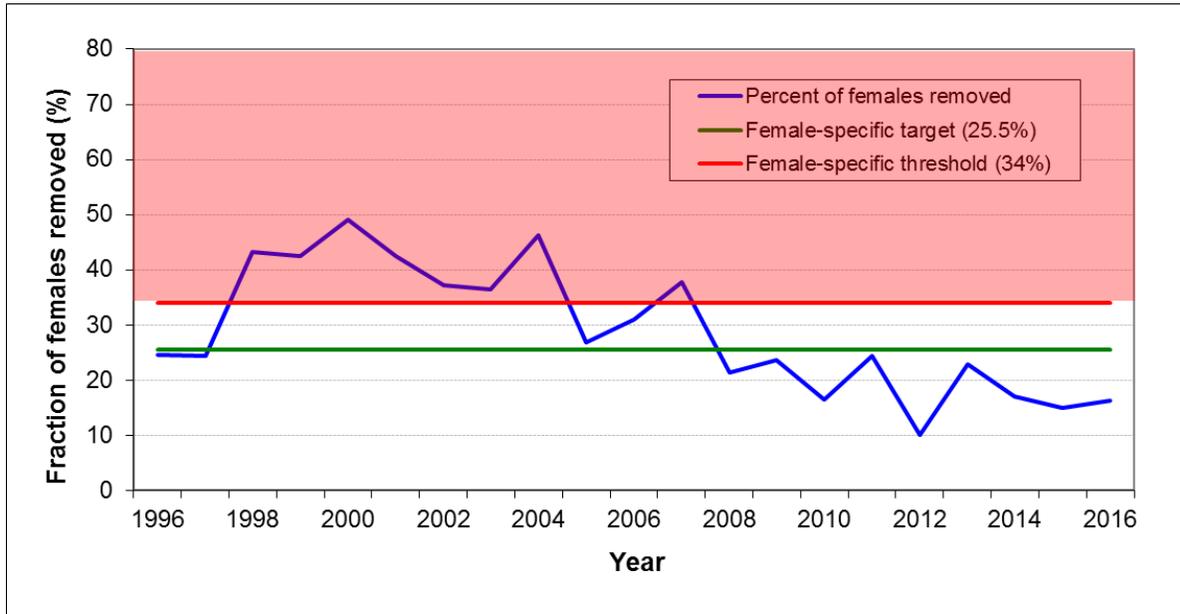


Figure 2. The percentage of all female blue crabs removed from the population each year by fishing relative to the female-specific target (25.5%) and threshold (34%) exploitation rates, 1990 through 2016. Exploitation rate (% removed) is the number of female crabs harvested within a year divided by the female population (age 0 and age 1+) estimated by the WDS at the beginning of the year.

2.4 Control Rule Visualization

Figure 3 shows the status of the blue crab stock for each year relative to both the female age 1+ abundance (N) reference points and female age 0+ exploitation (U) reference points (explained in sections 2.2 and 2.3). The red areas show where the threshold for female abundance and/or the threshold for female exploitation fraction are exceeded. The intersection of the green lines shows where both the abundance and exploitation fraction targets would be reached. The figure includes data through 2016. 2017 data will be added at the completion of the 2017 fishery.

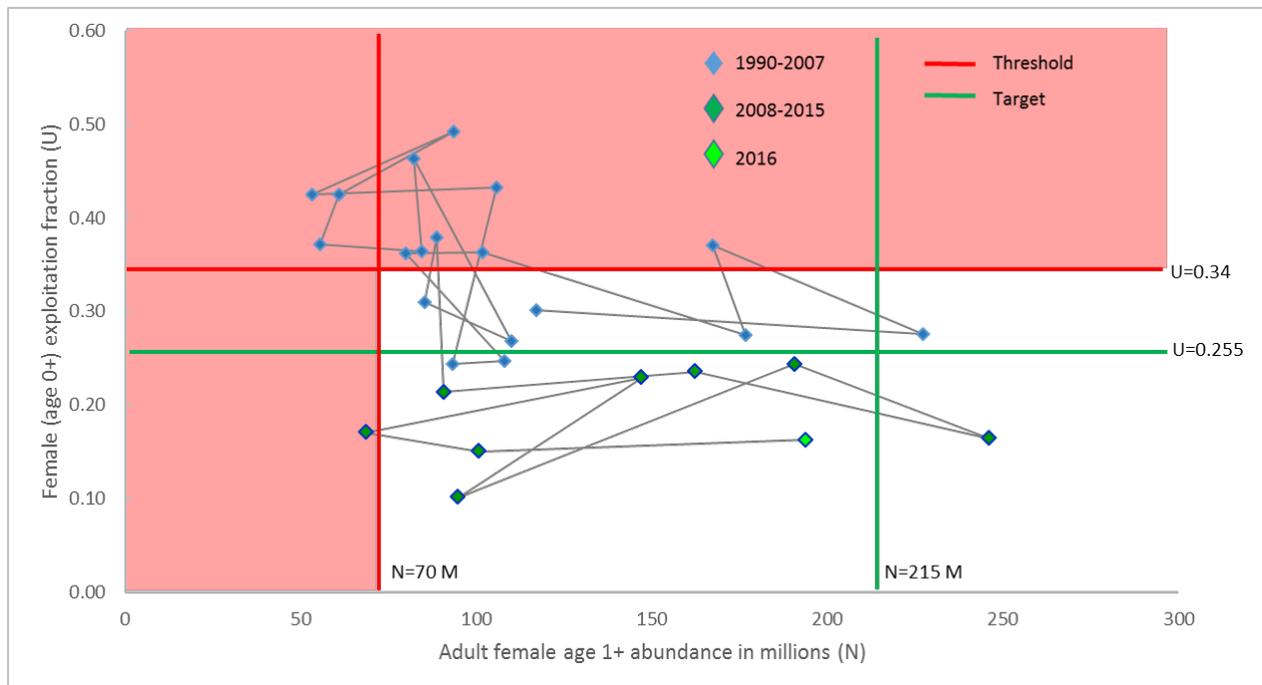


Figure 3. The female-specific control rule for the Chesapeake Bay blue crab fishery prior to and after implementation of initial female-specific management measures in 2008. The current female-specific management framework was formally adopted in 2011. In 2016, adult female abundance (N) was 194 million, which is below the 215 million target and above the 70 million threshold. The 2016 female exploitation fraction (U) was 16%, which was below the 25.5% target and 34% threshold.

3. POPULATION SIZE (ABUNDANCE)

3.1 All Crabs (both sexes, all ages)

Based on survey estimates, the total abundance of all crabs (males and females of all ages) decreased by almost 18% from 553 million crabs in 2016 to 455 million crabs in 2017 (Figure 4). The decline in total abundance was driven by the low 2017 estimates of age 0 crabs. The increase in age 1+ female abundance was offset by the large decrease in juvenile abundance (section 3.2) and a drop in the number of age 1+ males (section 3.3).

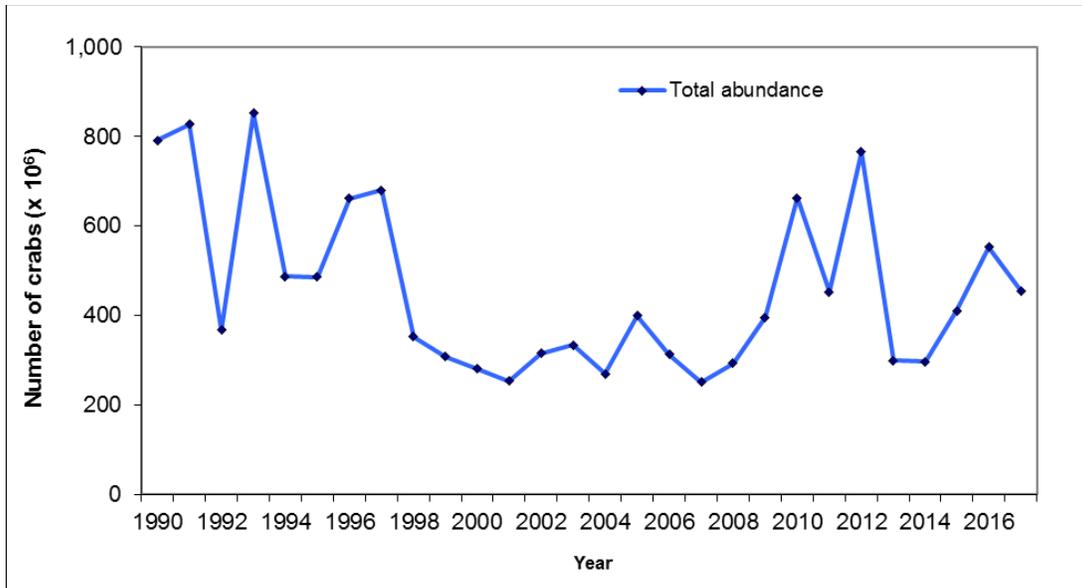


Figure 4. Winter dredge survey estimate of abundance of all crabs (both sexes, all ages) in Chesapeake Bay, 1990 through 2017.

3.2 Age 0 Crabs

Recruitment is estimated as the number of age 0 crabs (less than 60 mm or 2.4 inches carapace width) in the WDS. Based on survey estimates, the abundance of age 0 crabs was 125 million crabs in 2017, a 54% decrease from the 2016 abundance of 271 million crabs (Figure 5). Juvenile abundance in 2017 is among the five lowest estimates of the time series, the most recent of which occurred in 2013.

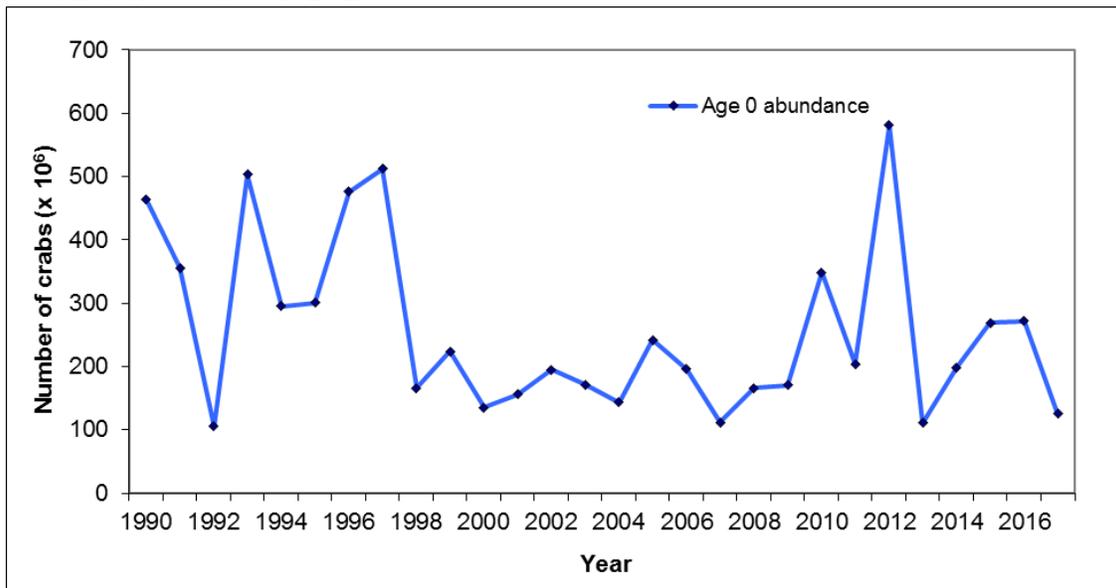


Figure 5. Winter dredge survey estimate of abundance of juvenile blue crabs (age 0), 1990-2017 calculated without the catchability (section 1.2) adjustment for juveniles. These are male and female crabs measuring less than 60 mm across the carapace.

3.3 Age-1+ Male

The survey estimate of age 1+ male crabs (greater than 60 mm or 2.4 inches carapace width) in 2017 was 76 million crabs, a 16.5% decrease from the 2016 estimate of 91 million adult male crabs (Figure 6). Although age 1+ male abundance is above the mean level observed between 1995 and 2017, it remains approximately half that of the levels observed in the early 1990s.

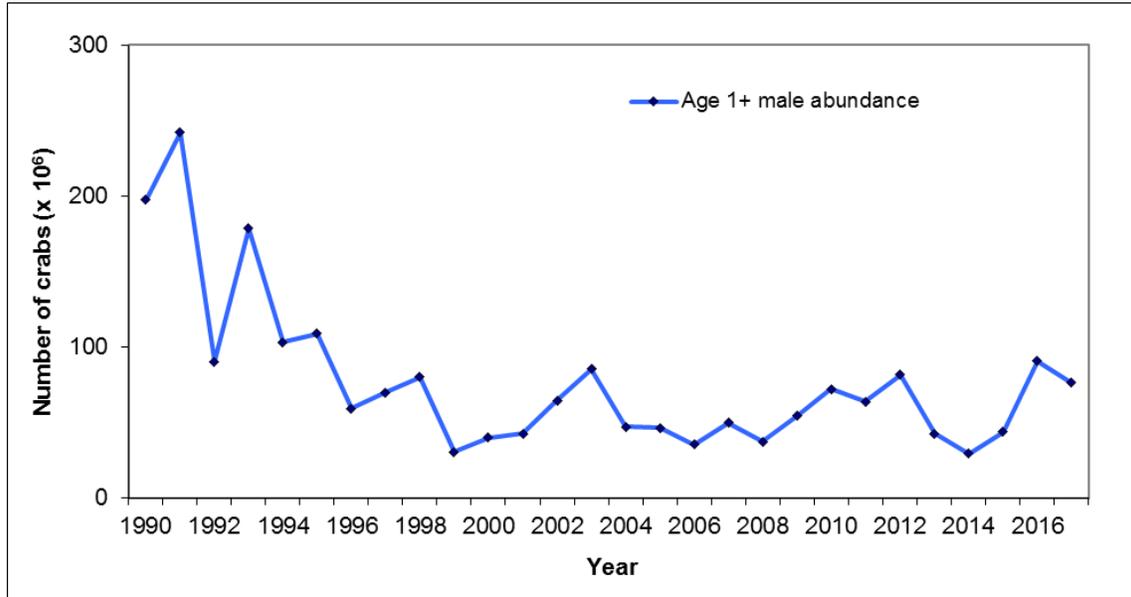


Figure 6. Winter dredge survey estimate of abundance of male blue crabs age one year and older (age 1+), 1990-2017. These are male crabs measuring greater than 60 mm across the carapace and are considered the ‘exploitable stock’ capable of mating within this year.

3.4 Overwintering Mortality

Overwintering mortality in 2017 was below average and lower than the high values seen in 2015 (Table 2).

Table 2. Percent dead crabs found in late winter dredge samples each year from 2012-2016 and the average for 1996-2011.

Baywide Age/sex group	1996-2011 average	2012	2013	2014	2015	2016	2017
All crabs	4.78%	1.59%	4.00%	3.79%	15.68%	1.9%	1.9%
Juveniles	1.00%	0.52%	0.00%	0.89%	10.84%	0.5%	0.5%
Adult Females	9.53%	2.69%	3.00%	7.68%	19.25%	3.0%	4.2%
Adult males	9.11%	4.90%	13.88%	13.58%	28.11%	1.1%	1.7%

4. HARVEST

4.1 Commercial and Recreational Harvest

Blue crab harvest has increased since 2014. The three management jurisdictions implemented additional commercial harvest restrictions, mostly lower bushel limits, for females for the 2014 season in response to the depleted abundance of females in 2014. Maryland increased these bushel limits in 2015 and 2016, and all three jurisdictions extended the fall crab pot season in 2016. The 2016 commercial harvest for both males and females from the Bay and its tributaries was estimated as 30.7 million pounds in Maryland, 26.0 million pounds in Virginia and 3.2 million pounds in the Potomac River. This was an increase from 2015 commercial harvest levels for all three jurisdictions: a 15% increase for Maryland, 24% increase for Virginia and a 60% increase for the Potomac River. The total 2016 Baywide commercial harvest of approximately 60 million pounds remains below average, but increased by 20% from the 2015 Baywide commercial harvest of approximately 50 million pounds (Figures 7-8).

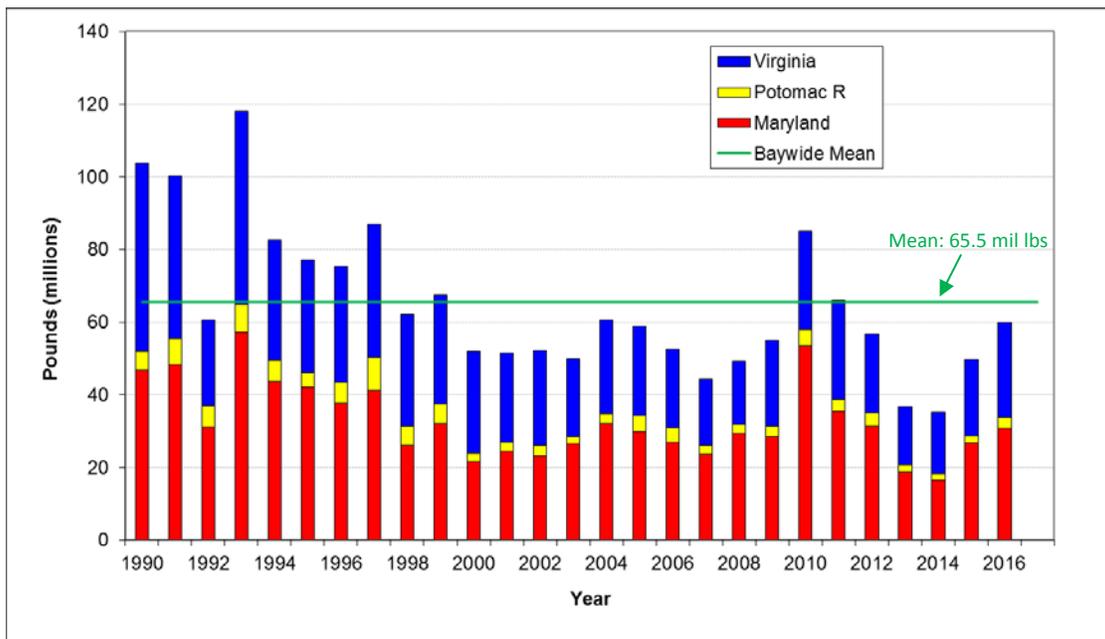


Figure 7. Total commercial blue crab landings (all market categories) in Chesapeake Bay, 1990-2016.

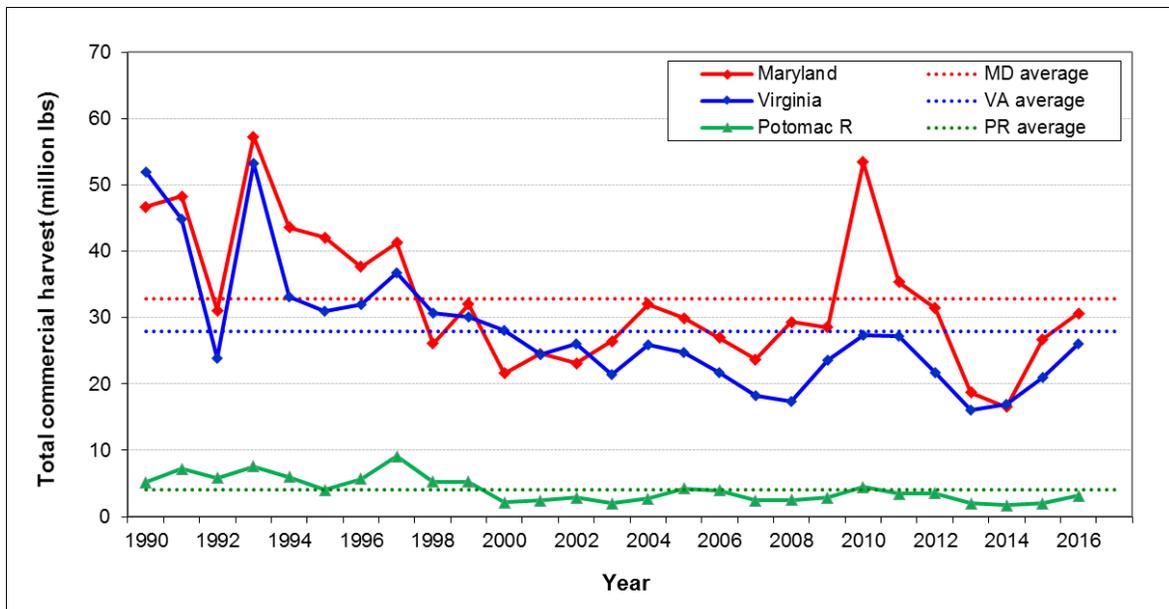


Figure 8. Maryland, Virginia and Potomac River commercial blue crab harvest in millions of pounds from Chesapeake Bay, all market categories, 1990-2016.

Prior to 2009, recreational harvest had been assumed to be approximately 8% of the total Bay wide commercial harvest.^{4,5,6} Since recreational harvest of female blue crabs is no longer allowed in Maryland or in the Maryland tributaries of the Potomac River, recreational harvest is better described as 8% of commercial male harvest in those jurisdictions. 2016 Baywide recreational harvest was estimated as 4.2 million pounds, a 20% increase from the 2015 recreational harvest estimate of 3.5 million pounds. Combining the commercial and recreational harvest, approximately 64 million pounds of blue crabs were harvested from Chesapeake Bay and its tributaries during the 2016 crabbing season.

5. STOCK STATUS

5.1 Female Reference Points

The Chesapeake Bay blue crab stock is currently **not depleted and overfishing is not occurring** (Figure 1-2). The 2017 estimated abundance of the stock is above the threshold of 70 million age 1+ female crabs and above the target of 215 million age 1+ female crabs outlined in the current management framework. The 2016 exploitation fraction of 16% was below the target (25.5%) and threshold (34%). Abundance, harvest, and exploitation of all crabs are summarized in Appendix A and in the preceding sections.

5.2 Male Conservation Triggers

In 2011, CBSAC recommended that male abundance should not be allowed to decline to a critically low level relative to female abundance and that a conservation trigger based on male abundance should be developed. In 2013, CBSAC recommended a conservation trigger for male

crabs based on the history of male exploitation. Under this trigger, conservation measures should be considered for male blue crabs if male exploitation rate exceeds 33% (calculated with the juvenile scalar as described in section 1.2), which is the second highest exploitation fraction observed for male crabs since 1990. Choosing the second highest value in the time series ensures a buffer from the maximum observed value of exploitation. It should be noted that this value does not represent a fishing threshold or target. Rather, this trigger will ensure that the male component of the stock is not more heavily exploited than at levels that have occurred in 24 of the last 26 years. The 2016 male exploitation fraction was estimated at 23%, which is below the 33% male exploitation rate conservation trigger (Figure 9). Because the male conservation trigger was not exceeded, no management action is recommended at this time specific to male blue crabs.

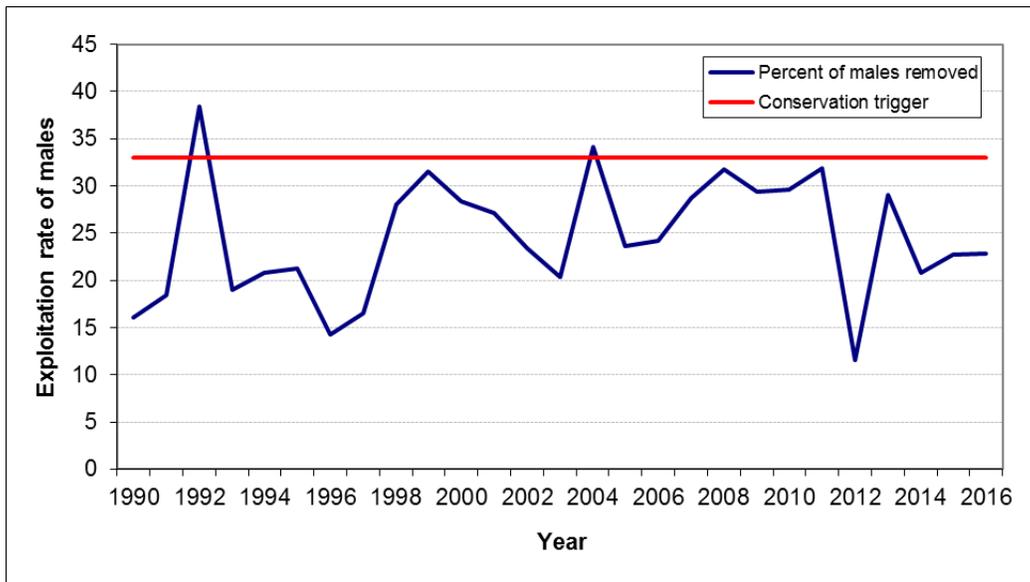


Figure 9. The percentage of male crabs removed from the population each year by fishing, 1990 through 2016. Exploitation rate (% removed) is the number of male crabs harvested within a year divided by the male population estimate (age 0 and age 1+) at the beginning of the year calculated with the juvenile scalar.

5.3 Potential Management Impact

Female exploitation fractions from 1990-2007 were much higher than the exploitation fractions seen from 2008-2016. These lower female exploitation fractions in recent years illustrate the probable influence of the female-specific management measures implemented by the jurisdictions starting in 2008. Male exploitation fractions have not shown the same pattern (Figure 10). Additionally, the rapid increase in abundance from 2008 to 2010 and again from 2014 to 2016 may indicate that the current management framework has allowed the stock to regain some of its natural resilience to environmental perturbations.

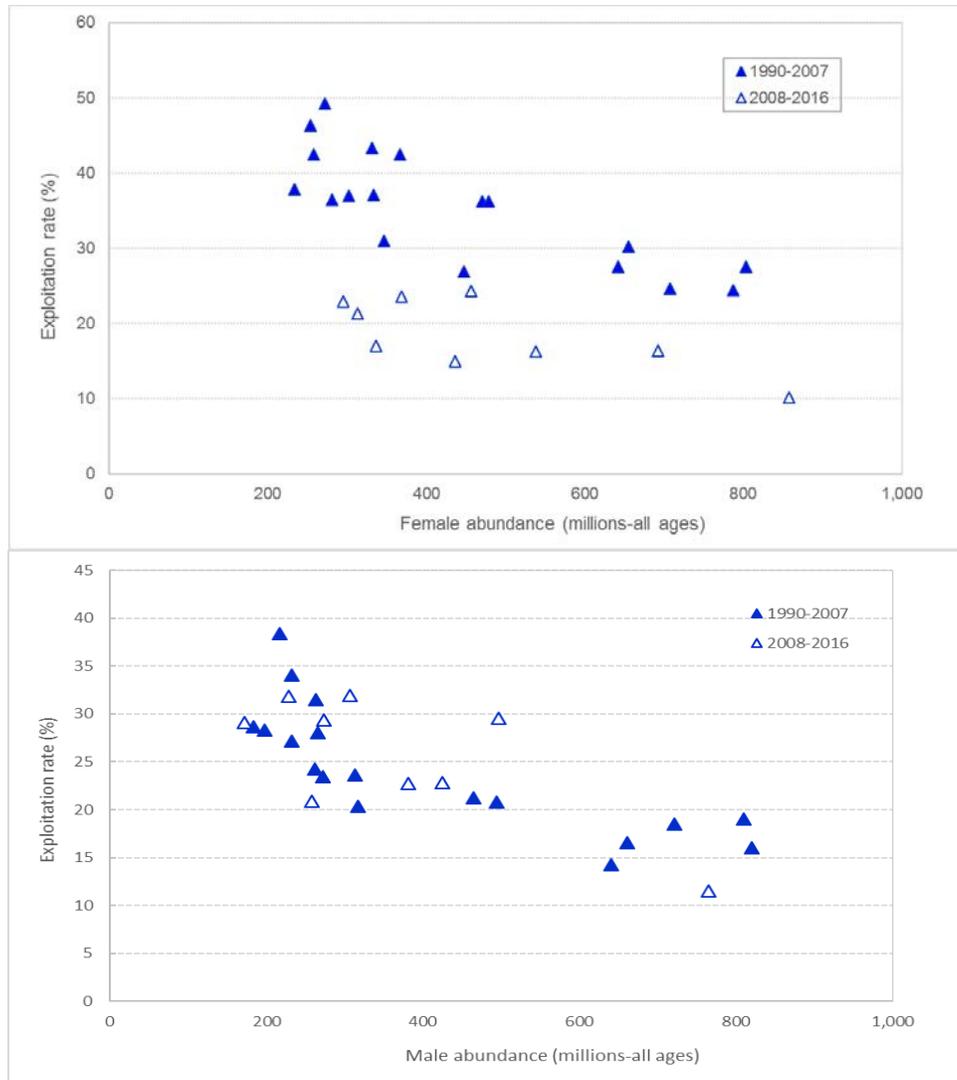


Figure 10. Female (top) and male (bottom) exploitation rate comparison of the time periods prior to and after the 2008 implementation of female-specific management measures.

6. MANAGEMENT ADVICE--SHORT TERM

6.1 Monitor fishery performance and stock status relative to reference points

The female exploitation fraction in 2016 was below the target of 25.5% for the ninth consecutive year. The abundance of adult female crabs increased and exceeded the target in 2017, but the abundance of juveniles decreased by 54%. Based on analysis of the 2017 winter dredge survey results, CBSAC recommends the jurisdictions maintain a cautious, risk-averse approach in the 2017 season, and consider scaling back the 2017 fall fishery from last year's more liberal fall regulations in order to protect the age 0 crabs. This incoming year class will become vulnerable to the fall fishery and represent the majority of spawners for next year. Past harvest regulations are summarized in Appendix B.

Large variations in recruitment (age 0 abundance) are a characteristic of blue crab biology and not unexpected. However, it should be the goal of management to maintain a robust spawning stock, thereby increasing the resiliency of the population to downturns in recruitment.

Beginning in the 2014 crabbing season, the three management jurisdictions adjusted their management timeframe to run from July 2014 through July 2015. CBSAC recommended this switch in the 2014 Blue Crab Advisory Report, which allows for consideration of the WDS results in the spring before management decisions are made in the summer. However, it places more importance on the estimate of juvenile abundance, as each year class is presumed to be the majority component of the fishery within this time frame. In this case, the low abundance of age 0 crabs will begin recruiting to the fall 2017 fishery. The current control rule does not account for juvenile abundance as a management-setting metric, but the jurisdictions should consider that the juvenile abundance estimate will comprise the majority of spawners the following year.

6.2 Catch Reports and Quantifying Effort

CBSAC again recommends that the jurisdictions implement procedures that provide accurate accountability of all commercial and recreational harvest. All three Chesapeake Bay management jurisdictions are working to improve the quality of catch and fishing effort information submitted by commercial and recreational harvesters. Maryland, Virginia, and PRFC all require daily harvest reports to be submitted on a regular basis and are collaborating with industry groups to pursue new reporting technologies. Maryland has implemented a pilot electronic reporting program that allows for daily harvest reporting in real time and harvest validation. Virginia continues to promote its online reporting system that began in 2009. PRFC is exploring the use of electronic reporting to potentially begin in the next few years.

While implementing systems for greater accuracy, efforts should also be made, where possible, to better determine the biological characteristics of the catch, both landed and discarded. Note that when changes in reporting requirements are implemented, it is vital that an analysis be undertaken to quantify the impact of these changes on the estimates of harvest. Efforts should also be undertaken to assess the reliability of estimates of recreational harvest Baywide.

7. MANAGEMENT ADVICE--LONG TERM

7.1 Characterizing and Quantifying Effort

The blue crab fishery is managed by both effort control and output control strategies. Most regulations in place focus on effort control in the form of limited entry, size limits, daily time limits, pot limits, spatial closures, spatial gear restrictions, and seasonal closures. Output controls currently used are daily harvest limits. In many cases, the amount of effort expended in the fishery is recorded at a broad resolution that makes it difficult to quantify. CBSAC

recommends further quantification of effort data in the next stock assessment and increased investment in Baywide effort monitoring, which may include a pot marking system and a Baywide survey of gear-specific effort to estimate the total, as well as spatial and temporal patterns of effort in the blue crab fishery.

7.2 Latent effort

In both Maryland and Virginia, significant numbers of commercial crabbing licenses are unused. This could pose the potential risk that unused effort could enter the fishery, causing unforeseen impacts on the fishery and the blue crab population. Based on recommendations from previous advisory reports, the jurisdictions conducted initial analysis of effort levels relative to crab abundance over time to evaluate this risk. These analyses indicate that there is little evidence that effort changes in response to changes in blue crab abundance. This indicates that latent effort has most likely not had a significant impact on the fishery in recent years. A comprehensive analysis of latent effort would, ideally, include a socio-economic component, and CBSAC recognizes that temporal and seasonal shifts in blue crab abundance may alter existing effort exerted by active licenses. These components could be incorporated into future continued analysis of latent effort.

8. CRITICAL DATA AND ANALYSIS NEEDS

CBSAC has identified the following prioritized list of fishery-dependent and fishery-independent data needs as well as the benefits provided to management.

In addition to specific data needs, CBSAC recognizes the importance of future stock assessments in providing in-depth analyses of the Chesapeake Bay blue crab population and scientific guidance to managers. The timing and need for a benchmark stock assessment can depend on availability of new data, consideration of a new management framework, or other reasons. In fall 2017, CBSAC plans to discuss potential drivers and resources needed for a future blue crab stock assessment and scope out specific objectives and research that would be needed.

8.1 Increased accountability and harvest reporting for both commercial and recreational fisheries

CBSAC recommends jurisdictions continue to develop, explore and evaluate implementation of real time electronic reporting systems to increase the accuracy of commercial and recreational landings. Improving commercial and recreational blue crab harvest accountability would provide managers with a more accurate exploitation fraction each year and better support mid-season management changes.

The jurisdictions have been working to implement new harvest reporting technologies over the past few years. Since pilot efforts were introduced in 2012, MD DNR has been using an electronic reporting system that allows commercial crabbers to enter each day's harvest from their vessel. The system includes random daily catch verification and a "hail-in, hail-out" protocol. Maryland is continuing to expand the use of this system for the commercial crabbing fleet. Virginia implemented electronic reporting in 2009 as an alternative mandatory harvest reporting option, but growth has been slow. Through cooperative work among VMRC, Virginia Sea Grant and various industry groups, promotional products were produced and participation of commercial crab harvesters has increased. There is interest among PRFC stakeholders, and it is possible that PRFC will consider using an electronic reporting system in the next few years.

CBSAC recommends a survey of recreational catch and effort be undertaken to ensure the reliability of estimates of recreational removals. The last available estimate for Maryland waters was that for 2011^{4,5,6,7}. The last available estimate for Virginia was 2002⁵. Future surveys should ensure that recreational harvest from the Potomac River is also included. A license for recreational crabbing in all jurisdictions would greatly increase the accuracy of catch and effort estimates.

8.2 Gear efficiency pertaining to selectivity of WDS methods

There is no update from 2016-17 regarding how gear efficiency is estimated. Data from paired tows between the two survey vessels were again collected, and the multi-year dataset should be analyzed to help guide the process dealing with the evaluation of efficiency corrections and, possibly, juvenile catchability. CBSAC recommends the jurisdictions continue to analyze these data from recent years.

Planning discussions for a future stock assessment have included the possible use of the winter dredge survey as an index of relative abundance rather than an index of absolute abundance. This approach was recommended by the independent review panel of the last stock [assessment](#). CBSAC will include this in any stock assessment discussions.

8.3 Improving recruitment estimate through a shallow-water survey

Based on the 2011 stock assessment and field experiments by VIMS and the Smithsonian Environmental Research Center, a large fraction of juvenile blue crabs in shallow water is not sampled by the WDS⁸. VIMS is actively pursuing funding at the state level to conduct a shallow-water survey concurrent with the Virginia WDS to assess the potential for interannual bias in the fraction of juveniles not sampled by the WDS. CBSAC will discuss applying this effort Baywide based on funding and based on initial findings if the Virginia survey moves forward.

8.4 Application of fishery independent survey data

CBSAC recommends continued review of existing fishery-independent survey data and potential application to provide additional information on the blue crab population,

complementing the population estimates from the WDS. Characterizing the spring through fall distribution and sex-specific abundance of blue crabs remains important, especially if agencies consider spatial management strategies.

8.5 Fishery-dependent data

Mandatory harvest reporting is currently the only fishery-dependent data in Virginia and the Potomac River. Understanding catch composition, by size, sex, and growth phase, spatially and temporally, as well as effort characterization (mentioned in 6.2), would help improve the effectiveness of regulations and assure they were compatible at a Baywide level. VMRC conducted short-term fishery-dependent sampling in 2016-17 to provide some characterization of commercial harvest. CBSAC recommends that the jurisdictions consider options for future fishery-dependent sampling programs. VMRC

8.6 Other sources of mortality

CBSAC also recommends analyzing the magnitude of other sources of incidental mortality, specifically sponge crab discards, unreported losses after harvest from the peeler fishery, and predation. An analysis of non-harvest mortality could improve reliability of exploitation fraction estimates and inform future assessments.

8.7 Investigation of the potential for sperm limitation

CBSAC recommends continued examination to quantify and better understand the influence of male crabs on reproductive success and overall population productivity. The evidence for sperm limitation resulting from a lower abundance of sexually mature male crabs is ambiguous and has been discussed in several recent studies^{9,10,11}.

8.8. Biological parameters

Longevity, age structure and growth rates, particularly with respect to the timing of recruitment to the fishery within the season, are not fully characterized and remain as sources of uncertainty.

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Joe Cimino	Virginia Marine Resources Commission
Ellen Cosby	Potomac River Fisheries Commission
Lynn Fegley	Maryland Department of Natural Resources
Daniel Hennen	NMFS, Northeast Fisheries Science Center
John Hoenig	Virginia Institute of Marine Science
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Appendix A. Estimated abundance of blue crabs from the Chesapeake Baywide winter dredge survey, annual commercial harvest, and removal rate of female crabs.

Survey Year (Year Survey Ended)	Total Number of Crabs in Millions (All Ages)	Number of Juvenile Crabs in Millions (both sexes)	Number of Spawning- Age Crabs in Millions (both sexes)	Number of spawning age Female crabs in Millions	Baywide Commercial Harvest (Millions of Pounds)	Percentage of Female Crabs Harvested
1990	791	463	276	117	104	43
1991	828	356	457	227	100	40
1992	367	105	251	167	61	63
1993	852	503	347	177	118	28
1994	487	295	190	102	84	36
1995	487	300	183	80	79	36
1996	661	476	146	108	78	25
1997	680	512	165	93	89	24
1998	353	166	187	106	66	43
1999	308	223	86	53	70	42
2000	281	135	146	93	54	49
2001	254	156	101	61	54	42
2002	315	194	121	55	54	37
2003	334	172	171	84	49.5	36
2004	270	143	122	82	60	46
2005	400	243	156	110	58.5	27
2006	313	197	120	85	52	31
2007	251	112	139	89	43	38
2008	293	166	128	91	49	21
2009	396	171	220	162	54	24
2010	663	340	310	246	85	16
2011	452	204	255	191	67	24
2012	765	581	175	95	56	10
2013	300	111	180	147	37	23
2014	297	198	99	68.5	35	17
2015	411	269	143	101	50	15
2016	553	271	284	194	60	16
2017	455	125	330	254	TBD*	TBD*

* 2017 Baywide commercial harvest and exploitation rate are preliminary (TBD= to be determined)

Baywide harvest totals and female exploitation rates listed on this page for 2010 and prior were updated in 2016 to reflect final Baywide harvest totals. Previous reports listed preliminary harvest data on this page.

Appendix B. Summary of Female Blue Crab Harvest Regulations in the Chesapeake Bay Jurisdictions 2008-2016

Starting in 2008, the jurisdictions (Maryland, Virginia, Potomac River Fisheries Commission) implemented female-specific management measures for the Chesapeake Bay blue crab fishery. The jurisdictions adopted the current female-specific reference points with targets and thresholds for spawning-age (age 1+) female abundance and female exploitation rate in December 2011. The chart below summarizes changes in spawning-age female management regulations each year from 2008-2016.

Year	All Crabs	Age 0 Juv Crabs	Age1+ Female Crabs	%Female Crabs Harvested	Maryland Female Harvest Regulations	Virginia Female Harvest Regulations	Potomac River Fisheries Commission Female Harvest Regulations
2008	293	166	91	21%	34% reduction: restricted access to female fishery from Sept 1 to Oct 22 based on harvest history; created tiered bushel limits for females based on harvest history.	34% reduction: closed winter dredge fishery; closed the fall season for females early on Oct 27 (five weeks early); eliminated the five-pot recreational crab license; required two additional/larger cull rings; reduced # pots per license by 15% as of May 1 & another 15% next year; reduced #peeler pots per license by 30% on May 1.	34% reduction: closed the mature female hard crab season early on Oct 22; established separate female daily bushel limits Sept 1 to Oct 22 for areas upstream of St. Clements Isl. and areas downstream of St. Clements Isl; reduced peeler & soft shell seasons; established that all hard males, hard females, peelers and soft shell crabs kept separate on catcher's boat.
2009	396	171	162	24%	Open access, with industry input created season-long bushel limits that vary by license type and through the season. Created a 15-day June (1-15) closure and a 9 day fall (9/26 - 10/4) closure to female harvest.	Closed crab sanctuary from May 1- Sept 15 (closed loophole that prevented a uniform May 1 closure for entire sanctuary). Nov 21 harvest closure; waived proposed 15% reduction of pots per license class; reinstated 5-pot recreational license; continued closure of winter dredge fishery.	Maintained 2008 season dates. Did not continue female daily bushel limits from 2008.

Year	All Crabs	Age 0 Juv Crabs	Age1+ Female Crabs	%Female Crabs Harvested	Maryland Female Harvest Regulations	Virginia Female Harvest Regulations	Potomac River Fisheries Commission Female Harvest Regulations
2010	663	340	246	16%	Same bushel limits as 2009, but eliminated the 9-day fall closure based on industry input.	Continued moratorium on sale of new licenses; relaxed dark sponge crab regulation to allow possession as of July 1 (instead of July 16); continued closure of winter dredge fishery.	Established three mature female hard crab closure periods: Sept 22-28 above 301 bridge; Sept 29-Oct 6 from 301 bridge to St. Clements Isl./Hollis Marsh; Oct 7-13 below St. Clements Isl./Hollis Marsh. Closed season Nov 30.
2011	452	204	191	24%	Increased bushel limits Sept 1 - Nov 10.	Closed sanctuary May 16 instead of May 1; continued closure of winter dredge fishery.	Refined mature female closed seasons: Sept 20-30 above St. Clements Isl./Hollis Marsh; Oct 4-14 below St. Clements Isl./Hollis Marsh.
2012	765	581	95	10%	Decreased bushel limits to compensate for removal of June closure, which added 15 days (based on industry advice). 6-day emergency extension to offset days lost to Hurricane Sandy.	Extended fall season until Dec 15; 6-day emergency extension to offset days lost to Hurricane Sandy; continued closure of winter dredge fishery.	Maintained 2011 mature female closed seasons.
2013	300	111	147	23%	Decreased bushel limits.	Implemented daily bushel limits to offset 2012 fall extension; extended fall pot season to Dec 15; continue closure of winter dredge fishery.	Refined mature female closed seasons: Sept 18-Oct 2 above St. Clements Isl./Hollis Marsh; Oct 3-17 below St. Clements Isl./Hollis Marsh.

Year	All Crabs	Age 0 Juv Crabs	Age1+ Female Crabs	%Female Crabs Harvested	Maryland Female Harvest Regulations	Virginia Female Harvest Regulations	Potomac River Fisheries Commission Female Harvest Regulations
2014	297	198	68.5	17%	Daily bushel limits the same as 2013; additional vessel bushel limit reduction of 12%.	10% reduction: reduced pot bushel and vessel limits; continued closure of winter dredge fishery.	10% reduction: Closed mature female hard crab season Nov 20 and extended closure periods: Sept 12-Oct 2 above St. Clements Isl./Hollis Marsh; Oct 3-23 below St. Clements Isl./Hollis Marsh.
2015	411	269	101	15%	Increase in min. peeler size April-July 14 due to low 2014 adult females. Daily bushel limits increased ~20% Sept-Nov 10 based on adult female increased abundance in 2015.	Maintained 2014 daily bushel limits; continued closure of winter dredge fishery. Redefined the blue crab sanctuary into 5 areas with separate closure dates.	Set female daily bushel limits from April-June.
2016	553	271	194	16%	Extended season to Nov 30, adding 20 days. Increased bushel limits in Sept and Oct.	Extended season 3 weeks to Dec 20; maintained 2014 bushel limits; continued closure of winter dredge fishery.	Extended fall season through Dec 10th. Set female daily bushel limits starting in July for the whole season.

Maryland Department of Natural Resources: <http://dnr2.maryland.gov/Fisheries/Pages/default.aspx>

Potomac River Fisheries Commission: <http://prfc.us/>

Virginia Marine Resources Commission: <http://www.mrc.state.va.us/>