Chesapeake Bay Program | Indicator Analysis and Methods (A&M) Document
Blue Crab Abundance

Each Indicator update must include an Analysis and Methods document that explains how the data are collected, analyzed, interpreted, and communicated to ensure transparency and consistency. Outcome Representatives and subject-matter experts complete the document during an Indicator's first iteration—addressing analytical methods, trends, and data quality—and update it with each new data release. The document is posted on ChesapeakeProgress with the associated data file, which contains more detailed metadata and reported metrics, for internal and external audiences across the Chesapeake Bay Program.

Relevant *Chesapeake Bay Watershed Agreement* Outcome(s): Blue Crabs

Relevant Outcome Target(s):

- Maintain blue crab abundance and harvest rate targets as determined by the most recent benchmark status assessment.
- Achieve cross-jurisdictional coordination by annually evaluating and communicating blue crab population status to resource managers and the public through the Blue Crab Advisory Report.

Link to Management Strategy: The Management Strategy will be developed by Summer 2027.

Location within Indicators Framework (i.e., Output or Performance): Performance

A. Analysis and Methods Document Metadata
Additional supporting metadata for this document is available in the associated Indicator data file; this document and the data file should be updated together to remain consistent.

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2. **Resource Date:** June 2026

B. Analysis and Interpretation
Where appropriate, please provide references or location(s) of documentation (e.g., link to downloadable dataset, story map, tool, report).

1. Briefly describe the dataset. What parameters are directly measured? What parameters are derived through calculation? For what purpose(s) are the data used? Blue crab abundance data for the Chesapeake Bay are collected from the annual Winter Dredge Survey (WDS), which is conducted by the Maryland Department of Natural Resources (MDNR) and the Virginia Institute of Marine Science (VIMS). The WDS measures the density of crabs (number/1,000 m^2) at approximately 1,500 sites throughout the Bay each year. All crabs sampled in the survey are measured from spine to spine across the top shell (i.e., carapace

width) and weighed. The sex and maturity of each crab are also noted. Measured crab densities are then expanded to the area of the Chesapeake Bay (9,812 km^2), providing an annual estimate of the total number of blue crabs in the Bay by age, sex, and maturity. The WDS also provides an estimate of overwintering mortality based on the percentage of dead crabs found in the survey each year.

The WDS provides information that is essential for blue crab management in the Chesapeake Bay, including the number of juveniles entering the population each year and the number of mature adult females present; these are important indicators of the population's recruitment and spawning potential, respectively. When paired with harvest data from each of the three jurisdictions, WDS estimates of abundance also allow managers to estimate exploitation rates, which are calculated as crab harvest (not including discards, bycatch, or unreported losses) divided by the total number of crabs (age 0+) estimated in the population at the start of the crabbing season. Managers assess the blue crab stock status annually by comparing the WDS estimates of adult female abundance and female exploitation rate to female-specific management reference points.

2. What methods are used to collect, process, model, analyze, and/or transform raw data into the Indicator? Please cite methods, analytical tools, modeling programs, and relevant documentation. Each year, the Winter Dredge Survey (WDS) randomly samples 1,500 sites in three strata of the Chesapeake Bay, collecting crab density data (number of crabs/1,000 m^2). Bay-wide blue crab abundance is calculated by multiplying the total crab density by the total area (m^2) of the Bay. The stratified random design of the WDS ensures that these Bay-wide estimates of abundance are statistically robust. More information about the WDS and how it is used to determine blue crab abundance can be found on the MDNR and VIMS websites, and in the following publication:

   Sharov, A.F., J.H. Volstad, G.R. Davis, B.K. Davis, R.N. Lipcius, and M.M. Montane. 2003. Abundance and exploitation rate of the blue crab (*Callinectes sapidus*) in Chesapeake Bay. Bulletin of Marine Science 72:543-565. http://www.ingentaconnect.com/content/umrsmas/bullmar/2003/00000072/00000002/art00021

3. Are there established targets, thresholds, reference conditions, or desired-state values for this Indicator? If yes, describe them and how they were derived. The current management reference points for adult female abundance (age 1+) include a target of 196 million females and a threshold of 72.5 million females. Blue crab stock status is also determined by the female exploitation rate (i.e., percentage removed from the population in a year) relative to a target of 28% and a threshold of 37%. These reference points were developed and recommended based on the theory of maximum sustainable yield, a widespread

convention in fisheries management.

4. Have there been any changes to targets, thresholds, data sources, methodology, or analytical approaches since the last reporting period? If yes, describe what changed and why. No.

C. Communicating the Data

Where appropriate, please provide references or location(s) of documentation (e.g., link to downloadable dataset, story map, tool, report).

1. Define the Outlook[1] toward achieving the Outcome as On Course, Off Course, Uncertain, or Completed. On Course.

2. What do the most recent data show compared to the previous reporting period? Are there any short-term trends? The overall blue crab population in the Chesapeake, as estimated in the annual Winter Dredge Survey, increased since the last reporting period. The adult female population decreased by 27 million since the last reporting period; however, adult female abundance (81 million) remains above the minimum viable threshold of 72.5 million. The initial female exploitation rate for the 2025 harvest season was 29%, which is slightly above the target of 28% but below the exploitation threshold of 37%.

   Detailed information on the status of blue crabs in the Chesapeake can be found in the *2026 Chesapeake Bay Blue Crab Advisory Report*.

3. What is the long-term trend since data collection began? The blue crab population is naturally highly variable from year to year. However, for the most recent six years, the overall blue crab population has been below the long-term 1990–2026 mean.

4. What is the key story told by this Indicator? Explain the "why" behind the data in clear, plain language. (e.g., Are there specific geographic areas of concern? Are there broader factors influencing the results?)
   i. What management actions or strategies have most influenced trends in the data? While blue crabs in the Chesapeake Bay face many challenges—some known, others unknown—using scientific reference points to manage the blue crab fishery has enabled resource managers to maintain the blue crab population. An updated in-depth Blue Crab Stock Assessment is nearly complete; it will provide updated reference points as we move into the future.
   ii. Are there any projects or case studies that showcase successful examples of progress? Provide contact information for individual projects or case studies, if possible. N/A

iii. What obstacles or challenges (e.g., resources, capacity, funding) currently limit progress? N/A

D. Data Quality

Where appropriate, please provide references or location(s) of documentation (e.g., link to downloadable dataset, story map, tool, report). For more information on metadata standards, see Chesapeake Bay Program Metadata Specification document.

1. Were the data collected and processed under an EPA-approved Quality Assurance Project Plan (QAPP)? No.
   i. If yes, provide the link and date of last approval. N/A
   ii. If no, are sampling, analytical, and data-processing procedures documented and accessible? Provide links or references. Information about data collection and statistical methods can be found on the MDNR and VIMS websites, and in the following publication:

   Sharov, A.F., J.H. Volstad, G.R. Davis, B.K. Davis, R.N. Lipcius, and M.M. Montane. 2003. Abundance and exploitation rate of the blue crab (*Callinectes sapidus*) in Chesapeake Bay. Bulletin of Marine Science 72:543-565. http://www.ingentaconnect.com/content/umrsmas/bullmar/2003/00000072/00000002/art00021

   Maryland Department of Natural Resources: https://dnr.maryland.gov/fisheries/Pages/blue-crab/dredge.aspx

   Virginia Institute of Marine Science: http://www.vims.edu/research/units/programs/bc_winter_dredge/index.php

2. Were sampling and analytical procedures consistent throughout the data record? Note any deviations, transitions, or merging of datasets that may affect interpretation. The Winter Dredge Survey design was slightly modified in the early 1990s but has been consistent since 1994. See method details at the following link: http://www.vims.edu/research/units/programs/bc_winter_dredge/methods/details/index.php

   Blue crab stock status has been determined based on female-specific reference points since 2012, after being developed and adopted in the 2011 benchmark stock assessment. The new reference points from the 2017 stock assessment update have been used to assess stock status since 2021.

MDNR conducts the Winter Dredge Survey (WDS) in the Maryland portion of the Bay and VIMS conducts the survey in the Virginia portion of the Bay. The WDS is a coordinated effort between the jurisdictions; they use the same sampling design and methods. Data are combined from both jurisdictions to calculate a Bay-wide population estimate. Estimates of gear efficiency differ between the jurisdictions, but catchability coefficients have been calculated to adjust for vessel differences over the years and between jurisdictions. Scientists continue to discuss and compare these estimates each year and are considering future studies to further compare gear efficiency and selectivity between Maryland and Virginia.

E. Additional Information (Optional)

Where appropriate, please provide references or location(s) of documentation (e.g., link to downloadable dataset, story map, tool, report).

1. Is there any additional information that would help ensure accurate communication and prevent misinterpretation of this Indicator? Include additional descriptions of analysis and methods, relevant context, caveats, or links to work plans or research, if applicable.

[1]*Outlook:* Outlook is the forecasted trajectory for whether the Chesapeake Bay Program is on course to achieve the Outcome. An Outcome's Outlook may be On Course, Off Course, Uncertain, or Completed.