# Population model estimates for oysters (Crassostrea virginica) in the Choptank and Little Choptank Rivers

Website: https://www.bco-dmo.org/dataset/808879 Data Type: model results Version: 1 Version Date: 2020-04-09

#### Project

» <u>Coastal SEES Collaborative Research: Oyster fisheries in the Chesapeake Bay: Integrating stakeholder</u> <u>objectives with natural system models to promote sustainable policy</u> (Chesapeake Bay Oyster Fisheries)

| Contributors                      | Affiliation  | Role                    |
|-----------------------------------|--|-------------------------|
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#### Abstract

This data set contains estimates derived from a population model of oysters in the Choptank and Little Choptank Rivers. The methods and data used in the model are described in Damiano et al. (2019).

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## Coverage

Temporal Extent: 1989 - 2015

## **Dataset Description**

This data set contains estimates derived from a population model of oysters in the Choptank and Little Choptank Rivers. The methods and data used in the model are described in Damiano et al. (2019).

Terms beginning with "obs" e.g. obs\_spat, small, mk, etc. Refer to "observed" log-scale indices of abundance from the MD DNR Fall Dredge Survey; values were obtained from MD DNR data for fitting in the standardization model.

Terms beginning with "log\_pred" e.g. log\_pred\_spat, small, mk, etc. Refer to standardized "predicted log scale indices of relative density that have been estimated using the standardization model.

Terms containing "\_mil" suffix e.g. sp\_mil, sm\_mil, mk\_mil contain abundance estimates from the population dynamics model in millions of oysters .

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## Data Files

File

oyster\_pop\_model\_estimates.csv(Comma Separated Values (.csv), 82.83 KB) MD5:eb69eb3e73aa412e4cc3a4aa542fed41

Primary data file for dataset ID 808879

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## **Related Publications**

Damiano, M. D., & Wilberg, M. J. (2019). Population dynamics of eastern oysters in the Choptank River Complex, Maryland during 1989–2015. Fisheries Research, 212, 196–207. doi:<u>10.1016/j.fishres.2018.12.023</u> *Results* 

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### **Parameters**

| Parameter      | Description  | Units               |
|----------------|--|---------------------|
| location_name  | Name of location/model run. "open" and "closed" refer to whether the model included closures from the implementation of oyster sanctuaries |                     |
| year           | Year; format: yyyy   | unitless            |
| obs_spat       | "observed" log-scale index of abundance of young of the year (YOY) oysters   | unitless            |
| obs_small      | "observed" log-scale index of abundance of small, sexually mature oysters  | unitless            |
| obs_mk         | "observed" log-scale index of abundance of market-sized, sexually mature oysters   | unitless            |
| obs_sm_b       | "observed" log-scale index of abundance of the oyster shell "box" left behind when small oysters die                                       | unitless            |
| obs_mk_b       | "observed" log-scale index of abundance of the oyster shell "box" left behind when market-sized oysters die                                | unitless            |
| log_pred_spat  | "predicted" log scale index of relative density of young of the year (YOY) oysters   | unitless            |
| log_pred_small | "predicted" log scale index of relative density of small, sexually mature oysters  | unitless            |
| log_pred_mk    | "predicted" log scale index of relative density of market-sized, sexually mature oysters   | unitless            |
| log_pred_sm_b  | "predicted" log scale index of relative density of the oyster shell "box" left behind when small oysters die                               | unitless            |
| log_pred_mk_b  | "predicted" log scale index of relative density of the oyster shell "box" left behind when market-sized oysters die                        | unitless            |
| spat           | population dynamics model estimate of 1000s of spat  | unitless            |
| small          | population dynamics model estimate of 1000s of small oysters   | unitless<br>(count) |
| mk             | population dynamics model estimate of 1000s of market oysters  | unitless<br>(count) |
| sp_mil         | abundance estimate of YOY oysters from the population dynamics model in millions of oysters  | unitless<br>(count) |
| sm_mil         | abundance estimate of small, sexually mature oysters from the population dynamics model in millions of oysters                             | unitless<br>(count) |
| mk_mil         | abundance estimate of market-sized, sexually mature oysters from the population dynamics model in millions of oysters                      | unitless<br>(count) |

| adult_mil      | Total estimated abundance, in millions, of small and market oysters   | unitless<br>(count) |
|----------------|---|---------------------|
| harvest_sm     | Estimated catch of small oysters  | unitless<br>(count) |
| harvest_mk     | Estimated catch of small oysters  | unitless<br>(count) |
| М              | Estimated instantaneous rate of natural mortality   | unitless            |
| А              | Estimated annual rate of natural mortality  | unitless            |
| u              | Estimated rate of exploitation  | unitless            |
| HT_CPUE_b      | Observed (calculated) catch-per-unit-effort for hand tong gear at the beginning of the oyster fishing season        | unitless            |
| pred_HT_CPUE_b | Standardized estimates of catch-per-unit-effort for hand tong gear at the beginning of the oyster fishing season    | unitless            |
| HT_CPUE_a      | Observed (calculated) catch-per-unit-effort for hand tong gear at the end of the oyster fishing season              | unitless            |
| pred_HT_CPUE_a | Standardized estimates of catch-per-unit-effort for hand tong gear at the end of the oyster fishing season          | unitless            |
| PD_CPUE_b      | Observed (calculated) catch-per-unit-effort for power dredge gear at the beginning of the oyster fishing season     | unitless            |
| pred_PD_CPUE_b | Standardized estimates of catch-per-unit-effort for power dredge gear at the beginning of the oyster fishing season | unitless            |
| PD_CPUE_a      | Observed (calculated) catch-per-unit-effort for power dredge gear at the end of the oyster fishing season           | unitless            |
| pred_PD_CPUE_a | Standardized estimates of catch-per-unit-effort for power dredge gear at the end of the oyster fishing season       | unitless            |
| Hab            | Estimated amount of oyster habitat in meters  | meters              |
| km_Hab         | Estimated amount of oyster habitat in kilometers  | kilometers          |
| A_upper        | 95% upper confidence interval for the estimated annual rate of natural mortality                                    | unitless            |
| A_lower        | 95% lower confidence interval for the estimated annual rate of natural mortality                                    | unitless            |
| r_upper        | 95% upper confidence interval for the estimated recruitment (YOY;spat)  | unitless            |
| r_lower        | 95% lower confidence interval for the estimated recruitment (YOY;spat)  | unitless            |
| N_upper        | 95% upper confidence interval for the estimated adult abundance (smalls, markets)                                   | unitless<br>(count) |
| N_lower        | 95% lower confidence interval for the estimated adult abundance (smalls, markets)                                   | unitless<br>(count) |
| u_upper        | 95% upper confidence interval for the estimated rate of exploitation  | unitless            |
| u_lower        | 95% lower confidence interval for the estimated rate of exploitation  | unitless            |
| hab_upper      | 95% upper confidence interval for the estimated amount of habitat r   |                     |
| hab_lower      | 95% lower confidence interval for the estimated amount of habitat   | meters              |

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# **Project Information**

Coastal SEES Collaborative Research: Oyster fisheries in the Chesapeake Bay: Integrating stakeholder objectives with natural system models to promote sustainable policy (Chesapeake Bay Oyster Fisheries)

#### Coverage: Chesapeake Bay

#### NSF Award Abstract:

Researchers will use the oyster fisheries in the Chesapeake Bay as a test case for collaborative policy development that is grounded in sound science. Environmental policies often create controversy and can be difficult to enforce, particularly when people do not understand the reason for the rules or do not consider the rules to be fair. Natural resources can be better sustained by policies developed cooperatively among all affected stakeholders, scientists, and government representatives. In a systematic approach, the project team will hold a series of workshops in which a full set of stakeholders will work with scientists to guide development of a model, select policy objectives, and apply the model to make policy recommendations. A collaborative modeling approach will ensure that stakeholders have an opportunity to incorporate their values, objectives, and knowledge into the model of the estuarine ecosystem which will include many benefits from the natural system such as commercial and recreational fishing, safe swimmable water, and other ecosystem services. Researchers will study the sociology and economics that influence stakeholder involvement and policy formation in order to better understand the human dimensions, improve the process, and enhance the implementation success of recommended policies. The lessons learned regarding the oyster ecosystem and fishery will advance the tools and practices of sustainable management of shellfisheries. The policy recommendations from the stakeholder workshops will be evaluated by state and federal agencies, and if implemented, would be an outcome that would directly enhance coastal sustainability. One Ph.D. student, two masters students, and one postdoctoral researcher will be trained in the science of coupled natural-human systems. This project is supported as part of the National Science Foundation's Coastal Science, Engineering, and Education for Sustainability program - Coastal SEES.

This research aims to improve the utility of predictive models for shaping natural resource policy and management. The research team will build an innovative natural systems model that integrates threedimensional hydrodynamic, water quality and larval transport models with oyster demographics, human uses, and economics at a scale that is applicable to restoration and management. The modeling system developed will substantially advance methods for investigating, and understanding, natural systems with complex feedbacks between physical conditions, vital rates of organisms, and humans. Researchers will include stakeholder values, objectives, and knowledge in the model design process. Through a series of workshops, stakeholders will select the policy objectives and the integrated model will project how well policies are expected to meet these objectives. This iterative process will ensure that the natural system model will incorporate the complex human uses of the ecosystem. A targeted effort will be made to study the socioeconomic drivers of stakeholder involvement, information flow, use and influence, and the policy formation in order to improve the process and enhance the implementation success of recommended policies. By doing so, this research will advance understanding of the human dimensions needed to create sustainable policy as well as provide important new strategies for integrating natural and social sciences, and scientists, in sustainable resource management. This generalizable research component provides an important complement to the research on oysters, both of which will advance the tools and practices of sustainable management of shellfisheries.

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### Funding

| Funding Source                           | Award              |
|--|--------------------|
| NSF Division of Ocean Sciences (NSF OCE) | <u>OCE-1427019</u> |

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