Maryland Oyster Stock Assessment Update

December 18, 2017

St. Mary's City, MD

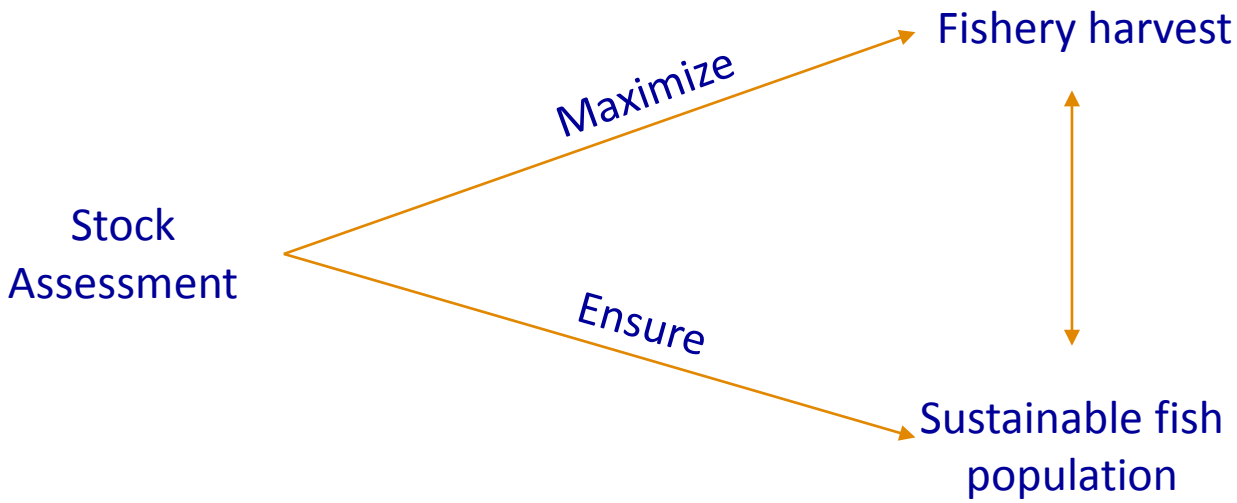
Stock Assessment Background

What are the goals of a stock assessment?

Stock assessments :

1. Estimate current fish stock status relative to relative reference points
2. Estimate current abundance and harvest rates
3. Estimate past abundance and harvest rates

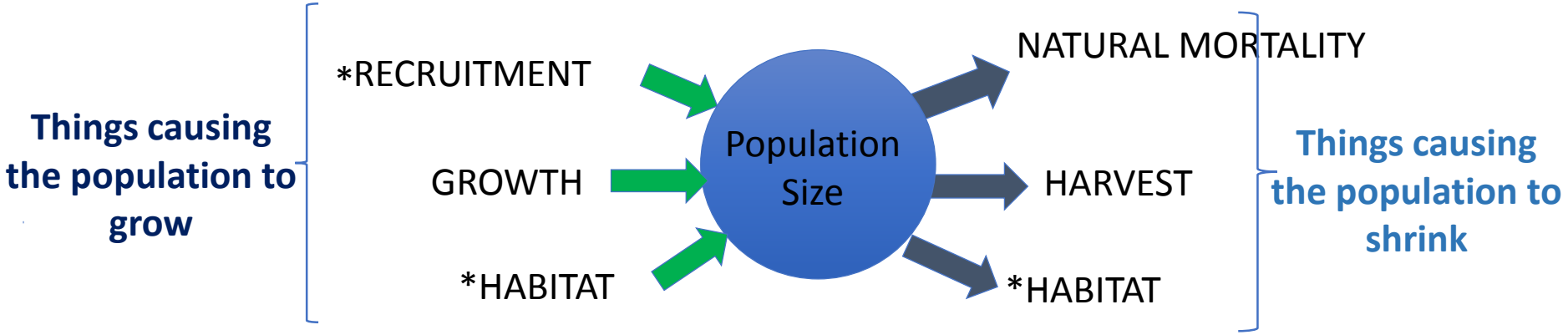
Stock assessments support sustainable fisheries by providing fisheries managers with the information necessary for sound management actions.



Stock Assessment **Background**

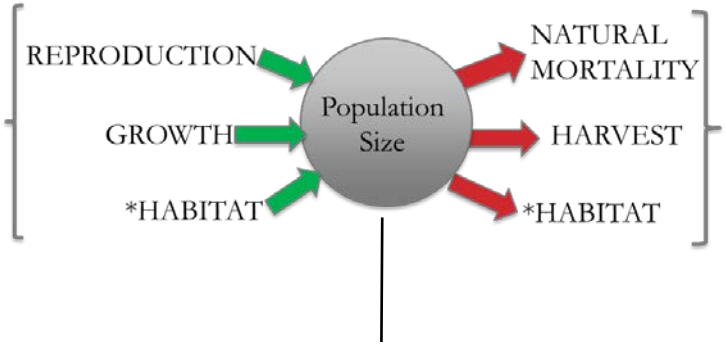
Stock assessment models use data and description of population dynamics to estimate population size, harvest rates, and recruitment over time.

Survey data reflecting trends in population size are used in the model to calibrate the estimates and help us understand how well the model is working.



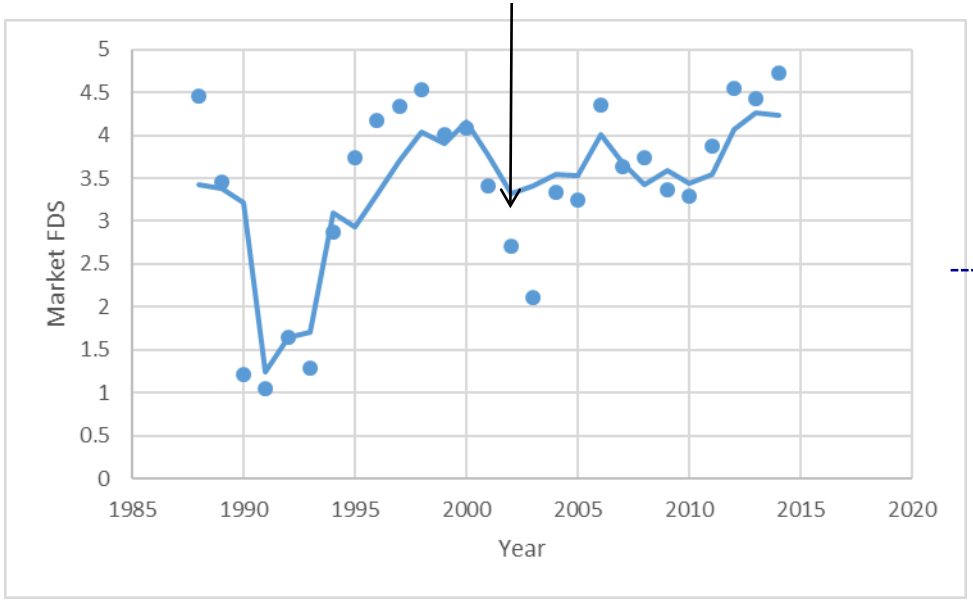
** Recruitment refers to the size of the spat fall each year. Habitat refers to shell and is unique to oysters since they create their own habitat.*

Stock Assessment **Background**



MODEL

Survey data used to calibrate model estimates: fall survey, patent tong surveys, commercial catch per unit effort.



Model-estimated population size

Stock Assessment **Background**

What are biological reference points?

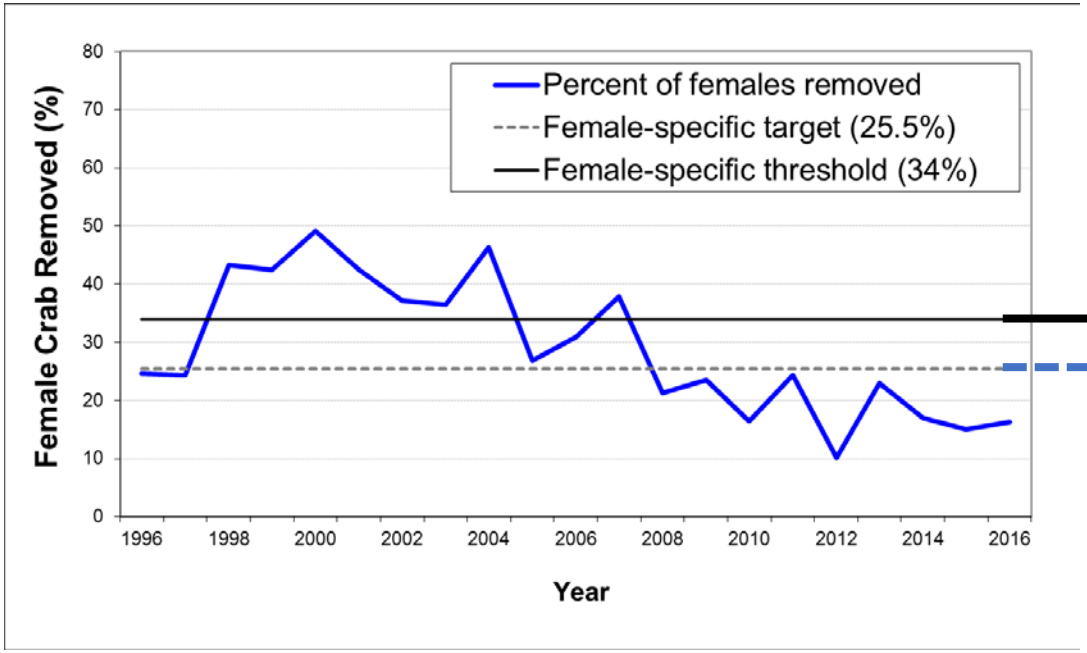
- Biological reference points **identify** levels of fishing that will maintain the population abundance at a desired level.

- Two types of biological reference points:
  1. Target reference point defined by managers through the public process
     Where we want to be
  2. Threshold reference point defined by the stock assessment
     Where we do <u>not</u> want to be

- Reference points for biomass/abundance and fishing mortality

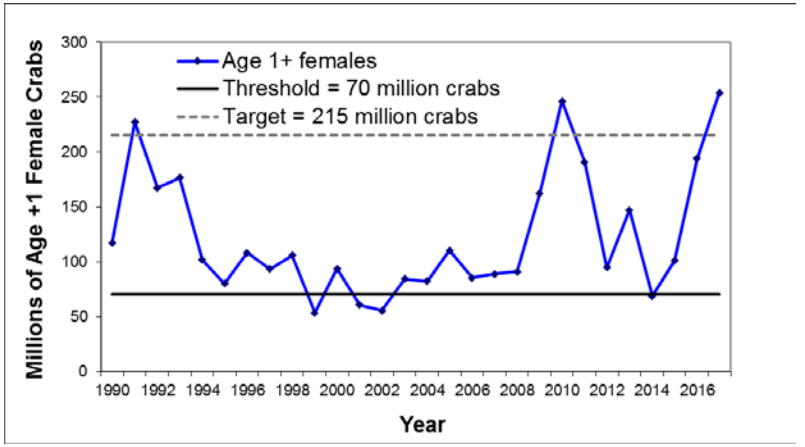
Stock Assessment **Background**

Example of a biological reference point



Where we DO NOT want to be

Where we want to be



Stock Assessment **Background**

Stock Assessment Approaches

Index-based approach (Uses survey data without a complicated model)

- Often used when there is not a lot of data.
- No estimate of population size but can show population trends over time
- Limited information about the population and how it reacts to fishing.
- When using an index approach, the goal is to keep some population measure (e.g. oyster density) within a given range. Fishing harvest rules are loosened or tightened to keep it within range.
- Can be used as a cross-check for model-based approaches.

Model-based approach

- Can estimate population size
- More complex models can incorporate data from many sources and allow for exploration of how differing fishing levels may impact the population over time.
- More complex models also allow us to explore how things we are unsure of impact model estimates.

Stock Assessment **Background**

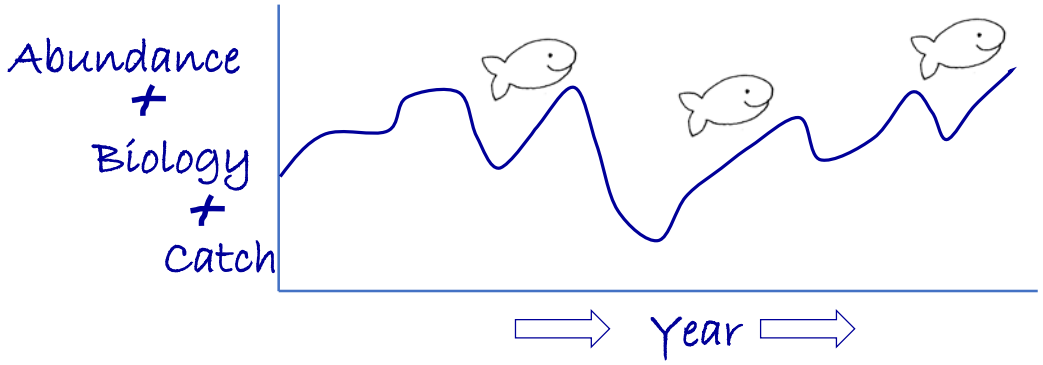
Stock Assessment Approaches

Most stock assessments will develop more than one type of approach in order to compare results.

All approaches are thoroughly **evaluated** by the science team and peer reviewed to make sure results are plausible (consistent with data sources and general knowledge about fishery history and population).

Specific approaches for the oyster stock assessment have not been selected yet.

The approach that is ultimately chosen depends on the data available and the objectives of the stock assessment project.



Stock Assessment Objectives

Based on Statute §4–215 / 2016 House Bill 937:

1) **Analyze** available data to provide index or model based definitions of threshold fishing and/or biomass levels for the Maryland Chesapeake Bay oyster population on a spatial scale that is supported by the available data.
2) **Evaluate and recommend** index or model-based biological reference points for oysters in the Maryland portion of Chesapeake bay that are based on the biological characteristics of the oyster population and other appropriate factors that affect the oyster population including shell dynamics.
3) **Identify** currently available field surveys or data gathering efforts that can be employed to monitor stock status relative to recommended biological reference points.
4) **Develop** estimates of oyster abundance and fishing levels over time on a spatial scale that is supported by available data.
5) **Ensure** that the assessment approach allows for the eventual evaluation of an array of management tools (e.g.) season and vessel limits that could be employed for the fishery on a spatial scale that is supported by available data.

Terms of Reference (TORs)

What are Terms of Reference?

- Developed to ensure that everyone has the same expectations from the assessment
- Details the items that should be included in the assessment
  - Questions to address
  - Approaches to explore
- Defines protocols and responsibilities when developing a stock assessment
- Used as guidelines during the peer review of the assessment

Draft Oyster Assessment Terms of Reference :

1) Complete a thorough data review: survey data, reported harvest and effort data, studies and data related to population rates (growth, mortality and recruitment), available substrate, shell budgets, and sources of mortality.
   a) List, review, and evaluate the strengths and weaknesses of all available data sources for completeness and utility for stock assessment analysis, including current and historical fishery-dependent and fishery-independent data.
   b) Identify the relevant spatial and temporal application of data sources.
   c) Document changes in data collection protocols and data quality over time.
   d) Justify inclusion or elimination of each data source

Terms of Reference

2) Develop stock assessment model or index based approach that estimates biological reference points and documents status of the stock relative to estimated reference points. To the extent possible, quantify sources of uncertainty within model.

3) Compare estimates of stock status generated by index and model-based approaches. Justify selected approach.

4) Include sanctuaries and restoration efforts in sanctuaries in the development of stock assessment approaches.

5) Examine how hatchery plantings (aquaculture and public fishery) impact spawning potential in fishery.

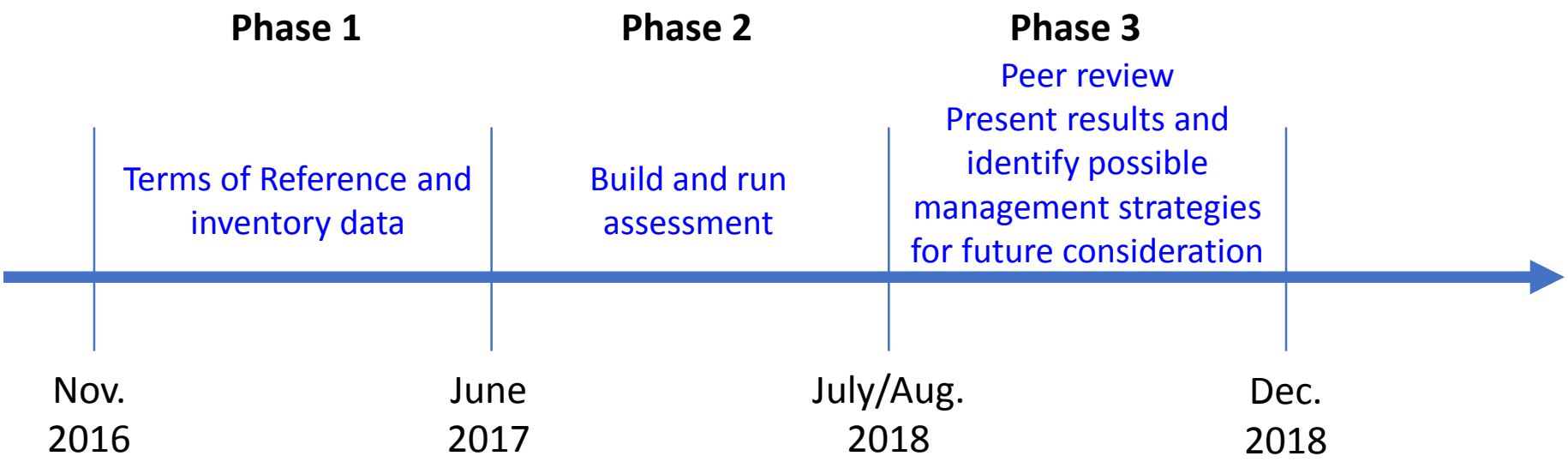
Inventory of Available Data

Terms of Reference #1

Primary data sources

Input category	Data Source
Recruitment	Fall dredge survey, Patent Tong surveys, Peer reviewed studies
Habitat	Yates Survey, Bay Bottom Survey, Current sonar surveys, Shell plantings
Harvest	Dealer buy tickets, Monthly harvester reports, Bushel tax forms
Natural mortality	Fall dredge survey, Peer reviewed studies, DNR and other analyses
Abundance trends	Fall dredge survey, Patent Tong surveys

Timeline


Phase 1
Phase 2
Phase 3
Peer review
Present results and identify possible management strategies for future consideration
Terms of Reference and inventory data
Build and run assessment
Nov. 2016
June 2017
July/Aug. 2018
Dec. 2018