

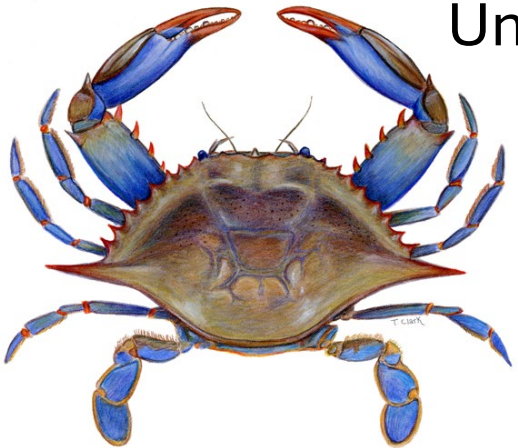
2026 Chesapeake Bay Blue Crab Stock Assessment

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This was a team effort!

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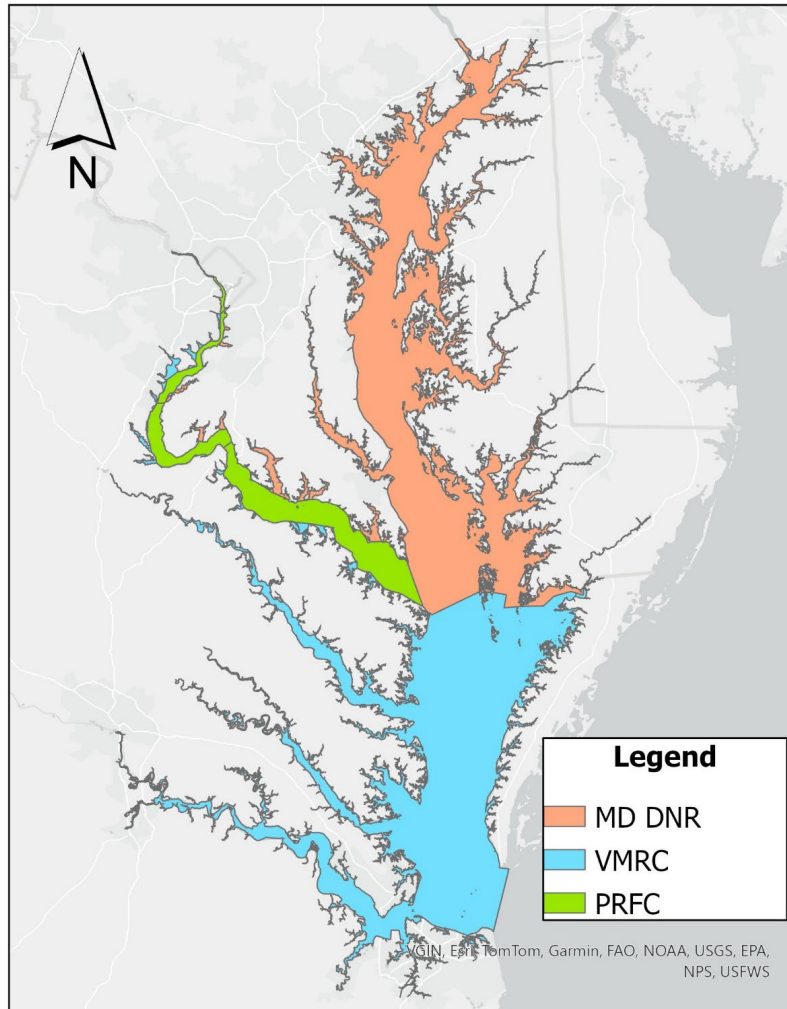
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Background

- Blue crab has supported an important commercial fishery since the early 1900s
- Currently the most valuable commercial fishery in Chesapeake Bay with dockside value > \$80 million/year
- Previous assessments were prompted by concerns about overfishing



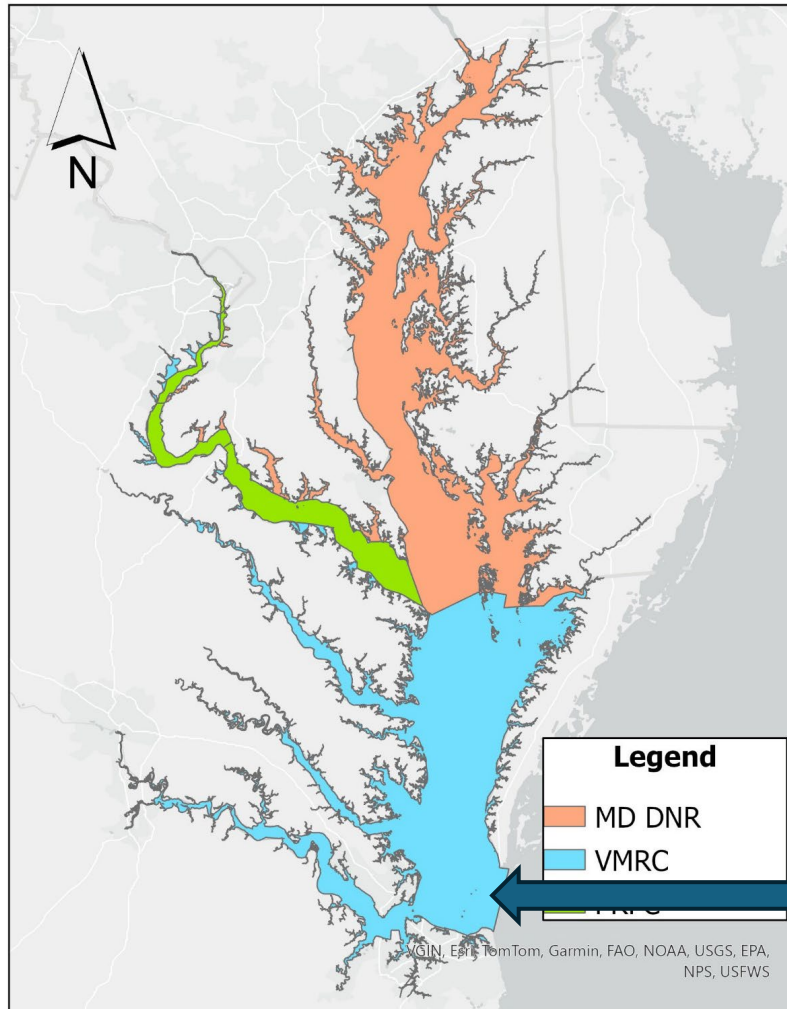
Chesapeake Bay



3 Management Jurisdictions

- Maryland (MD DNR)
- Potomac River (PRFC)
- Virginia (VMRC)

Crabs do not respect these boundaries!

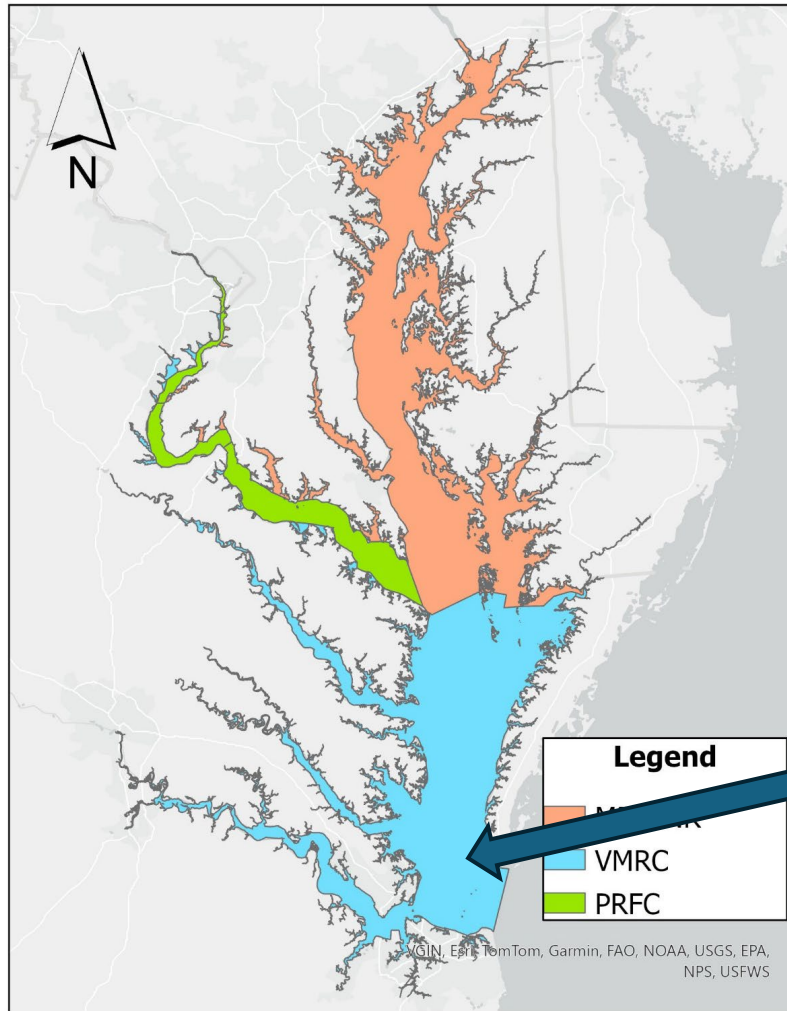


Adult females spawn near the mouth of the Bay

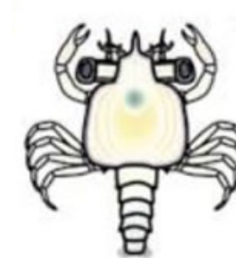
Spawning area



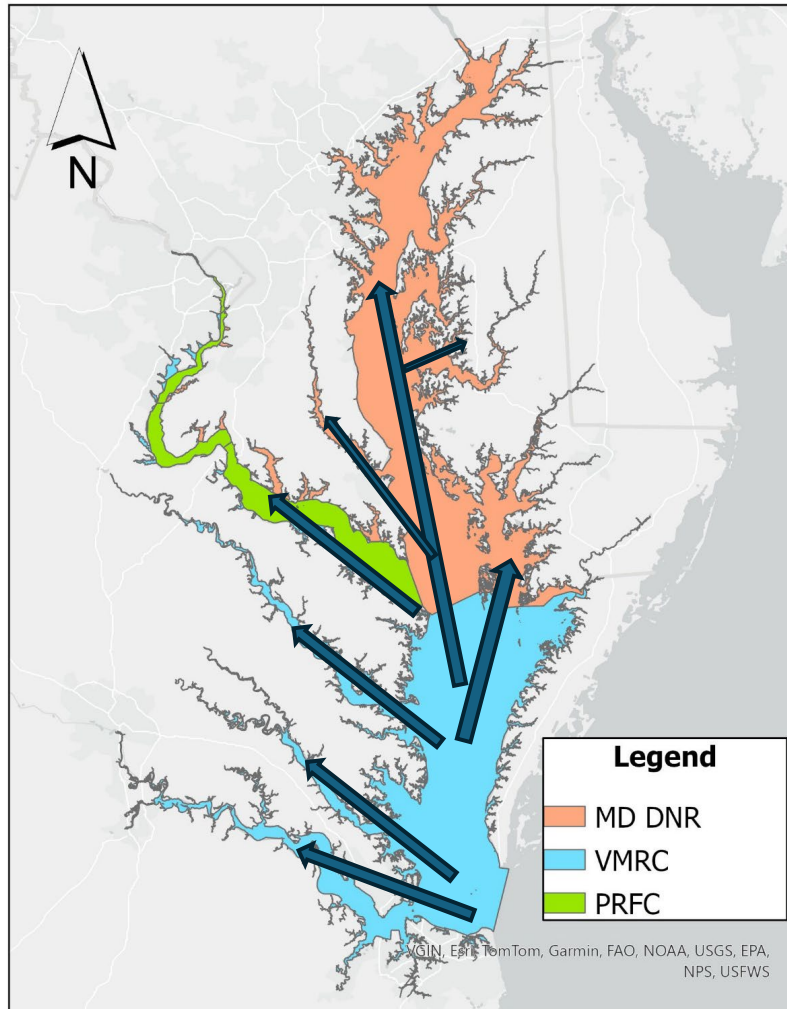
Crabs do not respect these boundaries!



Very young crabs initially settle in the lower Bay

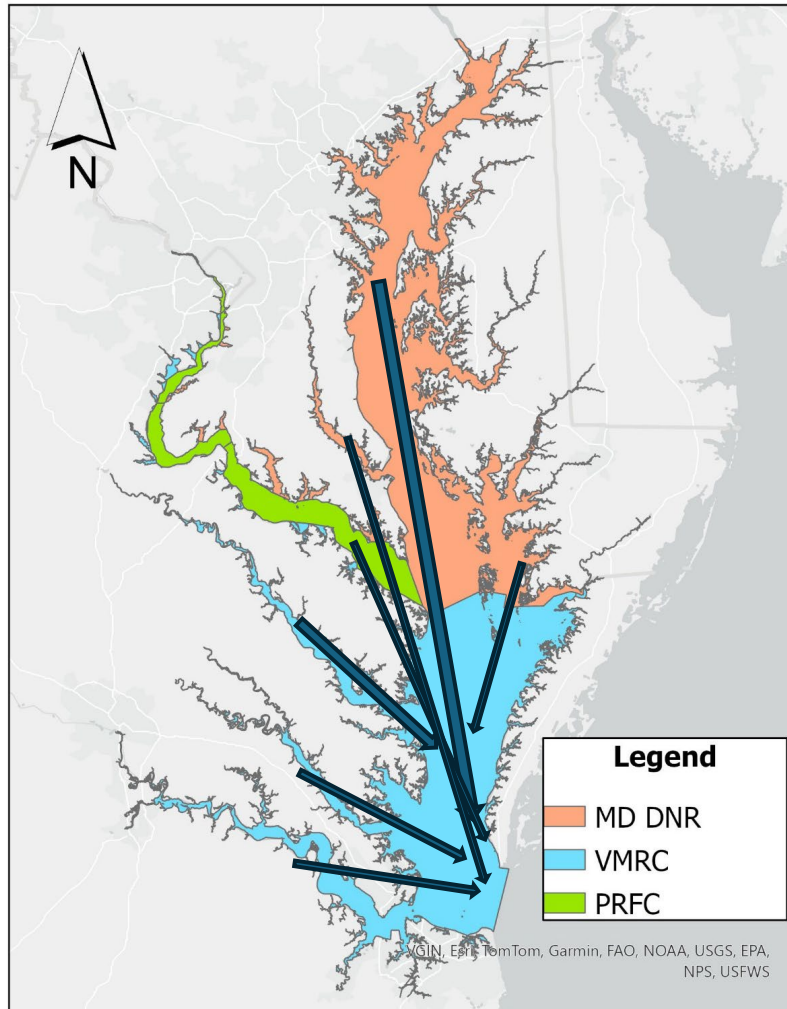


Crabs do not respect these boundaries!



Juveniles distribute throughout the Bay as they grow

Crabs do not respect these boundaries!



Mature females migrate to the mouth of the Bay to spawn after maturation

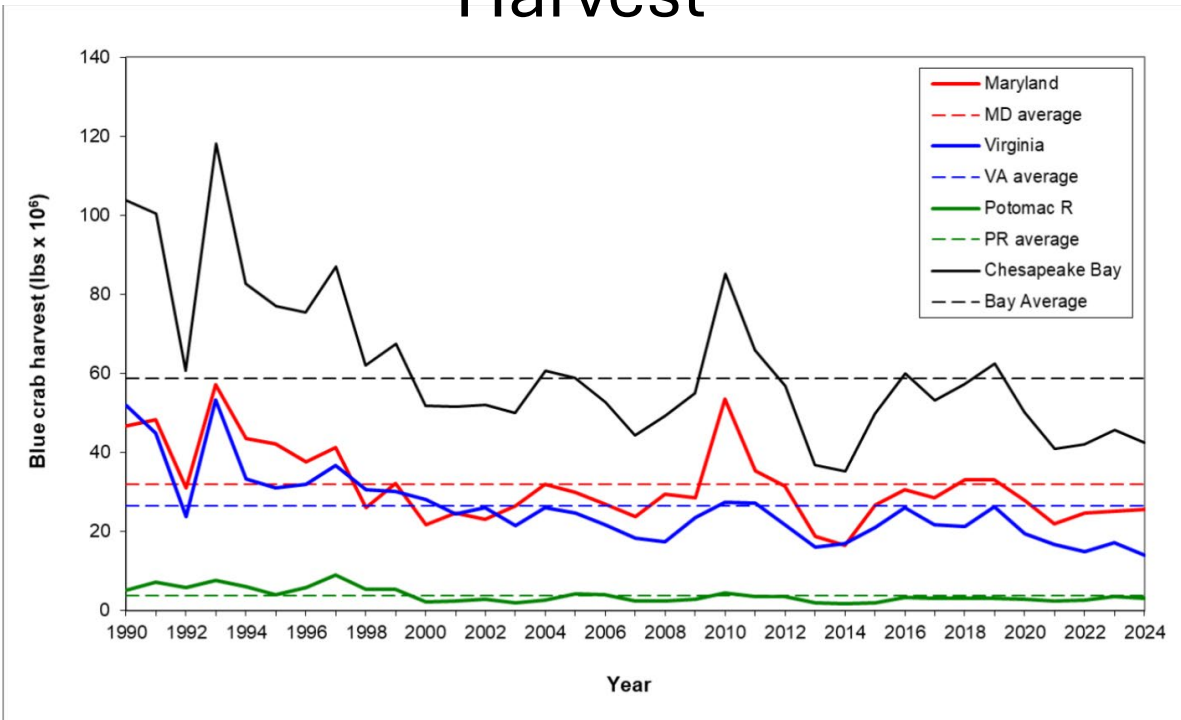


Males largely remain in the areas they moved to as juveniles

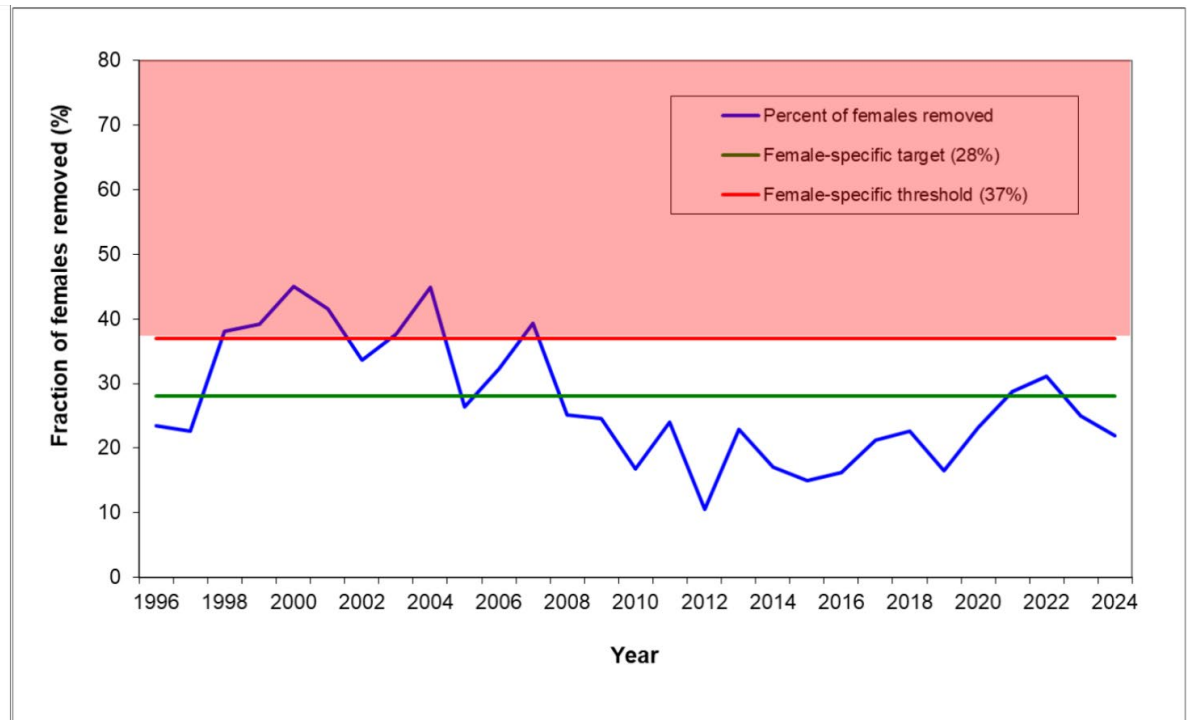
2023 Call for a new assessment

- Lower than expected abundance and harvest (despite fishing mortality on females being below target level)

Harvest



Abundance



Assessment funding and Terms of Reference (TORs)

- Maryland and Virginia (through ASMFC)
- NOAA Chesapeake Bay Office

- TORs were developed with the Chesapeake Bay Stock Assessment Committee and the management agencies

Terms of Reference

TOR 1: Critically review and estimate life history parameters and vital rates of blue crab in the Chesapeake Bay that are relevant to the stock assessment. In particular, the assessment should evaluate the extent and scale of interannual variation in life history parameters and vital rates of blue crab in the Chesapeake Bay.

TOR 2: Describe and quantify patterns in fishery-independent surveys to develop indices of abundance and characterize the size composition of the population. Analyses should include: (1) A comprehensive evaluation of the utility of fishery-independent surveys to inform the stock assessment; (2) Consideration of index standardization which may include effects of environmental and abiotic factors on survey catches; and (3) Characterization of uncertainty in indices of abundance.

TOR 3: Describe and quantify patterns in catch, effort, and CPUE. Analyses should include: (1) Estimation of catch and effort for each jurisdiction; (2) Evaluation of the utility of a commercial CPUE index in the assessment; (3) Examination of the impacts of reporting changes and trends in CPUE; (4) Evaluation and quantification of bycatch and/or discard mortality, and recreational harvest using available data from the jurisdictions; and (5) Characterization of uncertainty in the data.

TOR 4: Evaluate the feasibility of, and if possible, implement blue crab stock assessment models that operate on sub-annual time steps and/or at spatial resolutions lower than that of the entire Chesapeake Bay to better represent population dynamics.

TOR 5: Characterize uncertainty in assessment estimates (mortality and abundance).

TOR 6: Update the sex-specific catch survey models used in the 2011 benchmark stock assessment with relevant new data. Characterize major changes in assumptions between the 2011 assessment model and the 2023 model.

TOR 7: Based on assessment model results recommend appropriate biological reference points for management. To extent possible, evaluate the appropriateness and utility of (1) Aggregate bay-wide reference points; (2) Sex specific reference points; and (3) Recruitment reference points.

TOR 8: Evaluate stock status relative to recommended reference points.

TOR 9: Identify relevant ecosystem and climate influences (such as habitat, environmental drivers, prey availability, and predation/cannibalism) on the population dynamics and fisheries and, to the extent possible, explore other analyses that support the assessment.

TOR 10: Identify existing data sources and gaps, and, to the extent possible, characterize the uncertainty in the relevant sources of data.

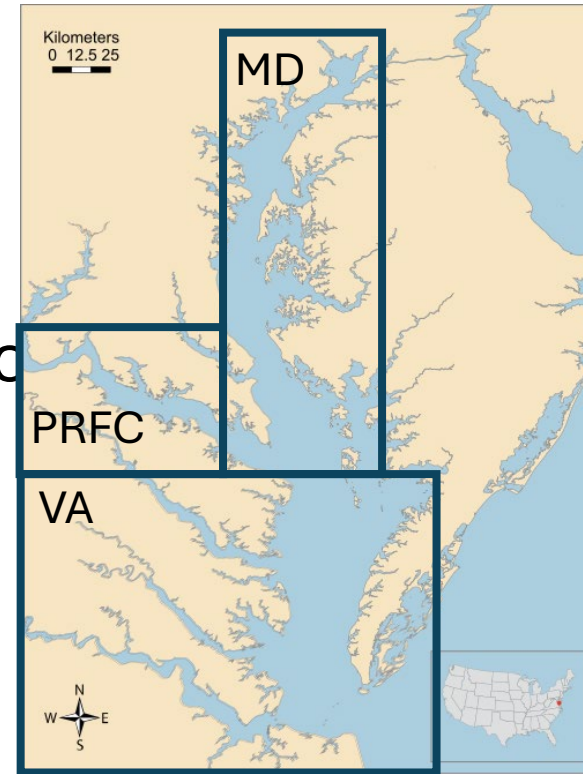
TOR 11: Report on the status of research recommendations from the most recent benchmark assessment. Identify and prioritize research recommendations for future work.

Fisheries

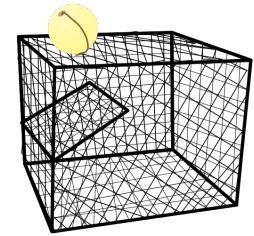
- Fishery catch data separated into fleets by crab condition, jurisdiction, and gear type

1. Maryland Pot
2. Maryland Trotline (+all non-pot gears)
3. Potomac River Fisheries Commission
4. Virginia Pot (+all non-dredge gears)
5. Virginia dredge
6. Peeler condition (jurisdictions and gears combined)

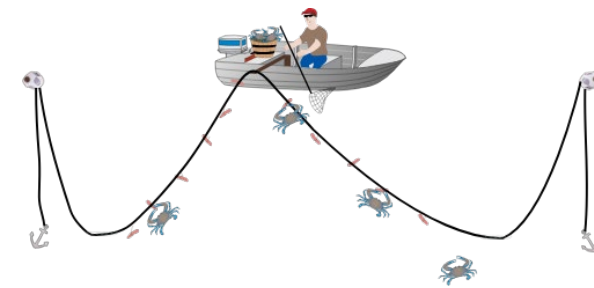
Hard Crabs



Crab Pot



Trotline

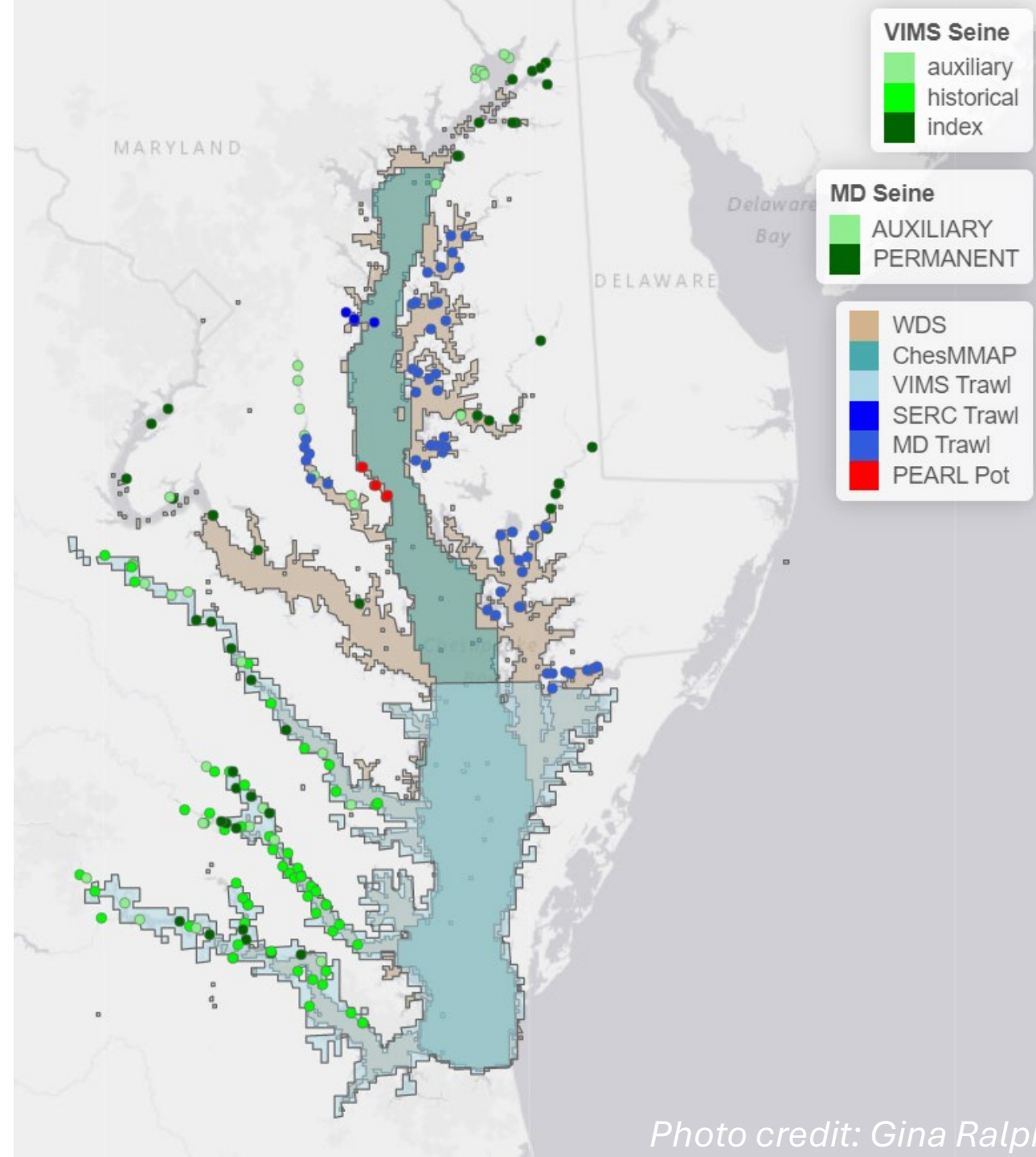


Peeler crabs show early signs of molting

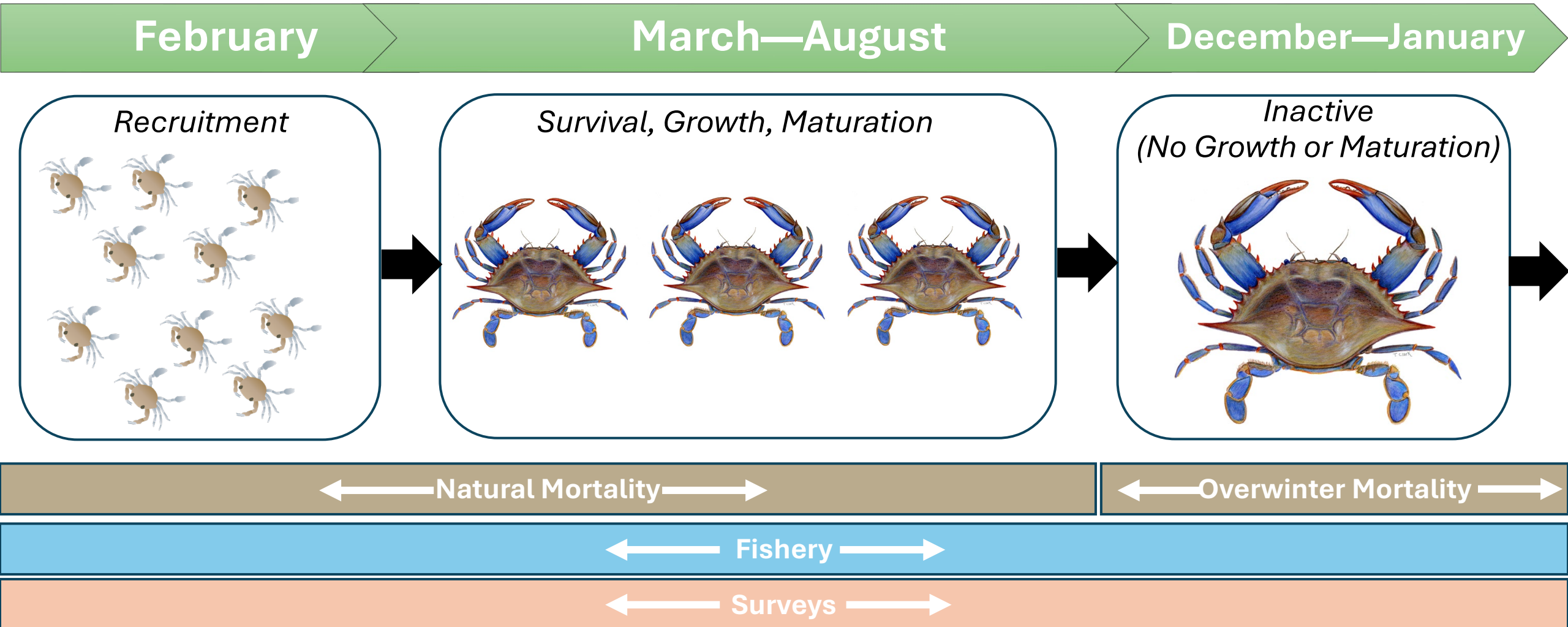
Photo Credits: Louisiana Sportsman; UMCES IAN

Surveys

- Winter Dredge Survey
- MD Trawl Survey (including SERC trawl)
- VIMS Trawl Survey
- PEARL Pot Survey
- ChesMMAP Trawl Survey



Length-structured Assessment Model schematic

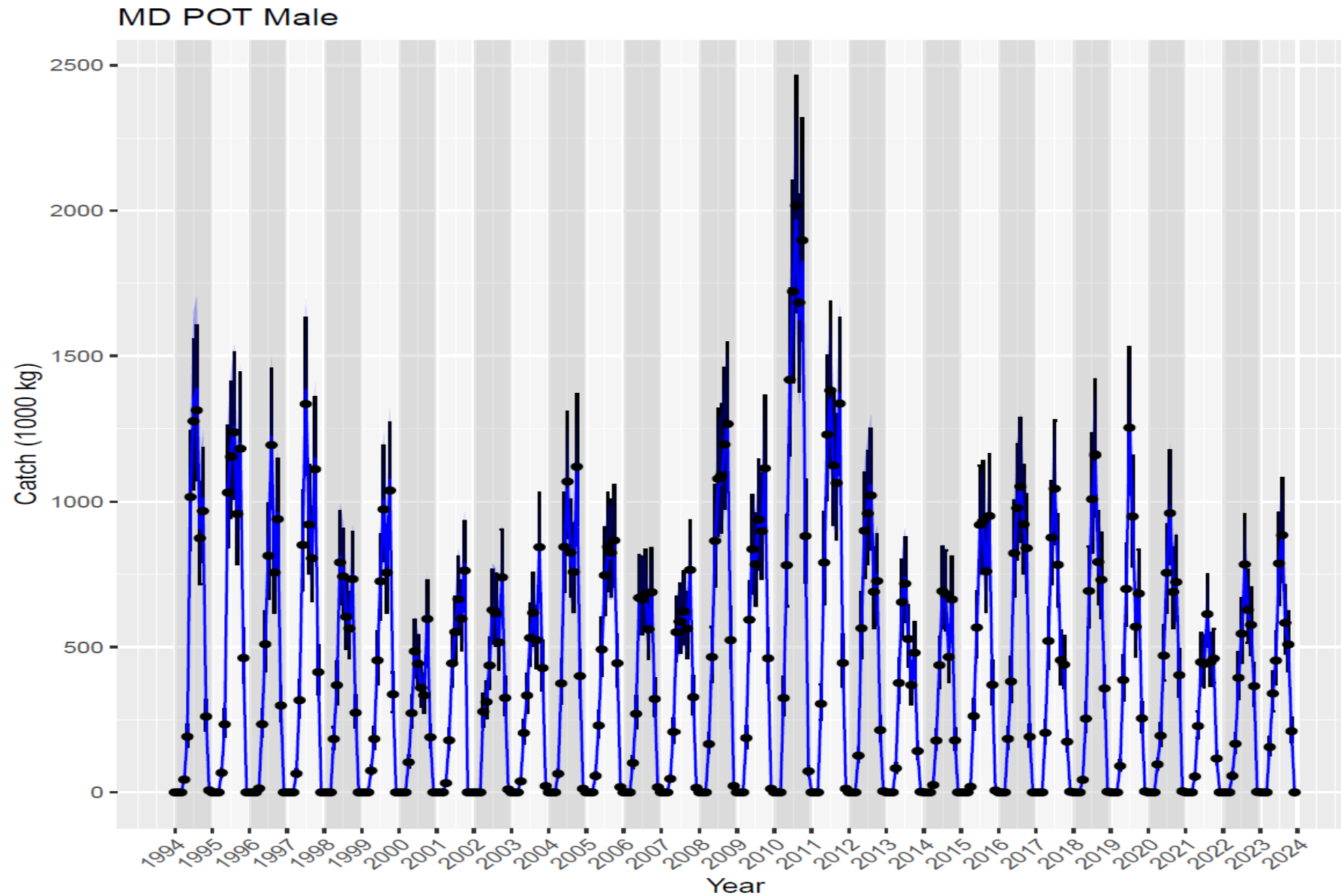


Assessment model

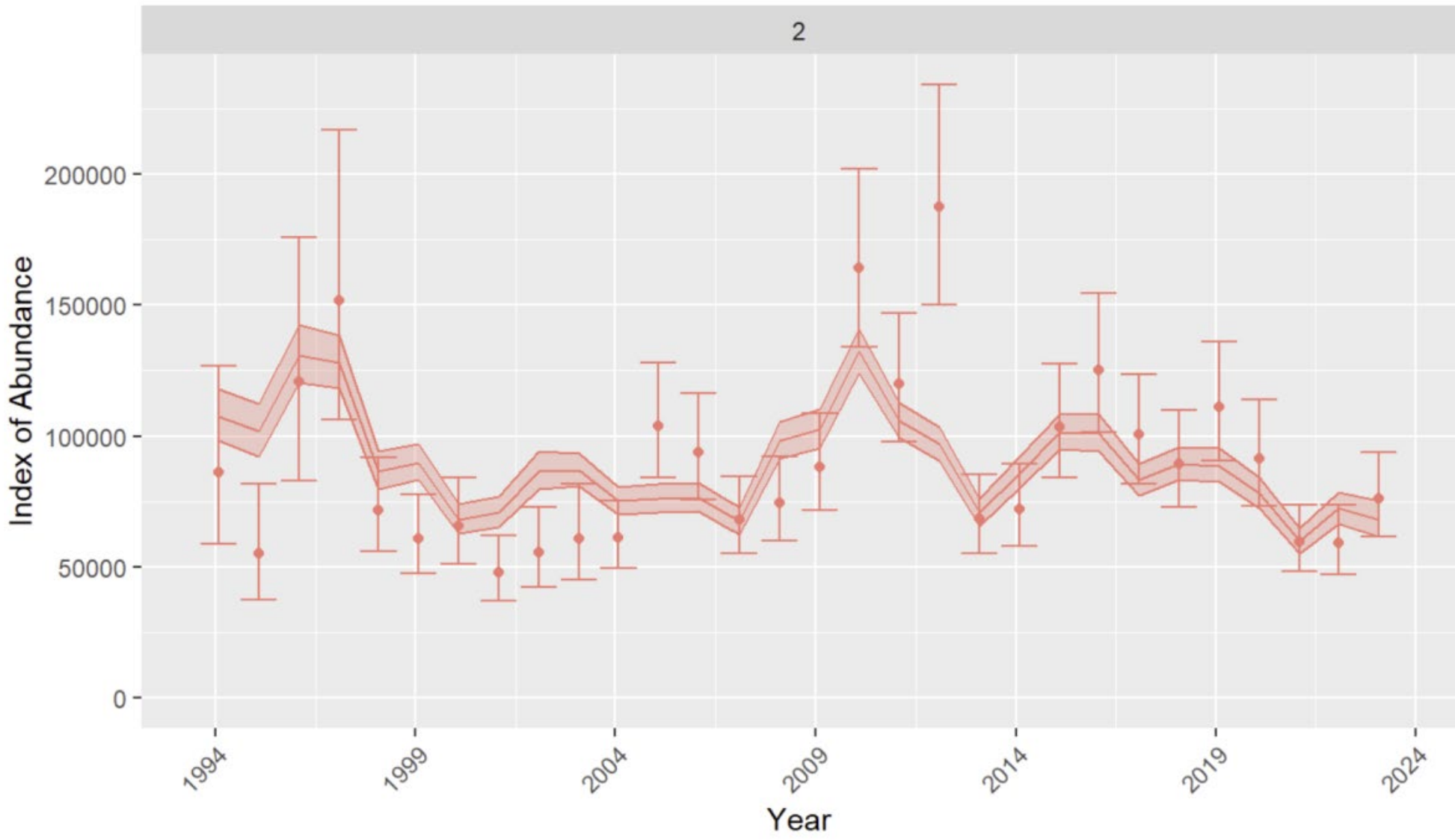
- The mathematical model is implemented in a computer program to describe how the number of crabs changes over time (by sex)
- It includes the effects of fishing, growth, maturation, natural mortality, and recruitment
- The model is statistically fitted to survey and harvest data to estimate abundance and fishing mortality



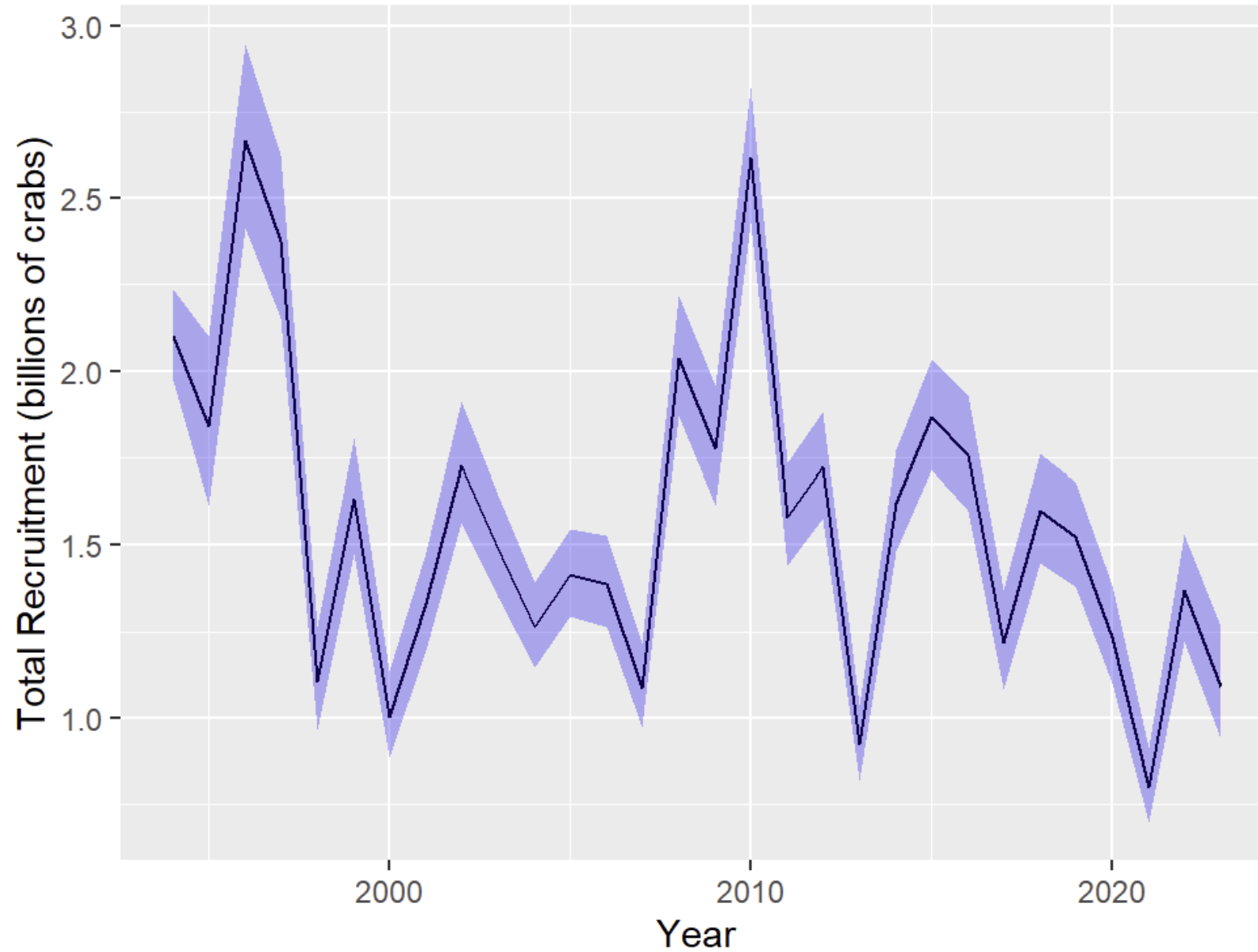
Model fit to the Maryland male pot fishery catch



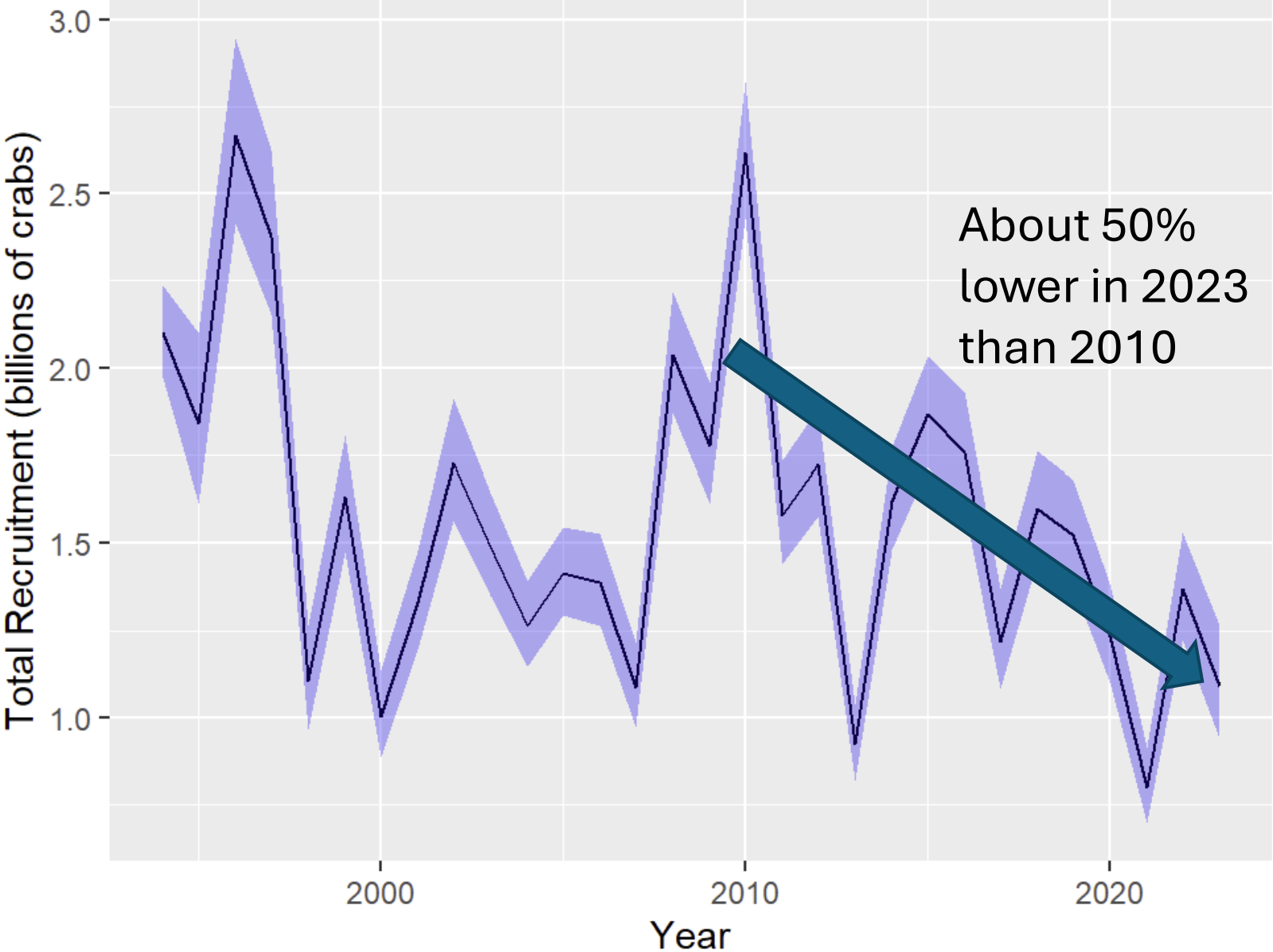
Winter dredge survey model fit



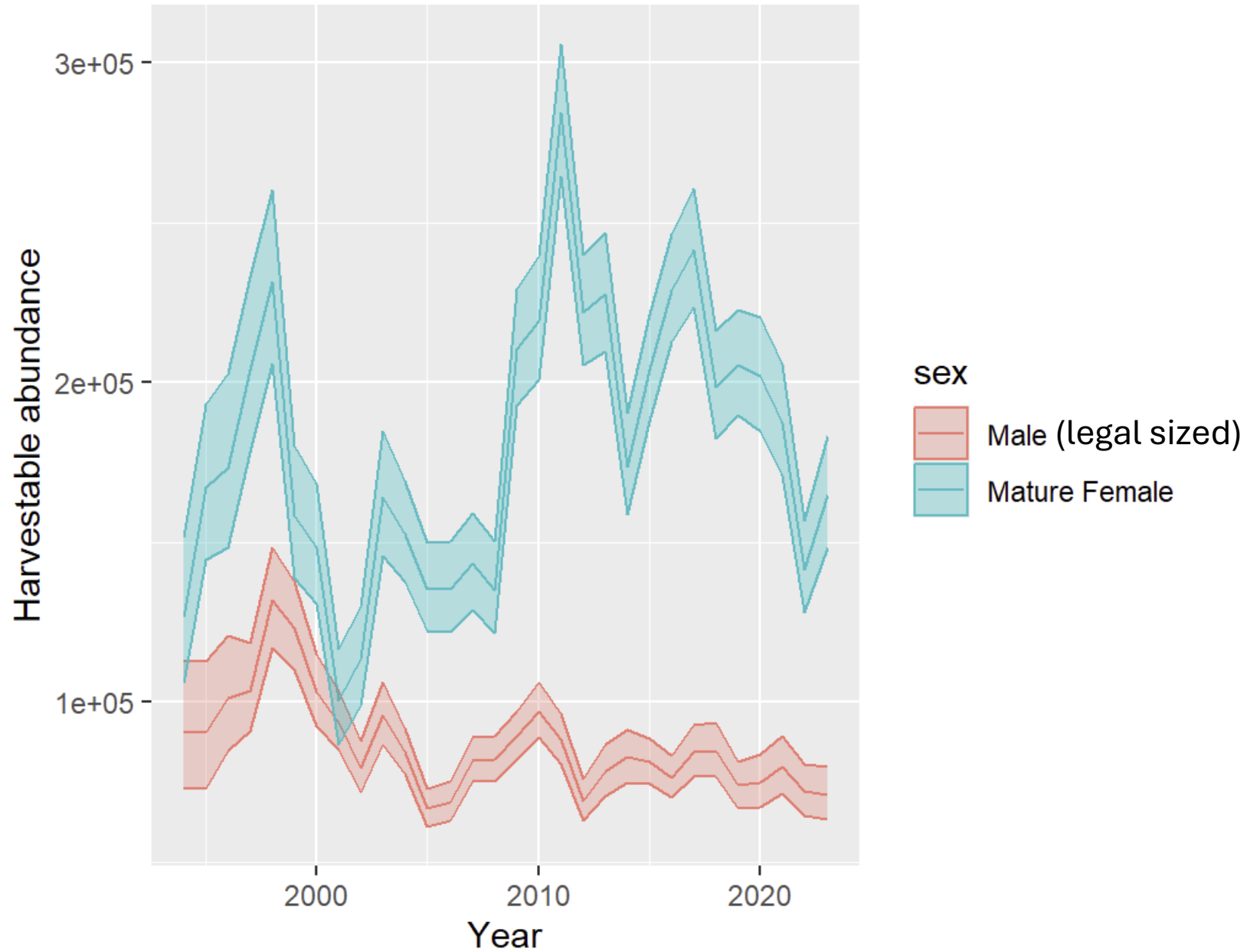
Recruitment (young crabs hatched that year)



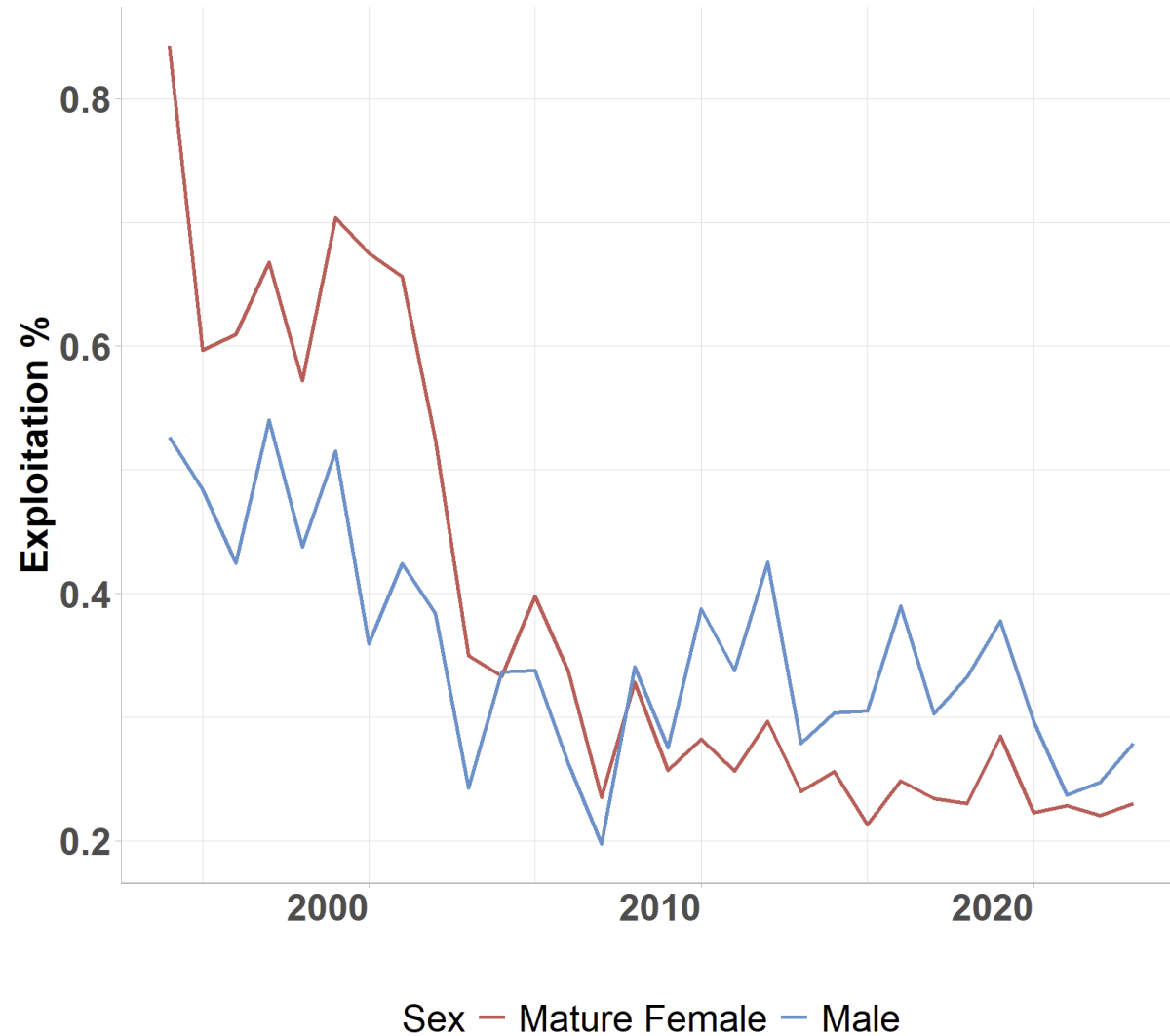
Recruitment (young crabs hatched that year)



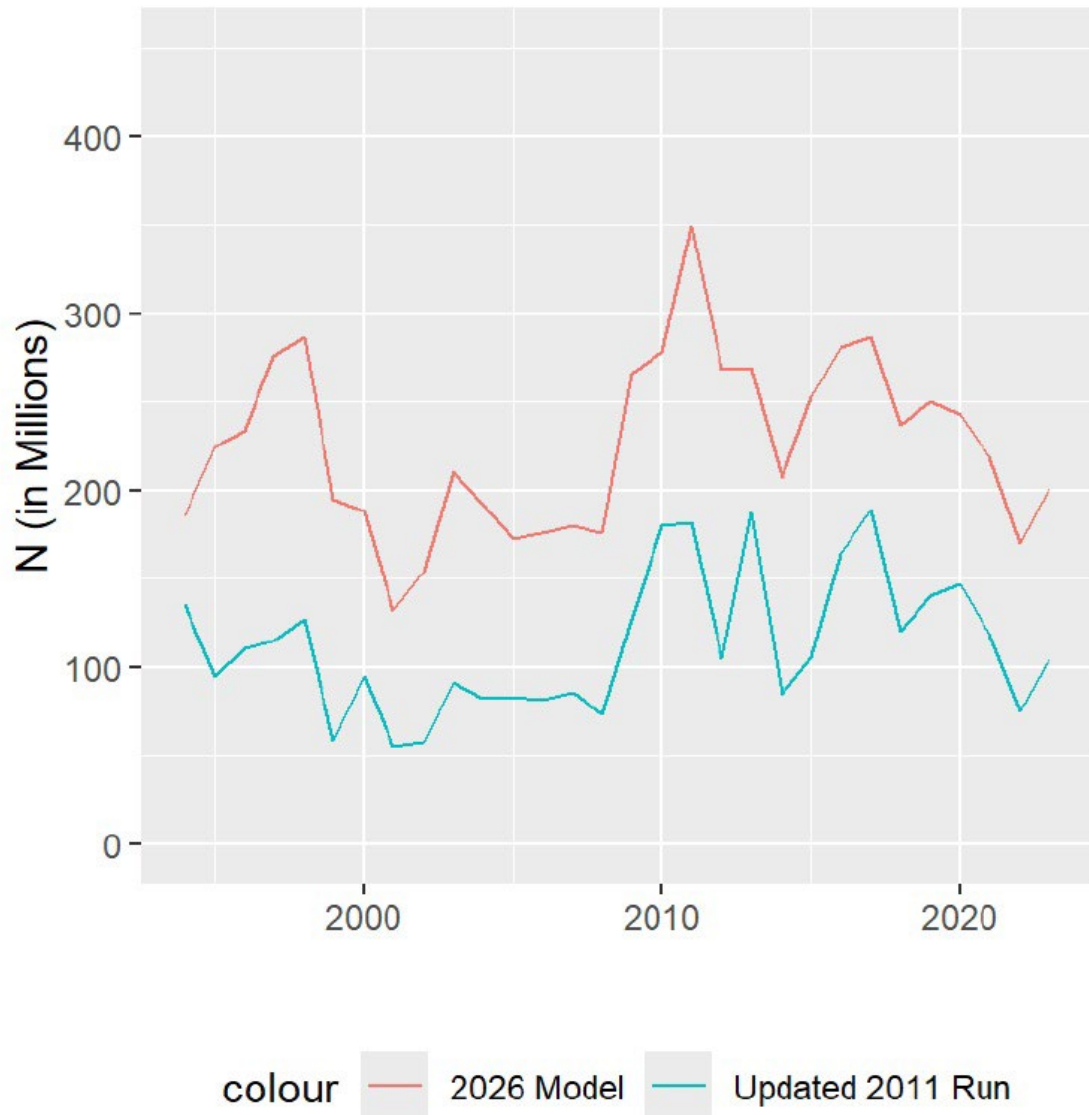
Number of “harvestable” crabs by sex



Fraction harvested

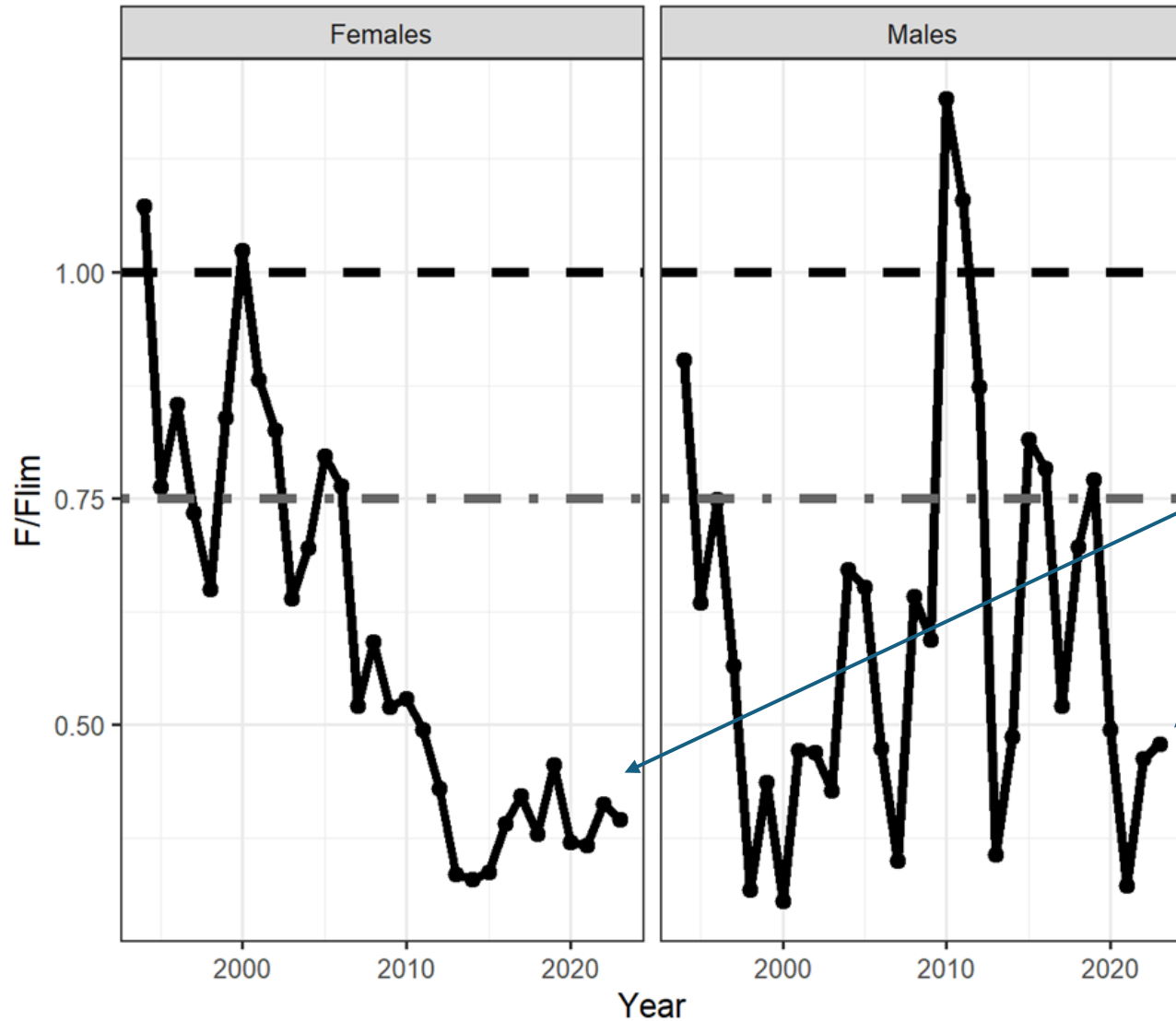


Comparison with previous assessment model



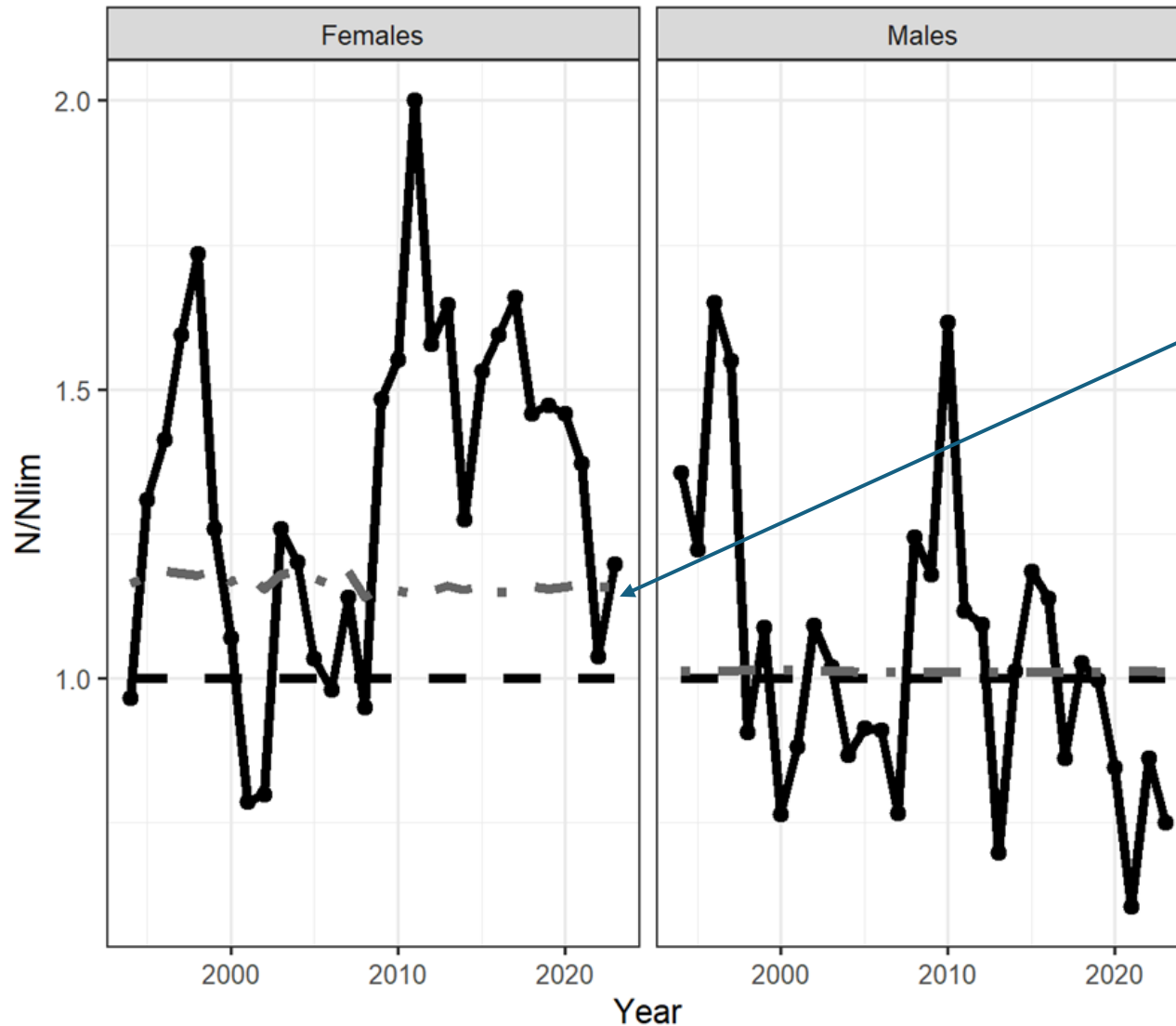
- The trends over time are similar
- 2026 model estimates higher abundance than the 2011 assessment model
- This is caused by different assumptions about the Winter Dredge Survey and the differences in growth patterns

Estimated status relative to fishing



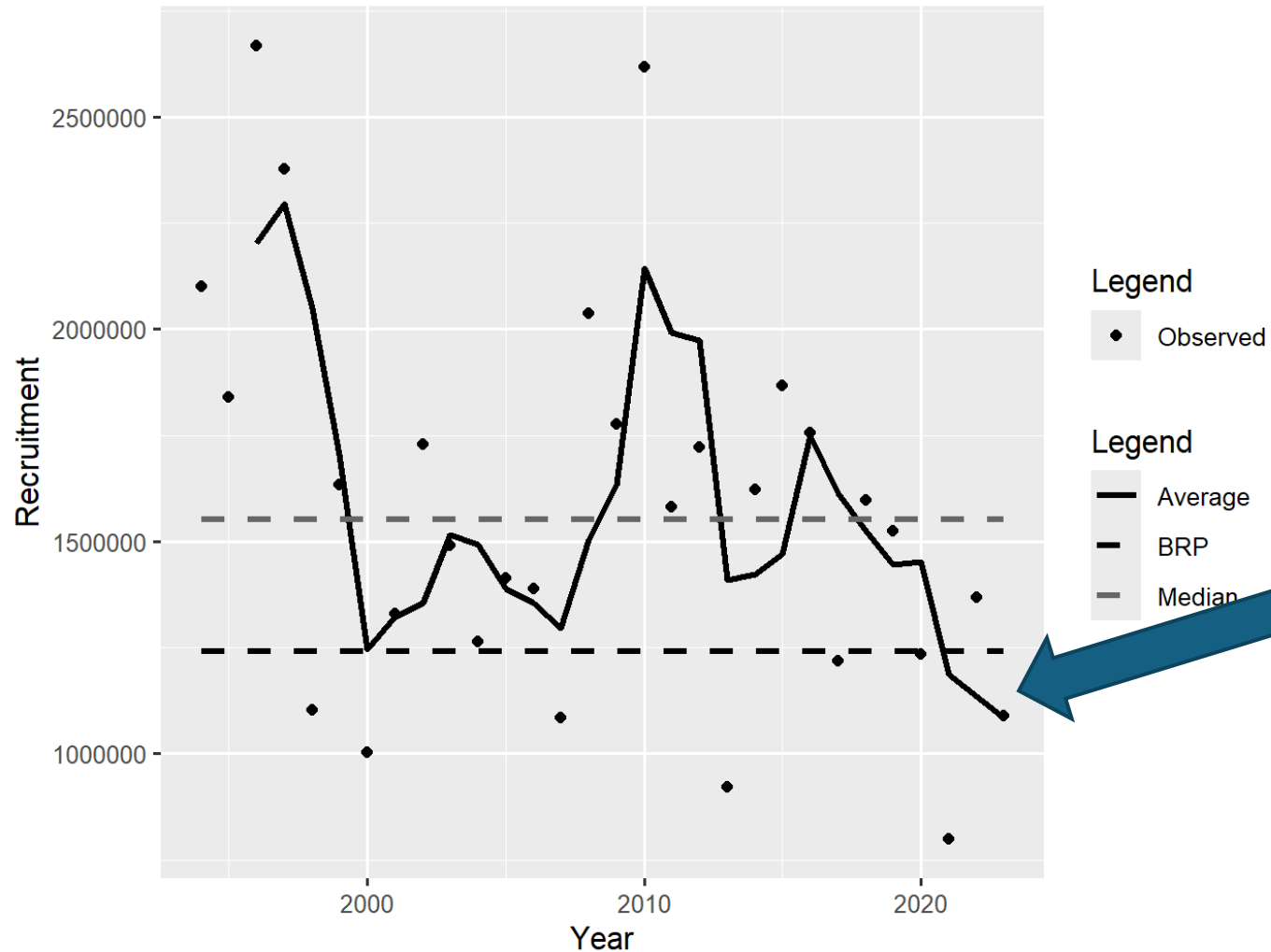
Harvest rates
currently
below
thresholds

Estimated status relative to abundance



- Female abundance is above the threshold
- Male abundance is below the threshold

Estimated recruitment reference points



Recruitment is below the reference point in 2022 and 2023.

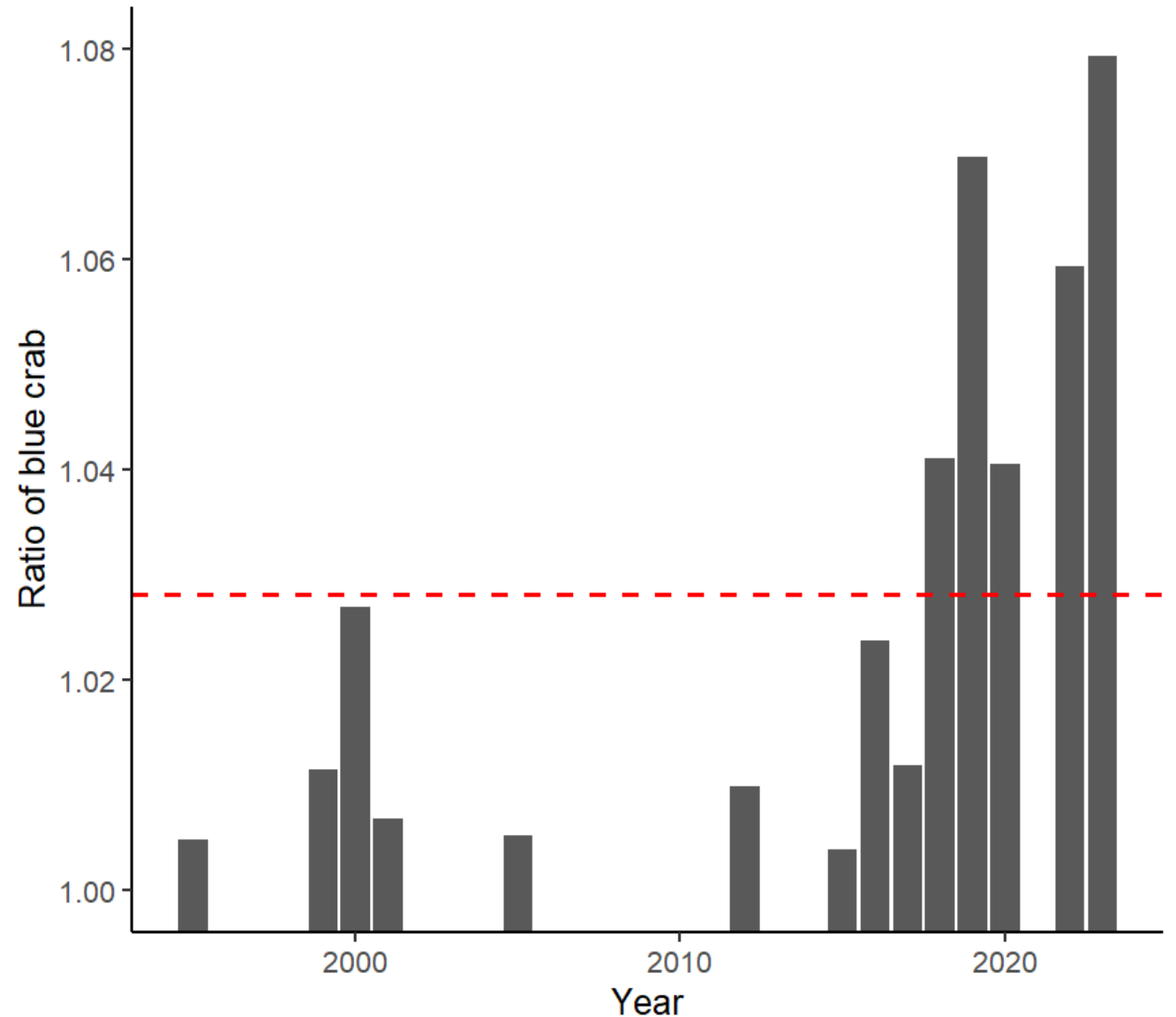
Ecosystem effects evaluated

- Blue catfish (invasive species)
- Temperature
- Overwinter mortality
- Hypoxia (no effect detected)

There is a currently ongoing project evaluating oceanic forcing effects by a team lead by NOAA, but that work is not included in this assessment

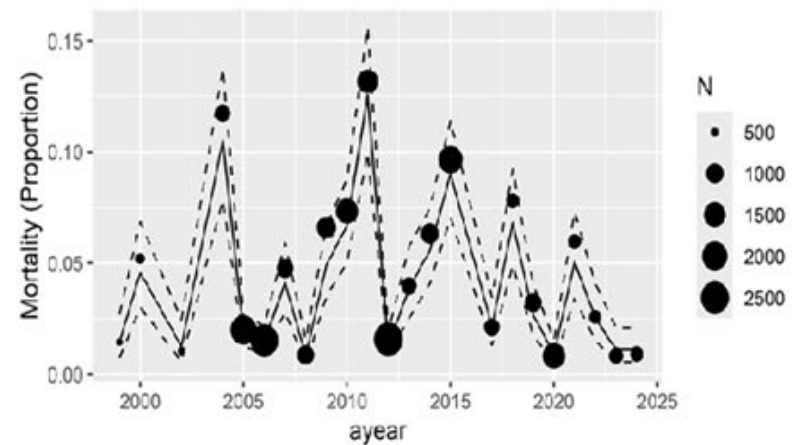
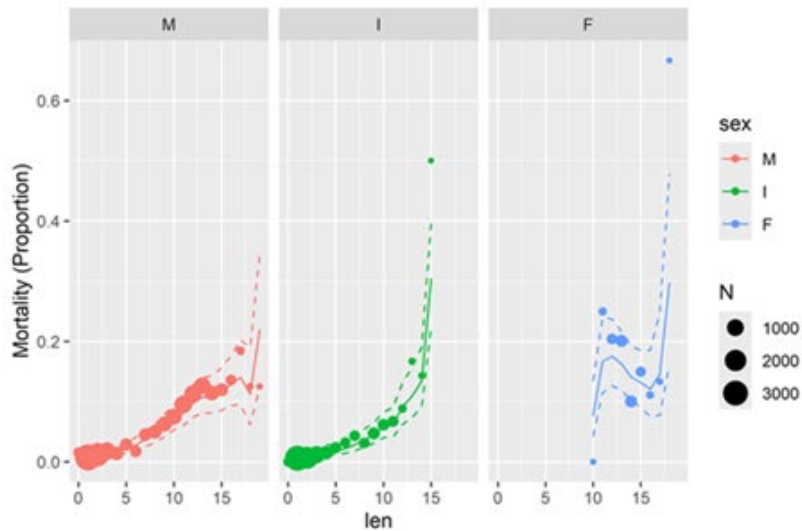
Effect of blue catfish on juvenile blue crab

- The effect of blue catfish on blue crabs has increased since the mid-1990s
- Blue catfish were estimated to reduce blue crab abundance by 2.8%, on average

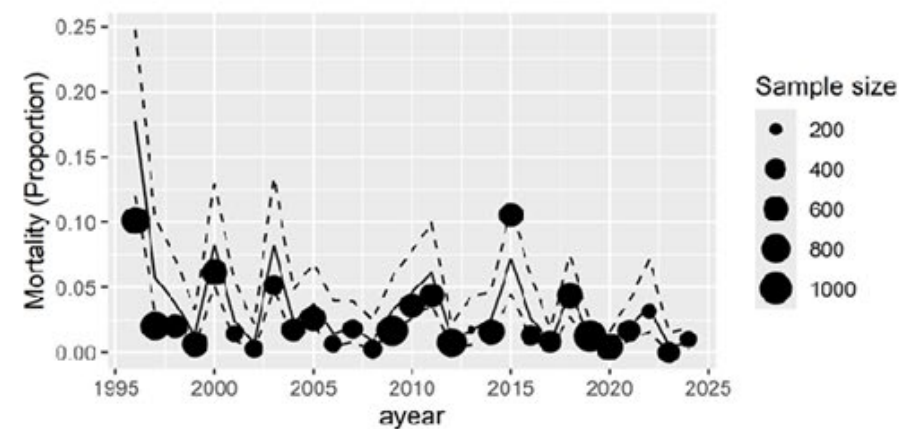
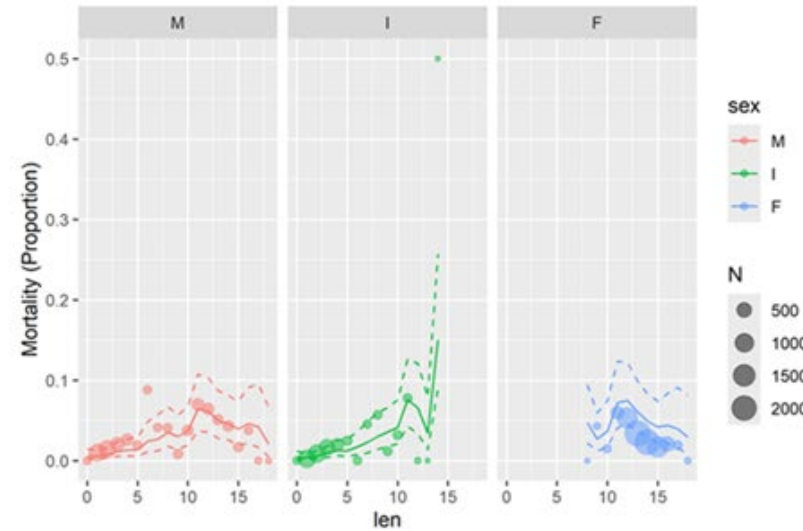


Estimated Overwinter Mortality

Maryland



Virginia



- Larger crabs have higher overwinter mortality
- Overwinter mortality different for Maryland and Virginia and changes over time

Data gaps and research recommendations

- Biological information on growth and maturation
- Additional information on recreational harvest and sex and size of commercial harvest

How does this influence management?

- New management reference points will be used to monitor status of blue crabs
- We will likely to modify how CBSAC provides annual advice to the management agencies
- Males and young crabs are at lower than desired abundance for unknown reasons (and females are near the threshold) – not the time to increase fishing

Do we have the information we need?

- We need to continue existing data collection programs
 - Winter Dredge Survey
 - VIMS and Maryland Trawl Surveys
 - Maryland Cooperative Fishery Data Program
- Improved harvest data
 - Recreational harvest
 - Size and sex of harvested crabs (primarily Virginia and the Potomac River, but Maryland would also benefit)

Other needs identified by the assessment

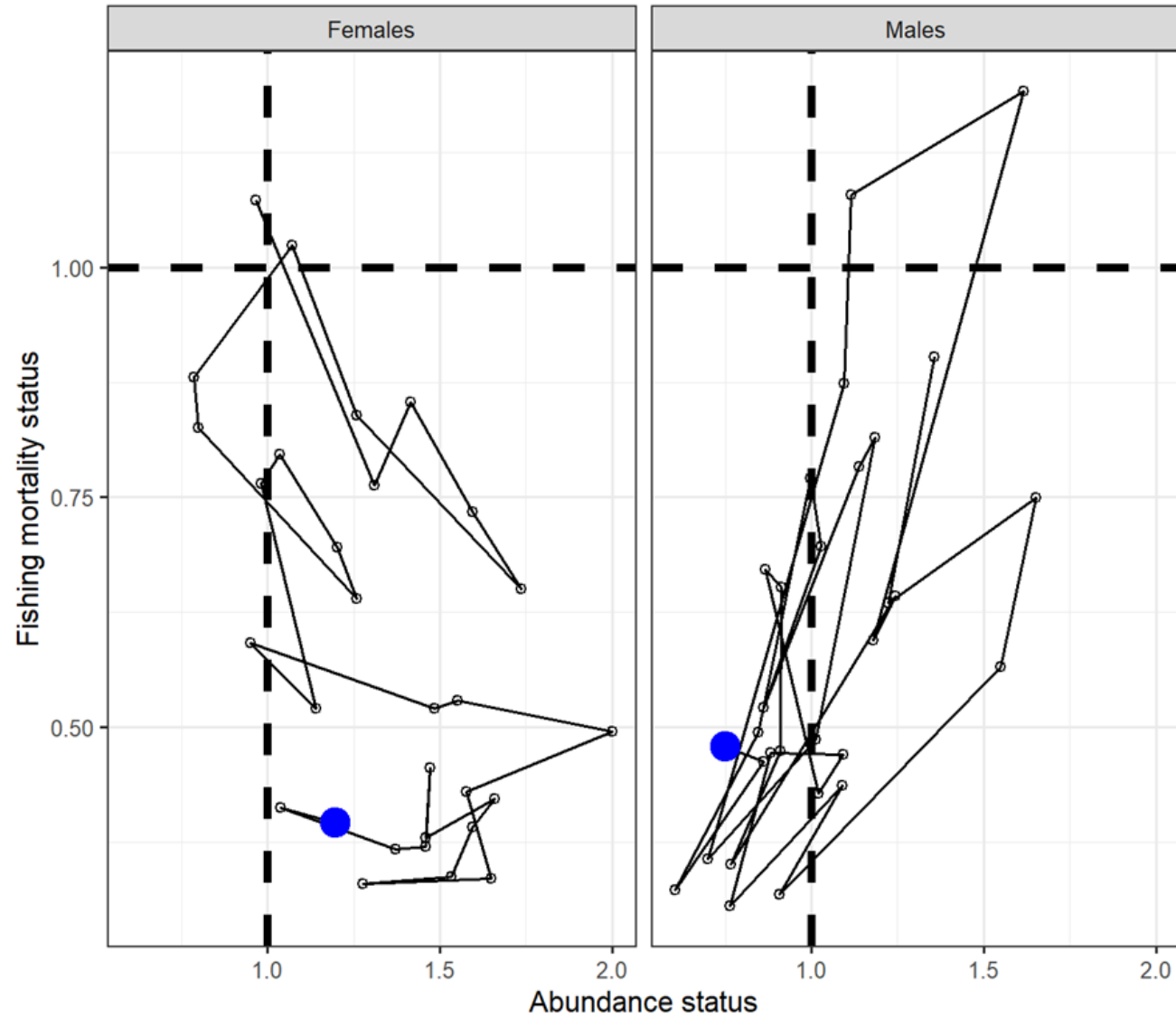
- Winter Dredge Survey
 - Project to evaluate the Winter Dredge Survey and determine whether it can be improved using the huge amount of information that is available
- Opportunities to continue the collaborations from the 2026 Assessment
 - Data sharing hub
 - Plan to update the assessment annually
 - Resources to continue to better understand blue crab

Questions?

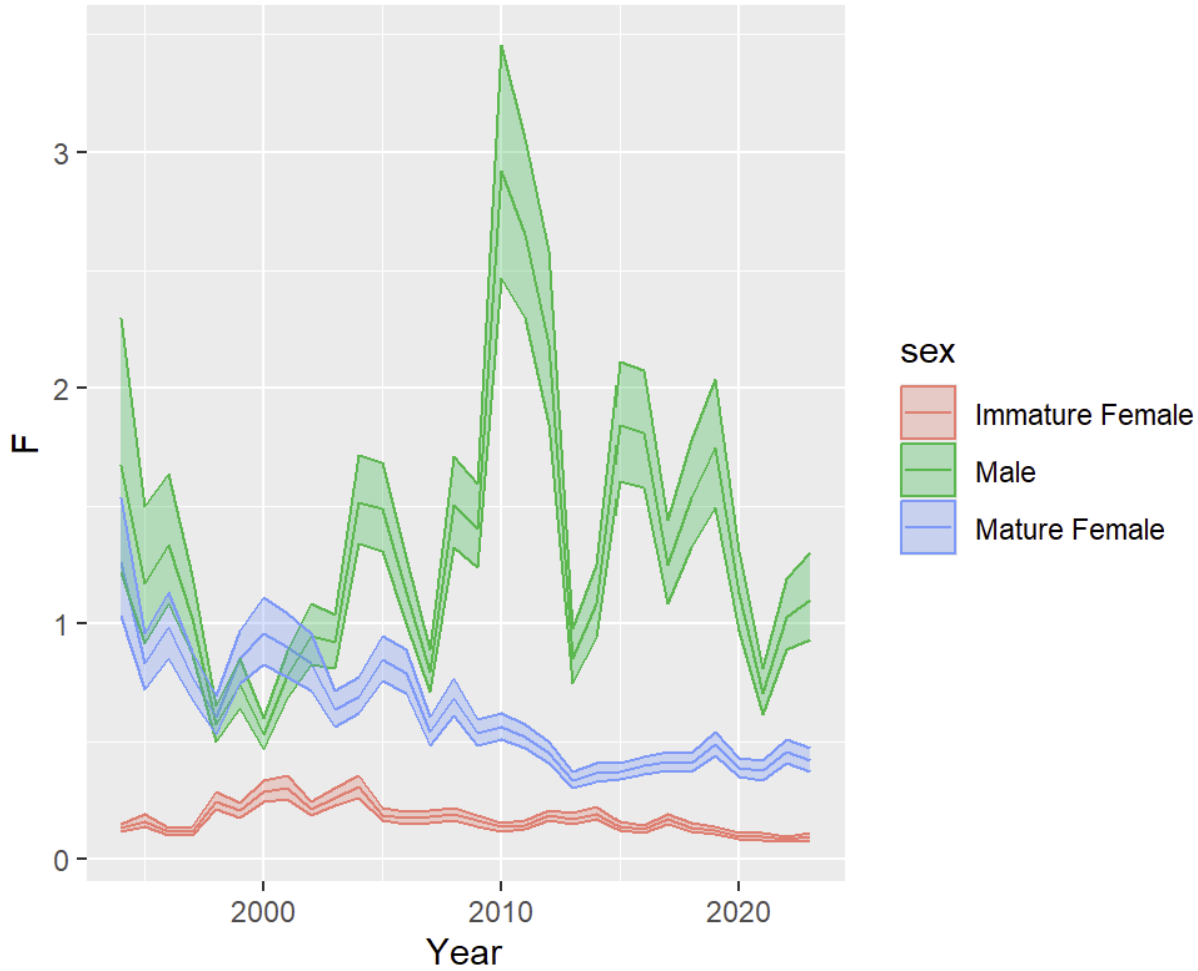
Reference points

- 40% as a limit reference point (for both Male and Females)
- 75% of $F_{40\%}$ as a target
- Abundance reference points calculated using median recruitment and $F_{40\%}$
- 25th percentile of recruitment as a recruitment reference point
 - 3-year running average is compared to the reference point

Joint stock status (Kobe plot)



Fishing Mortality Rate by Sex



Harvestable Abundance by Sex

