SEDAR 94 Florida Hogfish

Benchmark Assessment Terms of Reference

DRAFT September 2023

Data Workshop Terms of Reference

1. Review stock structure and unit stock definitions and consider whether changes are required.
2. Review, discuss, and tabulate available life history information available through 2023 as appropriate for inclusion in the stock assessment.
   - Evaluate age, growth, natural mortality, and reproductive characteristics.
   - Provide appropriate models to describe population growth, maturation, and fecundity by age, sex, and/or length by appropriate strata as feasible.
   - Evaluate and discuss the sources of uncertainty and error, and data limitations (such as temporal and spatial coverage) for each data source. Provide estimates or ranges of uncertainty for all life history information.
3. Characterize discard mortality rates.
   - Review available research and published literature.
   - Consider research directed at hogfish as well as similar species from similar depths in the southeastern United States and other areas.
   - Provide estimates of discard mortality rate for each assessed stock by fishery, gear type, depth, and other feasible or appropriate strata, if possible.
   - Provide justification for any recommendations that deviate from the range of discard mortality provided in the last benchmark or other prior assessment.
   - Provide estimates of uncertainty around recommended discard mortality rates.
4. Provide measures of population abundance that are appropriate for stock assessment.
   - Consider and discuss all available and relevant fishery-dependent and -independent data sources using a terminal year of 2023.
   - Document all programs evaluated, address program objectives, methods, coverage, sampling intensity, and other relevant characteristics.
   - Provide maps of fishery and survey coverage.
   - Develop fishery and survey CPUE indices by appropriate strata (e.g., age, size, area, and fishery) and include measures of precision and accuracy.
   - Discuss the degree to which available indices adequately represent fishery and population conditions.
   - Recommend which data sources adequately and reliably represent population abundance for use in assessment modeling.
   - Provide appropriate measures of uncertainty for the abundance indices to be used in stock assessment models.
   - Categorize the available indices with regard to their appropriateness for use in assessment modeling.

5. Provide commercial catch statistics through 2023, including both landings and discards in both pounds and number.
    - Evaluate and discuss the adequacy of available data for accurately characterizing harvest and discard by fishery sector or gear.
    - Provide length and age distributions for both landings and discards if feasible.
    - Provide maps of fishery effort and harvest and fishery sector or gear.
    - Provide estimates of uncertainty around each set of landings and discard estimates.
6. Provide recreational catch statistics through 2023, including both landings and discards in both pounds and number.
    - Evaluate and discuss the adequacy of available data for accurately characterizing harvest and discard by species and fishery sector or gear.
        - Explore the transition from MRIP-CHTS to MRIP-FES.
            - Discuss the Andrews 2022 investigation into telescoping error in MRIP FES
        - Explore the State Reef Fish Survey data from the State of Florida
        - Explore the Southeast For Hire Integrated Electronic Reporting (SEFHIER) data for potential inclusion in the Atlantic hogfish assessment
        - Explore whether the recreational fleet structure can be realigned into individual fleets as appropriate.
    - Provide length and age distributions for both landings and discards if feasible.
    - Provide maps of fishery effort and harvest and fishery sector or gear.
    - Provide estimates of uncertainty around each set of landings and discard estimates.
7. Identify and describe ecosystem, climate, species interactions, habitat considerations, and/or episodic events that would be reasonably expected to affect population dynamics.
    - Consider any known evidence regarding ecosystem, climate, species interactions (e.g. predation studies), habitat considerations, species range modifications (expansions or contractions), regime shifts, larval movement between stock boundaries, and/or episodic events (including red tide, upwelling events, and hypoxia) that would reasonably be expected to affect Hogfish population dynamics and are appropriate for inclusion in the stock assessment.
8. Incorporate social and economic information that affect stock status and related fishing effort and catch levels as practicable.
9. Provide recommendations for future research in areas such as sampling, fishery monitoring, and stock assessment.
10. Review, evaluate, and report on the status and progress of all research recommendations listed in the last assessment, peer review reports, and SSC report concerning this stock.
11. Prepare the Data Workshop report providing complete documentation of workshop actions and decisions in accordance with project schedule deadlines (Section II of the SEDAR assessment report).

Assessment Workshop Terms of Reference

1. Review any changes in data and data sources following the data workshop and any analyses suggested by the data workshop. Summarize data as used in each assessment model. Provide justification for any deviations from Data Workshop recommendations.
2. Develop population assessment models that are compatible with available data and document input data, model assumptions and configuration, and equations for each model considered.
   - Fully document and describe the impacts (on population parameters and management benchmarks) of any changes to the model structure, methods, application or fitting procedures made between this assessment and both the prior benchmark (SEDAR 37) and update (SEDAR 37U) assessments.
   - Provide a continuity model consistent with the prior benchmark (SEDAR 37) and update (SEDAR 37U) assessment configurations, if one exists, updated to include the most recent observations. Alternative approaches to a strict continuity run that distinguish between model, population, and input data influences on findings, may be considered. Provide additional continuity models which update these prior assessment's configurations and terminal years with MRIP-FES landings and discards.
3. Provide estimates of stock population parameters, if feasible:
   - Include fishing mortality, abundance, biomass, selectivity, stock-recruitment relationship (if applicable), and other parameters as necessary to describe the population.
   - Include appropriate and representative measures of precision for parameter estimates.
   - Compare and contrast population parameters and time series estimated in this assessment with values from the previous benchmark (SEDAR 37) and update (SEDAR 37U) assessments, and comment on the impacts of changes in data, assumptions or assessment methods on estimated population conditions.
4. Characterize uncertainty in the assessment and estimated values.
   - Consider uncertainty in input data, modeling approach, and model configuration.
   - Consider and include other sources as appropriate for this assessment.
   - Provide appropriate measures of model performance, reliability, and 'goodness of fit'.
   - Provide measures of uncertainty for estimated parameters.
5. Provide estimates of yield and productivity.
   - Include yield-per-recruit, spawner-per-recruit, and stock-recruitment models.
6. Provide estimates of population benchmarks or management criteria consistent with available data, applicable FMPs, proposed FMPs and Amendments, other ongoing or proposed management programs, and National Standards. Include values for fishing mortality (including assumed discard mortality if appropriate), spawning stock biomass, fishery yield, SPR and recruitment for potential population benchmarks.

- Evaluate existing or proposed management criteria as specified in the management summary.
- Review and provide recommendations for proxy values (e.g. MSY) when necessary, and provide appropriate justifications.
- Compare and contrast reference values (e.g. equilibrium yield at $F_{MSYProxy}$) estimated in this assessment with values from the previous benchmark (SEDAR 37) and update (SEDAR 37U) assessments, and comment on the impacts of changes in data, assumptions or assessment methods on reference point differences.
- Define recent fishing mortality rates ($F_{Current}$) and recent spawning stock biomass ($SSB_{Current}$) that will be compared to management benchmarks to determine management benchmarks as the geometric mean of the most recent three years and the terminal data year, respectively.

7. Incorporate known applicable environmental covariates into the selected model, and provide justification for why any of those covariates cannot be included at the time of the assessment.
8. Provide declarations of stock status relative to management benchmarks or alternative data poor approaches if necessary.
9. Provide uncertainty distributions of proposed reference points, stock status, and yield.
   - Provide the probability of overfishing at various harvest or exploitation levels.
   - Provide a probability density function for biological reference point estimates.
   - If the stock is overfished, provide the probability of rebuilding within mandated time periods as described in the management summary or applicable federal regulations.
   - Characterize the differences in fishing mortality, virgin biomass, terminal total biomass, terminal spawning stock biomass, and equilibrium yield at $F_{MSYProxy}$ as a result of updating recreational catch and effort data from MRIP-CHTS to MRIP-FES by comparing SEDAR 37U to a continuity model with MRIP-FES landings and discards and SEDAR 37U configuration and terminal year.
10. Project future stock conditions (biomass, abundance, and exploitation) and develop rebuilding schedules if warranted; include estimated generation time.
    - Request estimates of retained landings in numbers and biomass from data providers for interim years between the terminal year and first year of the projections, if available, to be used to project future stock conditions. If estimates of retained landings are unavailable, use the average of the previous three years.
    - Follow SAFMC Catch Level Projections Recommendations for Florida Keys-East Florida Stock.
    - Recommend levels of recruitment to be used in the projections.

- Stock projections (including yields) shall be developed in accordance with the following ($F_{Current}$ is the geometric mean of the most recent three years of data):

  A) If stock is overfished:
  $F=0$, $F_{Current}$, $F=F_{MSY}$, F at 75% of F_{MSY}, F_{OY})
  $F=F_{Rebuild}$ (per Magnuson-Stevens Act)

  B) If overfishing is occurring:
  $F=F_{Current}$, $F=F_{MSY}$, F at 75% of F_{MSY}, F_{OY}

  C) If stock is neither overfished nor undergoing overfishing:
  $F=F_{Current}$, $F=F_{MSY}$, F at 75% of F_{MSY}, F_{OY}

  D) If data limitations preclude classic projections (i.e. A, B, C above), explore alternative models to provide management advice.

  E) If an alternative proxy for F_{MSY} is recommended, provide outputs for both the current and recommended proxies.

11. Provide recommendations for future research and data collection.
    - Be as specific as practicable in describing sampling design and sampling intensity.
    - Emphasize items that will improve future assessment capabilities and reliability.
    - Consider data, monitoring, and assessment needs.
12. Review, evaluate, and report on the status and progress of all research recommendations listed in the last assessment, peer review reports, and SSC report concerning this stock.
13. Complete the Assessment Workshop Report in accordance with project schedule deadlines (Section III of the SEDAR Stock Assessment Report).

Review Workshop Terms of Reference

1. Evaluate the data used in the assessment, including discussion of the strengths and weaknesses of data sources and decisions, and consider the following:
   a) Are data decisions made by the DW and AW panels sound and robust?
   b) Are data uncertainties acknowledged, reported, and within normal or expected levels?
   c) Are input data series reliable and applied properly within the assessment model?
2. Evaluate and discuss the strengths and weaknesses of the methods used to assess the stock, taking into account the available data, and considering the following:
   a) Are methods scientifically sound and robust?
   b) Are assessment models configured properly and consistent with standard practices?
   c) Are the methods appropriate for the available data?
3. Evaluate the assessment findings and consider the following:
   a) Are population estimates (model output – e.g. abundance, exploitation, biomass) reliable, consistent with input data and population biological characteristics, and useful to support status inferences?
   b) Is the stock overfished? What information helps you reach this conclusion?
   c) Is the stock undergoing overfishing? What information helps you reach this conclusion?
   d) Is there an informative stock recruitment relationship? Is the stock recruitment curve reliable and useful for evaluation of productivity and future stock conditions?
   e) Are the quantitative estimates of the status determination criteria for this stock reliable? If not, are there other indicators that may be used to inform managers about stock trends and conditions?
4. Evaluate the stock projections, including discussing strengths and weaknesses, and consider the following:
   a) Are the methods consistent with accepted practices and available data?
   b) Are the methods appropriate for the assessment model and outputs?
   c) Are the results informative and robust, and useful to support inferences of probable future conditions?
   d) Are key uncertainties acknowledged, discussed, and reflected in the projection results?
5. Consider how uncertainties in the assessment, and their potential consequences, are addressed.
   - Comment on the degree to which methods used to evaluate uncertainty reflect and capture the significant sources of uncertainty in the population, data sources, and assessment methods
   - Ensure that the implications of uncertainty in technical conclusions are clearly stated

6. Consider the research recommendations provided by the Data and Assessment workshops and make any additional recommendations or prioritizations warranted.
    - Clearly denote research and monitoring that could improve the reliability of, and information provided by, future assessments
    - Provide recommendations on possible ways to improve the SEDAR process
7. Consider whether the stock assessment constitutes the best scientific information available using the following criteria as appropriate: relevance, inclusiveness, objectivity, transparency, timeliness, verification, validation, and peer review of fishery management information.
8. Provide suggestions on key improvements in data or modeling approaches that should be considered when scheduling the next assessment.
9. Prepare a Peer Review Summary summarizing the Panel's evaluation of the stock assessment and addressing each Term of Reference. Develop a list of tasks to be completed following the workshop. Complete and submit the Peer Review Summary Report in accordance with the project guidelines.