(Tab B, No. 7a)

# Shrimp Management Committee

VIII. SSC Recommendations on Development and Process of Using Empirical Dynamic Models on Brown and White Shrimp

- Dr. Michelle Masi (SERO) detailed the SEFSC's research since June 2019 on shrimp assessment models, including age-structured models.

- NMFS Shrimp SEAMAP Working Group had determined SEAMAP data to be a representative index of offshore penaeid stock abundance.

- Shrimp Amendment 15 used Stock Synthesis for developing annual status determination criteria (SDC) for the three penaeid species.

- SSC: Is an age-structured model appropriate to provide relative SDC for the three Gulf penaeid shrimp populations?

- Dr. Stephan Munch (Southwest Fisheries Science Center) described Empirical Dynamic Models (EDMs)
  - EDM can implicitly account for unobserved variables using lags in observed variables.
- EDMs:
  - (1) Don’t need continuous data on all variables to make accurate predictions
  - (2) Don’t need pre-defined parameter relationships if enough data are available
- Published research comparing prediction errors between EDM and traditional models across 185 fish stocks determined that EDM forecasts were better for roughly 90% of the populations.
- EDMs can predict adult shrimp abundance for brown and white shrimp in each SEAMAP statistical zone.

- Initial EDM using SEAMAP Trawl Survey data included lags of abundances, temperature, salinity, and dissolved oxygen.
  - Only temperature and abundance were found to be relevant in the models.
    - For brown shrimp, overall correlation was found to be 0.86.
    - For white shrimp, overall correlation was found to be 0.75.

- Next step: Use EDMs to determine stock status.

- SSC: A shift from age-structured models for shrimp may be needed, but encouraged running simple biomass models for comparison with EDM results.

- SEFSC plans to derive SDC for brown and white shrimp and provide Gulf-wide updates to the SSC in late 2022.

- State recruitment indices will need to considered for inclusion.

- A peer-review of the developed brown and white shrimp models, as part of the SEDAR research track assessment, will commence in 2023.

- Royal red shrimp is currently only tracked for its ACL and landings and that, at this time, there are not enough points from SEAMAP for EDM to be developed for pink shrimp.