Development of CASMs for Coastal Louisiana

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Background
The Louisiana Coastal Protection and Restoration Authority (CPRA) supported the development, testing, and application of several linked large-scale numerical models to simulate operational scenarios of planned Mississippi River diversions and assess impacts to the estuarine ecosystem (Fig. 1).

Methods
The Comprehensive Aquatic Systems Model (CASM) is a daily-bioenergetics-based model that used temperature, salinity, Chl a, and vegetation data to predict biomass of 32 taxa within a food web context (Fig. 2).

The CASM was initialized, calibrated and validated with biomass data (g/m²) collected in 1995-2010 by the Louisiana Department of Wildlife and Fisheries and NOAA NMFS Science Center (Fig. 1). Biomass estimates were averaged across years to represent a ‘climatic’ year for seasonal calibration (Fig. 3).

Calibration results for key species:
- Predicted brown shrimp biomass fit the data well in part because they have strong, consistent seasonal patterns (Fig. 7).
- Bay anchovy showed mixed results. Young of the year (YOY) predictions fit the data well. Age-1+ were intentionally calibrated to a flat distribution of higher biomass based on life history.
- Red drum were calibrated ad hoc to fit known life history traits that were not reflected in the data.
- Largemouth bass showed poor calibration success, but are not caught or under-sampled in the calibration data.

Next Steps and Future Directions
- Simulations to assess potential impacts of proposed large-scale river diversions. Results to be presented Thursday at 11:00 (session 34).
- Further model testing and improvements:
  - Simplify food web
  - Include movement between polygons
  - Improve recruitment and links between life stages