Life-history characteristics, otogenetic diet patterns, and escapement rate of Red Drum (*Sciaenops ocellatus*) in the north-central Gulf of Mexico

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Project Significance

- Data limited species
- Popular species
  - Recreational
  - Commercial
- Classified as “overfished”
# Agenda

- **Age and Growth**
- **Reproductive Characteristics**
- **Seasonal and Ontogenetic Diet Patterns**
- **Escapement Rate**
- **Outreach and Education**
Collection

- Collect Specimens in the north-central Gulf of Mexico
  - 30 per month
- Record specimen information
  - Wet weight
  - Length
  - Sex and reproductive phase
- Collect biological samples
  - Otoliths
  - Gonads
  - Tissue sample
  - Stomach

http://gulffishinfo.org/
1. Age and Growth

Quantify sex-specific length and weight relationships
Previous Analysis
Length-at-age

- Sex combined von Bertalanffy growth function (VBGF)
  - Sexual dimorphism
  - More suitable growth functions
Length and weight-at-length

Length-at-age
- VBGF
  - “Double” VBFG
  - “Linear” VBFG
- Logistic function
- Gompertz (1825)
- Porch (2002) seasonal and damped model

Weight-at-length
- Power function
2. Reproductive Characteristics

Determine reproductive characteristics
Reproductive Characteristics

- Fecundity
  \[ TF = BF \times SF \times Ts \]

- Sex-specific length at 50% maturity
  - Two parameter logistic model

- Sex-specific age at 50% maturity
Diet Patterns

Determine seasonal and ontogenetic diet trends
Seasonal and Ontogenetic Diet Patterns

- Obtain tissue sample
- Freeze dry
- Grind
- Obtain $^{13}$C and $^{15}$N ratios
  - Size and seasonal trends
- Validation tool for emigration from estuary
Use previous chapters’ work to inform an escapement rate estimate.
Escapement Rate

\[ E = \frac{e^{\sum_{i=1}^{Age_{50}} F_i + M_i}}{e^{\sum_{i=1}^{Age_{50}} M_i}} \]
Escapement Rate
Total Mortality

\[ N_t = N_0 \cdot e^{-Zt} \]

- Observations:
  - Age vs. Catch Number (\times 1000)
  - Decline model: \( e^{-Zt} \)

- Graph:
  - Logarithmic scale
  - Slope (Z)
  - Observed vs. Modelled
Hierarchical model structure

Global Model

2004

2005

Year n
• Lorenzen equation

\[ M_L = M_1 \left( \frac{1}{L} \right) \]

• Hoenig equation

\[ M = 4.899(t_{max})^{-0.916} \]
Preliminary Results

Natural Mortality

![Graph showing natural mortality as a function of total length (cm)]

- Lorenzen
- Hoenig
Outreach and Education

Involve students and the public in my work
Outreach and Education

- Project INSPIRE
- Public
Questions?