

Atlantis: A Policy Simulation Tool



Michelle Masi, PhD
NOAA Fisheries
March, 2022



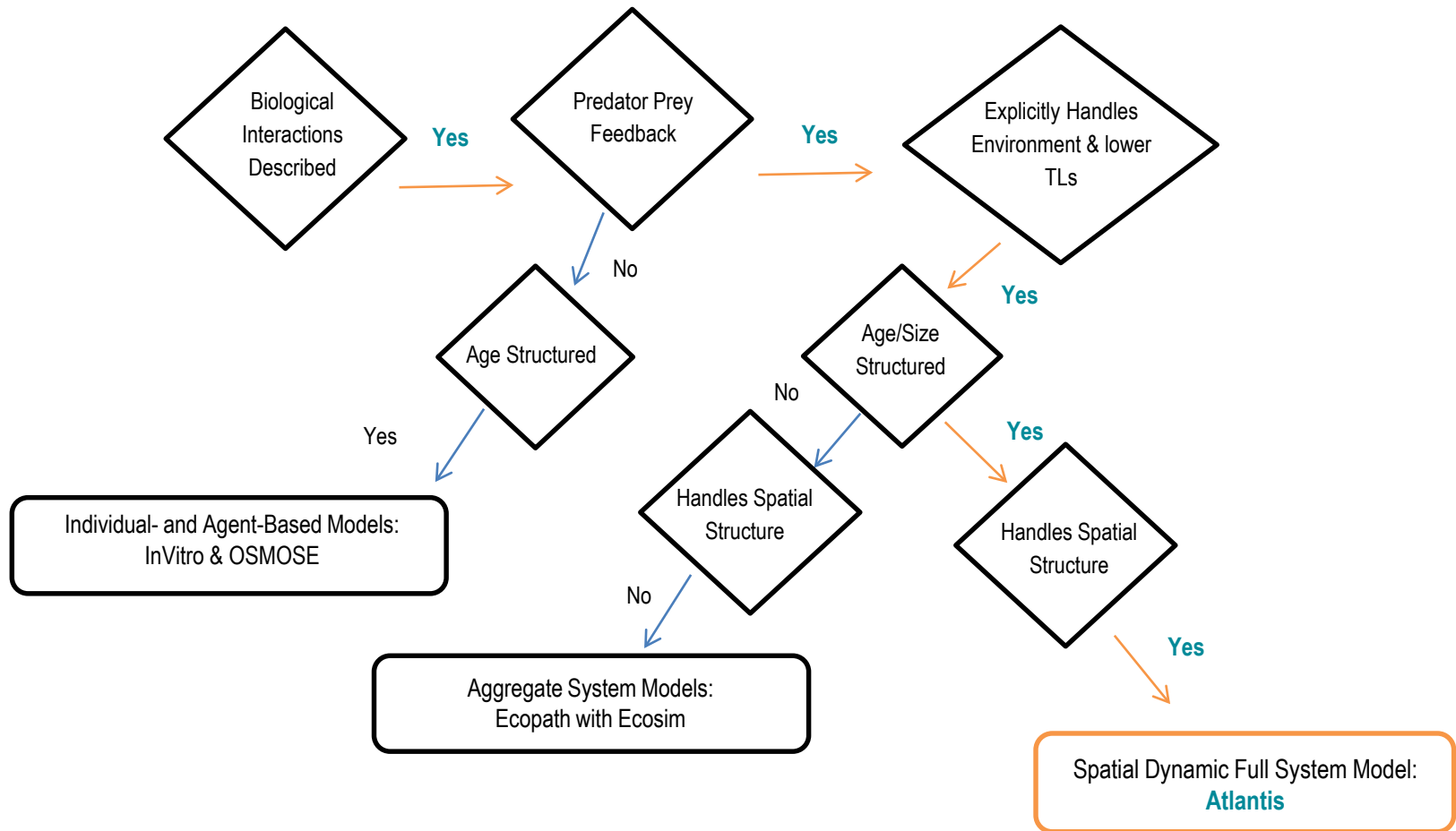
In Today's Presentation



1. Ecosystem models and their use in mgmt.
2. Gulf of Mexico Atlantis model
3. Project overview (FY21-FY23):
 - Expert and CIE (external) review
 - Model updates and Tech Memo
 - Strategic shrimp policy simulations
4. Industry input and discussion



Types of Ecosystem Models



Ecosystem Modeling:

Tactical vs Strategic Management Advice

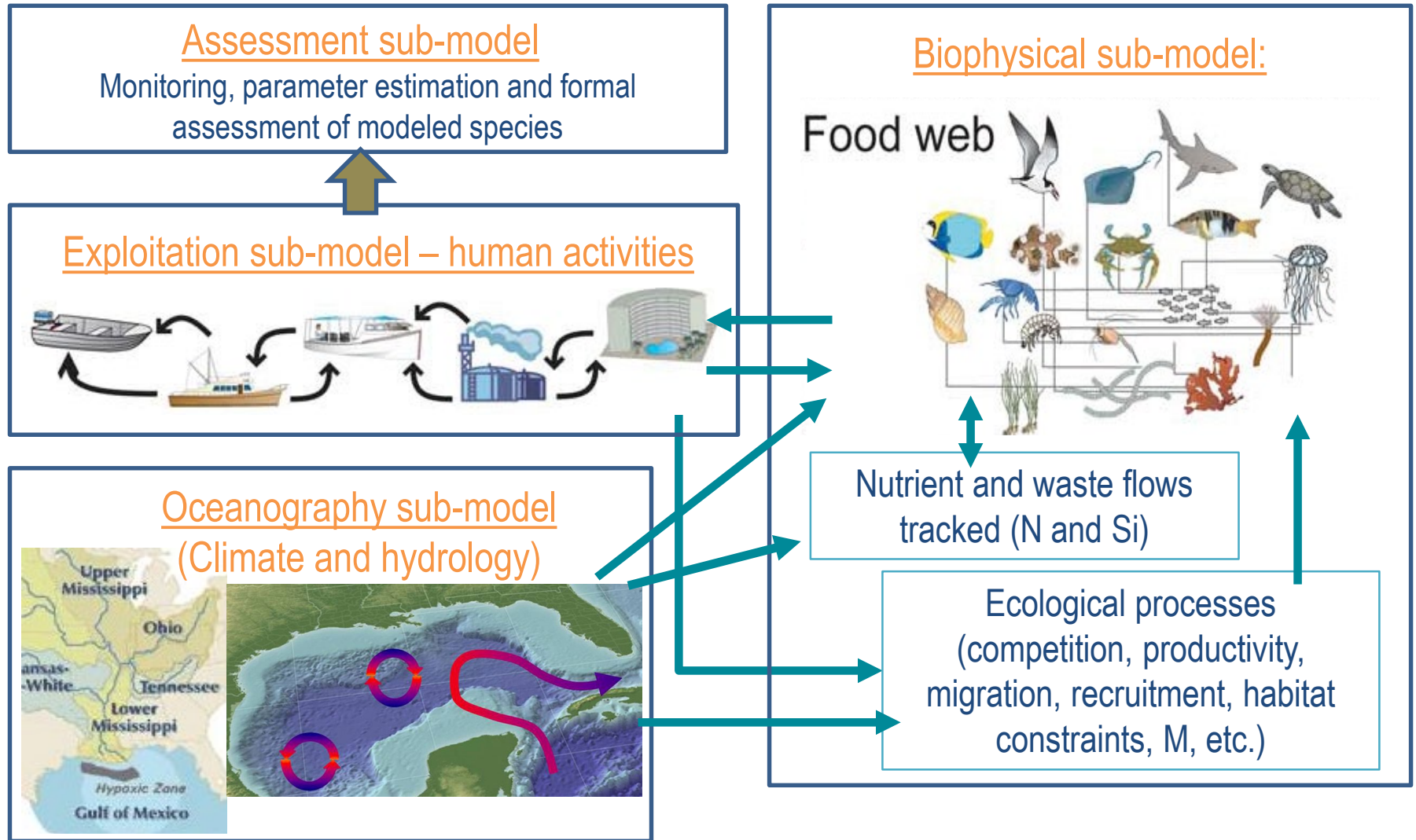
Tactical: decrease next year's quota for a specific species (e.g. Gag)

- Tactical advice is highly quantifiable; short-term mgmt. action on an individual species

Strategic: to understand the broader impacts of a mgmt. action

- Strategic mgmt. advice can be qualitative or quantitative; typically a longer-term analysis, at a multi-species level
- **Example Scenario**: managers want to reduce marsh habitat in inshore Louisiana
 - An ecosystem model can simulate low -> high habitat reduction scenarios; assess the tradeoffs on the whole ecosystem to guide policy decisions

Gulf of Mexico (GOM) Atlantis Model: Simulating Reality



GOM Atlantis Model Species/Groups

91 Species groups

Fish and crustacean groups

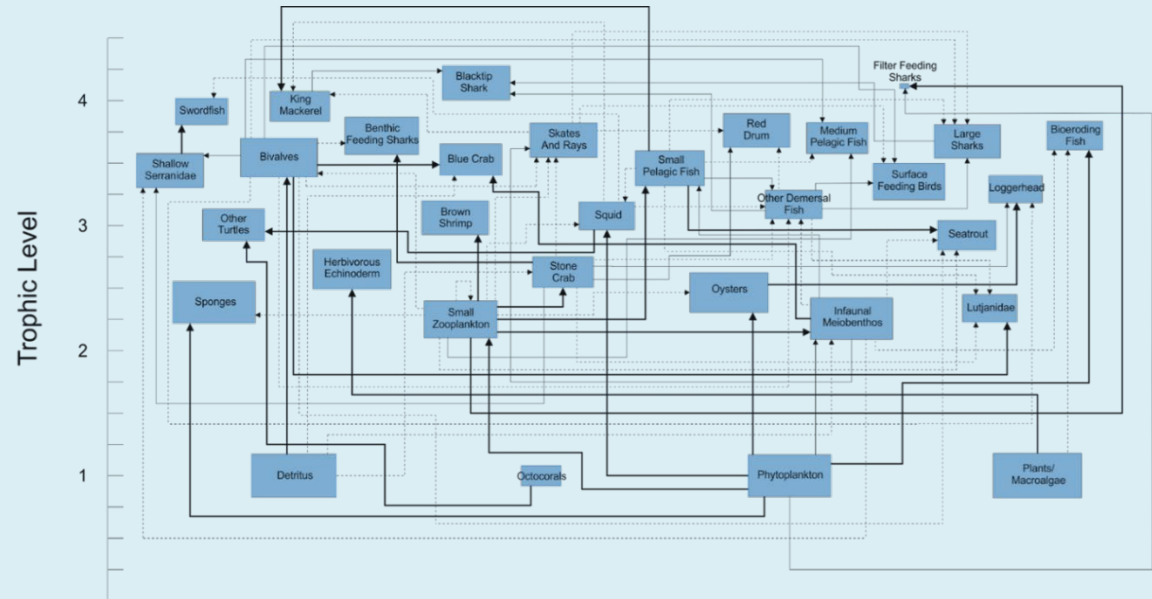
- Serranidae (5)
- Lutjanidae (3)
- Sciaenidae (4)
- Carangidae (3)
- Scombridae (6)
- Elasmobranchs (6)
- **Shrimp** (4: White, Brown, Pink and Other shrimp)
- & more...

4 mammal groups

2 bird groups

3 Turtle groups

5 biogenic habitat groups (corals, oyster, bivalves, seagrass, macroalgae)



GOM Atlantis Model Fisheries

Shrimp Fisheries

Shrimp trawl estuary

Shrimp trawl shelf

Royal Red shrimp trawl

Trap Fisheries

Crab pot estuary

Crab pot shelf

Lobster pot shelf

Reef fisheries

Hook and line reef shelf

Longline reef shelf

Pelagic Fisheries

Menhaden seine

Longline shark shelf

Pelagic longline

Estuary gillnet

Shrimp are fully age-structured groups

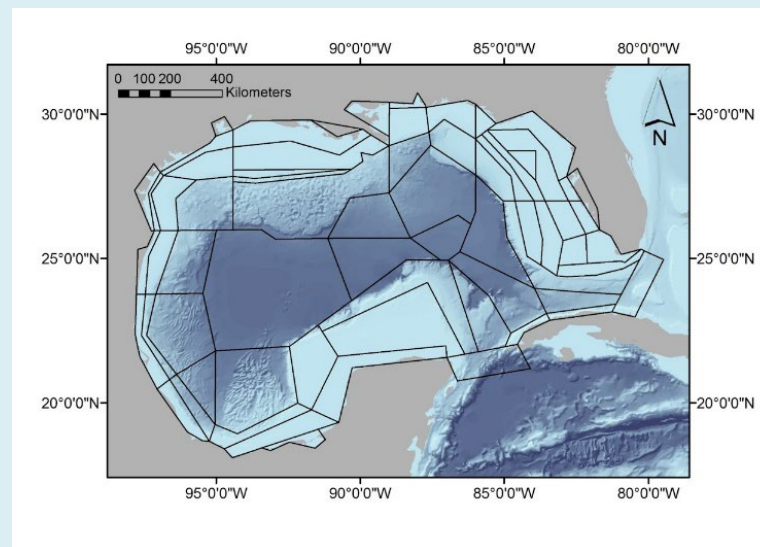


Brown, White, Pink, & Other shrimp

Is Atlantis Well-Suited to Represent the GOM?

❖ YES!

1. Good representation of Mississippi R.
 - Water quality explicit (nutrient, salinity & light effects)
2. Good representation of Loop Current
 - Intrusion (& upwelling) onto WFS
 - Effect on larval dispersal
3. Explicit biogenic habitat effects
 - Coral, oyster, bivalves, macroalgae, seagrass
4. 4D forcing for lethal & sub-lethal effects
 - E.g. *K. brevis*, oil, hurricanes

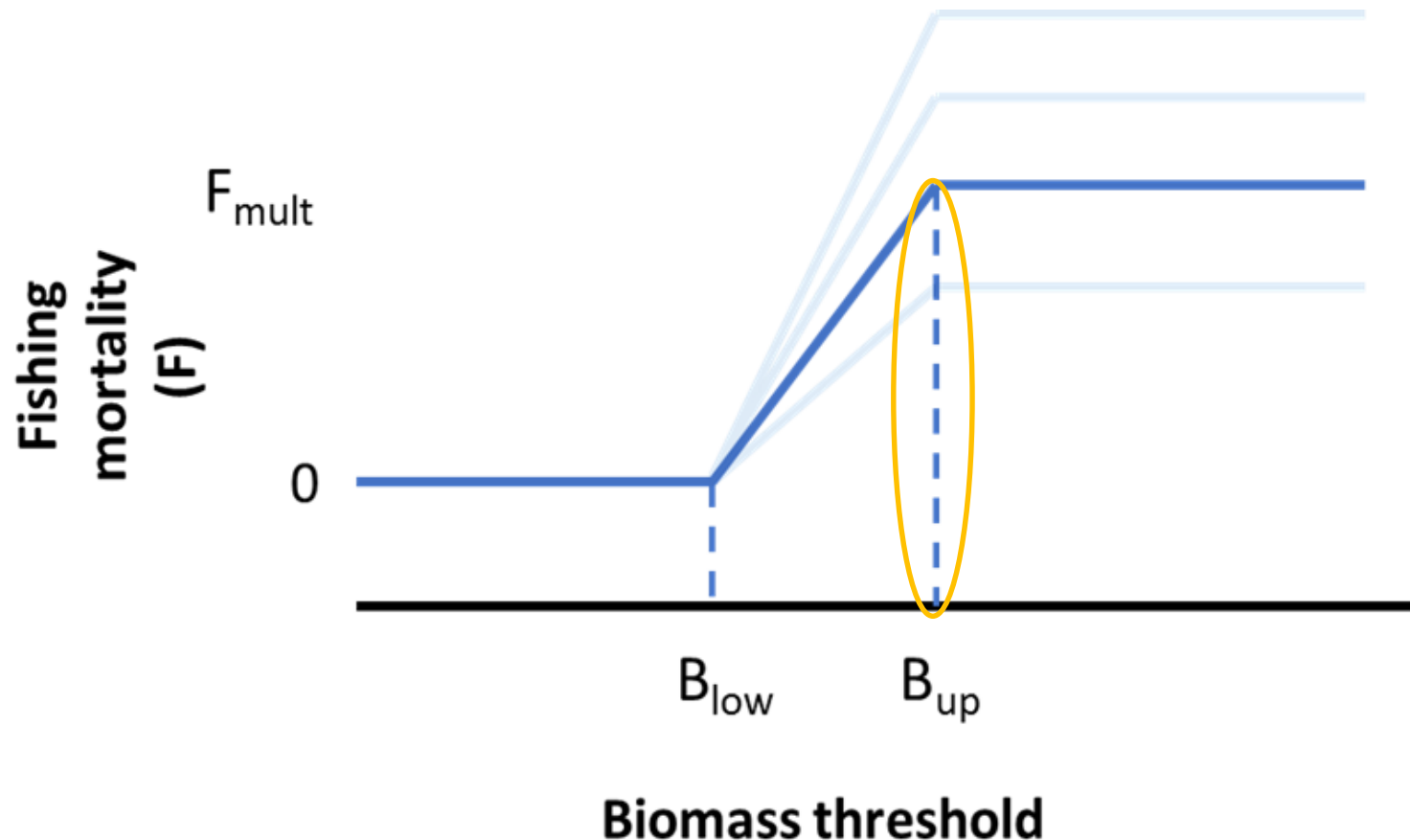


Gulf of Mexico Atlantis Model Map

66 polygons

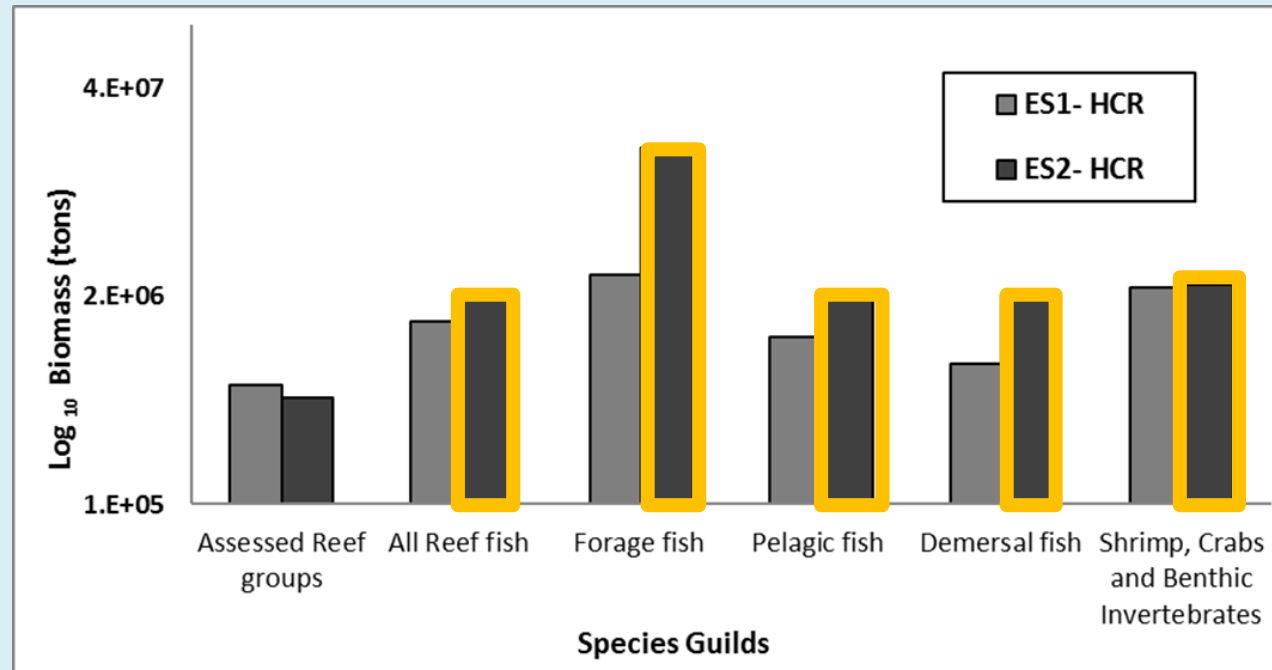
7 depth layers

Using Atlantis as a Policy Simulation Tool: Evaluate a 2-point Harvest Control Rule

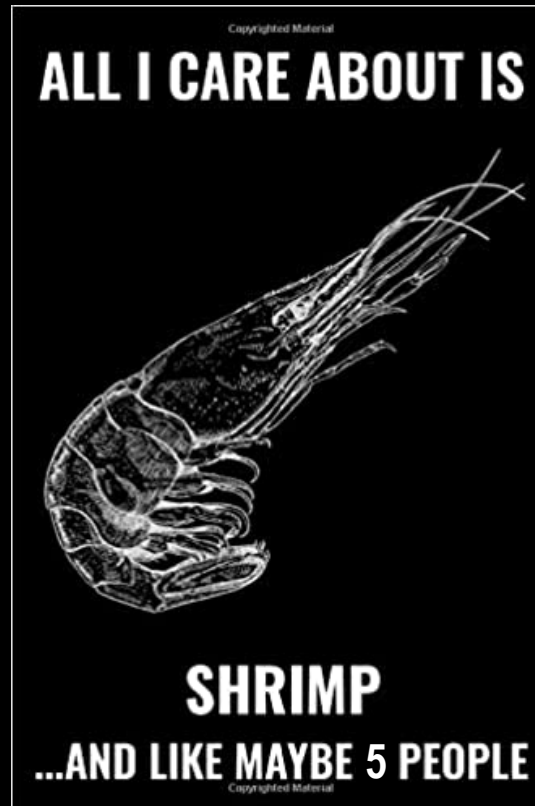


Using Atlantis as a Policy Simulation Tool: Evaluate a 2-point Harvest Control Rule

Atlantis predicted
higher levels of fishing
mortality led to a
“cultivation effect”



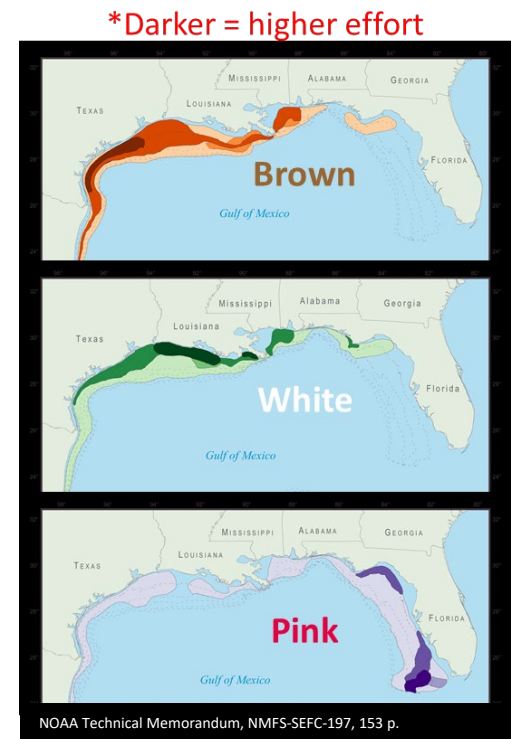
GOM Atlantis Model Project Overview



GOM Atlantis Project: Overview/Timeline

Year 1 (FY21): update existing (2010) GOM Atlantis model, focusing updates on Penaeid shrimp groups and major interacting species; host a series of internal model review workshops - to ensure FY21 model updates are in line with expert opinion

- To-date: hosted 2 internal review workshops; still 2 more to go
- Expert input used to direct FY21 model updates/improvements
- Suggested updates to Penaeid species distributions, predator-prey interactions and fishery locations are in process



GOM Atlantis Project: Overview/Timeline



- Year 2 (FY22): rigorous peer-review (through Center for Independent Experts; aka CIE review); any necessary model improvements following CIE review. Publish updated NOAA Tech Memo
- Year 3 (FY23): use peer-reviewed GOM Atlantis model to run Gulf Penaeid shrimp simulations (e.g. habitat loss) and strategically evaluate the long-term biological, economic and ecosystem-level tradeoffs

Industry Input/Discussion



Acknowledgements

Drs. Cameron Ainsworth & Holly Perryman

University of South Florida

Atlantis project co-PI

Dr. Mandy Karnauskas

Southeast Fisheries Science Center

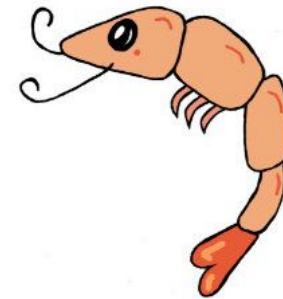
EBFM coordination and project support

Dr. Isaac Kaplan

National Marine Fisheries Service

NWFSC Atlantis expertise & co-PI

YOU'RE SHRIMP
THE BEST



Special Thanks To: **Shrimp Industry**

