PROJECTED CHANGES OF THE DISTRIBUTION OF NASSAU GROUPER SPAWNING HABITAT AND ITS MANAGEMENT IMPLICATIONS

Introduction/Background

- Nassau Grouper (Epinephelus striatus) are critically endangered under the IUCN Red List.
- During spawning events, their thermal tolerance is narrow.
- Climate change will likely alter spawning location, affecting spawning habitat suitability (Asch & Erisman, 2018).

Research Questions & Modeling

Research Questions:
1. How will climate change impact habitat suitability for E. striatus spawning aggregations?
2. How will climate change influence the effectiveness of marine protected areas (MPAs)?

Spawning Aggregation Sites:
- Science & Conservation of Reef Aggregations (SCGRA)

Earth System Models:
- NOAA Geophysical Fluid Dynamics Laboratory (GFDL) ESM2M
- Institute Pierre Simon Laplace (IPSL) CM5A Medium Resolution
- Max Planck Institute (MPI) ESM Medium Resolution

Environmental Variables:
- Sea surface temperature (SST) & seasonal SST gradients (AVHRR)
- Geostrophic currents in the v direction (AVISO altimetry)

Species Distribution Model:
- Non-Parametric Probabilistic Ecological Niche (NPPEN) model (Beaugrand et al., 2011)

Marine Protected Areas:
- UNEP-WCMC Protected Planet database
- SCGRA database

Environmental Conditions at Spawning Sites

Results

NPPEN varies across climate models

Spawning habitat probability declines under varying climate change scenarios

Climate change will lead to declines in habitat suitability in many MPAs

Findings & Significance

- NPPEN output varies based on how sensitive the model used is to greenhouse gases, implying that averaging NPPEN output across multiple models will help to quantify model uncertainty.
- Spawning habitat probability at the mid-century shows similar patterns under both climate scenarios, with spawning habitat probabilities increasing in northern areas, and declining in southern regions.
- Nassau Grouper spawning habitat probability by the end of the century will decline for all models in the future, but the severity of decline will be heavily influenced by climate mitigation.
- MPAs will see declines in spawning while northern MPAs will see negligible or positive changes in spawning habitat probability.

References & Acknowledgements