Evaluating Adaptive Management Strategies for Climate-Resilient Fisheries

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Approach

Our team developed a model to test different management actions on fishery outcomes, made up of three components:

- Biological: to track the growth of the fish stock over time
- Climate: to incorporate the effects of climate change on the fish stock
- Management: to simulate FISHE management actions

With this model, our team assessed the ability of different management actions to mitigate the effects of climate change.

1. Sampling Accuracy
   - It’s impossible to know exactly how many fish are in the water, but managers can manage climates. We tested the impact of investing resources to make better estimates on fishery outcomes. We compared three levels of sampling accuracy: 50%, 30%, and 10% sampling error.

2. Reductions in Fishing Pressure
   - One common action available to fisheries managers in response to a poor fishery status is to reduce the amount of fishing that is allowed. We tested and compared a range of reductions in fishing pressure, from 5% to 50% reductions.

3. Assessment Frequency
   - Repeating the process of estimating the status of the fishery and instituting a management action more often means a fishery manager is more likely to correct a past poor decision with a better one. We tested and compared assessment frequencies of every 20, 30, 10, 5, and 1 years.

4. Climate Change Anticipation
   - We simulated fisheries managers that took climate change into account when making decisions by assuming the growth of the fish stock would change in some way due to climate effects. In this test, managers were perfect in their climate response.

Findings

Objective 1: FISHE Climate Comparison

Fishery biomass was tracked over a 100-year time period without climate change and with climate change. We assume a 10-year assessment interval and good sampling accuracy (10% error margin).

For this scenario in our model, 90% of fish stocks managed using FISHE were healthy after 100 years without climate change while less than 50% were healthy with climate change incorporated.

Our findings showed that FISHE will not perform as expected under various climate change scenarios.

RECOMMENDATIONS

A Regional Proxy for Climate Change Anticipation

We recommend that EDF incorporate an additional management question into FISHE: How is climate change affecting your resource? Different geographies will experience different severity and rates of climate effects. Taking a precautionary approach, fisheries managers can institute a climate change anticipation “proxy” — an assumed change in the growth of the fish stock that is scaled to the expected severity of climate change in their region.

Conclusion

Climate change is affecting how fast fish grow and where they can be found, but how quickly and severely these impacts are occurring is uncertain and varies across species and regions. Our project provides EDF with evidence that precautionary management can improve outcomes despite the uncertainties of climate change and provides a framework for testing strategies that improve outcomes and promote more climate resilient fisheries.