A framework to evaluate the effectiveness of no-take marine reserves in Mexico

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BACKGROUND

No-take marine reserves are often implemented to recover overfished stocks. The extent to which these reserves have met their objectives is unclear. Current methods for reserve evaluation are not standardized and rely solely on biological data, excluding the socioeconomic and governance dimensions. Existing frameworks do not provide a tool to perform the analysis. Existing frameworks provide a list of possible indicators to evaluate the effectiveness of MPAs, but they are not specific to no-take reserves and do not describe how to select indicators based on reserve objectives nor provide a tool to analyze these indicators.

GOAL AND STEPS

Develop a general approach for evaluating the effectiveness of marine reserves, and create a user-friendly tool to conduct the evaluation.

1. We reviewed legislation, management plans, and decrees to identify commonly-stated management objectives, which were grouped into seven main categories. These objectives were matched to a set of 29 biophysical, socioeconomic, and governance indicators.

RESULTS

Where are these no-take Marine Reserves?

Biophysical indicators are evaluated with a Difference-in-Difference analysis, estimating the net effect of the reserve. Linear regression models are fitted to socioeconomic indicators through time, testing for the difference in trends before and after the implementation of the reserve. Governance indicators are analyzed based on literature, identifying common governance structures and their associated effectiveness.

2. Indicators were selected to match the objectives and based on data availability and a literature review. These were reviewed in a workshop with managers, fishers, and academics.

3. We developed an open source application named MAREA (Marine Reserve Evaluation Application) that automates the framework and provides the user with results that are simple to interpret.

CONCLUSIONS

• This framework will be used by COBI and fishers to evaluate existing and future marine reserves.
• Mexican fisheries management agencies are interested in adopting our framework as the go-to way of evaluating marine reserves in Mexico.
• Though our framework is designed for Mexican marine reserves, we believe that the methodology of how to select indicators, collect data, and perform appropriate analyses can be applied to no-take marine reserves worldwide.
• The provided list of biophysical, socioeconomic, and governance indicators, and the real-world examples of how to evaluate reserve success based on these indicators are applicable to other reserves across the globe.

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