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Gulf of America Ecosystem Status Report

Southeast Integrated Ecosystem Assessment Program

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U.S. DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Northwest Fisheries Science Center

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1. NOAA Fisheries, Southeast Fisheries Science Center

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1 Introduction

1.1 About this report

The purpose of this report is to synthesize diverse information sources to assist with implementation of ecosystem-based fisheries management in the U.S. Gulf of America region. A suite of indicators that span physical, biological, social and economic elements of the ecosystem are reported with the goal of helping the Gulf Council and other resource managers measure progress toward fishery management objectives. The report relies on both previously identified proposed indicators and expert vetting to select a suite of indicators that best address the fishery management plan (FMP) objectives for the U.S. Gulf of America. Information in this report is organized into two sections: 1) tracking performance toward predefined fishery management objectives, and 2) potential risks to meeting those fishery management objectives.

The first set of indicators can be used to consider progress toward stated management objectives. Management objectives were gleaned from the Fishery Management Plans and categorized into seven groups: food production, socioeconomic health, equity, engagement and participation, bycatch reduction, governance, and protection of ecosystems. Each of these sections contains a selection of indicators that can be used to better understand how well these respective management objectives are being met. Note that for some indicators, directionality can be associated with positive or negative progress toward management objectives (e.g., increases in abundance of economically important species is generally associated with improved management). However for other indicators, directionality can be considered neutral (e.g., proportion of diving trips, changes in contribution to revenue), although changes in these indicators represent important shifts in the fishing dynamics of which managers should be aware. The risk indicator section quantifies major stressors (as identified by stakeholders) that capture the potential risks to meeting fishery management objectives. These indicators provide managers with an understanding of the backdrop against which management is occurring. Major changes in these indicators may be associated with decreased effectiveness of fisheries management, if the influences of external environmental or economic stressors are strong relative to influences from adjustments in fishing activity.

This report was created in Quarto (https://github.com/quarto-dev/quarto-cli/) using the NOAA Quarto book template (https://github.com/nmfs-opensci/NOAA-quarto-book). A github repository houses all the indicator data and R code used to compile the report (https://github.com/Gulf-IEA/Gulf-ESR).

1.2 Indicator selection

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1.3 Notes on interpreting time series figures

Time series data are plotted in a standardized format for ease of interpretation (e.g., Figure 1.1). The x-axis represents the temporal dimension, which may be monthly, yearly, or irregular time steps, and the y-axis represents the indicator value in units specified in the axis label. Measures of uncertainty in the indicator values are also shown, when available. The dashed horizontal line represents the mean indicator value across the entire time series, and the solid horizontal lines denote the mean plus or minus one standard deviation. Red shaded areas and green shaded areas show years for which the indicator value is below or above one standard deviation from the mean, respectively. The blue vertical shaded box highlights the last five years of indicator values, over which additional metrics are calculated. Black circles to the right of each figure indicate whether the indicator values over the last five years are greater (plus sign), less than (minus sign), or within (solid circle) one standard deviation from the mean of the overall time series. Arrows to the right of each figure indicate whether the least squares linear fit through the last five years of data produces a positive or negative slope that is greater than one standard deviation (upward or downward arrows respectively), or less than one standard deviation (left-right arrow).

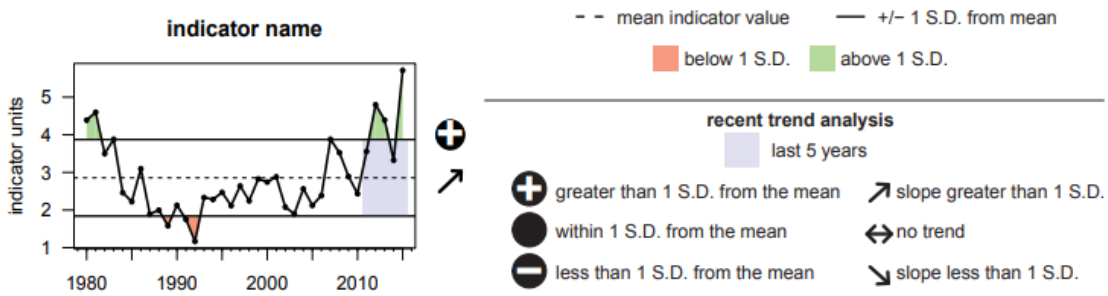

Figure 1.1: Example time series plot, showing an indicator plotted with its mean and standard deviation, and trend analysis for the most recent five years of data. See text for a more detailed description of specific calculations.

2 Tracking performance toward fishery management objectives

In this section, we report indicators that are intended to capture progress towards meeting Fishery Management Plan objectives related to food production, socioeconomic health, equity, engagement and participation, bycatch reduction, governance and protection of ecosystems.

3 Risks to meeting fishery management objectives

In this section, we report indicators that capture identified risks to the ecosystem that could impact the ability to meet Fishery Management Plan objectives. Unless otherwise specified, physical indicators reported for the U.S. Gulf of America region were calculated over a bounding box with limits of longitude xx degrees W to xx degrees W and latitude xx degrees N to xx degrees N.

4 Integrated ecosystem perspectives

For the purpose of synthesizing the information contained in the full suite of indicators presented in this report, we analyze the full indicator suite using multivariate methods. Principal components analysis (PCA) is a statistical method that distills a large number of potentially related indicators into a smaller number of indices representing most of the variability in the data set. We analyze the indicator suite separately by category: 1) risks to meeting management objectives, 2) management objective indicators based on fishery-independent data, 3) management objective indicators based on fishery-dependent data, and 4) other management objective indicators. A traffic light plot of the indicator suite is presented for the purpose of comprehensively viewing changes in the different parts of the ecosystem over time (figure). A biplot of the principal components analysis is presented to convey temporal patterns in the progression of ecosystem status (figure). PCA was carried out on a scaled matrix for all indicators with at least 12 years of data; any missing values were imputed with means of the time series. In the biplot, the labels represent time (years xxxx-xxxx), the rainbow line represents chronology between adjacent years, and the distance between points conveys how different the indicator values were in those years.

5 Research recommendations

5.1 Risks to meeting management objectives

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5.2 Fishery-dependent and fishery-independent data sources

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5.3 Human dimensions

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6 Acknowledgments

6.1 Contributions

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6.2 Resources

This repo and GitHub Action was based on the tutorial by Openscapes quarto-website-tutorial by Julia Lowndes and Stefanie Butland.

7 Contributors

7.1 Editors

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7.2 Contributors

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References