NOAA Integrated Ecosystem Assessment Program's Gulf of Mexico Ecosystem Status Reports



DEPARTMENT OF CON

NOAA

NATIONAL OCA

Mandy Karnauskas¹, Christopher R. Kelble², Seann Regan³, Charline Quenée⁴, Rebecca Allee⁵, Michael Jepson⁶, Amy Freitag⁷, Kevin Craig¹, Cristina Carollo⁴, Neda Trifonova⁴, Leticia Barbero⁴, David Hanisko¹, Glenn Zapfe¹

> ¹NOAA Fisheries, Southeast Fisheries Science Center ²NOAA Research, Atlantic Oceanographic and Meteorological Laboratory ³National Ocean Service, National Centers for Coastal Ocean Science, Hollings Marine Lab ⁴Cooperative Institute for Marine and Atmospheric Studies ⁵National Ocean Service, Office for Coastal Management ⁶NOAA Fisheries, Southeast Regional Office ⁷National Ocean Service, National Centers for Coastal Ocean Science Cooperative Oxford Lab

State of the Gulf of Mexico Summit, March 26-27, 2017

NOAA's Integrated Ecosystem Assessment Program



Currently implemented in five U.S. Large Marine Ecosystems





The Integrated Ecosystem Assessment Loop



Developed from Levin (2008)



The Gulf of Mexico IEA and Status Report

Mission statement of the GoM IEA:

Balancing the needs of nature and society through integrated science for current and future generations in the Gulf of Mexico

Ecosystem Status Report objectives:

- to provide scientific knowledge of the Gulf of Mexico integrated ecosystem, and transfer that knowledge to scientists and managers
- to provide a broad-level overview of the current state of the Gulf of Mexico with respect to recent and historical trends



Gulf of Mexico Ecosystem Status Report history

- Original report in 2013
- First update report in 2017
 - More emphasis on scoping with management community
 - Greater inclusion of human dimensions
 - Reduced indicator list





Conceptual model – indicator selection

INTEGRATED SOCIO-ECOLOGICAL SYSTEM OF THE GULF OF MEXICO

Ecosystem Status Seabirds, Protected Species, Species Interactions, Primary Productivity, Fish Abundance



Human Wellbeing Social Services, Basic Needs, Economic Security, Education, Health, Safety, Social Connectedness

Habitat Marine, Estuarine, Freshwater, Seagrass, Oyster, Artificial Habitat Human Activities Fishing, Farming, Water Use, Recreation, Research, Management, Energy Extraction



5

Local Social Systems Laws, Policies, Economic Institutions, Political Systems



Social Drivers Population Growth, Tourism, Economic Patterns





NOAA FISHERIES

Ecosystem pressure: hypoxia



NOAA FISHERIES

Ecosystem state: overfishing status









Data source: NOAA's Status of U.S. Fisheries



0.3

0.2

0.1

Ecosystem service: bird abundance Cornell University's eBird

eBird Submit Observations Explore Data My eBird Help







Ecosystem response: social connectedness







Highlights: 2017 Update

- Atlantic Multidecadal Oscillation begun to slightly decline after period of increase since 1975
- Sea surface temperature, sea level rise, hypoxia, increasing at faster rates in some areas
- Natural habitats on the decline; artificial habitats on the rise
- Nearly all fish species of primary or secondary economic importance at biomass levels above mean of the last three decades; proportion of stocks undergoing overfishing at an all-time low
- Total commercial landings and revenues, recreational fishing effort, employment in ocean economy and GDP all recently increasing
- Urbanization increasing at faster rates
- External shocks to the system (e.g. Hurricane Katrina) show susceptibility of populations in low-lying areas



Web version of Ecosystem Status Report

 C
www.aoml.noaa.gov/ocd/ocdweb/ESR_GOMIEA/index.html 52 **KEY INDICATORS** ← \rightarrow C www.aoml.noaa.gov/ocd/ocdweb/ESR_GOMIEA/landings.html HOME key indicators \equiv In terms of value of landings there is still a concentration in the northern Gulf and particularly in Louisiana, but all Gulf States have counties with significant value of landings with shrimp contributing largely to the value of landings in many counties, although lobster and stone crab are important to South Florida counties. Monroe and Pinellas are the leading counties in Florida, while Texas has significant landings value in Galveston and Cameron counties with Jefferson and Matagorda also contributing. Louisiana parishes of Plaquemines and Terrebonne lead in value, with Jefferson, Lafourche and Vermilion also contributing substantial value of landings. Gulf-Wide Landings (pounds) ≡ 3.000M 2,500M 2,000M 1,500M 1,000M 500M 0 1950 1955 1960 1965 1970 1975 1980 1985 1990 1995 2000 2010 2015 Landings (pounds) X - 🖿 🐯 🗎 🔥



Challenges and needs

- Information gaps:
 - Protected species (mammals, turtles, corals)
 - Estuarine processes and fisheries productivity
 - Zooplankton dynamics
 - Tourism value of species and habitats
 - All of southern Gulf of Mexico!
- Need further exploration of relevant spatial scales, process studies



Future work

- Scaling down indicators to look at spatially variable processes (e.g., uneven surface warming patterns)
- Impacts of natural and anthropogenic shocks to the system (Hurricane Katrina, DWH)



Comments and feedback welcome

Mandy Karnauskas <u>Mandy.Karnauskas@noaa.gov</u> NOAA Fisheries, SEFSC

Acknowledgements:

Matt McPherson, Michael Schirripa, Pamela Fletcher, Scott Cross, Steve Giordano, Bonnie Ponwith, Alex Chester, Randy Clark, Shannon Martin, Ruben van Hooidonk, Frank Muller-Karger, Amy Schuller, Penny Hall, David Gloeckner, Steve Turner, Vivian Matter, Kenneth Brennan, Shannon Cass-Calay, Craig Newton, James Sanders, Mike McDonough, Wesley M. Hochachka, Jeffrey Gleason, and the science and management community that provided feedback on the original Ecosystem Status Report.



How have the Status Reports been used?



 Gulf of Mexico ESR: recognition of physical shift in ~1995 led to re-interpretation of data on fish abundances and mammal strandings

