

Cooperative Monitoring Program for Spawning Aggregations in the Gulf of Mexico: An Assessment of Existing Information and Research Priorities

Programa de Monitoreo Cooperativo para Agregaciones de Desove en el Golfo de México: Una Evaluación de la Información Existente y Prioridades para Investigación

Programme Concerté de Surveillance des Concentrations de Reproducteurs dans le Golfe du Mexique: Une Évaluation des Informations Existantes et des Priorités de Recherche

WILLIAM HEYMAN¹, BRAD ERISMAN², SHINICHI KOBARA³, CHRIS BIGGS², NICK FARMER⁴,
SUE LOWERRE-BARBIERI⁵, MANDY KARNAUSKAS⁶, and JORGE BRENNER⁷

¹*LGL Ecological Research Associates, Inc., 4103 S. Texas Avenue, Suite 211, Bryan, Texas 77802 USA.
wheyman@lgl.com

²*Department of Marine Science, University of Texas at Austin, Port Aransas, Texas 78373 USA.*

³*Department of Oceanography, Texas A&M University, College Station, Texas 77843-3146 USA.*

⁴*NOAA Fisheries, Southeast Regional Office, 263 13th Avenue S., St. Petersburg, Florida 33701 USA.*

⁵*Fisheries and Aquatic Science Program, School of Forest Resources and Conservation,
University of Florida, 7922 North West 71st Street, Gainesville, Florida 32653-307 USA.*

⁶*NOAA Fisheries, Southeast Fishery Science Center, 75 Virginia Beach Drive, Miami, Florida 33149 USA.*

⁷*The Nature Conservancy, Texas Chapter, 205 N. Carrizo Street, Corpus Christi, Texas 78411 USA.*

EXTENDED ABSTRACT

Introduction

The most important fish species (e.g. groupers, snappers, drums, and croakers) harvested by commercial and recreational fisheries throughout the Gulf of Mexico (GOM) are known to form fish spawning aggregations (FSAs). However, the proper management of FSAs, including understanding the potential impact of oil spills on their stocks and fisheries or the importance of oil platforms as FSAs sites, is greatly impeded by the fact that the GOM is one of the world's least studied areas for the biology and management of FSAs (Russel et al. 2014). Meanwhile, fishers that depend on these resources have extensive knowledge of the timing and location of spawning aggregations and could be better integrated into monitoring, management, and conservation. Many researchers also have valuable data and information that has not been synthesized towards this end. In response to this perceived need, our team was funded by the RESTORE Act Science program for "RESTORE SCIENCE – Cooperative Monitoring Program for Spawning Aggregations in the Gulf of Mexico: An Assessment of Existing Information, Data Gaps and Research Priorities" (Erisman et al. 2015). This extended abstract offers a snapshot of the project objectives, preliminary results, and status.

The goals of this two-year project are to:

- i) Compile existing biological and fisheries information for the GOM on species known or likely to form FSAs,
- ii) Identify existing datasets and monitoring programs in the GOM that could inform regional monitoring of FSAs,
- iii) Synthesize the results obtained in 1 and 2 into a draft document to share with a wide group of stakeholders for review,
- iv) Convene a regional workshop to evaluate the draft and prioritize a suite of species, habitats, monitoring methods and areas of research moving forward,
- v) Synthesize the outputs of the workshop and draft document into a peer-reviewed manuscript focused on existing knowledge, data gaps, monitoring techniques, and priorities for future research related to FSAs and the management of their fisheries in the GOM, and
- vi) Engage in a comprehensive outreach and data-sharing program to ensure data are available to inform management.

The project is led by a diverse group of experts representing academia, federal government, private business, and non-governmental organizations (NGOs) from throughout the Gulf. Each member has core understanding of FSA ecology but our broader expertise spans fisheries stock assessment and management, marine ecology, GIS and remote sensing, physical and biological oceanography, and marine conservation. Workshop participants and reviewers of the final products will include academics from diverse fields; state, federal, and regional fishery and marine resource managers; and leaders in the fishery and oil and gas industries. This project supports graduate and undergraduate students at the University of Texas at Austin, and the results will be made publicly available on several online databases.

The project commenced in September 2015 and will be completed by August 2017. Many aspects of the project are well under way at this time. Preliminary project outputs were presented at a regional workshop, held October 4-6, 2016 at the NOAA Fisheries Southeast Regional Office (SERO). Originally planned for only 16 participants, the workshop generated a great deal of interest and we were able to accommodate over 30 participants that broadly represented commercial and recreational fishing interests, academic research institutions, non-government conservation organizations, and state

and federal scientists and resource managers. In addition, we had participation from Mexico and the Seychelles and side meetings and social events included several additional fishermen and NOAA staff from SERO. Several workshop participants mentioned the value of having participation from this diverse group of stakeholders – particularly fishermen and scientists.

Preliminary Results

A total of 30 focal species were selected and characterized via an intensive literature review through compilation of over 800 references. The reference database will be made public via an interactive website housed by the Gulf of Mexico Coastal Ocean Observing System (<http://gcoos.org/>). The website offers species profiles, summaries of spawning seasons, key life history parameters (Biggs doctoral dissertation and publications in prep.), and a cooperative monitoring protocol for spawning aggregations in the Gulf of Mexico (Heyman et al. 2017). One observation made during the workshop was that the spawning season for many species corresponds with the peak recreational or commercial fishing effort. Project team members are evaluating this hypothesis in a quantitative way.

Summary of Highest Priority Workshop Findings and Recommendations

Data Gaps

- i) With the exception of a few species e.g. spotted seatrout (Lowerre-Barbieri et al. 2014) there is a dearth of information about the locations of spawning aggregations in the Gulf of Mexico. This information gap impedes management.
- ii) A unified digital bathymetric coverage for the Gulf of Mexico is still lacking but would facilitate prediction, identification, monitoring, assessment, and manage spawning aggregation sites for key species.
- iii) Data on the behavioral dynamics of spawning aggregations (e.g. timing, dimensions, durations, abundance, fish movements) and fine-scale, spatio-temporal interactions between spawning aggregations and fisheries is lacking for many species of recreational, commercial, and conservation importance but critical for management.

Recommendations for Research and Monitoring

- i) Work with fishermen to identify and characterize where and when focal species are spawning in the Gulf of Mexico,
- ii) Improve metrics that allow productivity parameters associated with spawning aggregations (e.g. spawning potential ratio estimates that include non-fatal impacts of fishing on reproductive output) to be integrated with stock assessments, and
- iii) Create a unified bathymetric coverage for the Gulf of Mexico.

Recommendations for Fisheries Management

- i) Engage constituents from all sectors (commercial, private recreational, charter/for-hire, and head-boat) in monitoring, to improve understanding of reef fish spawning ecology and the fisheries significance of spawning aggregations,
- ii) Present results of this project to the Gulf of Mexico Fisheries Management Council,
- iii) In collaboration with fishermen, provide sufficient information to allow the Council to improve temporal protection for spawning or develop a framework for spatial protection of spawning sites through the FMC process following the precedent set by the South Atlantic Fisheries Management Council's Amendment 36 (SAFMC 2016),
- iv) Locate and characterize spawning areas for key species (particularly multi-species sites) and recommend them for protection in large enough areas to allow recovery and resilience., and
- v) Improve stock assessments by incorporating spawning aggregation metrics of reproductive resilience (Lowerre-Barbieri et al. 2017).

KEYWORDS: RESTORE Act Science Program, spawning aggregations, Gulf of Mexico, cooperative research, monitoring

ACKNOWLEDGEMENTS

This document is a result of research funded by the National Oceanic and Atmospheric Administration's RESTORE Act Science Program under award NA15NOS4510230 to the University of Texas at Austin.

LITERATURE CITED

- Heyman, W.D., B. Erisman, S. Kobara, N.A. Farmer, C. Biggs, K. McCain, S. Lowerre-Barbieri, M. Karnauskus, J. Brenner, and S. Fulton. 2017. *Cooperative Research and Monitoring Protocols for Fish Spawning Aggregations in the Wider Gulf of Mexico*. LGL Ecological Research Associates, Inc. Bryan, Texas USA. 37 pp.
- Erisman, B.E., W.D. Heyman, S. Kobara, N.A. Farmer, S. Lowerre-Barbieri, M. Karnauskus, and J. Brenner. 2015. *RESTORE SCIENCE – Cooperative Monitoring Program for Spawning Aggregations in the Gulf of Mexico: An Assessment of Existing Information, Data Gaps and Research Priorities*. Proposal to the RESTORE Act Science Program from the University of Texas at Austin USA. 104 pp.
- Lowerre-Barbieri, S., G. DeCelles, P. Pepin, I.A. Catalán, B. Muhling, B. Erisman, S.X. Cadrin, J. Alós, A. Ospina-Alvarez, M.M. Stachura, M.D. Tringali, S.W. Burnsed, and C.B. Paris. 2017. Reproductive resilience: a paradigm shift in understanding spawner-recruit systems in exploited marine fish. *Fish and Fisheries* **18**(2):285-312.
- Lowerre-Barbieri, S.K., S. Walters, J. Bickford, W. Cooper, & R. Muller. 2013. Site fidelity and reproductive timing at a spotted seatrout spawning aggregation site: individual versus population scale behavior. *Marine Ecology Progress Series* **481**:181. <http://doi.org/10.3354/meps10224>.
- Russell, M.W., Y. Sadovy de Mitcheson, B.E. Erisman, R.J. Hamilton, B.E. Luckhurst, and R.S. Nemeth, R.S. 2014. *Status report – world's fish aggregations 2014. Science and Conservation of Fish Aggregations, California USA*. International Coral Reef Initiative.
- SAFMC (South Atlantic Fishery Management Council). 2016. *Snapper Grouper Amendment 36 Actions to Implement Special Management Zones in the South Atlantic*. August 30, 2016. South Atlantic Fishery Management Council, Charleston, South Carolina USA.