Gulf of Mexico Fishery Management Council
Updated List of Fishery Monitoring and Research Priorities for 2020-2024

The following list of research and monitoring priorities is organized in four main sections: (i) broad multi-purpose research, monitoring, and survey programs; (ii) fish biology and stock status concerns; (iii) social, cultural, and economic concerns; and (iv) ecosystem considerations. The first section contains recommendations for research, monitoring and survey programs, socioeconomic issues, and ecosystem-based management concerns. Additional priorities for socioeconomics are in **Section III**, and those for ecosystem management are in **Section IV**.
As per the request from NOAA/NMFS, the research and monitoring priorities indicated in **Section I** are ranked and labeled using the following priority code:

Priority Codes:
A: Highest Priority – Surveys to meet critical needs for stock assessments and management.
B: 2nd Priority – Surveys to improve indices of abundance, life history, or human dimension data that complements priority A.
C: 3rd Priority – Surveys to characterize stocks or parameters for assessments.

I. Priorities associated with broad, multi-purpose research and monitoring programs aimed at collecting a variety of data for a number of species.

a. **Fishery-Independent Sampling**: Expand Gulf-wide, fisheries-independent monitoring programs to enhance the capacity to associate fisheries data with: environmental data, habitat quality and abundance, and physical oceanographic parameters. Particular emphasis should be placed on the expansion and enhancement of the SEAMAP Reef Fish Video Survey, the NMFS Panama City Laboratory Reef Fish Video Survey, and the SEAMAP Groundfish Trawl Survey in the eastern Gulf of Mexico. Additional Gulf-wide vertical, bottom longline, video, visual, and larval survey efforts are needed to better inform stock-recruit relationship determination efforts in stock assessments. Moreover, expanded sampling efforts should be implemented to enhance physical and biological sampling that allows development of long-term time series of physical, biological, and chemical oceanographic data for use in future ecosystem-based modeling approaches. **Priority Code: A**

b. **Fishery Monitoring and Research – Socioeconomic Parameters:** Develop a longitudinal human dimensions study to examine and monitor change over time among recreational and commercial fishermen and communities, including a comprehensive survey of individuals (or fishermen panel studies) throughout the Gulf of Mexico which should be repeated periodically (e.g., as an add-on survey to MRIP, for the recreational sector). By providing a series of snapshots over time, socioeconomic change can be studied, understood, and applied to management. In addition to basic socio-demographic characteristics of commercial and recreational fishermen (such as age, gender, income, boat ownership, fishing mode, and experience), additional components to evaluate include:

- Angler attitudes, motivations and satisfaction, management preferences, attitudes toward catch and release, expenditures, and perceptions of resource health.
- Survey of engagement and reliance/dependence on marine fisheries. For commercial fishermen, indicators include information about the proportions of their household incomes derived from marine fisheries. For recreational fishermen, indicators include information about how often they participate in marine fishing compared to other recreational activities.
- Census of employees at fish dealers and processors.
- Census of captains and crew of reef fish and CMP commercial permitted vessels.
- Census of captains and crew of federally permitted for-hire vessels.
- Update census, landings, and permit data included in fishing community profiles.
- Identify potential populations of Environmental Justice concern. **Priority Code: A**

c. **Fishery-Dependent Monitoring and Sampling**: Enhance existing recreational (i.e., for-hire and private/rental components) and commercial fishery-dependent sampling programs. Specifically, improve temporal/spatial coverage (ideally Gulf-wide and potentially including international fisheries such as Mexico), distribution of ex-vessel prices by size class, increase collection of ageing structures and tissues to support life history studies and catch-at-age analyses, particularly for data-poor stocks. Develop and implement an effective and efficient electronic data reporting system for the recreational components of the fishing community, specifically the charter for-hire vessels. **Priority Code: A**

d. **Estimation of Bycatch**: To improve stock assessments, implement more comprehensive species identification and abundance information for reef fish and CMPs harvested as shrimp trawl bycatch. Continue collecting information on bycatch from reef fish and CMP fisheries for all vertical line and bottom longline gear types in order to disseminate practical methods for minimizing bycatch, including through state-facilitated recreational landings and effort surveys. Observers and observer coverage continues to be a critical part of monitoring fishing effort, shrimp-trawl bycatch estimation, interactions with endangered species, and fishing gears. As such, this plays an important role for *in situ* data collection and validation, discard mortality estimates, and catch-per-unit-effort estimations. **Priority Code: A**

e. **Estimation of Discards**: Develop research and monitoring programs to evaluate the magnitude and effects of discard mortality rates (both commercial and recreational), and disseminate practical methods for minimizing mortality. The estimation of the total number of discards requires a continued expansion of fishery observer programs, in some cases by adding observer personnel and in others (small or unsafe vessels) by use of innovative technologies (cameras, phone/tablet applications). Better information regarding discard estimation is a priority across all components of the commercial and for-hire industries and the private recreational sector. Continue development of methodologies to improve the accuracy of discard data for all relevant fleets. Modify survey methods to derive length observations from recreational discard data. **Priority Code: A**

f. **Ecosystem-Based Management – Data Collection Priorities**: As the Council moves toward incorporating an ecosystem-based approach to management, the following data

collection and analyses are needed.

A. Data Needs

- Human components (social and economic inputs), including land use and environmental change.
- Simulation or prioritization exercise for changes in fishing behaviors (such as changes in response to stock size, regulation, profitability).
- Biotic components (coastal habitat, coral, algal/zooplankton, fishery, etc.).
- Ecosystem components (valuation of ecosystem services, nutrient cycling, ecosystem management, ecosystem restoration, marine spatial planning).
- Physical components (GIS database development/mapping of habitat, climatology, geographic and oceanographic variables). **Priority Code: B**

B. Ecological Relationships, Linkages and Networks

- Habitat mapping, quality assessment, species utilization and alterations
- Community structure/fish assemblage analysis and resilience
- Understanding of predator-prey and competitive interactions for ecosystem-based management
  - Large data gaps exist for older, larger, deep-water dwelling reef fish and pelagic species
- Analysis of ecosystem network and interactions
- Monitoring and research on Marine Protected Areas
- Development of biological and physical indicators including:
  - fish recruitment, distribution, and migration;
  - ecosystem community structure;
  - annual fish growth patterns from length-at-age data;
  - fishery production and other mortalities;
  - primary and secondary production;
  - invasive species (e.g., lionfish, orange cup coral, Asian tiger prawns) distribution, and interactions and effects;
  - remote sensing and oceanographic measurements;
  - large-scale atmospheric and oceanic fields (both time series and derived products); and
  - climate and environmental variability.
- Development of social and economic indicators including assessment methodologies for the potential social and economic effects of an ecosystem-based fisheries management plan. **Priority Code: B**

g. **Discard Mortality Changes**: Determine changes in regulatory discards or catch-and-release fishing of target species and subsequent deviations in discard mortalities resulting from changes in fishermen's behavior from regulatory modifications such as seasonal closures, area closures, industry quotas, trip limits, minimum size limits, etc. This research recommendation is related to research recommendation number 4 under Economic and Socio-cultural Recommendations, except that the emphasis is on how the changes in fishermen's behavior affect discard mortality rates, rather than how supply and production functions are affected. **Priority Code: A**

h. **Episodic Mortality Events**: Determine effects of episodic mortality events on specific species and groups. Examples of known events include red tide (2005, 2014, 2017-18), atypical weather conditions (2010 cold weather period), and the *Deepwater*

Horizon MC252 oil spill (2010). Develop metrics for incorporating the effects of such events into abundance index calculations (e.g., 2005 red tide input into models as a discard fleet). Work towards refining predictive abilities to generally estimate the potential effects of such events in the future. Incorporate methods for adjusting management recommendations based on the evaluation of episodic mortality events by species. **Priority Code: B**

i. **Large-scale Tagging Program**: Continue support of large-scale tagging programs (conventional external tags, PIT tags, telemetry, and genetic tagging methods) aiming to better quantify fishing mortality rates, movements, and improve estimates of natural mortality. **Priority Code: C**

II. Priorities associated with individual species or specific research topics.

Each species listed in this section has identified research needs provided by SEDAR workshop panel recommendations or peer-reviewed literature and is assigned a priority code as indicated below. Priority was given to species currently in a rebuilding plan. This list includes some species jointly assessed across the Gulf and South Atlantic Councils' jurisdictions, but is not a comprehensive list of all species managed by the Gulf Council. In some cases research needs for each species are to be addressed by the broad-based research and monitoring programs described in **Section I** above. Additional research needs are listed individually under each species, when applicable, and are in addition to the combined research recommendations collated by SEDAR (http://sedarweb.org).

The research and monitoring priorities indicated in **Section II** are ranked by the priority code that follows:

Priority Codes:
A: Highest Priority – Stocks designated as overfished AND undergoing overfishing or in critical need of an assessment.
B: 2nd Priority – Stocks designated as overfished OR undergoing overfishing or in need of an assessment.
C: 3rd Priority – Stocks with SEDAR assessments scheduled but not classified A or B.
D: Not yet prioritized – Criteria needed to prioritize non-SEDAR recommendations

1. **Gulf of Mexico Red Snapper** – **Priority Code: A**
   - Incorporate the Connectivity Modeling Simulation recruitment index into the base model and investigate ways to use the index to improve recruitment forecasting in the projections.
   - Explore the potential for developing a fully spatial model of red snapper that can account for differential recruitment and life history patterns across the Gulf of Mexico including differential dynamics on and around artificial versus natural reef habitat.

2. **Gulf of Mexico Greater Amberjack** - **Priority Code: A**
   - Remote sensing or other survey methods of determining spatiotemporal variations of Sargassum coverage in the Gulf of Mexico, particularly during the spawning season, and any correlations to recruitment success for greater amberjack.

3. **Gulf of Mexico Gray Triggerfish** - **Priority Code: A**
   - Remote sensing or other survey methods of determining spatiotemporal variations of

Sargassum coverage in the Gulf of Mexico, particularly during the spawning season, and any correlations to recruitment success for gray triggerfish.

Research and monitoring priorities indicated in **Sections III** and **IV** are ranked and labeled using the following priority codes:

Priority Codes:
A: Highest Priority – Critical research and data needs for socio-economic analyses.
B: 2nd Priority – Supplementary data collection and research needs.
C: 3rd Priority – Longer term data needs and research efforts.

III. Economic and Social Recommendations

Over the next 5 years and beyond, fishery management challenges will increasingly pertain to the human environment resulting in social and economic effects. Addressing socio-economic issues such as maximizing fishing opportunities under finite quotas and allocating scarce resources among competing user groups requires a better understanding of the human environment.

(1) Estimate the effect of proposed management alternatives on recreational fishing. Estimate suitable recreational benefit functions and participation rates by fishery and mode of fishing (private boats, charter boats, headboats) to evaluate the economic effects of regulations for recreational fisheries such as (but not necessarily limited to): minimum size limits, bag limits, quotas, seasonal closures, and marine reserves. Economic effects include changes in economic surpluses (consumer surplus for fishermen, producer surplus for charter and headboats), levels of fishing effort and catch, and switching behavior among target species and other forms of recreational activities in response to regulation. **Priority Code: A**

(2) (2) Development of regional input-output models and the data needed to make them operational. Economic impact models characterize the linkages between industries in regional economies and can be used to estimate the effects of fishery regulations or environmental events such as major hurricanes or red tides as they ripple through state and regional economies for all sectors of the fishery. A research priority is to make the models operational by conducting an economic survey of fishing-related businesses to quantify the linkages between them. Fishing-related businesses include suppliers of inputs to fishermen and marketing channels for commercially landed fish. The data collection should focus on revenues, expenditures, employment data, and firm characteristics. These data become the inputs to regional impact models that calculate the direct and indirect effects of changes in allowable harvests or environmental events on employment and income. **Priority Code: A**

(3) Development of methodologies to assess the cumulative economic and social impacts of individual fishing quota management on Gulf of Mexico fisheries. **Priority Code: A**

(4) Estimate fishing behavioral models, including effort, supply, and production functions for the commercial and for-hire sectors. Specific attention should be given to species targeting behavior, and seasonal and spatial decisions. The intent of this research is to determine how fishermen change their fishing practice and strategies, including what species to target in response to changes in management tools such as seasonal closures, area closures, industry quotas, trip limits, minimum size limits, etc. This includes switching behavior among fishing activities and the rates at which boats enter or exit the fishery, as well as changes in fishing practice by non-quota holders following implementation of catch share programs. **Priority**

Code: A

(5) Continue the development of social and economic indicators, such as those employing factors of vulnerability and resilience. Develop scales to use socioeconomic indicators as triggers for evaluation of fishery management decisions (e.g., allocation, fishing zones, etc.). **Priority Code: A**

(6) Evaluate the social and economic impacts of ecosystem management on the various categories of stakeholders to support National Standard 8 of the Magnuson-Stevens Act in regard to the impact of an ecosystem approach on fishing communities. **Priority Code: A**

(7) Develop quantitative models for evaluating social and economic impacts of allocation or reallocation decisions. Evaluate the appropriateness of various incentive-based approaches for the management of recreational fisheries and assess their socioeconomic effects. **Priority Code: B**

(8) Identify all ecosystem stakeholders and assess the relationship between the ecosystem (of which fisheries are a part) and these stakeholders (i.e., how the various stakeholder interactions with the broader ecosystem affect the fishery, and conversely, how changes in the ecosystem or fishery will affect stakeholders). Develop a historical model that integrates the array of relevant human activities to ecosystem management in a way that is meaningful. **Priority Code: B**

(9) Develop methods to assess land-use changes and the impact of land-use change on vulnerable human populations and marine ecosystems. **Priority Code: C**

(10) Evaluate effectiveness of communication and stakeholder engagement approaches including: Opportunities for stakeholders to provide input to stock assessment and management processes and barriers to participation; effects of engagement opportunities on stakeholders' perceptions of management processes and opportunities for meaningful participation; and related issues. **Priority Code: A**

(11) Evaluate the efficacy and consequences of humane options for shark and porpoise deterrents to be used during commercial and recreational fishing operations. Interactions between anglers and large pelagic predators like sharks and dolphins have increased recently, and continued interactions with these animals under the course of fishing activity may result in otherwise detrimental behavioral changes in these animals over time. **Priority Code: B**

IV. Ecosystem-Based Management Recommendations

The short-term goal is the continued development of predictive ecosystem models to project fisheries productivity, assess uncertainty in stock assessments, improve single-species management, and evaluate impacts of proposed management actions from an ecosystem perspective. The long-term goal is to develop data and methods to conduct integrated ecosystem assessments (IEAs) for the Gulf of Mexico, and to provide the necessary information to effectively adapt management to mitigate the ecological, social, and economic impacts of major shifts in the productivity and mortality of living marine resources.

Ecosystem Model Development: - Priority Code: C

The development of an ecosystem model uses the ranking for the previous three sections' priorities, because this item builds upon the previous data collection and research needs outlined above.

Develop predictive models for ecosystem assessment and to project/forecast fish productivity based on:

- Developing models to conduct IEAs as discussed in NOAA Technical Memorandum NMFS-NWFSC-92;
- Anthropogenic factors (e.g., current and planned fishing activities, coastal development);
- Physical habitat and natural forcing events (e.g., hurricanes, ocean features, short-term climatic changes/ENSO events, dry/wet years)
- Trophic dynamics/networks, ocean productivity, interaction with protected species, and introduction of invasive species;
- Habitat availability and quality;
- Long-term climate change and its relationship with the interaction of anthropogenic factors, physical habitat, trophic dynamics, and habitat availability;
- Descriptive models that provide a snapshot of the ecosystem (e.g., Ecopath/Ecosim, Atlantis);
- "Nowcasting"/"Forecasting" Models (e.g., Multispecies Virtual Population Analysis (MSVPA), Very Large Individual Based Models (IBMs), and Agent-Based Models) which provide useful interface with stock assessment/fishery management, and a way to evaluate possibilities for policy/decision-making. Components of Ecosystem Forecasting include: Review and evaluation of current tools; tool development and model tuning; and tool application and evaluation. Components of Ecosystem Monitoring include: Data and communication portal development; continuing assessment need for EBM; and incorporating climate change;
- Identifying opportunities and strategies for collaborative management of resources that are outside the jurisdiction of NOAA Fisheries but affect fishery stocks (e.g., freshwater inflows, non-point source pollution, human dimensions, loss of habitat such as marshes);
- Develop methods to incorporate other significant stakeholders (i.e., municipalities, authorities, and state governments) into the ecosystem management process; and
- Identify environmental justice issues related to ecosystem management.