Disclaimer

These draft Fishery Ecosystem Issues (FEIs) were compiled by staff across the Southeast Fishery Science Center and are based on their expert knowledge as well as stakeholder outreach conducted by the Center in order to scope priorities for ecosystem-based fishery management. These drafts are intended to serve as a starting point for discussions on FEI criteria and prioritization. The set of ideas presented here is not intended to be inclusive of all priority issues in the region; rather, they represent a limited sample of issues on a variety of subjects that can facilitate discussions on how to operationalize a Fishery Ecosystem Loop. It is recognized that once a plan for stakeholder engagement is formalized and more stakeholder groups are brought into the FEP process, additional perspectives and ideas will be developed and incorporated into Ecosystem Technical Committee discussions.

04/13/2023

Title: Management and mitigation of pelagic *Sargassum* in the Gulf of Mexico as an Essential Fish Habitat and a nuisance alga

Description of the management issue:

Sargassum is considered Essential Fish Habitat (EFH) for many managed fish species and critical habitat for some protected resources in the Gulf of Mexico. Periodic *Sargassum* mats have occurred seasonally with various sizes and distributions throughout the Gulf of Mexico, with the beaching of *Sargassum* historically limited to the Texas coast. More recently, massive *Sargassum* mats have originated along the equatorial Atlantic (since 2011) and continued via currents into the Caribbean Sea and Gulf of Mexico. Healthy *Sargassum* mats provide refuge and food to numerous species at young life stages in the Gulf of Mexico. If the Sargassum mats are pushed up on land there can be negative impacts to fishery resources and wildlife. It can deteriorate other Essential Fish Habitats (e.g., reefs, seagrass, mangroves), and cost coastal communities millions of dollars to cleanup beached *Sargassum*. Thus, it is possible that under future climate scenarios, these effects could worsen. In parts of Mexico and Caribbean, mitigation efforts have been initiated that include the harvesting of *Sargassum* prior to stranding; however, because *Sargassum* is a protected habitat, this form of mitigation would be a complicated (regulatory) issue in U.S. waters. Several key questions need to be addressed: can we identify when *Sargassum* switches from being an important marine habitat to a nuisance algal bloom, and what regulatory authorities need to be involved in permitting any mitigation actions (if actions are taken prior to beaching).

Fisheries involved:: Greater amberjack, lesser amberjack, almaco jack, gray triggerfish, filefishes, mahi mahi, tripletail, among others; also protected species (e.g., juvenile sea turtles); *Sargassum* (Essential Fish Habitat, but in contrast to the South Atlantic Council, the Gulf Council does not have a Sargassum FMP)

Geographic area of focus including habitats: Neritic and coastal waters of Gulf of Mexico (likely subregions: Eastern Gulf Neritic, Southwest Florida Neritic, Dry Tortugas Reef Tract, Florida Keys, among possible others)

Key actors and institutions and their interests: NOAA SEFSC, AOML, coastal communities, beach/recreational area managers, Florida Keys National Marine Sanctuary, National Park Service, USFW, NOAA Protected Species, among others

Relevant institutions that can affect the outcome or contribute to the solution: many of the key institutions listed above

Data or information gaps: *Sargassum* (in situ) growth rates; cross-shelf gradients and temporal patterns in *Sargassum* habitat use by managed and protected species. Spatial distribution and abundance monthly and annually.

Vision of success: Establish a regulatory framework for assessing cost/benefit of removing *Sargassum* prior to coastal inundation and understanding potential economic/ecological impact of that removal; Inclusion of *Sargassum* habitat index and associated species in relevant stock assessments.

04/13/2023

Title: Red tide on the West Florida Shelf

Description of the management issue:

Red tide events tend to occur off the west coast of Florida. Depending on the spatio-temporal scale of these events, mass mortalities of marine organisms can occur including forage fishes, pelagic fishes, reef fishes, invertebrates, elasmobranchs, marine mammals, marine turtles, and birds. Additionally, essential fish habitat can be affected due to the mortality of structure-formatting species like seagrasses, corals, and sponges. Hypoxia has also been observed with red tide events, likely exacerbating impacts to affected ecosystems. Declines in indices of abundance and commercial and recreational catches have been observed for gag and red grouper, and have been at least partially attributed to red tide events. There are also concerns about fishermen having to travel further to escape impacted areas or limited ability to diversify the target species portfolio in response to red tide events.

Fisheries involved: forage/bait fish, reef fish, pelagic fish, protected species, essential fish habitat, coral

Geographic area of focus including habitats: West Florida Shelf out to the 200 m isobath; estuarine and nearshore essential fish habitats; seagrass meadows; coral reefs, live hardbottom

Key actors and institutions and their interests: Commercial and recreational fishermen; GMFMC - management of fisheries in federal waters; FL FWC - red tide monitoring and management of fisheries in state waters; NOAA - management of protected marine species, federal fisheries, and aquaculture in federal waters; FL Department of Agriculture and Consumer Services - management of aquaculture and shellfish harvesting in state waters; FL Department of Environmental Protection - water management districts and water quality; US Army Corps of Engineers - manages water discharges from Lake Okeechobee

Data or information gaps: Long-term effects of red tides on biomass, spatial distribution, and age distribution of exploited reef fishes and their prey; numbers and species composition of fish in fish kills; length/age composition data from fish kills are needed to determining lengths/ages susceptibility to red tide severity; movement and avoidance of species to red tide events; relationship between the spatio-temporal scale and toxicity of an event to mortality and habitat destruction; changes to ecosystem diversity and community structure including possible redistribution or colonization by competing species; effects on IFQ lease availability and price or ex-vessel prices; how do fishermen change their behaviors to adapt to events; spatio-temporal index of red tide

Vision of success: Better quantification of fishery impacts can be used to advise other management bodies on improving nearshore water quality. Continued incorporation of red tide impacts in stock assessment, quota setting, and consideration of indirect impacts (e.g., strong red snapper recruitment events possibly caused by colonization post-red tide). Consideration of tradeoffs between maximizing catch and precautionary buffers or harvest control rules to account for future red tide events. Management that is nimbler and more reactive to extreme events (e.g., additional permit flexibilities to help industry adapt to severe events by switching gears, target species, allocation flexibilities and changes to recreational regulations).

04/13/2023

Title: Chasing Optimum Yield

Description of the management issue:

Optimum yield (OY) is defined as the yield that provides the greatest benefit to the nation, with explicit consideration of economic, ecological, and social factors (NS1 Guidelines). Calculation of OY, like maximum sustainable yield (MSY), is dependent on the dynamics of the stock-specific fleet structure, specifically allocation and selectivity. If these properties change, the sustainable yield, and accordingly the OY, will also change. Rather than being a quantity that can be explicitly solved for within a model, OY will likely emerge as a compromise across multiple competing objectives. Fishery management objectives reflect the stakeholder-defined goals and priorities of the fishery, potentially including environmental, ecological, and socioeconomic considerations and perspectives from other disenfranchised interest groups. Management objectives are often competing (e.g., maximize catch while minimizing risk to the resource), potentially even within a fishing sector. One clear example of this is in the South Atlantic dolphin fishery, where charter fishermen in the Florida Keys want very different trip and bag limits than charter fishers in North Carolina, due to the type of clientele they serve and differing expectations of what makes a "good" fishing trip. However, to date, rarely have these non-yield based objectives been quantified and our management options simulation tested to evaluate how it performs relative to them.

Extensive and repeated communication with stakeholders is necessary to define and operationalize fishery management objectives, and selecting the ideal compromise between competing objectives ('maximizing net happiness') requires full characterization of the management trade-offs associated with alternate management actions and iterative engagement with stakeholders and managers. For example, in the Pacific northwest, management stability is a key priority for recreational fishers of salmon and Alaska halibut. Consequently, the percentage allocation that goes to the recreational and charter fishery is higher at low catch limits in an attempt to increase year to year stability for recreational fishermen (https://www.fisheries.noaa.gov/management-plan/alaska-salmon-fisheries-management-plan and https://www.pcouncil.org/managed_fishery/pacific-halibut/).

Fisheries involved: all fisheries

Geographic area of focus including habitats: Gulf of Mexico

Key actors and institutions and their interests: Interested stakeholders who have a vested interest in the resource, biological and social scientists, MSE analysts, fishery managers; e.g., Figure 1

Relevant institutions that can affect the outcome or contribute to the solution: Gulf of Mexico Fishery Management Council, social scientists from the Southeast Fisheries Science Center and academic community

Data or information gaps: stakeholder-defined operational management objectives; definition and understanding of management trade-offs

Vision of success: Achieving OY in the fishery

Possible path towards vision:
Management strategy evaluation may be a useful process to address the question of what is OY and can we derive management procedures[1] that obtain it. MSE is a simulation-based, analytical framework used to evaluate the performance of multiple candidate management procedures relative to the prespecified management objective. A key first step in MSE is to identify the conceptual[1] and then eventually operational[2] management objectives, which is usually done through stakeholder participatory workshops (Figure 1). Subsequent steps involved developing a testing or simulation framework for evaluating the performance of different management procedures relative to how well they meet management objectives. Stakeholder participatory workshops are a key component of this effort. The Council can support these efforts through collaborating and leading stakeholder workshops designed to elicit management objectives and define OY.

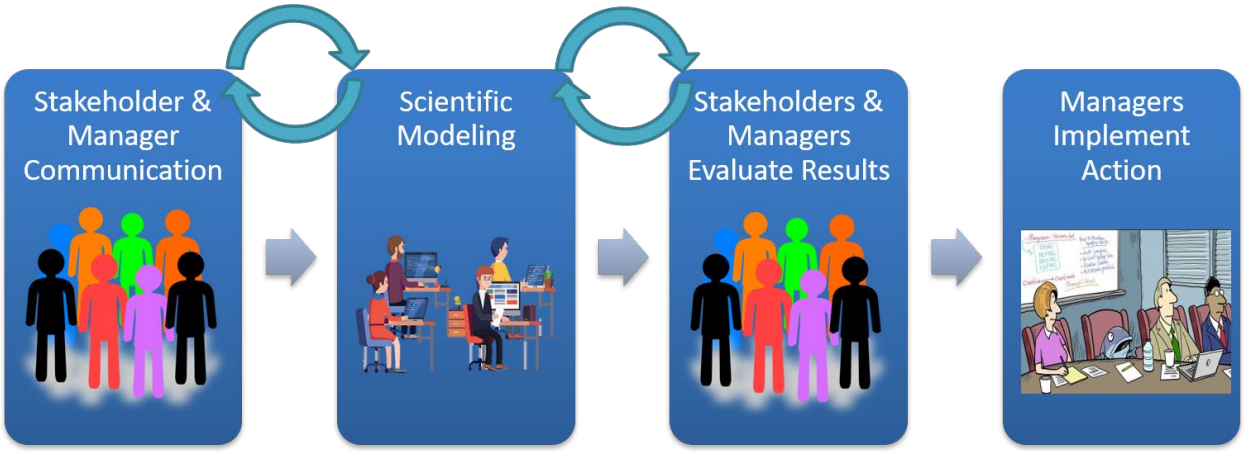

Figure 1. Diagram of the MSE process, which begins with (1) stakeholder and manager communication to define management objectives, followed by (2) scientific modeling of the management process, which requires continued engagement with stakeholders and managers, (3) stakeholder and manager evaluation of the scientific modeling results, which will likely lead to alterations and refinements of the model. The purpose of this iterative stakeholder and manager interaction is to reach a suitable compromise in management objective weighting, which will inherently define OY. Lastly, once OY has been defined, (4) managers will implement a management action to maximize OY. Diagram modified from JW Cummings.

Management procedures: a pre-agreed framework used to make decisions about managing a resource, designed to achieve specific management objectives (Miller et al., 2019). This framework may include, but is not limited to, specifying resource surveys, assessments, and how information about the status of the resource is used to make decisions about catch (e.g., catch control rules or catch limits). It can be empirical where it is based on indicator data, such as an index of abundance, or model-based where it is based on an estimation model output.

1. Conceptual management objectives: desired goals for fishery, e.g, achieve Optimum Yield, maintain stock size at spawning biomass that supports maximum sustainable yield (SSBmsy), maintain recreational opportunity.
2. Operational management objectives: quantified goals for the fishery with timelines and probabilities, e.g. maintain 60% probability of B>BMSY, recreational utility of 6 fish per trip with 80% probability, etc.

04/13/2023

Title: Potential Effects of Offshore Wind Energy Infrastructure on Fish Ecology, Species Distribution, and Gulf Fisheries

Description of the management issue:

On February 22, 2023, the Department of Interior announced the first proposed offshore wind sale in the Gulf of Mexico. The Proposed Sale Notice (PSN) includes three areas in federal waters off the coasts of Galveston, TX and Lake Charles, LA. The scale, magnitude, and rapid expansion of offshore wind energy development is quickly becoming a fisheries, protected species, and habitat management issue within the Southeast U.S. This requires immediate attention to address the significant interactions between offshore wind and ocean uses in the Gulf including, notably, shrimping and other commercial and recreational fishing. The cumulative effects of the construction, operation, and management of offshore wind energy in the Gulf will impact all ocean uses, including commercial and recreational fishery resources (marine and anadromous fish species, and shellfish, and their habitats); fishing operations and associated fishing communities; endangered and threatened marine species and the ecosystems on which they depend, including designated critical habitat or habitats; marine mammals, turtles, and their habitats; complex habitats and unique benthic features, marshes, mangroves, seagrass beds, coral reefs, and other coastal habitats; and resources associated with National Marine Sanctuaries and National Estuarine Research Reserves.

Fisheries involved: All; also protected species (e.g., sea turtles)

Geographic area of focus including habitats: Gulf of Mexico continental shelf from west of the Mississippi River to the Texas/Mexican border (see BOEM Gulf of Mexico Call area)

Key actors and institutions and their interests: BOEM, BSEE, NOAA SEFSC and SERO, AOML, coastal communities, fishery participants, beach/recreational area managers, Flower Garden Banks National Marine Sanctuary, National Park Service, USFW, NOAA Protected Species, among others

Relevant institutions that can affect the outcome or contribute to the solution: all institutions listed above

Data or information gaps: General information related to ecological, physical, and human dimensions effects of offshore wind energy infrastructure construction and operation

Vision of success: Robust and well-cited OSW infrastructure that provides a renewable source of energy and employment for the US Gulf Coast while minimizing the adverse impacts to natural and cultural resources and fishing communities.

04/13/2023

Title: Management Strategy Evaluation for Penaeid Shrimp in the Gulf of Mexico

Description of the management issue:

Penaeid shrimp in the Gulf of Mexico are short-lived productive species, whose productivity is largely environmentally driven. Shrimp were previously assessed with an integrated statistical-catch-at-age model. The delay between data collection, assessment, and management implementation is longer than the lifespan for Gulf of Mexico shrimp. This management delay, combined with the comparatively rigid structure of an assessment model compared to the highly variable dynamics of the stock, begs the question of whether a fully parameterized Stock Synthesis assessment model is the most appropriate way to manage them. Empirical (or indicator-based) management procedures (MPs) are timely and flexible, and as such, may be a more appropriate mechanism to generate catch advice compared to the more traditional stock assessment plus projection process. Empirical dynamic modeling (EDM) has proved useful for describing and forecasting Gulf of Mexico shrimp dynamics (Tsai et al. 2022), which may form the basis for an empirical MP.

While the TAC is currently set very high for shrimp, the fishery is functionally effort-regulated, as driven by economic considerations and bycatch-related effort restrictions. Given that the drivers of fishing activity are unconventional, stakeholder input may be useful to identify the fishery management objectives of the shrimp stocks. Once identified, a full, stakeholder-inclusive management strategy evaluation (MSE) could serve to explicitly identify potentially competing operational management objectives, and provide a framework in which to maximize the ability of management to achieve these objectives. This is a critical step in conjunction with the upcoming research track assessment to ensure a model is built that informs pertinent management trade-offs. The goal of this MSE is to develop an empirical MP that best achieves the suite of operational management objectives for the Gulf of Mexico shrimp fishery.

Fisheries involved: Gulf of Mexico White, Pink, and Brown Shrimp, as well as all fish stocks that are caught as bycatch in the shrimp fisheries.

Geographic area of focus including habitats: Gulf of Mexico White, Pink, and Brown Shrimp

Key actors and institutions and their interests: Stakeholders who have a vested interest in the resource, social scientists, economists, MSE analysts, assessment analysts, fishery managers, academic partners

Relevant institutions that can affect the outcome or contribute to the solution: Gulf of Mexico Fishery Management Council, scientists from the Southeast Fisheries Science Center and MSE Contractor

Data or information gaps: stakeholder-defined operational management objectives for the Gulf of Mexico shrimp fishery; definition and understanding of management trade-offs

Vision of success: Implementation of a management procedure that best achieves a suite of predetermined operational management objectives for the Gulf of Mexico shrimp fishery.

04/13/2023

Title: Identifying the Gulf of Mexico underserved communities to better address the needs of our stakeholders in the context of ongoing and expected pressures from environmental change

Description of the management issue:

Fishing communities in the Gulf of Mexico (GOM) are experiencing the cumulative effects of hurricanes, red tides, as well as coastal development and demographic changes. In addition, the impacts of climate change on the marine ecosystem are expected to increase the number of pressures that fishing communities are facing. Ongoing and expected ecosystem changes can be complicated by potential inequities in the management of fisheries allocations and permits. Inequities decrease the ability of certain communities or stakeholder groups that depend on marine ecosystems for their economic, environmental and cultural well-being to respond in resilient ways to environmental change impacts. Six barriers to achieving equity and environmental justice have been identified in the National Equity and Environmental Strategy (page 6). Among the six barriers, unawareness of the underserved communities is a key concern. If we do not know who the underserved communities in our region are, we cannot document and address the needs of our stakeholders. The need to develop a wider and more diverse network of communication with the GOM stakeholders has also been highlighted in recent public comments on the draft National Equity and Environmental Strategy. Therefore, one of the key first-steps in addressing inequities in the management of the GOM fisheries consists of identifying and building a communication network with the underserved communities in the region. While the Southeast region has augmented its efforts to broaden current stakeholder networks of communication, a concerted effort that involves the Southeast Fisheries Science Center, the Southeast Regional Office and the Gulf of Mexico Fisheries Council is needed. In this Fishery Ecosystem Issue, we propose to develop a series of collaborative strategies that are aimed at increasing the capacity to serve the GOM stakeholders.

Fisheries involved: Focus on reef fish fisheries, pelagic fish species, shrimp; all managed GOM fisheries where underserved communities are identified.

Geographic area of focus including habitats: Gulf of Mexico

Key actors and institutions and their interests: SEFSC, SERO, State –level fisheries and wildlife management, city/community governments, GOM Fisheries Council, federally recognized tribes, state-only recognized tribes

Relevant institutions that can affect the outcome or contribute to the solution: NOAA SEFSC, SERO, GOM Council

Data or information gaps: Who are the underserved communities in the GOM region? What are the key environmental justice issues these communities face?

Vision of success: Equitable treatment and meaningful involvement of the GOM underserved communities in fisheries management.

04/13/2023

Title: Addressing regulatory discards in Gulf fisheries

Description of the management issue:

Regulatory discards occur when fish are caught by fishermen but are discarded because management regulations do not allow the fish to be retained. Although for certain fisheries, discarded fish have a high probability of survival, and discarding may not have substantial impacts on population dynamics, discarding represents a suboptimal use of the resource and should be avoided in well managed fisheries. Through a series of participatory workshops, stakeholders from both commercial and recreational sectors identified a number of factors that are thought to drive increased rates of discarding, including: high-grading, reductions in season length, changes in depth of fishing, and lack of awareness of the negative impacts of discarding. High-grading was noted to occur more often when bag limits are low, as some anglers will aim to retain the largest fish they can find. Season length was said to affect discard rates because reef fish in particular can be incidentally caught during closed seasons while targeting other species. Additionally, stakeholders felt that the overall practicality and complexity of regulations often resulted in forcing fishermen to discard in order to avoid breaking laws, and that greater study was needed to understand the multi-species consequences of single-species regulations. Participatory modeling efforts in the Gulf of Mexico red snapper fishery also revealed that commercial fishermen in some areas can be forced to discard when they are unable to obtain quota for non-target species. For example, grouper fishermen in southwest Florida report that they lack quota for red snapper (due to historical low landings in the area) and that discarding is more likely to occur as red snapper abundance increases in the eastern Gulf. Overall, discarding can increase management uncertainty because estimating discard mortality is challenging and can vary over space, time, and environmental or ecological conditions. Thus, accounting for the impacts on the overall population dynamics creates increased uncertainty.

Fisheries involved: Gulf reef fish complex, CMP, and Spiny Lobster

Geographic area of focus including habitats: Gulf of Mexico

Key actors and institutions and their interests: Gulf of Mexico Fishery Management Council, stakeholders from commercial and recreational sectors

Relevant institutions that can affect the outcome or contribute to the solution: Domestic federal, state and university fishery managers and researchers, specifically the Gulf of Mexico Fishery Management Council

Data or information gaps: Understanding of physical factors and regulatory factors – and their synergistic effects – on discarding rates and discard mortality.

Vision of success: Achieve a state where both recreational and commercial fisheries achieve optimal yield by converting dead discards into retained fish.

04/13/2023

Title: Finfish Depredation by Highly Migratory, Protected, and Managed Species

Description of the management issue:

Depredation is defined as the act of a predator partially or completely consuming an animal caught by fishing gear before it can be retrieved[1]. These predators span a wide range of species and commonly include marine mammals, sharks, and large teleosts. Depredation contributes not only to a generally unquantified and unaccounted measure of dead discards but also to gear interactions with managed or protected species, which may in turn result in hooking injury or entanglement. As management measures work to rebuild previously overfished populations, those increased population numbers are more frequently interacting with fishing gear. For instance, shark depredation in the Gulf of Mexico has reportedly been on the rise for many reef fish and pelagic fisheries. As some shark species and marine mammal species retain their protected statuses, there is the potential for continued further increases in depredation. Additionally, discards of those depredated individuals is also likely to increase, as anglers are unlikely to retain a partial/damaged fish as part of their daily bag limit. Those instances of fishing mortality will either typically go unreported with no accountability in stock assessments or, where data are available, will be incorporated into assessments as an additional source of (non-landed) fishing mortality. In addition to impacts on specific fisheries, stakeholders have expressed concerns that an overpopulation of predators may be leading to an ecosystem imbalance, affecting marine food webs. The potential for reference points that are codependent on predator and prey abundances, for stocks managed under different fishery management plans or by different management bodies, makes this an ecosystem issue.

Fisheries involved: Reef fish, pelagic fish, highly migratory species, and shrimp fishery

Geographic area of focus including habitats: Gulf of Mexico and potential co-management with wider Atlantic and Caribbean

Key actors and institutions and their interests: Commercial, for-hire, recreational fishing sectors, Federal and state fishery managers

Relevant institutions that can affect the outcome or contribute to the solution: Federal, state and university fishery researchers; Collaborating fishermen

Data or information gaps: Spatial and temporal measures of depredation, including frequency/quantity relative to both predator and prey species; Predator and prey abundance/biomass estimates by geographic area and month/season, as appropriate. A major gap is to understand why stakeholder perceptions are that depredation has increased significantly while stock assessments suggest only minor increase in predator populations in some species.

Vision of success: Establishment of a standardized depredation, quantification of predator and prey species population/community dynamics, suitable estimates of depredation for incorporation into stock assessments, potential use of ecosystem modeling to explore multispecies reference points, and investigation of potential methods or management measures to reduce depredation events. The ultimate goal is to meet MSA and MMPA requirements while achieving a minimally acceptable level of depredation in fisheries.

04/13/2023

Title: Mitigation of rapidly changing artificial reef habitats in the northern Gulf of Mexico

Description of the management issue:

At the peak of the offshore oil and gas platform construction in 1981 the Gulf of Mexico had 4530 structures in place, by 2020 that number has been roughly cut in half at 1717 with removals continuing as platforms are pulled off production and decommissioned by law. Coincidently the attraction/production debate continues relative to the contributions of this habitat type to fisheries with no resolution in sight. What is clear is that these structures provide hard-bottom habitat in regions for which it is otherwise sparse, such as found in the northwest Gulf of Mexico. Platforms host a wide diversity of fish and invertebrate species that otherwise would be unlikely to occupy the region. In addition, these structures host important species for recreational and commercial fishing sectors (e.g. red snapper and greater amberjack) and are highly popular due to their ease of locating and fishing them. Platforms on average have 4x the fish densities as compared to natural habitats and also create habitat that has unique species composition both vertically (water column) and by depth (e.g. inshore/offshore). Importantly, recent evidence suggests that 45% of the greater amberjack population utilizes these habitats and thus removals would present significant issues for managing the fishery. In addition, removal of this habitat likely displaces fishing effort as they are primary targets for recreational fisherman in the west Gulf. Finally, these artificial habitats host several invasive species providing habitat in regions that would have otherwise been unavailable and also providing a corridor to colonize natural reefs that otherwise might have had a natural barrier to invasion. Because the impacts of artificial structures on population dynamics are not fully understood, installation or removal can result in unintended consequences (e.g., loss of fishing areas, increased catchability leading to increased discards and shortened seasons, creating hotspots for depredation).

Fisheries involved: reef fish (red snapper), pelagic fish (tunas and jacks), invasive species (lionfish),

Geographic area of focus including habitats: northern Gulf of Mexico (primarily west of Cape San Blas).

Key actors and institutions and their interests: Commercial and recreational fishermen; GMFMC - management of fisheries in federal waters; AL/MS/LA/TX state agencies managing inshore fisheries; federal fisheries; oil and gas industry; BOEM; Gulf academic institutions and Centers of Excellence.

Relevant institutions that can affect the outcome or contribute to the solution: NOAA SEFSC; recreational and commercial fishing sectors; oil and gas industry; state and federal agencies.

Data or information gaps: These habitats are frequent subjects of study but typically those have been one off observational type studies with scant efforts to survey them with scientific fisheries surveys. Thus we lack knowledge of their dynamics and contributions to population dynamics, particularly over long time periods. Data that do exist were collected using hook and line (e.g. bandit gear) methods that are highly species- and size-selective. In 2019 NMFS in partnership with FWC began to sample artificial habitats across the northern GOM using camera based

techniques. Despite the recent efforts the survey is in its infancy, methods sorted out, and analysis of the data is needed. All of these structures have associated pipelines stretching through the region of which most are buried but some are exposed. Coupled with recent information from the Great Snapper Count, these habitats are potentially harboring a significant amount of biomass that is potentially a pool of cryptic biomass and their contribution to population dynamics remains a large question.

Vision of success: Coordination among state and federal partners to continue research on contribution of artificial structures to population dynamics and incorporate in management advice, study spatial deployment that is optimal to meet fishery management objectives, determine best practices for removal of structures, and mitigate impacts from the construction of new structures.

Title: Resilience to Climate Change in the Gulf of Mexico Fishing Communities

Description of the management issue:

Profound and pervasive changes are expected to occur in the ocean ecosystem as a result of climate change. Climate change is expected to accelerate the rate of coastal habitat loss, accelerate shifts in species distribution and productivity, and lead to related losses in livelihoods, income opportunities as well as lead to impacts on the cultural and social services. Fisheries managers face an imperative to manage the GOM fisheries so that fishing communities can withstand, cope with, and adapt to climate stressors; in other words, the key management objective is to build socio-economic, ecological and governmental resilience in the Gulf of Mexico fisheries ecosystem. This is an extremely ambitious objective, especially in a context where we lack a comprehensive understanding of the GOM-specific fisheries resilience attributes. Five fisheries-resilience domains have been identified as key to facilitating climate adaptation and achieving resilience in fishery systems in general: assets, flexibility, organization, learning and agency (see Manson et al. 2021). An analysis of historic responses to climate disturbances in the Gulf of Mexico region, can provide important insights on the different fishing-community resiliency attributes (see Mason et al. 2021) that intersect in a community to create fishing-community resilience typologies. These typologies can further our understanding on what we can expect with different climate-change scenarios, and what are the management actions that need to be prioritized to meet the challenges posed by climate change in more resilient ways. The focus of this FEI is identifying the GOM communities that show both significant change or show significant stability in the fishing character throughout the years, and investigate the factors that have contributed to these changes or stability. Longitudinal data from a series of existing data sources, qualitative and quantitative data collected in response to various GOM disasters as well as follow up data collection initiatives are needed to begin to build a comprehensive understanding of GOM fishing-community resilience attributes. This comprehensive understanding will provide the knowledge base needed to draft management actions that will allow fishing communities to cope with and adapt to climate change.

Fisheries involved: All Gulf fisheries

Geographic area of focus including habitats: Gulf of Mexico

Key actors and institutions and their interests: NOAA SEFSC, Gulf of Mexico Fishery Management Council, State agencies, local community organizations, fishing industry representatives, fishing associations and NGOs.

Relevant institutions that can affect the outcome or contribute to the solution: NOAA SEFSC, Gulf of Mexico Fishery Management Council, State agencies, local community organizations, fishing associations and NGOs.

Data or information gaps: Long-term trends in fishing engagement and reliance, gentrification patterns, population migration, fishing business consolidation, and fishing economy diversity

Vision of success: A detailed understanding of the specific needs for resilience in the GOM Fishing communities as well as paths for achieving them. Translation of climate resilience

attributes into operational management objectives that can be measured and considered in management strategy evaluations.