

FL DEP portal submission - Habitat Mapping

Project name: Expand and Enhance Florida Gulf Habitat Mapping

Contact information: Elizabeth Fetherston, Ocean Conservancy, St. Petersburg, FL 33701

Project Location: Florida's Gulf of Mexico continental shelf area

Project description:

In association with the proposed expansion of the FWC component of the SEAMAP reef fish survey, side-scan sonar surveys will be expanded to include shallow habitats out to the shelf break (9m – 110m) from statistical zones 2 – 6. These surveys will be conducted using identical methods to the existing survey, and will be complementary to new and recurring surveys conducted in similar depths by NMFS – Panama City in statistical zones 7 – 10 as well as expanded shelf-edge and deep-coral surveys conducted by NMFS – Pascagoula. Side-scan sonar provides a high-resolution image of the seafloor through visualization of echo strength (i.e., backscatter) to provide a geo-referenced image. These images or mosaics are visually interpreted to identify reef habitat.

Side-scan sonar surveys will be augmented by incorporating multi-beam sonar to collect high-resolution bathymetry and backscatter data necessary to assess sea-floor parameters such as slope, roughness, and hardness and ultimately better evaluate essential fish habitat. Multibeam sonar improves on side-scan sonar imagery by providing fine-scale measures of bathymetry and backscatter (dB) in geo-referenced pixels; providing quantifiable data suitable for spatial analyses and improved classification of reef (and non-reef) habitats. Bathymetric, backscatter, and habitat data along the continental shelf and slope of the eastern Gulf of Mexico have long been recognized as a critical need for improving the efficiency of existing surveys by assuring that sampling gears are deployed on appropriate habitat. Reef-fish abundance and distribution patterns, correlated with improved scale of habitat classification will improve the precision of model-based indices of relative abundance. Collection of swath bathymetry, swath sea-bed backscatter, and side-scan mosaics will go a long way towards filling in many gaps in habitat distribution and abundance within the eastern Gulf of Mexico, improving single-species assessments, and improving our ability to conduct spatially-explicit, ecosystem-based assessment and management.

Estimated Cost:

Other funding: Ongoing funding for both directed and opportunistic habitat mapping data collection from NOAA and other states.

Technical feasibility:

Environmental benefits: There are many benefits of mapping habitats to marine resource management. For example, fisheries biologists are able to assess the availability of suitable habitat for various commercially important fish and shellfish species. Resource managers can reference the maps when siting projects such as docks and piers, mooring fields, dredging sites, cable/pipeline routes, aquaculture

sites, no wake zone designation and other activities that potentially affect the quality of habitats. A better understanding of habitat types and distributions generated through habitat mapping would provide a foundation and support for the entire NRDA-based restoration program. Habitat mapping will also provide fishery scientists and wildlife managers with the information necessary to detect changes in abundance of fish populations and other species exposed to or injured by oil or chemical dispersants and will aid managers with adaptive management decisions.

Improved Gulf habitat maps give NMFS scientists information at appropriate spatial and temporal scales to improve design and interpretation of fish population surveys and to use in current stock assessment models to improve field surveys, improve stock assessments, and reduce need for high precautionary limits in fisheries management. These maps give NMFS the necessary information to deliver high-quality habitat science that can be readily applied by fishery managers – a more comprehensive understanding of the role of habitat in trophic and community interactions and other critical ecosystem processes can result in successful ecosystem-based fishery management (EBFM) and fishery management decisions that have a greater positive impact on the long-term sustainability of habitats, fish production, and many other ecosystem services.

Economic and social benefits: Improvements to habitat mapping data will improve fishery stock assessments and, by association, the fisheries they inform. Florida's world class fishing and the economy it supports depend on the best available information informing assessments of population health.

Community resilience:

Conflicts or compliments to existing efforts:

Complies with local, state, federal laws/regulations:

Readiness for implementation:

Public acceptance: A variety of stakeholders will benefit from comprehensive mapping marine waters including those concerned with: underwater archaeology, cable/pipe laying, navigation/shipping, sand/gravel mining, offshore energy development, aquaculture, resource management, modeling storm impacts, fishing and research. For our purposes, the primary audience will be fisheries and marine resource managers and the resolution of the maps should be detailed enough to meet their needs such as guiding resource assessment surveys and facilitating planning.

Additional information

FL DEP portal submission – Fishery Independent Surveys

Project name: Expand and Enhance Florida Gulf Fishery-Independent Monitoring

Contact information: Elizabeth Fetherston, Ocean Conservancy, St. Petersburg, FL 33701

Project Location: Florida's Gulf of Mexico continental shelf area

Project description:

Fishery independent research data from Florida, along with those collected by the National Marine Fisheries Service (NMFS) Southeast Fisheries Science Center (SEFSC) and the other Gulf states represent the most extensive fisheries-independent information available on long-term changes in fish species composition, abundance and distribution in Gulf of Mexico waters in depths of 5-200fm. These surveys have been designed to collect information in support of stock assessment efforts, and the primary emphasis has been to increase the efficiency of surveys and the amount of data collected. Because our primary mandates are authorized by the Magnuson-Stevens Fishery Conservation and Management Act of 1996, the Endangered Species Act of 1973, and the Marine Mammal Protection Act of 1972, surveys have concentrated on meeting these requirements.

Fisheries-independent data are especially valuable because these data 1) are based on a statistically-valid sampling design, 2) incorporate standardized sampling methodologies, and 3) are collected over relatively long-term periods. To meet the emerging needs of fisheries-independent data, the Florida Fish and Wildlife Conservation Commission's Fish and Wildlife Research Institute (FWC) has been working collaboratively with the remaining Gulf states and the National Marine Fisheries Service Southeast Science Center in recent years to expand regional monitoring capabilities. Funded by multiple grants to FWC, these efforts have focused on the implementation of a multi-gear approach to provide data on various species and life-history stages to not only improve single-species stock assessments, but to further ecosystem-based assessment and management capabilities. This project would expand and enhance the following existing fishery independent data collection programs.

Groundfish Trawl Survey:

Initiated in 2008, the FWC component of the SEAMAP groundfish trawl survey was conducted during both summer and fall within statistical zones 2 – 10 from 2008 – 2010 (spatial extent varied due to funding availability) and depths between 9m and 110m, although current recurring SEAMAP funding is only sufficient to continue sampling statistical zones 2 – 10 in the summer from 2011 onward. This survey provides relative abundance, length and biomass data for numerous species of fishes and macroinvertebrates associated with low-relief, soft-bottom habitats in the eastern Gulf of Mexico as well as associated environmental data, and is a source of valuable life-history data (i.e., age and growth, diet, reproduction, fish health, mercury concentration) for many taxa.

Enhancement of current groundfish trawl sampling activities will be conducted. The FWC component of the SEAMAP groundfish trawl survey will be expanded temporally to include a fall survey in waters 9m – 110m from statistical zones 2 – 10 (Figure 1). These surveys will be conducted using identical methods to the existing survey, and will be complementary to recurring surveys conducted throughout the rest of the Gulf of Mexico by NMFS and the other Gulf states. NMFS – Pascagoula will continue to collect a subset of trawl samples in the eastern Gulf of Mexico, primarily in deeper waters. These enhancements

will help reduce the variance of species-specific data as well as improve abilities to conduct a broad-scale, ecosystem-level characterization of living resources in the eastern Gulf of Mexico. In addition, these surveys will provide additional biological material for various life-history studies (i.e., age and growth, reproduction, diet, mercury concentration) in support of single-species assessment of managed species as well as ecosystem-based approaches to assessment and management.

Plankton Survey:

Currently FWC does not participate in the plankton monitoring survey; however, FWC does house and maintain the SEAMAP Ichthyoplankton Archiving Center. FWC provides facility support for the SEAMAP Ichthyoplankton Archiving Center, including laboratory space for visiting investigators, microscopes, and office space. FWC provides curatorial and technical staff for operation of the Center. The Archive staff receives, catalogs, maintains, distributes, and curates individual lots of ichthyoplankton, adhering to the SEAMAP Operations Plan. All data on identified ichthyoplankton from the Polish Sorting Center is logged into the SEAMAP data management system and transmitted to the SEAMAP / NMFS data manager. FWC maintains computer software and hardware for automated curatorial activities and services.

FWC proposes to continue to operate and support the Archiving Center. However, additional funds are required to support the increased volume of material coming into the Center as FWC, and our state and federal partners increase plankton collection programs.

Additionally, FWC proposes to “piggyback” plankton monitoring surveys onto the summer and fall groundfish monitoring surveys as is done by other state partners (Table 2; Figure 2). Five days at sea will be added to both the summer and fall groundfish monitoring surveys to allow time to complete plankton surveys. All plankton surveys will be completed using both a 61cm bongo net fitted with 0.33mm mesh netting and towed obliquely from the surface to depths of 200m or 2-5m off the bottom and a 2x1m single or double pipe frame neuston net fitted with 0.947mm mesh netting towed at the surface. Collection and processing of plankton surveys will be completed following the strict SEAMAP sampling protocols.

Reef Fish Camera and Trap Survey:

Initiated in 2008, the FWC component of the SEAMAP reef fish survey was conducted within statistical zones 4 and 5 from 2008 to 2012, although current recurring SEAMAP funding is only sufficient to continue sampling in statistical zone 5 from 2013 onward. Through the use of stereo cameras and chevron traps, this survey provides relative abundance and length data for numerous species of fishes and macroinvertebrates associated with high-relief and hard-bottom habitats in the eastern Gulf of Mexico as well as associated environmental and habitat data, and is a source of valuable life-history data (i.e., age and growth, diet, reproduction, fish health, mercury concentration) for several managed species.

Enhancement of current reef fish sampling activities will be conducted. The FWC component of the SEAMAP reef fish survey will be expanded to include shallow habitats out to the shelf break (9m – 110m) for statistical zones 2 – 4 and statistical zone 6 (Figure 3). These surveys will be conducted using identical methods to the existing survey, and will be complementary to new and recurring surveys conducted in similar depths by NMFS – Panama City in statistical zones 7 – 10 as well as expanded shelf-edge and deep-coral surveys conducted by NMFS – Pascagoula. These enhancements will help reduce the variance of species-specific data as well as improve abilities to conduct a broad-scale, ecosystem-level characterization of living resources in the eastern Gulf of Mexico. Further, these surveys will provide valuable life history data (i.e., age and growth, reproduction, diet, mercury concentration) in support of single-species assessment of managed species as well as ecosystem-based approaches to assessment and management.

Bottom Longline Survey:

Currently the FWC does not participate in the bottom longline survey.

FWC will implement a bottom longline survey of reef fishes that includes shallow habitats (< 5fa) from statistical zones 2 – 10 (Table 4; Figure 4). These surveys will be conducted using either commercial vessels or the state-supported R/V *Gulf Mariner* following standardized SEFSC methodologies. Sampling sites will be proportionally allocated among NMFS statistical zones, and specific sampling sites will be randomly selected; overall sampling effort will involve approximately two days of effort per statistical zone. At each sampling site, a 1nm bottom longline will be deployed that consists of 100 15/0 circle hooks placed at a spacing of 31m and baited with cut Atlantic mackerel. Bottom longlines will be deployed parallel to depth contours and will soak for one hour prior to retrieval. All individuals collected will be identified, enumerated, and measured, and a random subset will be retained for life-history studies (i.e., age and growth, reproduction, diet, mercury concentration) in support of single-species assessment of managed species as well as ecosystem-based approaches to assessment and management.

Vertical Longline Survey:

Although FWC has conducted exploratory vertical longline sampling in association with multiple funded proposals between 2008 and 2012, no ongoing surveys are currently funded.

FWC will implement a vertical longline survey of reef fishes that includes shallow habitats out to the shelf break from statistical zones 2 – 10 (Table 5; Figure 5). These surveys will be conducted using either commercial vessels or the state-supported R/V *Gulf Mariner* following standardized SEAMAP methodologies. Sampling sites will be randomly selected from a universe of known reef sites developed based on available habitat data, historical literature, and information provided by commercial and recreational fishers. Sampling effort will be equally allocated among statistical zones, with approximately two days of effort < 20fa and three days of effort > 20fa. At each sampling site, three 10-hook vertical line rigs will be simultaneously deployed. Each rig will be deployed and retrieved using a commercial bandit reel. Each vertical line rig will consist of a 7.3m section of 181.4kg monofilament backbone connected to a 136.1kg mainline. The backbone will be rigged with ten 0.5m gangions at intervals of 0.6m that are made up of 45.4kg monofilament. Each gangion will be connected to the backbone using a snap swivel. Each rig will contain ten gangions of the same hook size (Mustad 39960D circle hooks, sizes 8/0, 11/0 and 15/0), so sampling at a site will consist of the deployment of one 8/0 rig, one 11/0 rig, and one 15/0 rig. All hooks will be freshly baited with Atlantic mackerel cut proportional to the hook size prior to deployment. SEAMAP vertical longline rigs will be deployed, allowed to soak for five minutes, and then retrieved. All individuals collected will be identified, enumerated, and measured, and a random subset will be retained for life-history studies (i.e., age and growth, reproduction, diet, mercury concentration) in support of single-species assessment of managed species as well as ecosystem-based approaches to assessment and management.

Acoustic Survey:

Initiated in 2010, FWC has conducted side-scan sonar habitat surveys in association with the reef fish camera and trap survey. This survey provides valuable data on the distribution and nature of reef habitat in the eastern Gulf of Mexico as well as improves overall survey efficiency.

Enhancement of current acoustic surveys will be conducted. In association with the proposed expansion of the FWC component of the SEAMAP reef fish survey, side-scan sonar surveys will be expanded to include shallow habitats out to the shelf break (9m – 110m) from statistical zones 2 – 4 and statistical zone 6 (Figure 6). These surveys will be conducted using identical methods to the existing survey, and will be complementary to new and recurring surveys conducted in similar depths by NMFS – Panama City in statistical zones 7 – 10 as well as expanded shelf-edge and deep-coral surveys conducted by NMFS – Pascagoula. Side-scan sonar provides a high-resolution image of the seafloor through visualization of echo strength (i.e., backscatter) to provide a geo-referenced image. These images or mosaics are visually interpreted to identify reef habitat.

Side-scan sonar surveys will be augmented by incorporating multi-beam sonar to collect high-resolution bathymetry and backscatter data necessary to assess sea-floor parameters such as slope, roughness, and hardness that are known to influence the distribution and abundance of reef fishes. Multi-beam sonar provides advantages over traditional side-scan sonar, in that backscatter (i.e., amplitude or dB) and bathymetry values are recorded within fine-scale (0.25 – 2m²) pixels across a swath perpendicular to ship track. Co-located bathymetry and backscatter data provides quantifiable metrics to interpret sea-floor habitat through spatially-explicit, habitat classification models. Software will be used to conduct real-time data gathering and mosaicing as well as produce geo-referenced images with high-resolution imagery and backscatter.

Biological Processing and Ecosystem Assessment Capabilities:

FWC currently has established laboratories to process life-history samples for age and growth, diet, mercury, and reproductive histology. Further, FWC scientists have developed working models (i.e., Ecopath with Ecosim, Ecospace, Atlantis) for ecosystem-based assessment of living resources in the Gulf of Mexico.

Estimated Cost: The total budget for all proposed Florida activities is \$40,428,097 over a period of 10 years. Annual budgets vary from year one total \$4,151,529 (including several onetime start-up equipment costs) to \$4,231,389 in year 10. The following provides an itemization of the budget by each specific category.

Other funding: Ongoing fishery independent data collection from NOAA and existing FWC funding for this work.

Technical feasibility: The proposed activities are either currently or have recently been run by FWRI and have scalable research plans.

Environmental benefits: Expansion of fishery independent data collection beyond what is currently sampled will improve the estimates of species abundance and enhance knowledge of geographic distributions. The long-term benefits will be an improved understanding of species interactions over an expanded area and temporal range. This work also provides detailed age, reproductive, trophic, genetic, and health information, along with relative abundance data on multiple components of demersal nekton assemblages which are essential for conducting single-species stock assessments as well as implementing an ecosystem-based approach to resource management.

Economic and social benefits: Improvements to fishery independent data will improve fishery stock assessments and, by association, the fisheries they inform. Florida's world class fishing and the economy it supports depend on the best available information informing assessments of population health.

Community resilience:

Conflicts or compliments to existing efforts: Fishery independent data collection from NOAA and other Gulf states are coordinated through the SEAMAP process and expansion of FWC's fishery independent data collection programs will compliment ongoing efforts.

These specific monitoring plans were developed by the Florida Fish and Wildlife Conservation Commission's Fish and Wildlife Research Institute (FWC) to expand and enhance monitoring activities in the eastern Gulf of Mexico. Combined with integrated surveys proposed by the National Marine Fisheries Service Southeast Science Center (SEFSC) and the other Gulf states (Texas, Louisiana, Mississippi and Alabama), these efforts will provide a comprehensive, ecosystem-level approach to assess the disturbance and ultimate recovery of natural resources in the Gulf of Mexico for the next ten years.

Complies with local, state, federal laws/regulations: There should be no conflict here since the project is a continuation of existing research.

Readiness for implementation: The time it takes to staff and otherwise resource this effort is the only impediment to rapid implementation.

Public acceptance: This project supports state agency personnel and informs management of Florida's world class fisheries that support recreational and retail businesses up and down the coast.

Additional information