Species Protection
FISHERIES MANAGEMENT 101: IMPLICATIONS OF THE SUSTAINABLE FISHERIES ACT FOR GALVESTON BAY

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Purpose
Fisheries Management 101 will briefly review the regulatory framework for fishery resource protection in the Gulf of Mexico and Galveston Bay. It will then discuss the key changes made in fisheries management in the Gulf by the Sustainable Fisheries Act of 1996. Finally it will explore the implications of the Sustainable Fisheries Act on fishery resource management and protection in Galveston Bay.

Overview
The fishery resources of Galveston Bay are an important ecological, economical and cultural asset to the Bay area and the entire Gulf of Mexico. Recognizing the importance of these resources, the United States Congress in 1976 passed the Magnuson Fishery Conservation and Management Act of 1976 which created an exclusive federal economic zone in which our fisheries would be managed to achieve net benefits for the nation. This Act has been amended over time, most notably with the passage of the Sustainable Fisheries Act of 1996 (SFA). The primary focus of the SFA is securing sustainable fishery resources by focusing on identifying and protecting "essential fish habitat"; ending the overfishing of fishery species and rebuilding "overfished" fisheries; minimizing the waste or "bycatch" in our fisheries; and reforming the decision making process of the regional fishery management councils by recusal of voting members who have a financial stake in the outcome.

The passage of the SFA has major implications for our federally managed fisheries in the Gulf of Mexico, as well as those in Galveston Bay. Thus far, these include the following:

1. Galveston Bay was identified as "essential fish habitat" (EFH) for managed Gulf fisheries and the prey that they depend on. This has two effects. First, federal law now requires that federal agencies which authorize or fund activities impacting EFH must assess any adverse impacts on managed and prey species. Second, federal fishery managers must minimize the negative impacts of fishing operations on EFH. This could have major implications for fisheries in Galveston Bay, most notably the shrimp fishery.

2. The requirements that bycatch be minimized has already had an impact on shrimp trawls in the federal EEZ through the required use of bycatch reduction devices (BRDs). The state of Texas will now require consistency with these federal requirements by mandatory use of BRDs in shrimp trawls for state waters (excluding bait trawlers).
3. The identification and rebuilding of federally managed "overfished" fisheries such as red snapper, red drum, and king mackerel will impact commercial and recreational fishermen alike in the coming years.

While some changes in fishery resource management have been made, the implications of the SFA are for the most part unknown as a number of the provisions of this Act have yet to be implemented in the Gulf of Mexico region.
DIAMONDBACK TERRAPIN (*Malaclemys terrapin*) DISTRIBUTION AND NESTING IN ARMAND BAYOU, TEXAS: A DEVELOPED URBAN ESTUARY

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Armand Bayou, in Southeastern Harris County, is a relatively undisturbed Gulf Coastal watershed within the city limits of Houston. The Armand Bayou Coastal Preserve covers 2,800 acres of the Armand Bayou watershed, and is comprised of marshes surrounding large prairies and hardwood forests. The Preserve protects vital riparian and aquatic habitat for hundreds of coastally influenced communities, including benthic macroinvertebrates, fish, and reptiles and amphibians.

Species inhabiting Armand Bayou, however, face serious threats to their long-term survival. Habitat is quickly dwindling in the face of urban development. Real estate sells portions of the Bayou to private landowners, and increasing amounts of real estate in the Armand Bayou watershed are being sold for home construction. In addition to development, the Bayou also faces the threat of subsidence, and water levels have increased up to six feet. As a result, marsh vegetation faces threats of inundation. Almost 95% of tidal marsh vegetation in Armand Bayou has disappeared over the last forty years.

Although 2,800 acres of the Bayou are managed by the state of Texas as a nature preserve, the upper reaches are not protected. A large portion of the Bayou is owned by Exxon, and faces additional stress from cattle grazing and feral hogs. Grazing from these animals threatens marsh vegetation as well as ground-nesting species, including many turtle species.

I plan to survey the abundance, diversity, and density of diamondback terrapin (*Malaclemys terrapin*) along the Bayou in order to determine the effects of historical changes in land-use on diamondback terrapin populations. I will choose four sites along undisturbed and disturbed areas in the Bayou. Two disturbed sites will be located north of the limit of the Preserve, while two undisturbed sites will be situated inside the state-managed land. Sites will be compared for ambient water-quality conditions, including dissolved oxygen, pH, temperature, and salinity. Sites will also be compared for differences in composition and density of riparian vegetation by conducting point quarter vegetation surveys, and by categorizing sites into habitat types based on vegetation and amount of disturbance. I also plan to assess the status of terrapin nesting habitat by rectifying a time series of historical, aerial photographs to the U.S. Geological Survey’s 1996 digital orthophoto quadrangles (DOQ’s).
A web site called DermoWatch (www.blueblee.com/dermo) has been established to help manage *Perkinsus marinus* (*Dermocystidium marinum*) disease of eastern oysters, *Crassostrea virginica*. The main page provides the most recent data for nine stations in Galveston Bay, Texas. Data include water temperature (T) and salinity (S), weighted incidence (WI) and percent infection, and estimated time to a critical level of disease (\( t_{\text{Crit}} \)). Archived historical data for each site is available from the main page and via a map of the Bay. With a utility called the Dermo Calculator, the web site is useful wherever Dermo disease is found. The Dermo Calculator allows anyone with information on water T and S, oyster length (L), and initial WI of disease to calculate a \( t_{\text{Crit}} \). A prototype utility has been developed that uses real-time values for water T and S from a fixed monitoring station. The utility requires input of the time period of interest and L; it returns, in graphical form, a time course of T, S and \( t_{\text{Crit}} \). More frequent values of T and S permit more frequent estimates of \( t_{\text{Crit}} \) and should increase the reliability of the model.
The catch of non-targeted species from directed fisheries has been studied in various fisheries throughout the world (University of Alaska Sea Grant Program 1995) and represents one of the greatest challenges facing fishery biologists and managers today. Reducing the catch of these non-targeted species often comes with some loss of the targeted species, which has been unacceptable to the commercial industry. Finding an effective bycatch reduction device (BRD) that reduces the catch of non-targeted species, yet results in minimal loss of the targeted species, is one of the goals of fisheries managers throughout the world.

The Galveston Bay estuary is an extremely productive and highly diverse ecosystem. At least 175 species of finfish and shellfish have been documented to spend some or all of their life cycle in this system (Parker 1965; Galveston Bay National Estuary Program 1994; Fuls 1996; Fuls and McEachron 1997). Additionally, the bay supports a large commercial shrimp fleet and consistently ranks first in shrimp landings among the commercial ports in Texas (Robinson et al. 1998). During the 1997 fishing year over 7.4 million pounds of shrimp, valued at over $13 million was landed from the Galveston Bay system (Robinson et al. 1998). Over 600 commercially licensed shrimp boats are home ported in the four county area surrounding Galveston Bay (TPW unpublished data) and represent the fishing potential for this system.

Shrimp (otter) trawls are the primary gear used in the commercial shrimp fishery in Texas bays and the Gulf of Mexico (Kjelson and Johnson 1978; Gutherz and Pellegrin 1988; Branstetter 1997). Bycatch characterization studies of the commercial shrimp fleet in Galveston Bay have shown an approximate 4:1 ratio (by weight) of bycatch to shrimp in this trawl fishery (Martinez and Nance 1993; Fuls 1996). Using this ratio with Texas commercial landings data the estimated bycatch in Galveston Bay during 1997 exceeded 29 million pounds.

The Galveston Bay ecosystem is considerably different from other bay systems in Texas where BRD studies have been conducted. Bycatch ratios have been shown to be less, and species composition different in Galveston Bay compared to these other bay systems (Martinez and Nance 1993; Fuls 1996). Additionally, the significance of the current commercial shrimp fishery in Galveston Bay and the potential fishing effort of the fleet resulted in this study being conducted during the spring and fall 2000 commercial shrimp seasons.

Comparative trawl sampling was done using the 26-in² fish-eye and Sea Eagle installed in the top of the bag, six feet forward of the bag tie-off. Trawl catches were sub-sampled for species composition, and weight (nearest 1 g) and counts recorded. Final results will be presented during
this presentation and will include a summary of bycatch groups (eg. Finfish, invertebrates other than shrimp), catch rates (no. and kg) of commercial shrimp species and major bycatch groups and overall bycatch reduction rates (% BRD vs. control).