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Flower Garden Banks National Marine Sanctuary: Introduction

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DEDICATED ISSUE

Flower Garden Banks National Marine Sanctuary

Introduction

The history of exploration, research, and environmental protection at the Flower Gardens is a model of accomplishment through partnerships—a demonstration of how a spirit of mutual support leads to the achievement of shared goals.

More than 100 years ago, Gulf of Mexico fishermen working far from shore discovered a number of shoals with tremendous fish populations. They began to routinely harvest the bounties of these productive ecosystems. Understandably, word of their existence or their location didn't filter far from their own wheelhouses for quite some time.

It was not until the 1930s that many of these two dozen or so features were located and mapped by chart makers. Geologists studied two of the shallowest features, called the Flower Garden Banks because of the brightly colored "rocks" that sometimes snagged on anchors and fishing hooks, in the 1950s and began to suspect they might harbor tropical corals and associated organisms. The first scuba divers at the Flower Gardens in the early 1960s, which consisted of scientists and volunteers working with the Houston Museum of Natural Science, were greeted by massive, continuous coral reefs, larger than most golf courses, and dense schools of tropical fish, manta rays, turtles, and sharks in the warm clear waters over the banks. Over the next 35 yr or so, first-time visitors to the Flower Gardens have consistently reacted with the same awe as those first adventurers—Tom Pulley, Charlie Doh, Dick Thomoy, and others—some of whom can still be coaxed to tell their sea stories.

Thus began about two decades of exploration at the Flower Gardens. Between 1960 and 1980, expeditions to the banks by divers and submersibles, mutually funded by the Museum, the Flower Gardens Ocean Research Center, and later by the Bureau of Land Management, gradually elucidated the tropical assemblages not only on the tops of the banks, but throughout their depths down to over 100 m deep. Scientists also found some unique features, including ancient drowned reefs, natural gas seeps, and a brine lake and overflow canyon on the East Bank inhabited by chemosynthetic bacteria. Studies on the brine seep suggested that large volumes of salt must be in the pro-

cess of dissolving from beneath the bank. High-resolution images of the banks, made possible by technological advances in the 1980s and 1990s and produced first by the Navy and then at even higher resolution by the U.S. Geological Survey, clearly revealed a depression more than a mile across, up to 15 m deep, and surrounded by faults, which strongly supports this theory.

The last 20 yr has seen a scientific evolution at the Flower Gardens from exploration to monitoring and research on the shallow coral reef zones. The descriptive and taxonomic surveys of the banks through the 1970s gave way in the 1980s to studies on coral growth rates, recruitment, coral recovery rates following mechanical damage, and the effects of a region-wide die-off of sea urchins. In the 1990s, scientists investigated coral bleaching, mass spawning, embryology, genetics, uptake of trace metals by corals, coral-algae symbiosis, fish assemblages and trophic structure, sea turtle habitat use, manta and shark behavior, and even the occurrence of birds in the sanctuary. Some of these studies are featured in this issue.

The 1990s also was a period of significant growth for tourism at the Flower Gardens, with 3,000 or so recreational divers arriving each year aboard large dive charters. But this decade also benefited from a genuine commitment by this group to protection of the Flower Gardens from real-life threats to their continued health. To reduce the effects of anchoring, a group of divers installed mooring buoys on the banks in 1990, then later donated them to the marine sanctuary, which was designated in 1992. Some of the same people served on the advisory committee for the sanctuary and participated on the many monitoring and research projects conducted during this period. During one phase of monitoring between 1989 and 1992, 64 divers participated on the project. More than 50 were unpaid volunteers.

Another group to pitch in during the 1990s was the oil and gas industry. From annual do-

nations to the Flower Gardens Fund, an arm of the Gulf of Mexico Foundation established to support the sanctuary, to allowing scientists to live and work on their platforms for weeks at a time, companies working around the Flower Gardens actively supported conservation and scientific research.

The first decade of the new millennium brings new challenges to the Flower Gardens. Predicting use and the threats posed by changing patterns of multiple use may be the most important. For example, how the recreational diving industry will change in the next decade is unclear. On one hand, people are coming from farther and farther to visit this unique location. Dive groups from many U.S. states frequently book trips aboard the two largest live-aboards that operate at the Flower Gardens. On the other hand, repeat visits by divers from the Gulf Coast may be on the decline, as most of the active divers in the region have been there numerous times. Thus, depending on what balance results, one possibility is that more or larger live-aboard charter boats will begin to operate at the Flower Gardens. In preparation for this eventuality, it would be prudent for managers and researchers to begin to address the question of the carrying capacity of the reefs. Research and monitoring topics of specific interest might be determining current use levels, predicting future use, seeking evidence of impacts at current use levels, modeling future impacts, and conducting table-top risk assessments, such as reasoning potential impacts and identifying ways to monitor them.

Also among the challenges for continued preservation of the Flower Gardens is the need to remain vigilant in the face of a changing offshore oil industry. As oil prices drop, or as deepwater production increases, large companies tend to sell off marginal assets. This has begun to happen near the Flower Gardens, particularly among the older platforms and fields. Smaller companies purchasing such platforms may or may not be as environmentally sensitive as their larger associates, potentially increasing the risk of spills or other operational accidents. In any case, a substantial effort needs to focus on educating the new companies about the value of the neighboring resources and the regulations, policies, and operating procedures of the sanctuary. The objectives should be to understand each party's needs, to develop collective respect, and to form a mutually productive partnership by pursuing shared goals.

An area of negligible research attention over

the years has been tracking the effects of commercial fishing on the Flower Gardens. Though gear restrictions exist in the sanctuary, mainly to reduce the threat of mechanical damage by destructive bottom fishing methods, fishing effort is not controlled. Most fishing takes place in the extensive area of rugged topography in the deeper portions of the banks beyond scuba diving depths, but little is known regarding how much fishing occurs, when it occurs, or what proportion of the commercial stock is removed annually. One way to address the question of impact would be to establish deep-water monitoring stations in areas known to be fished regularly. Data collection could involve traditional sampling or repetitive visual censuses using submersibles or remotely operated underwater vehicles, preferably in cooperation with the National Marine Fisheries Service. Shipboard or aerial surveys and observations from nearby platforms could help to discern temporal and spatial patterns of fishing and other activities.

Another challenge in the next decade will be to monitor the effects of regional and global changes in climate patterns. There is much debate over the evidence purported to indicate the effects of climate change at many reefs throughout the world—coral bleaching and mass mortalities, for example. In many cases, this is because it is difficult to separate the impacts of the apparent regional changes in climate from all the other stressors affecting coral reefs on a local scale, such as overfishing or water quality changes. The Flower Garden Banks would be ideal locations to conduct such studies. The ecosystems are fairly simple compared to other reefs. The banks are far from shore, have very predictable annual temperature cycles, and have relatively low diversity, and the shallowest reefs are comparatively deep, around 20 m, reducing the confusion caused by the short-term variability typical of shallow-water reefs. For these reasons, annual and longer term events would probably be easier to identify and evaluate here. Recent studies on coral skeletons suggest that regional climate change over the last 100 yr or so is clearly recorded by the annual bands of corals on the banks. Strong and distinct yearly fluorescent banding records in corals suggests that even annual changes may be more clearly identifiable at the Flower Gardens than at most other reefs.

Perhaps the most exciting future potential resides in the most significant challenge—to build increasingly productive partnerships with the public and with conservation-minded sup-

port organizations. From research to public education, active participation by members of the public is the only way for a small sanctuary to have a large impact. The sanctuary staff will have to stimulate students, teachers, divers, dive clubs, environmental action groups, off-shore industry, and researchers to continue to help meet the resource protection needs for this remote area. In so doing, the site will develop a broader constituency for itself and for the national system of marine sanctuaries. They will have to facilitate projects by graduate students in any number of fields, including science, technology, socioeconomics, or public policy. Staff will also have to convince funding agencies in the government and nonprofit arenas to sponsor research, education, and conservation programs at substantially higher levels than have been realized to date. This should include efforts to raise the level of recognition of the Flower Gardens among major scientific funding agencies, perhaps even pursuing special area designations that encourage directed research. This may not be as large a challenge as one might expect. The Flower Gardens clearly harbor two of the healthiest coral reefs in the western Atlantic, and may be among the few reefs anywhere that can still be considered to be in nearly pristine condition.

They are, quite simply, ideal locations for fundamental coral reef research.

So it is to all those who helped make the Flower Garden Banks what it is—protected, healthy, respected, yet still something of a mystery to the outside world—who helped the graduate students and professional scientists do research and monitoring and who volunteered their time to bear witness to children, teachers, and friends about the allure of the place, that this issue is dedicated. Abiding thanks to all of you.

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