Gulf Gems:

Treasured Places in Troubled Waters

Marine Conservation Institute

"Protecting vital sources of renewal—unscathed marshes, healthy reefs, and deep-sea gardens—will provide hope for the future of the Gulf, and for all of us."

—Sylvia Earle

On The Cover: The Gulf of Mexico as seen from space, Credit NASA.
Inside Cover: Life in Madison Swanson, Credit NOAA.

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Suggested Citation:
Shugart-Schmidt, K. L. P., E. O. Ruff, and M. Z. Gravitz. 2014. Gulf Gems: Treasured Places in Troubled Waters. 32 pp. Marine Conservation Institute. Seattle, WA.

About Marine Conservation Institute

Marine Conservation Institute is a team of highly-experienced marine scientists and environmental-policy advocates dedicated to saving ocean life for us and future generations. The organization's goal is to help the world create an urgently-needed worldwide system of strongly protected areas—the Global Ocean Refuge System (GLORES)—a strategic, cost-effective way to ensure the future diversity and abundance of marine life. Founded in 1996, Marine Conservation Institute is a US-based nonprofit organization with offices in Seattle, near San Francisco, and in Washington DC.

Acknowledgements

We are deeply indebted to Thomas Shirley, Charles Fisher, Erik Cordes, Harriet Nash, Tim Jones, and Sandra Brooke for providing valuable insights and constructive comments, and to Beth Pike for her mapping work, Stacey Harter for providing images, Lance Morgan for his thoughtful review, and Carolina La Rotta Dratva for the design and layout. We would like to thank the Herbert W. Hoover Foundation for supporting Marine Conservation Institute on the Gulf Gems report and many other important projects over the years.

For more information visit
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Table Of Contents

Introduction 1
Key Terms 2
Pulley Ridge 3
Madison Swanson, Steamboat Lumps, & The Edges 5
Big Bend 7
The Pinnacles 9
Map of the Gulf 11
South Texas Banks 13
West Florida Slope Lithoherms 15
Horseshoe Bank 17
Florida Keys 19
Viosca Knolls 21
Florida Middle Grounds 23
References 25

Image Credit: NOAA

Introduction

Americans, by and large, have three different images of the Gulf of Mexico. The first is of idyllic white sand beaches and palm trees that line the west coast of Florida and Alabama; the second is of vast marshlands off the coast of Louisiana filled with birds and other wildlife; and the last is of the 2010 Deepwater Horizon disaster with oil gushing out of the underwater pipe and oiled birds and turtles floating lifeless on the surface of the water. These conflicting images, especially the last, have thrust the pollution and health of the Gulf of Mexico into the public consciousness in a way and at a scale that has never happened before.

Significantly, the last image of the blowout preventor spewing oil into the water column, onto the surface of the water, and in the marshes showed people that the Gulf is more than just a collection of sparkling waves and beaches. These events illustrated that the Gulf has depth and is home to ecosystems as varied and dynamic as wafting sea grass beds, coastal marshes, open ocean spawning areas, and near-lightless coral reefs.

The Deepwater Horizon spill damaged many rich, unique ecosystems of the Gulf. Unfortunately, restoring quite a few of these sites to undamaged condition will be difficult, if not impossible. Also, the cumulative and long term effects of the oil and dispersants may not be fully known for many years. Sites that were deep underwater close to the outpouring of oil, coastal waters where oil mats formed and sank, and marshes that were heavily coated with oil will take a very, very long time to regain health, if ever.

One way of mitigating or compensating for this long lasting damage is to protect comparable ecosystems in undamaged locations. But these relatively undamaged places face threats besides oil pollution, such as climate change, destructive fishing methods, and water pollution that can be controlled or moderated by other measures.

Recognizing this, Marine Conservation Institute wanted to highlight ten (out of hundreds) of the most spectacular areas found in the US region of the Gulf of Mexico that remain undamaged by the Deepwater Horizon oil spill but could use protection from other threats. The "**Gulf Gems**" we chose range in depth from just a few feet to hundreds of feet, and contain hundreds of species which need clean water and protection from extractive activities.

Our **Gulf Gems** span the breadth of the Gulf, from Texas to Louisiana to the Florida Keys. While not intended to represent the full span of important ecosystems across the Gulf, they do showcase some of its places that are still untouched enough to contain incredible ecosystems worth preserving.

We believe that protecting sites is important, whether from destructive bottom trawl fishing, extractive oil and gas activities, or coastal pollution from nutrients or sediments. In most cases, there are several ways to protect each one of our **Gulf Gem** sites, ranging from critical habitat status designation under the Magnuson-Stevens fishery law (e.g. Habitat Areas of Particular Concern), to national marine sanctuary or national monument status, or simply limitations on nearby oil and gas exploration.

These suggestions are just that – initial ideas that will require much more detailed analysis and balancing. While we have tried to suggest a specific enhanced protective status for each **Gulf Gem**, we ask the reader to focus not so much on that but on the wonderful places, rich biodiversity, and unique ecosystems represented in our selected **Gulf Gems**.

We hope that you will agree that our underwater **Gulf Gems** are every bit as spectacular and worthy of care as the beautiful beaches, bayous, and bays with which most people are familiar. Our aim is to inspire efforts to protect these underwater places much as citizens around the Gulf have worked to protect their marshes, beaches, and bays.

Key Terms

Essential Fish Habitat (EFH): specific waters and substrates that are necessary to fish life cycles

Habitat Areas of Particular Concern (HAPC): subgroups of rare EFH that are of ecological importance and are especially susceptible to anthropogenic damage

National Marine Sanctuary (NMS): areas protected under the U.S. National Marine Sanctuary Act that do not exclude extractive uses, however, activities that take place within these allocated areas are regulated by the Secretary of Commerce

Marine Protected Area (MPA): a clearly defined marine space recognized and managed by law or other effective means to protect and conserve local flora and fauna as well as historical and cultural features; a no-take zone refers to a specific designation of MPA where extractive uses of any kind are strictly and totally prohibited

Aquatic Preserve: specific area implemented for the protection of localized marine habitats and organisms

Mesophotic Coral Ecosystem (MCE): light-dependent coral communities that occur in the deepest half of the photic (light-receiving) zone in tropical or sub-tropical waters

Lithoherms: short for "lithified bioherm"; a deep-water carbonate mound

Remotely Operated underwater Vehicle (ROV): unoccupied, highly maneuverable vessels used in deep water exploration

Bureau of Ocean Energy Management (BOEM): U.S. agency that manages oil, gas, and renewable energy-related activities including resource evaluation, planning, and leasing

Image Credit: Pete Markham, https://www.flickr.com/photos/pmarkham

Pulley Ridge

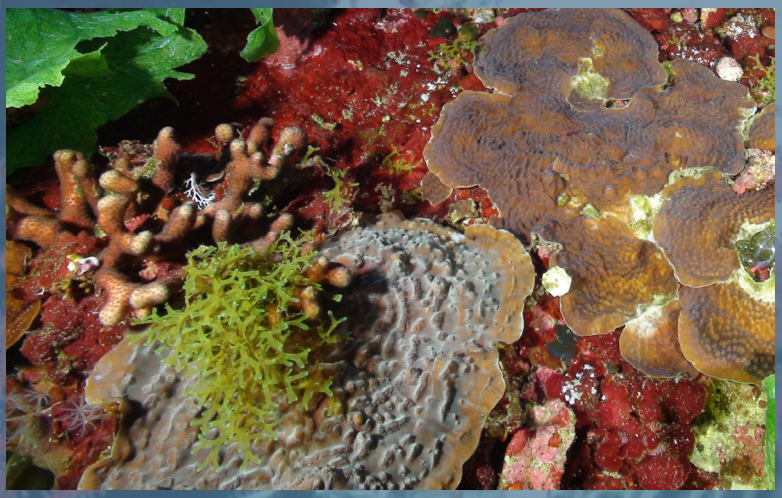
In the zone between where SCUBA divers delight in sunlit waters and where Remote Operated Vehicles explore the darkest depths, one coral reef lies right at the edge of what is possible. When descending two hundred feet under the surface of the ocean, over a hundred pounds of pressure fall on each square inch of a diver's body and special mixes of breathing gas are required as a regular oxygen mix becomes toxic. But if we took the plunge, we would arrive at Pulley Ridge – the deepest known photosynthetic coral reef off of the continental United States.

Reef-building (or hermatypic) corals are rarely found below 150 feet, but Pulley Ridge is a riot in color, dominated by blue-purple and tan-brown stony corals and dotted with neon-bright splashes of orange, yellow, and green. A particularly striking macro algae is also prevalent along the substrate, giving the ridge the appearance of being covered by fields of green lettuce. While fish are not particularly dense along the ridge, it is inhabited by more than 60 species, including commercially important species such as red grouper. Many of the species found at Pulley Ridge are also found in much shallower reef ecosystems, but these shallower areas face greater threats, mainly due to their proximity to human activities and effects.

Current Status and Threats

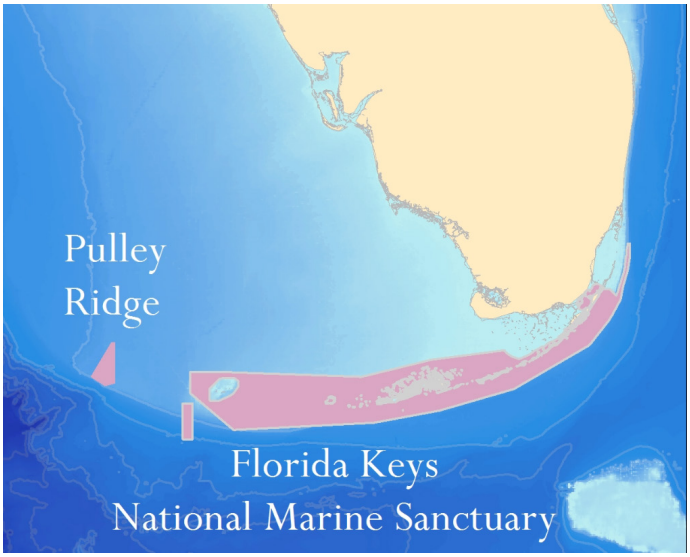
Although many coral reefs have faced declining health in recent years from ocean warming, overfishing, or land-based pollution, Pulley Ridge seems to be an exception to the rule. Scientists are unsure if it's the warm current, nutrient rich waters, or simply that the depth of the ridge better protects it from human influence, but Pulley Ridge may be so healthy that it even supplies new fish and coral larvae to shallower water coral sites surrounding the Florida Keys.

In 2005, a section of Pulley Ridge was designated as Habitat Area of Particular Concern (HAPC), which prohibited bottom anchoring by fishing vessels, bottom trawling, bottom longlines, buoy gear, and all trap/pot use in the area. However, HAPC status does not regulate activities (such as anchoring) by vessels not engaged in fishing, nor does it regulate other non-extractive uses (such as diving). Additionally, only a portion of the ridge is currently protected.



Future and Recommended Protection

Both the uniqueness and vulnerability of Pulley Ridge highlight its need for increased protection from damaging activities. An expansion of the nearby Florida Keys National Marine Sanctuary could extend key protections to the Ridge, including prohibitions on anchoring, discharging and dumping, and resource extraction. In the meantime, enlarging HAPC coverage would be a good first step to ensuring that the corals of Pulley Ridge not only continue to thrive, but continue to act as a genetic reservoir protecting against the consequences of ocean change.



Species Spotlight

Roughtongue bass
(Protonogrammus martinicensis)

This colorful fish likes to live in the depths of the United States' deepest photosynthetic coral reef, preferring depths of 215-750 feet. Like red grouper and parrotfish, roughtongue bass are protogynous hermaphrodites, which means they are born as females but convert to males during their lifespan.

At a maximum length around 8 inches, these small fish serve as a crucial link in the food chain between zooplankton and large secondary consumers such as red snapper and grouper. Due to its bright color and small size roughtongue bass are popular among aquarium enthusiasts. Roughtongue bass have robust populations in the Pulley Ridge area and other regions of the Gulf of Mexico.

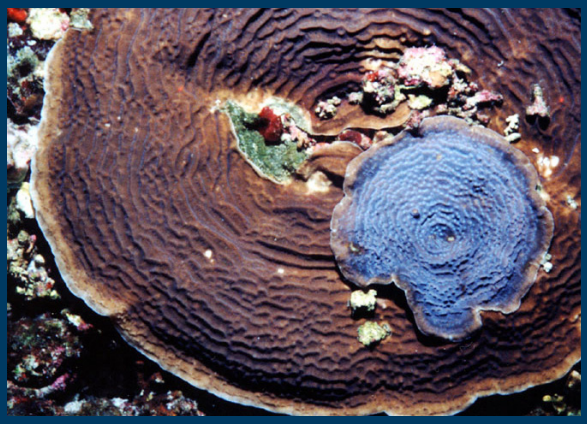


Image Credit: Opposite Page from Left to Right, John Reed using the University of North Carolina at Wilmington Super Phantom S2 ROV; Current Page from Left to Right, Brian Cousin at Florida Atlantic University Harbor Branch, NOAA, NOAA; Current Page Center, USGS

Madison Swanson, Steamboat Lumps, & The Edges

Implemented over a decade ago as experimental "no-take" sites, Madison-Swanson and Steamboat Lumps Marine Reserves are now established MPAs. They are closed year-round to reef fish fishing (i.e. bottom fishing) and seasonally for non-reef fish species. To go along with their interesting names, these two reserves provide necessary habitat for a plethora of fascinating marine organisms.

Arrow crabs, hermit crabs, basket stars, sea fans, corkscrew sea whips, and Oculina coral are just of few of the countless species that call the reserves home. The topography of the seafloor in these areas varies as much as the species that reside there. Limestone cliffs, rocky outcrops, and sandy fields can be found throughout these sites.

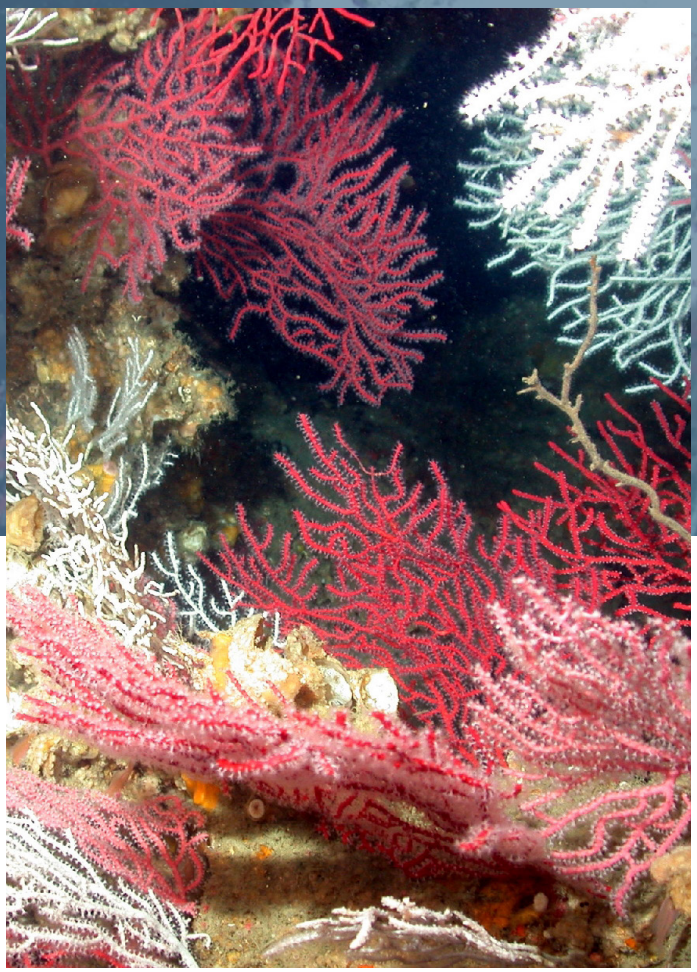
Declining populations of grouper species, especially the gag grouper, prompted the initial design of these two areas. With the addition of The Edges during seasonal closures, Madison-Swanson and Steamboat Lumps cover 600 square miles of the Gulf, but research has suggested that spatially larger MPAs are needed for full recovery.

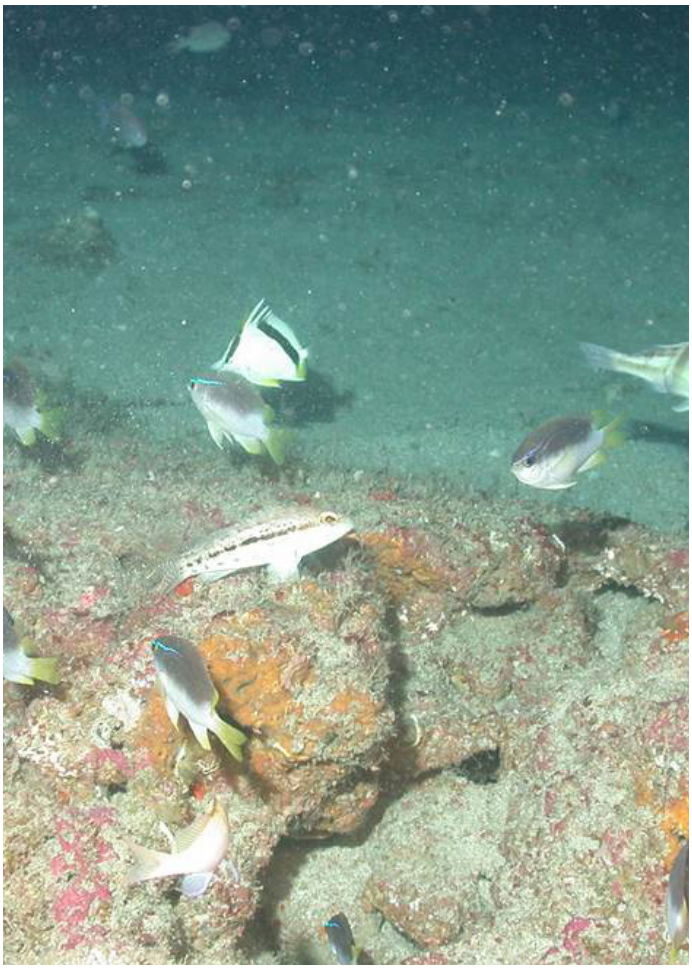
Current Status and Threats

While Madison-Swanson and Steamboat Lumps do not permit reef fishing at any time of the year, The Edges is seasonally open to all fishing from May through December. Large male groupers are often targeted during this open season, which can be problematic as declines in their numbers negatively impact the reproduction cycle of localized populations. Additionally, abandoned longlines left by reef fishers during this open season continue to "fish" the waters even after the close of the season.

Future and Recommended Protection

Year-round restrictions on fishing are optimal for the linked ecosystems that make up Madison-Swanson, Steamboat Lumps, and the Edges. Research shows that grouper in Madison-Swanson and Steamboat Lumps, where reef fishing is prohibited year-round, are both larger in size and number than those found in the surrounding fished waters. Fully connecting the three areas through consistent regulations would more completely protect vulnerable species and help to ensure vibrant populations into the future.





Species Spotlight

Gag Grouper (*Mycteroperca microlepis*)

Often confused with the black grouper due to similar spot patterns, the gag grouper is smaller than most grouper species, varying between 2-4 feet in length and 10-20 pounds in weight. Like most species of grouper, the Gag is slow to mature and takes longer to reproduce which makes populations vulnerable to overfishing.

These fish like the deep seas, choosing to dwell on the ocean bottom in water over 60 feet deep and feed on fish (sometimes their own young), crabs, shrimps, and crustaceans. The gag grouper are also protogynous hermaphrodites, starting their lives as females before transitioning to males later in life. Populations of gag grouper are plentiful in the southeast, but overfishing and a large algal bloom in 2005 caused a significant decline in Gulf of Mexico numbers.

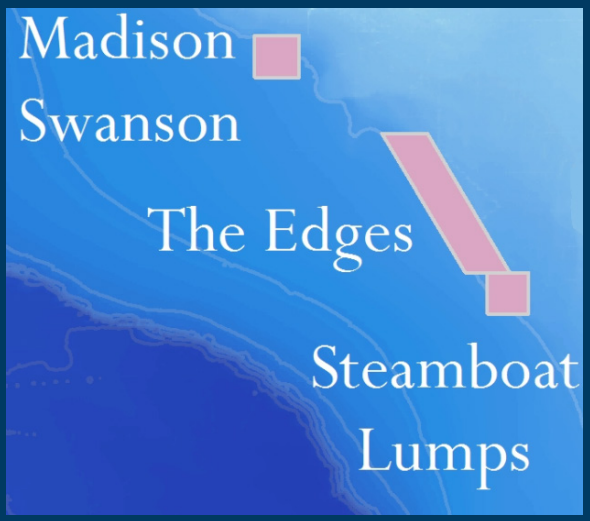


Image Credit: Opposite Page from Left to Right, NMFS/SEFSC, NMFS/SEFSC; This page from Left to Right NOAA, NMFS/SEFSC; Bottom Center, NMFS/SEFSC

Big Bend Seagrasses Aquatic Preserve

Work your way along the Florida gulf coast, north from Tampa or south from Destin, and you'll find yourself suddenly in a world without parking garages or apartment buildings. You'll arrive instead at the Big Bend Seagrasses Aquatic Preserve – an almost million acre wilderness and vestige of natural Florida. Take a boat out from shore, and you'll find shoal grass, turtle grass, star grass, and manatee grass. Amidst the waving green, you'll encounter bay scallops, dolphins, sea turtles, and more.

Established in 1985 by the state of Florida, Big Bend protects an ecosystem no longer common along the Gulf Coast. Coastal development, commercial fishing operations, and environmental changes have reduced seagrass beds, and that trend is continuing. But here in Big Bend, seagrasses still reign. They provide habitat and homes for a huge variety of species, including more than 50 which are threatened or endangered (including manatees, sea turtles, birds, fish, reptiles, and plants, as well as others).

Big Bend is also well known for its population of bay scallops. Although heavily recreationally fished, the population of scallops is the most stable in Florida. However, heavy use has also resulted in significant problems caused by "prop" scarring – divots and cuts left in the seagrass beds by boat propellers slicing through too-shallow water.

Current Status and Threats

One of the major challenges facing the Big Bend area is the increasing fragmentation of the continuous seagrass beds into patchy zones. Not only is this a troubling sign of possible large-scale problems from increased pollution, it also results in reduced habitat availability for resident species. Compounding this challenge is the difficulty associated with identifying and surveying seagrass beds found in the deeper water around the edges of the preserve.

Researchers believe that the beds extend past state waters (i.e., beyond nine miles) and into federal waters, but funding difficulties have prevented surveys of these areas, and their current status is unknown. However, there is reason to suspect that these seagrasses (primarily paddle grass) may be heavily impacted by commercial trawling for pink shrimp, and that this activity may harm crucial habitat for a number of fish species. Gag grouper, the most important and highest priced reef fish in the southeastern region of the US uses these seagrasses and rocky reef habitats for its nursery years.

Future and Recommended Protection

Since on-site enforcement is difficult and restoration is expensive, an educational campaign aimed at recreational boaters may provide a better strategy for reducing prop scarring. Additionally, efforts to "close the gap" in the preserve and extend the protected area into one continuous strip may assist in the fight against seagrass fragmentation.

Most importantly, surveying the federal edge of the preserve is critical to understanding the current status and extent of deeper water seagrasses, as well as to ensure that proper protections are in place for them. Not only will this protect the physical environment, but also help to sustain key fish populations into the future.

A Manager's Perspective

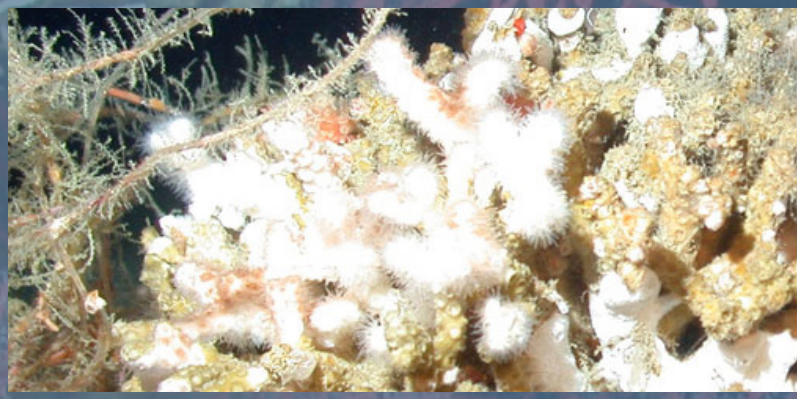
Tim Jones, Big Bend Aquatic Preserve Manager

"Big Bend Seagrasses Aquatic Preserve (BBSAP) is comprised of mostly rural and sparsely developed coastal habitats spanning more than 984,000 acres. These pristine and relatively undisturbed waters make ideal habitats for nature based tourism. Within BBSAP is one of the largest contiguous seagrass beds on the Gulf Coast. Seagrass meadows make an ideal nursery for many of these creatures by acting as a food source and providing cover from larger predators.

BBSAP is especially important for commercial and recreational fisheries. The seagrass beds provide vital habitat to many sport fish such as redfish, speckled sea trout and grouper. Commercial catches also include stone crab, blue crab, oysters, shrimp and mullet. Bay scallops are found in abundance. Many of the Big Bend's coastal communities depend on the millions of dollars in revenue generated by the annual recreational harvest of bay scallops. In 2009, research findings indicated that the 2.2 million acres of seagrass in the Big Bend area provides ecological services of more than $40 billion on an annual basis.

Seagrass beds are an indicator of a healthy ecosystem, and our biggest challenge as resource managers is maintaining these coastal habitats in their pristine condition for future generations. As part of Florida Coastal Office, our vision is a healthy coastal environment, achieved through credible science, partnerships, stakeholder input, and place-based management, that encourages sustainable recreation, education, and economic opportunity."

Image Credit: All Photos, Tim Jones



The Pinnacles

Step off the Alabama coast, jump in a time machine, and set the dial back 18,000 years. You'll arrive at a world where ice covers most of North America and sea level is a dramatic 300 feet lower than it is today. In this world, the continental shelf of the Gulf of Mexico is much closer to the surface and is inhabited by thriving, sun drenched coral reefs. Look out the window as you fast forward back to the present, and you'll see these reef building communities try in vain to keep up with rising seas, ultimately "drowning" in 300 feet of water. Today, they exist as tall, steep-sided pinnacles.

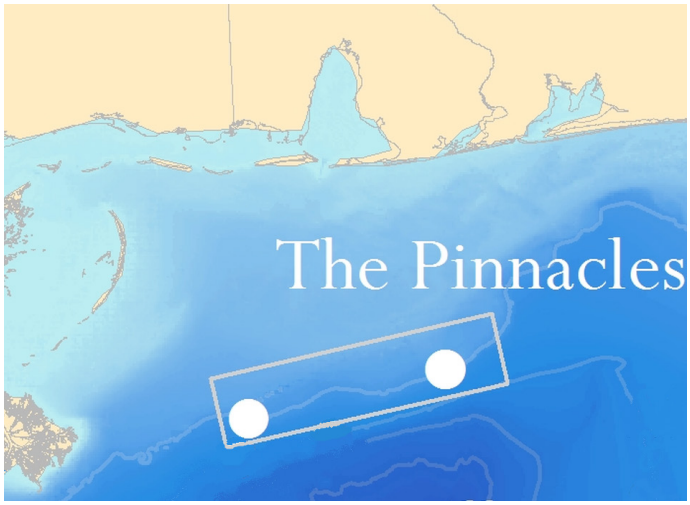
Yet as always – life finds a way – and today these fossil reefs are inhabited by soft corals, sponges, crinoids, black corals, and small, solitary hard corals. The area is dominated by roughtongue bass and red barbier. Large predatory fish species like snowy grouper, red snapper, and amberjack hunt among the slopes.

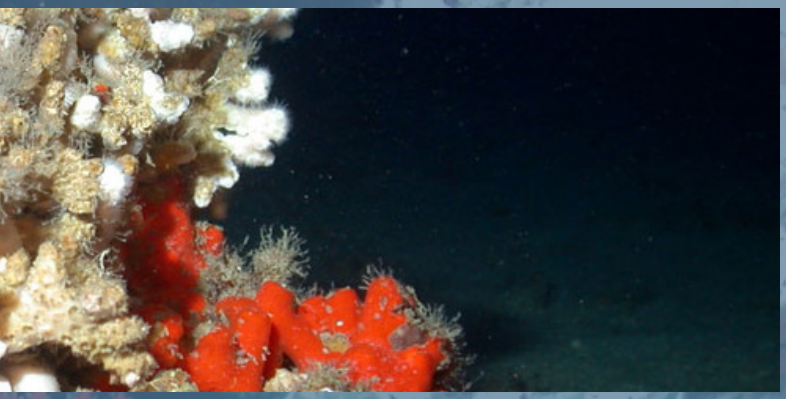
Herbivorous grazers, like parrotfish, are absent as little plant growth can occur in such light-limited water, and plankton is the most common food source.

Current Status and Threats

With names like Yellowtail Reef, Roughtongue Reef, and the Alabama Alps, each of the Pinnacles hosts its own small world of creatures. Yet the area surrounding the Pinnacles region is dense with oil and gas exploration and production.

Production platforms now span the continental shelf, and many potential drilling "lease sites" are still open to new development. Additionally, the Pinnacles are open to fishing activity and harbor many commercially desired species. There are no marine protected areas in the region.





Future and Recommended Protection

The uniqueness of the Pinnacles and the fragility of the ecosystems there suggest that some level of habitat protection would be appropriate. Designation as a Habitat Area of Particular Concern (HAPC) or inclusion in a National Marine Sanctuary (such as Flower Garden Banks) could help protect the Pinnacles and ensure that they remain for another 18,000 years.

Species Spotlight

Basket Star *(Gorgonocephalidae)*

Although the derivation of its family name comes from a physical similarity to the writhing serpents that form the hair of the lethal Gorgons of Greek mythology, the basket star is only deadly to the small crustaceans, zooplankton, and jellyfish that make up its diet. Like tree branches, the five arms of the basket star split one after another into smaller and smaller offshoots. These arms are covered in tiny hooks that help them grip their food and can be regrown if damaged or eaten.

Basket stars are nocturnal and curl up into a tight ball to protect themselves from predators during the day. Gorgonocephalidae fossils have been found dating to the Miocene Epoch (~23 million-5 million years ago).

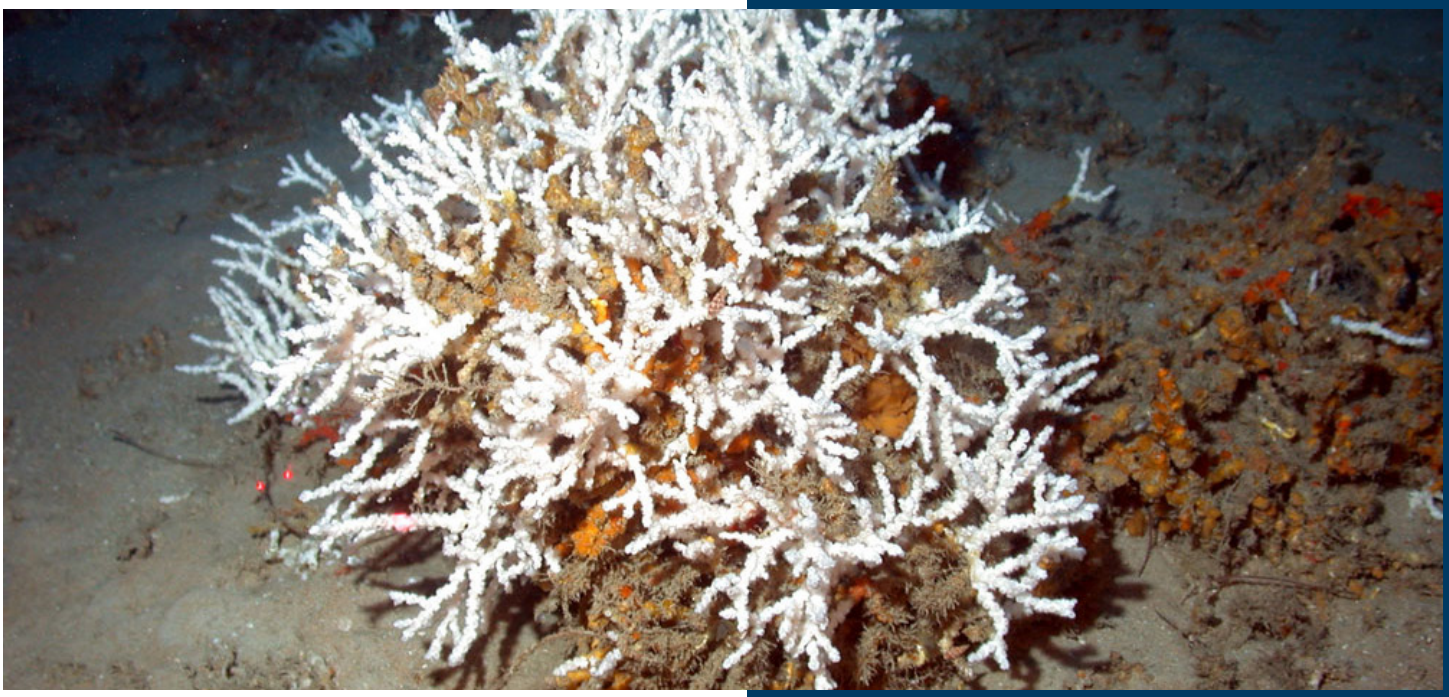
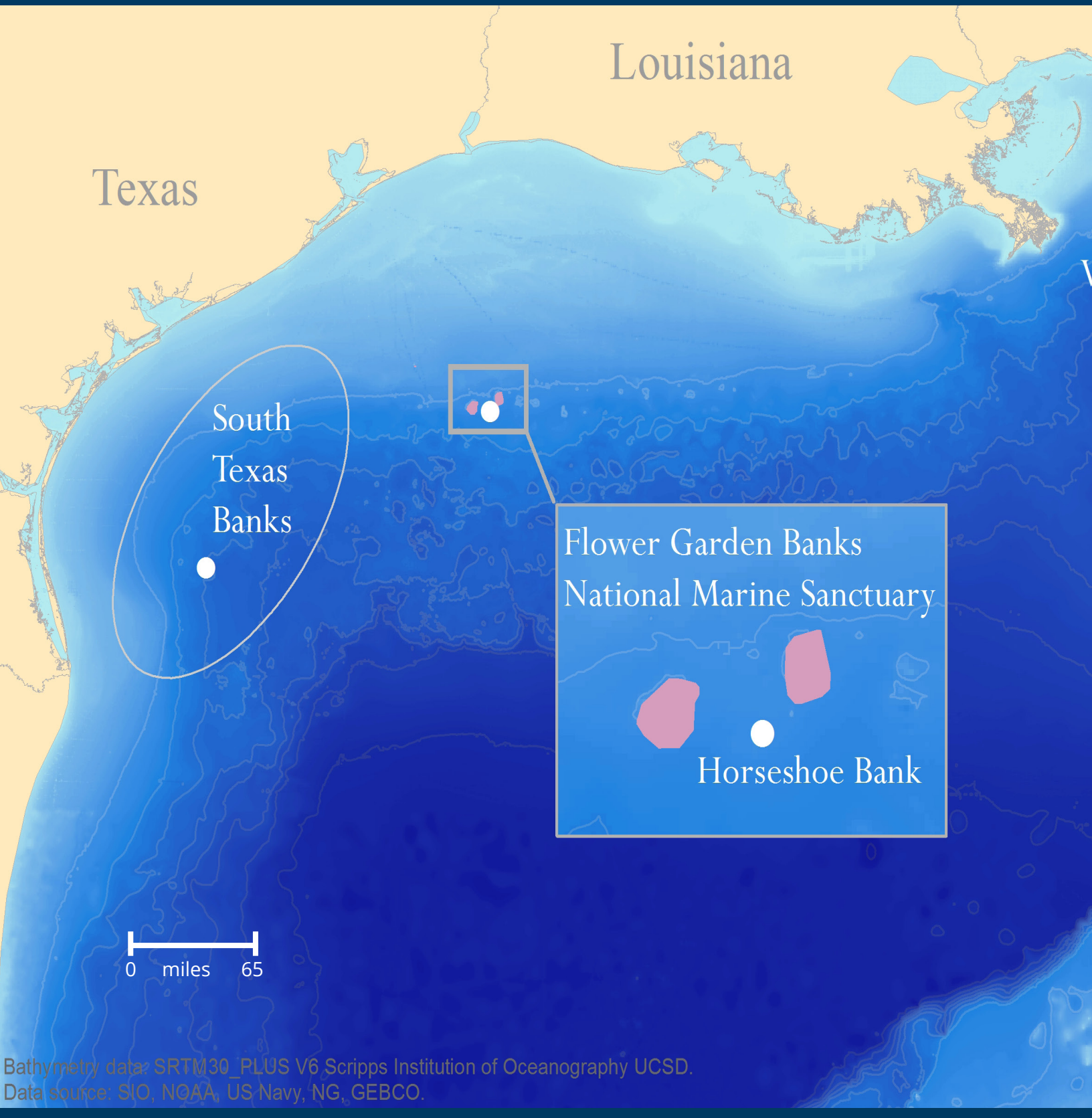
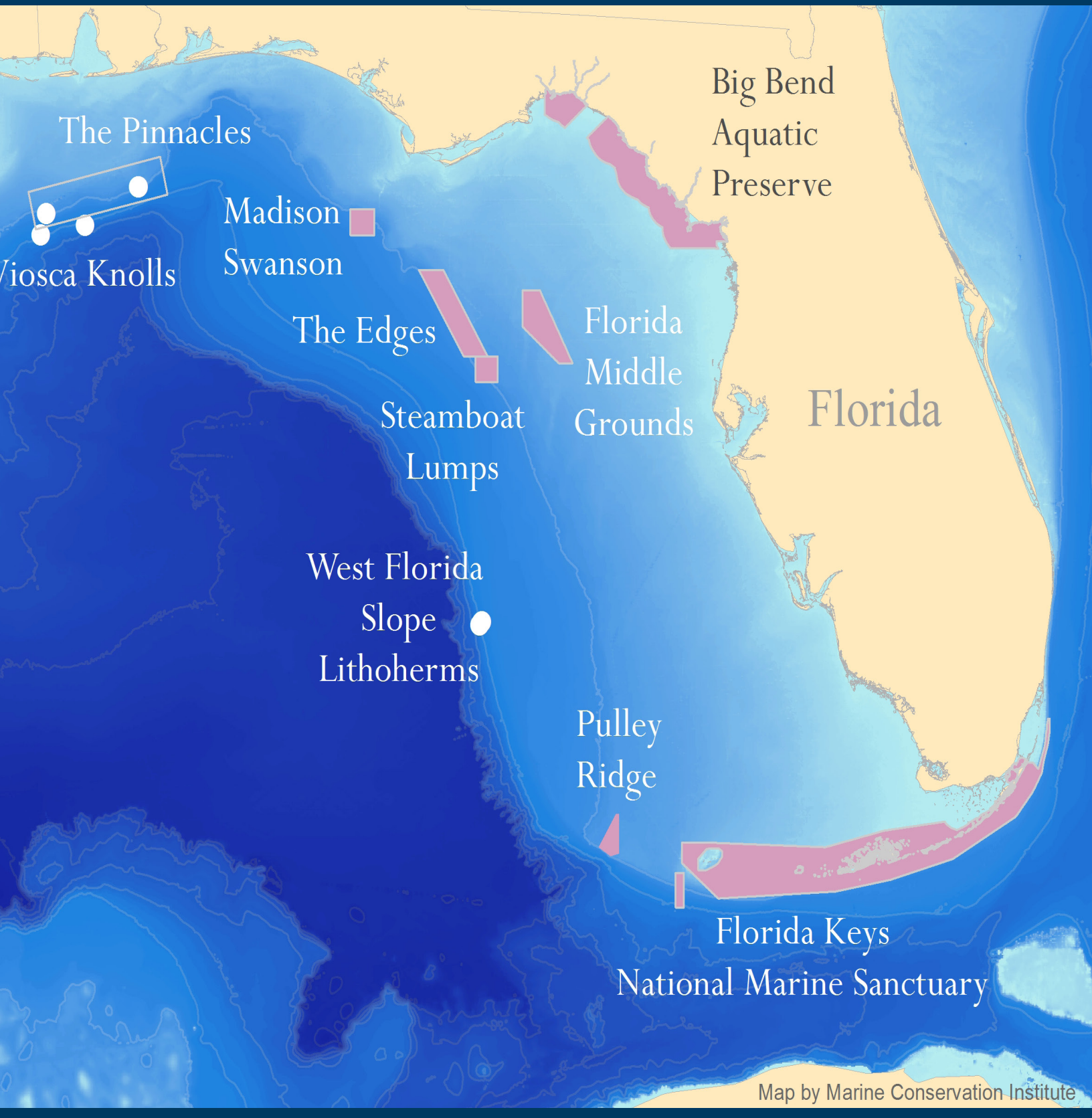


Image Credit: Opposite Page, NURC/UNCW; This Page Center, Islands in the Stream 2001 NOAA/OER; This Page Top Right, USGS

VISUALIZING



Gulf Gems


The Pinnacles
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Florida
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Big Bend
Aquatic
Preserve
Florida
West Florida
Slope
Lithoherms
Pulley
Ridge
Florida Keys
National Marine Sanctuary
Map by Marine Conservation Institute

South Texas Banks

With our satellite images and GPS devices, it is easy to think that the Earth has been mapped in its entirety – and to be fair, much of our terrestrial world has been. However, our oceans are another story. The great depths and dark waters that they contain make them tough to explore, and our aerial photography shows us little save for a vast expanse of blue. Instead, we have to rely on other methods to discover our oceans – from scanning systems that can paint us a picture of seafloor topography to remotely operated vehicles that can travel down into the deep while sending back video and return with samples of water, earth, and living organisms. Each of these technologies allows us to add another snapshot of information and usually reveals to us new discoveries.

The South Texas Banks which rise from the soft muddy clay that covers most of the Gulf are no exception to this observation. Marine biologists continue to discover a remarkable diversity of marine life there. Southern Bank and Hospital Bank have been long known from the surface as their high-relief habitat provides a perfect home to many desirable fish. Mysterious Bank is shrouded in the nepheloid layer – a murky layer of suspended sediment. Around these banks are fields of black corals, with feathery branches, and meadows of wire corals, with corkscrew spires, rising from the bottom. So far, more than 40 banks have been discovered, ranging in size from 10 to almost 40,000 acres and in height from a mere 6.5 feet to 72 feet. More than 877 species have been identified throughout the complex. These banks are "drowned" coral reefs that thrived during the Pleistocene when seas were much shallower.

And it seems there is more to come. Predictive habitat modeling, combined with an analysis of fishing records, has indicated that there may be more Banks winding along the ancient continental shelf coastline. In April 2014, a NOAA research vessel will depart for the area, and there's little doubt that more discovery will occur along the way.

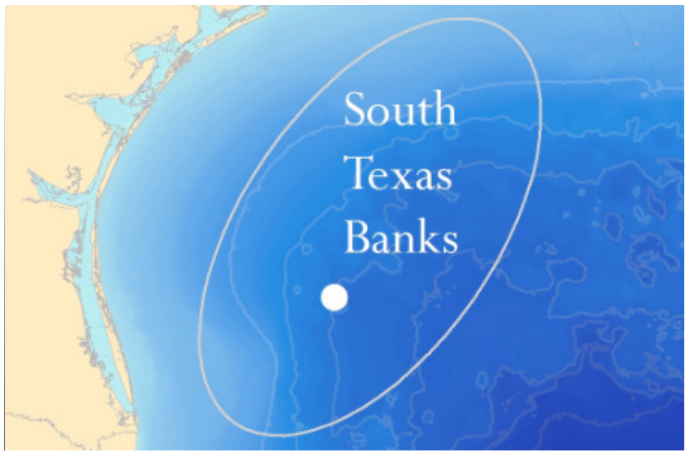
Current Status and Threats

At present, the South Texas Banks are vulnerable to a variety of human activities – from intensive fishing to anchors from vessels. Oil and gas exploration also exists throughout the region, and while some banks have recieved designations as "No Activity Zones" (a BOEM classification that protects them from petroleum exploration), banks that have yet to be mapped have no protected status at all.

An Explorer's Perspective

Dr. Harriet Nash

The South Texas Banks consist of over 20 sites ranging from 12 to 45 miles off the coast of Corpus Christi, Texas. For decades, very few scientific research projects have targeted the South Texas Banks, also known as the "snapper banks" to local fishermen who frequent the sites. I'm thrilled that these important hard-bottom habitat sites in the Gulf of Mexico are receiving increased attention from scientists and fisheries managers, and I hope the efforts continue to contribute to our growing knowledge about the role the banks play in connecting populations of fish and other organisms throughout the region.



Future and Recommended Protection

As the banks provide habitat for many commercially valuable species, designation of the area as a Habitat Area of Particular Concern (HAPC) would begin the process of ensuring protection for the most critical areas by prohibiting bottom anchoring by fishing vessels, bottom trawling, and the use of longlines, buoy gear, and traps and pots that contact the seafloor.

I was lucky enough to have the opportunity to explore the South Texas Banks as a member of the science team aboard the Schmidt Ocean Institute's *R/V Falkor* in September 2012. Not only was I eager to work on a vessel with new, state-of-the-art technology (an extravagant treat to say the least for a marine scientist!), but I was also excited to map and explore places that few scientists had ever visited. I read some descriptive accounts written in the 1970s of submarine exploration of a couple of our sites of interest, so in theory I knew what to expect. However, the preparation I did couldn't possibly prepare me for the experience in reality. The science control room of the *R/V Falkor* was like something out of a movie. I can only begin to describe the rush of adrenaline when our nerdy, data-collecting team of scientists got our first clear view on the 10-15 high-resolution monitors in the control room. We were cheering and hollering so loudly that the journalist in the next room came running in thinking we must have found something as rare as the extinct megalodon shark. Alas, we did not discover a living representative of an extinct species, but we were incredibly excited nonetheless. As the ROV (remotely operated vehicle) hovered over the site, we watched the live 3-D video feed revealing amazing images--dense fields of colorful wire corals with fully extended polyps feeding, patches of ancient black corals, colorful tropical reef fishes, a variety of large snappers, and even a shark or two.

A few days later and a few kilometers farther south we woke up to some exhilarating news. During the overnight mapping activities, a new site was discovered, and my pioneering itch was scratched. We rushed to process the data quickly enough to identify a good path for the ROV. The site was teeming with life. Based on the site's proximity to the edge of the continental shelf, I believe that it acts as an important habitat link for ecological connectivity between nearshore waters and much deeper waters beyond the continental shelf. The outer-shelf South Texas Banks collectively represent an historic shoreline, and although we only discovered one new site in 2012, I am convinced that there are at least two or three additional sites in US waters (and more toward the south in Mexican waters) that represent the continuation of this historic shoreline.

Such knowledge, combined with analytical results from the 2012 research cruise, guides explorers on future expeditions (in 2014 and beyond) to discover additional sites that will contribute to the network of gems in the Gulf of Mexico. The South Texas Banks lie between Federally protected coral reefs in Mexico and in the US, and the important provision of stepping-stone habitats to connect the true coral reefs certainly warrants consideration for additional protection.

Image Credit: Opposite Page, Schmidt Ocean Institute/Deep Sea Systems International; This Page, Harriet Nash

West Florida Slope Lithoherms

When picturing a coral reef, bright colors and sunlit waters often come to mind. It is therefore hard to imagine coral reefs thriving in deep, dark waters. In the case of the West Florida Slope Lithoherms, deep down is a long way down indeed. In fact, at this remarkable spot in the Gulf of Mexico, a nearly pristine coral ecosystem exists 1500 feet below the surface of the water.

At the very edge of the continental shelf, the surface slopes away, descending deeper to the central Gulf. Much of the bottom of the Gulf of Mexico is soft, composed of mud and clay, which makes it difficult for organisms to grow up without sinking in. Any place that hard rock or ancient coral emerges from the soft mud or clay is prime real estate.

On that sloped edge lie large boulders and protruding rocky surfaces thought to number in the dozens, or possibly hundreds. Now colonized primarily by deep sea corals like *Lophelia pertusa,* these habitats are home to sponges, fish, crustaceans, mollusks, and others. Golden crab (which are part of an economically important fishery) are also found amongst the lithoherms.

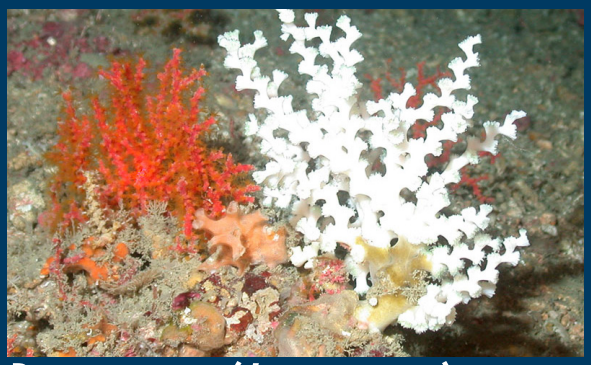
Current Status and Threats

The lithoherms found on the west Florida slope are completely unprotected against many potentially damaging activities, including deep sea fishing and the use of pots for crabbing. Along the continental slope, oil and gas exploration is more the norm than the exception, and the area surrounding the lithoherms is highly exploited for resource extraction.

Future and Recommended Protection

The incredible longevity of deep sea corals mandate a correspondingly high level of protection. A designation as a no-take area would be the only adequate action that would fully protect this ecosystem from harm, although intermediate protections under HAPC against detrimental fishing activities would be worthwhile.

Species Spotlight



Deep-water coral (*Lophelia pertusa*)

Lophelia pertusa is probably not as well-known as its tropical counterparts, but it supports just as much diversity as shallow water reefs. This deep-sea coral is primarily found at depths of 650-3,000 feet and provides habitat for over 850 species including sponges, anemones, worms, fish, mollusks, and crustaceans. Living on the deep ocean floor makes lophelia pertusa susceptible to deep-sea trawling.

The coral prefers attaching to hard surfaces which often means the deep sea platforms that support oil and gas platforms. As a result, some populations of *Lophelia pertusa* were damaged by the 2010 Gulf oil spill. *Lophelia pertusa* is extremely slow-growing (~0.03 inches per year) which makes the damages caused by trawling and the oil spill even more severe.

Image Credit: All, USGS

Horseshoe Bank

In 2004, the oceanographic research ship, *Thomas Jefferson*, set off on a journey of discovery. It's destination – Flower Garden Banks National Marine Sanctuary and the surrounding seas. The ship brought with it an arsenal of research tools, from side-scan sonar units to sediment sampling equipment. As they "pinged" along the bottom, the ship's high resolution multi-beam survey instruments drew pictures on computer screens, revealing the hidden world at the bottom of the ocean.

As it passed between the East and West Flower Garden Banks, the ship's equipment began to show that all was not mud and clay. Instead, it illuminated hundreds of patch reefs ringed around scattered mud volcanoes. These patch reefs formed a horseshoe shape around the central volcanoes, and thus, the new bank was named. After the *Thomas Jefferson* moved on to other explorations, another crew of researchers returned to the site, this time equipped with ROVs.

The video and pictures from the ROVs showed that Horseshoe Bank is home to extensive coral assemblages. Black corals, octocorals, and deep reef fish all inhabit the patch reefs that make up the bank, and act as the foundation of a habitat that provides shelter and resources for pelagic animals (i.e. creatures living in the water column between the surface and the bottom). Additionally, the site acts as a nursery for juvenile fish, such as groupers, that then migrate to Flower Garden Banks as adults.

Current Status and Threats

Currently, no anchoring or bottom contact fishing gear is allowed at Horseshoe Bank. However, the surrounding area is still vulnerable to gas and oil exploitation as Horseshoe is not yet designated by BOEM as a "No Activity Zone" and fishing is still common in the waters above.

Future and Recommended Protection

During the Flower Garden Banks management plan review process, much support was expressed for an expansion of the Sanctuary's boundaries to include areas like Horseshoe Bank. One of the current proposals would result in its inclusion. Not only would this be beneficial for the Bank itself, but would also better protect the biological connectivity of the ecosystem and provide regulatory consistency between the banks.

Species Spotlight

Shortnose batfish *(Ogcocephalus nasutus)*

Winning "Most Beautiful" is probably out of the question for the shortnose batfish, but this bottom-dweller has some distinctive features. This species uses a modified dorsal fin, which looks more like a spine, as a lure to entice prey close enough to attack. These unsuspecting meals include small crabs, shrimps, mollusks, worms, and juvenile fish. With its horizontal pectoral and pelvic fins as well as a flat body shape, the shortnose batfish has adapted to crawling across the ocean floor rather than swimming. Also known as the "walking batfish", this species and the most of the members of the Ogcocephalidae family have rough skin covered in bony tubercles.

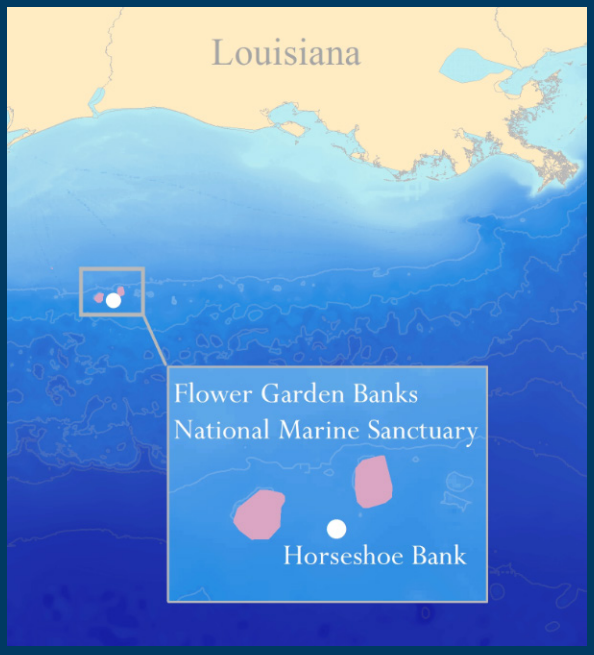
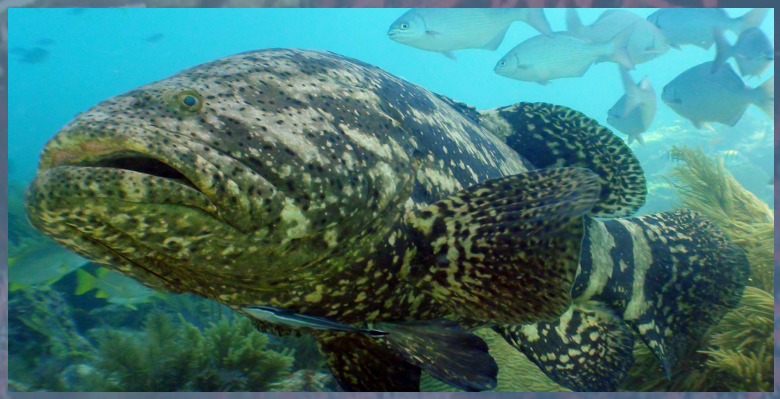


Image Credit: Top Right, FGBMNS; Others, NOAA



Florida Keys National Marine Sanctuary

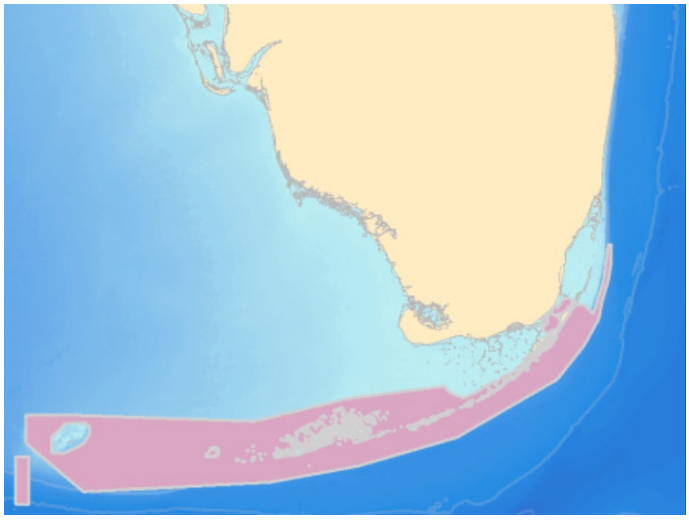
Throw on your snorkel and fins, and let's jump out of the boat and into the bright waters of the Florida Keys National Marine Sanctuary. Designated in 1990, this 2,842 square mile area is home to an incredible amount of marine life, including endangered species like the elkhorn coral and the Florida manatee. Within its boundaries lie extensive seagrass beds, the world's third largest barrier reef, and mangrove-fringed islands, in addition to more than 6,000 species who call the area home. Recreational swimming, fishing, snorkeling, and scuba diving opportunities are plentiful.

Intermediate and deep reefs provide another important component of this diverse ecosystem, and are home to hundreds of species of reef fish, especially commercially important groupers and snappers. The Sanctuary also has high water quality – critical in an era of acidifying oceans.

However, not all of the area's waters are protected. Around the boundary line, both species and habitat are vulnerable to the effects of anchoring, discharge, dumping, and resource extracting, as well as bottom trawling and the use of traps and pots. To the southwest of the sanctuary lies the Tortugas South Ecological Reserve – a no-take area that protects important habitat and growing fish.

Current Status and Threats

Both within and outside of the Florida Keys National Marine Sanctuary, rules and regulations are varied and complex. Fishing is allowed in many areas, but not in all, along with other activities such as anchoring or diving. This mix of regulated uses can promote confusion for users about where certain activities are permitted and where they are not. Additionally, the patchwork nature of the Sanctuary may not optimally protect the area's species.



Future and Recommended Protection

Connecting the boundaries of the Florida Keys National Marine Sanctuary and the Tortugas Ecological Reserve and enclosing the waters in-between would provide more consistency in the regulatory framework throughout and better protect the species within. Expanding the Sanctuary to completely enclose the Reserve would ensure more uniform protections for the area's important habitat. As research continues to indicate that larger areas of protection better serve ecosystems than smaller ones, the inclusion of the Tortugas South Ecological Reserve within the larger framework would magnify the positive impact of both areas.

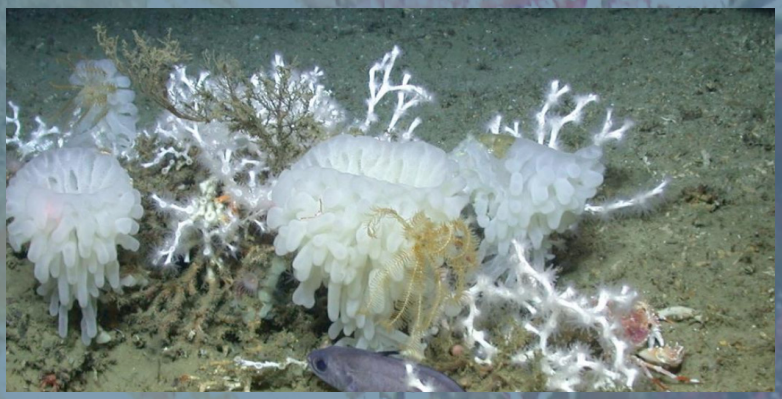
Species Spotlight

Lionfish (*Pterois volitans*)

Don't let this vibrantly colored fish fool you. It might look like a native among the other tropical species in the Florida Keys, but the lionfish is an outsider in this ecosystem. Traditionally found in Indo-Pacific waters, this invasive species wreaks havoc on native fish species, consuming over 50 economically and ecologically important fish species in the Atlantic. Venomous dorsal spines that deter predators and a reproduction cycle with quick turnover (30,000 to 40,000 eggs every few days) has led to a population explosion of lionfish that threatens the native biodiversity of the Florida Keys.

Pet owners are blamed for the introduction of this species into Florida waters, and now humans are the only predator that stands between the lionfish and the extensive damage they cause to the Florida Keys coral reef ecosystem. Spear-fishing hunts have had some success in curtailing lionfish numbers.

Image Credit: Opposite Page from Left to Right, NOAA, NOAA, NOAA/FKMNS, NOAA; Center, NOAA



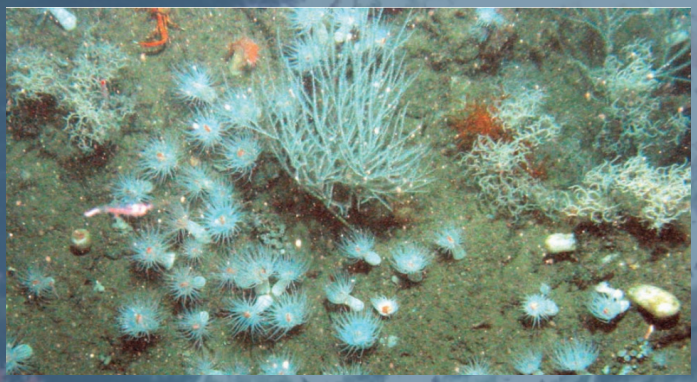
Viosca Knolls

The only thing harder than pronouncing the name (vi-ah-sca) of this conglomeration of deep-sea coral communities is locating it 1,640 feet beneath the Gulf's surface due south of Mobile Bay. If you happen to find your way to these depths—most likely through an ROV video feed—you will witness a range of biodiversity usually only attributed to shallow water coral reef ecosystems. Viosca Knolls are home to some of the most developed and well-documented Lophelia pertusa communities in the Gulf of Mexico, and these cold-water corals are a veritable hot bed of marine life. Keep an eye out for the plethora of anemones, sponges, worms, crustaceans, and fish species that call Lophelia pertusa home.

The different coral reef communities that comprise Viosca Knolls are labeled with a series of numbers which identify the oil and gas lease block that encompasses that particular area—generally 9x9 miles. For example Viosca Knoll 906 refers to the deep reef located just 20 miles north of the *Deepwater Horizon* oil rig responsible for the 2010 British Petroleum (BP) oil spill.

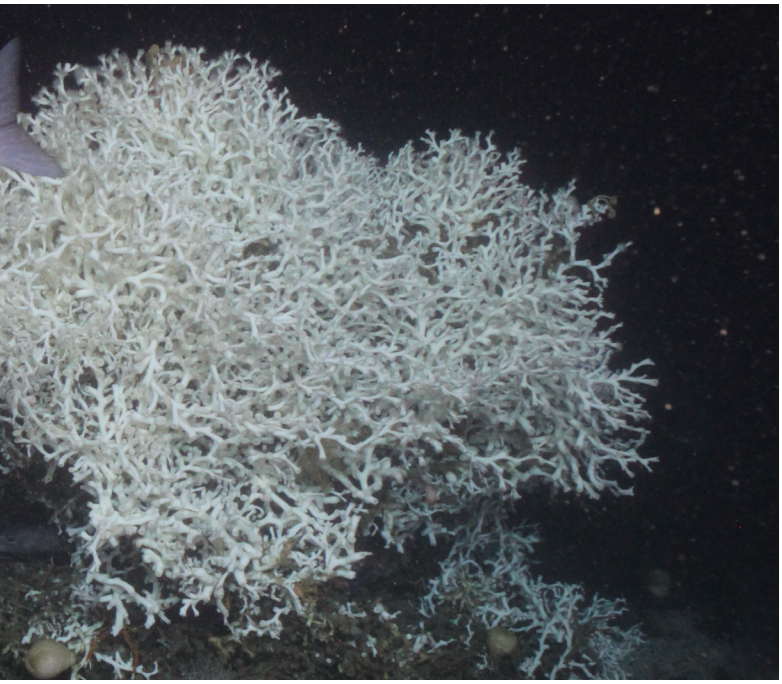
Current Status and Threats

Fortunately, Viosca Knolls 906/862 and 826 are listed in the BOEM database of seismic anomalies which means they are protected from drilling and oil infrastructure within 1.24 miles of the BOEM-drawn boundaries. Despite this protection, fishing exploitation and other human activities such as oil spills can still pose a threat to these vulnerable corals.



Future and Recommended Protection

Because overfishing both diminishes local fish populations and all but destroys the essential *Lophelia pertusa* communities, designation of these sites as no-take coral areas or HAPC is crucial. Additionally, understanding the impacts of the BP oil spill on Viosca Knoll 906/862 will provide insight into the deep water consequences of this disaster and help to shape responses to possible future events.



Super Site Highlight

Roberts Reef

Nestled in Viosca Knoll 906, Roberts Reef has been the home of *Lophelia pertusa* for over 300,000 years. Black corals, which are actually orange-red in color, also inhabit the area. The reef itself is a mound of *Lophelia* skeleton over 65 feet thick and over 650 feet in diameter. The site is one of the largest continuous *Lophelia* reefs and the first reported cold-water carbonate mound in the Gulf. Despite its advanced age, the reef was not discovered until 2009.

Image Credit: All, NOAA

Florida Middle Grounds

The Florida Middle Grounds are thought to have been first discovered by fisherman tracking red snapper towards the end of the 19th century. Dropping lines into 100 feet of water, fishermen would pull up hooks heavy with fish. In the 1970s, researchers discovered the reason behind the bounty – a relict coral-reef complex was providing critical habitat to many desirable species.

Found approximately 80 miles offshore from the west coast elbow of Florida and from Tampa-St. Petersburg, this area ranges in depth from 85 to 150 feet and scientists have so far identified 23 species of stony coral, approximately 40 sponges, 103 species of algae, and 170 species of fish. The ecosystem represents the northern most appearance of mid-shelf octocoral communities in the entirety of North America, and, interestingly, the fauna are distinctly tropical. This may be a result of the presence of the Gulf's Loop Current, which pulls species northward from the Caribbean and brings warmer temperatures (up to 60°F) with it.

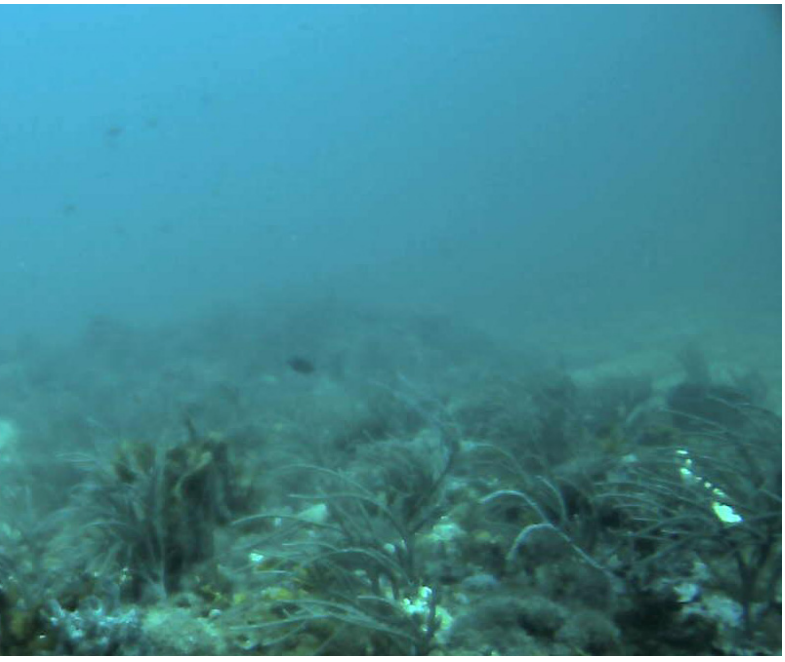
The most abundant fish species in the Middle Grounds is the purple damselfish, but the economically important gray snapper, scamp, and red grouper also frequent the area.

Current Status and Threats

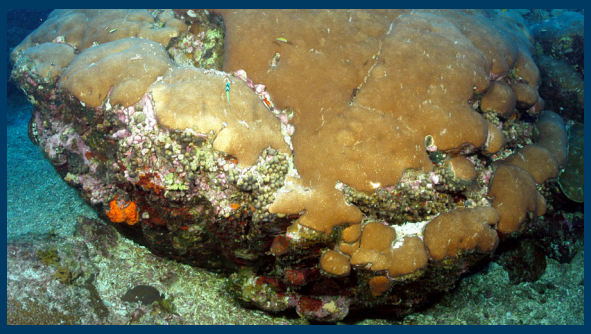
The habitat found within the Florida Middle Grounds is in remarkably good shape in comparison with global trends for corals elsewhere. No indications of coral die-off or disease have been found, and a comparison of surveys across time has indicated that species biodiversity has remained high. However, researchers have identified a dearth of economically valuable fish species, and have attributed this lack to intensive fishing efforts.

Future and Recommended Protection

The uniqueness of this habitat and the biodiversity found within it, combined with the low abundance of certain fish, suggests that further protections are needed. A large portion of the area was designated as a Habitat Area of Particular Concern in 2001, but many extractive and destructive activities (such as anchoring) can still occur within the site. At a minimum, the northern half of the Florida Middle Grounds should be permanently closed to these activities, and the area in its entirety should be surveyed and assessed to determine any additional impacts that may be occurring.



Species Spotlight



Massive Starlet Coral *(Siderastrea siderea)*

Characterized by its dome-like shape, the massive starlet coral can grow over six feet wide and live at depths of up to 130 feet, though they tend to live around 30 feet. The coral's surface ranges in color from light gray to pink to golden brown and is covered in dimples, known as corallites, where its reproductive polyps reside.

One of the more resilient coral species, the massive starlet coral has shown the ability to recover from ocean acidification when water conditions improve. The greatest threat to massive starlet corals is habitat loss due to climate change-induced temperature extremes and human impacts such as anchoring.

Image Credit: Top Left, CIOERT; Top Right Center, NOAA; Top Right, NOAA; Bottom Center, FSU/NOAA;

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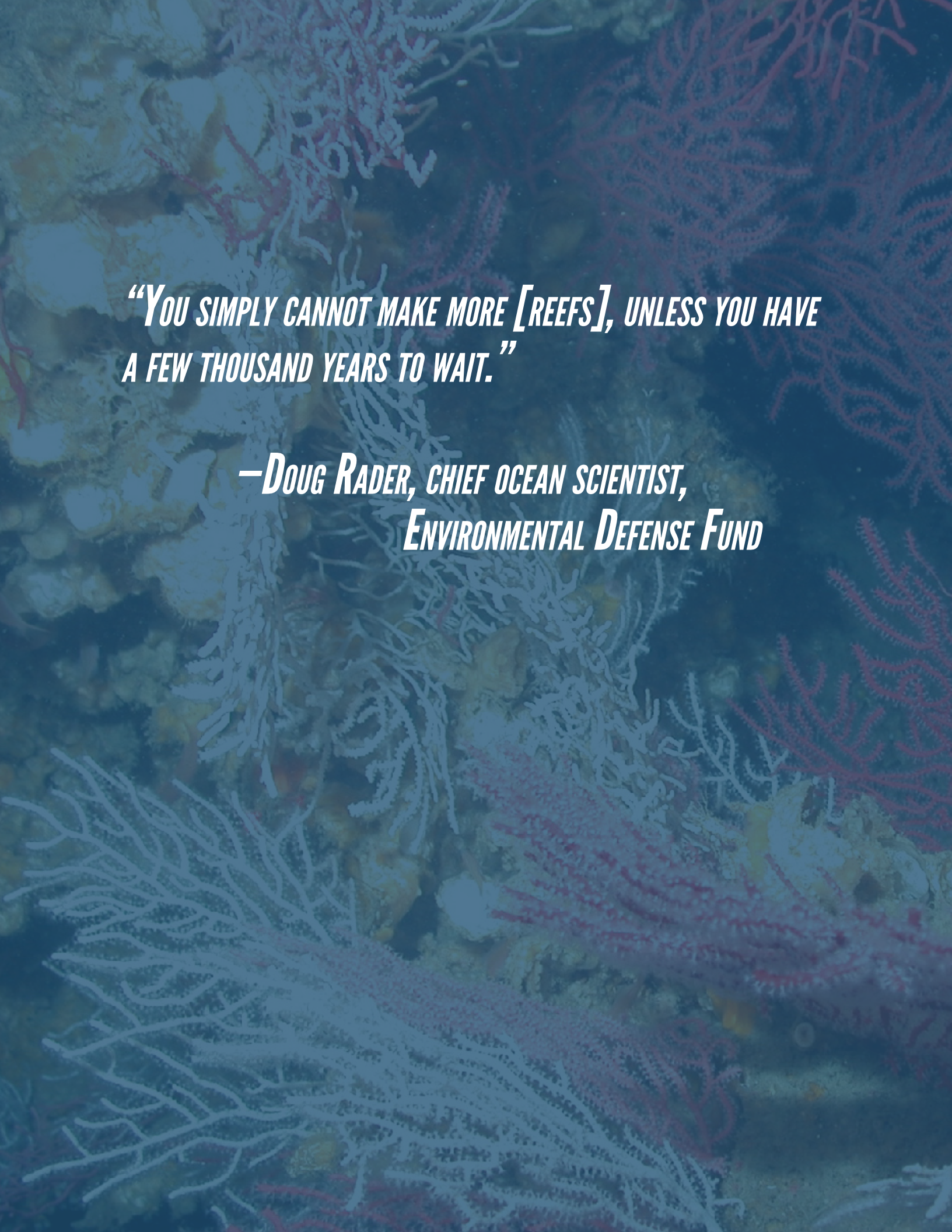

"You simply cannot make more [reefs], unless you have a few thousand years to wait."

—Doug Rader, chief ocean scientist,
Environmental Defense Fund

Marine Conservation Institute

Marine Conservation Institute is a team of highly-experienced marine scientists and environmental-policy advocates dedicated to saving ocean life for us and future generations. The organization's goal is to help the world create an urgently-needed worldwide system of strongly protected areas—the Global Ocean Refuge System (GLORES)—a strategic, cost-effective way to ensure the future diversity and abundance of marine life. Founded in 1996, Marine Conservation Institute is a US-based nonprofit organization with offices in Seattle, near San Francisco and in Washington DC.

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