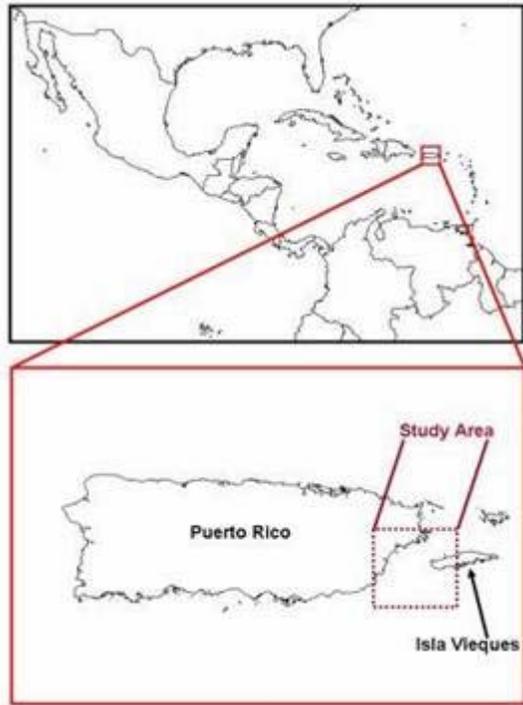


Puerto Rico/Viequest Cruise 2006 Mission Web Page

This 10-day research cruise aboard NOAA Ship NANCY FOSTER represents a continuation of work initiated in 2004 in the nearshore waters off the coast of southeastern Puerto Rico and Isla Vieques.



Cruise dates: April 5-15, 2006

Mission: Recovery and conservation of seagrass meadows, associated fish communities, and the endangered Antillean manatee are important NOAA stewardship missions in southeastern Puerto Rico and Isla Vieques. Our work is critical to the development of forecasting models for predicting seagrass response to natural and anthropogenic stresses and to assess alternative management strategies.

The Scientific Party

NOAA, Center for Coastal Fisheries & Habitat Research

- Jud Kenworthy
(Chief Scientist)
- John Burke
(Research Fisheries Biologist)
- Amy V. Uhrin
(Research Ecologist)
- Brian Degan
(Biological Science Technician)
- John Hackney
(Research Technician)
- Abigail Poray
(Research Technician)
- Guiseppe DiCarlo
Post-Doctoral Researcher

NOAA, Damage Assessment Center

- Kevin Kirsch
- Sean Meehan

NOAA, NMFS

- Michael Judge

Florida Wildlife Conservation Commission

- Manuel Merello
- Jennifer Kunzelman
- Marc Julian
- Kevin Madley

University of North Carolina, Wilmington

- Brooke Landry



Our objectives for this mission include:

- Repeat field surveys of existing seagrass injury and disturbance sites resulting from Hurricanes Hugo (1989) and Georges (1998).
- Evaluate the effects of physical disturbance on seagrass communities, including species composition and rates of recovery.
- Conduct field surveys of fish populations across habitat gradients extending from the mangrove fringe out to seagrass beds and coral reefs;
- Characterize benthic habitats utilized by Antillean Manatees.
- Data from these studies will enable us to calibrate our existing tropical seagrass recovery model over a significantly longer time period.
- We will gain a better understanding of how to distinguish between the effects of natural and human induced disturbances in tropical seagrass communities.
- These improved models will significantly enhance the capabilities of resource managers and economists to assess damages and develop restoration plans for disturbed seagrass communities.
- Comparative analysis of our fish data with similar surveys conducted in southwestern Puerto Rico will significantly improve our understanding of the complex connections and interactions between adjacent coastal ecosystems and the ecological services they provide.



Seagrass among the mangroves

Puerto Rico Cruise Day 1



El Morro

Photo: Amy V. Uhrin

Under cloudy skies we set sail shortly after 9am. There was a mild chop to the sea as we cruised past El Morro, the antiquated guardian of Puerto San Juan. The flags of Puerto Rico, the United States, and the Spanish military waving majestically seven levels above the rolling surf, as if wishing us bon voyage.



Commanding Officer Jamie Verlaque

Photo: Amy V. Uhrin

Commanding Officer Jamie Verlaque at the helm of *Nancy Foster*, making sure our transit is safe and as smooth as possible



Nancy Foster crew members deploying the Sea Ark.

Photo: Amy V. Uhrin

Six hours later we arrived at our anchorage off the east end of Isla Vieques and began deploying the small boats to carry divers to their sampling destinations. Launching the small boats is no easy feat, involving no less than four line handlers and one crane operator to tame the boat like a Macy's Parade balloon.



Blowout Disturbances

Our first order of business was to send two dive teams to the northwest corner of Isla Vieques to revisit three of our seagrass disturbance sites. These natural, crescent-shaped blowout features were created from scouring during the passing of Hurricanes Hugo (1989) and Georges (1998). The teams marked shoots of seagrass, by piercing the base of the leaf bundles with a hypodermic needle. As the leaves grow and elongate, the hole-punch will migrate up the blades, and a leaf growth rate can be

calculated given the distance that the hole has moved. The shoots that were marked today will be harvested on the last day of the cruise.

Our first day was a success. However, the trip out to Isla Vieques and subsequent diving has left everyone a bit droopy-eyed. Tomorrow we will focus on the fish and habitat surveys and begin taking seagrass samples from an area heavily disrupted by manatees during feeding activities.

Puerto Rico Cruise Day 2



Scientist Manuel Merello posing with the seagrass core.
Photo: Amy V. Uhrin)

Up bright and early, the small boats were launched and we were off to our sites at 8am.

Today we began seagrass sampling within a manatee feeding area. A number of random plugs of seagrass were collected from within a heavily disturbed meadow of seagrass where manatees are known to feed in large numbers. In addition, a number of plugs were taken from outside the disturbed area. A plug of seagrass is extracted using a 15cm diameter coring device which is pushed into the sediment, capped, and then pulled out manually.



Seagrass core
Photo: John Burke.

The seagrass core team returns to the ship after a long day at work taking core samples.



Scientists Kevin Madley and Kevin Kirsch rinsing seagrass
Photo: Amy V. Uhrin.

The plugs of seagrass are removed from the core, bagged, and returned to the ship for processing. Once on the ship, each plug is thoroughly rinsed to remove all sediment.



Scientist Giuseppe DiCarlo counting seagrass shoots.
Photo by Amy V. Uhrin

The number of individual seagrass shoots per plug are then counted and the shoots are separated into blade material and root material. At this stage, the seagrass is frozen and will be processed further back at the lab.

Our second mission today was to begin our fish and habitat survey work. At each site, one of a pair of divers swims along a 30m transect line while identifying and recording all fish sighted within 1m on either side of the line. The second diver follows behind and estimates the percent cover at 6 m intervals of various habitats falling within a 0.5 x 0.5 m square. Today we focused on deeper (~ 60 ft) sites composed primarily of algae fields and soft coral forests. A team of six divers (3 pairs) completed 7 sites today. A great start!



A school of yellow goatfish

Photo: Amy V. Uhrin



A smiling porcupine fish!

Photo by Amy V. Uhrin



Scientist Amy V. Uhrin estimates algal cover
Photo: Mike Judge



*Scientist Abby Poray lays out a transect tape
for the fish/habitat team.* Photo: Mike Judge

Puerto Rico Cruise Day 3

Vieques' Military Past



Isla Vieques

Isla Vieques (seven miles southeast of mainland Puerto Rico) was formerly used by the [United States Navy](#) for naval gunfire support and air-to-ground ordnance training since the early 1940s. Beginning in 2001, the Navy turned over land on the western end of Isla Vieques to the Municipality of Vieques, the United States [Department of the Interior](#) (DOI), and the Puerto Rico Conservation Trust. On May 1, 2003, the Navy ceased all military operations on the island and transferred its property on the eastern side

of the island to the [US Fish and Wildlife Service](#) and the land was designated as a wildlife refuge.

The Navy is currently investigating areas it previously occupied to determine the extent of any potential contamination. [NOAA's Office of Response and Restoration \(ORR\)](#) is assisting the Navy with the assessment of contamination, identification of risks to the environment, and development of cost-effective strategies for assessment, cleanup, and restoration of natural resources. It just so happens that two ORR personnel are participating on our cruise. [Learn more about ORR's work in Vieques.](#)



White grunt
Photo: Amy V. Uhrin

During our fish and habitat surveys, we've been keeping an eye out for one fish in particular, the white grunt (*Haemulon plumieri*). One of our fellow scientists at CCFHR is examining white grunt populations from the southeast and Caribbean for genetic similarities. Where and when possible, we were asked to retrieve 30 white grunt specimens from our study areas. Today our spear fishing experts hunted down six fish! The fish were

transported to the lab, measured, and a small (~ 1 gram) sample of muscle tissue extracted.



Nancy Foster's Executive Officer, Dave Score, hunting for the elusive white grunt.
Photo by Amy V. Uhrin



Scientist Sean Meehan taking aim with a spear gun.
Photo: Amy V. Uhrin



Scientist Brian Degan measures the length of a white grunt he collected earlier in the day.
Photo: Amy V. Uhrin

Puerto Rico Cruise Day 4

Close Encounter with a Local Legend



Moises the manatee

It's murky. The kind of murky where the *Jaws* soundtrack starts playing in your head. You feel something bump into your leg. You try not to panic because your colleagues back on the boat will all laugh at you. Then a gentle nudging in your middle. There's nowhere to run because your feet have sunk into the mud and the mangrove roots above your head would snap under your weight. The water begins to boil in front of you. You wish you'd eaten that second brownie after dinner because in a second it won't matter. As you close your eyes and prepare for the worst, you hear what sounds like a muffled sneeze. Already you are laughing inside. This is no man-eater. You open your eyes and find yourself staring into the warm, affectionate gaze of Moises the manatee.

Yes, today four members of the fish and habitat survey team had the pleasure of meeting this Puerto Rican hometown hero. As each of us entered the water, we were greeted in turn by Moises with his version of an underwater head-butt. As we snorkeled around, trying to find a good spot to work, Moises followed one fin-kick behind, seemingly wondering why he wasn't given a clipboard and pencil for taking notes.



Moises the manatee

Moises is a legend in his own time here in Puerto Rico. Moises was found by some fishermen near San Juan in November 1991 when he was only two weeks old. Moises was nursed back to health under the care of the Caribbean Stranding Network in Lajas, Puerto Rico for over two years before being transferred to a fenced-in area in the waters within the Naval Station Roosevelt Roads where he was allowed to acclimate before being completely freed on August 22, 1994.

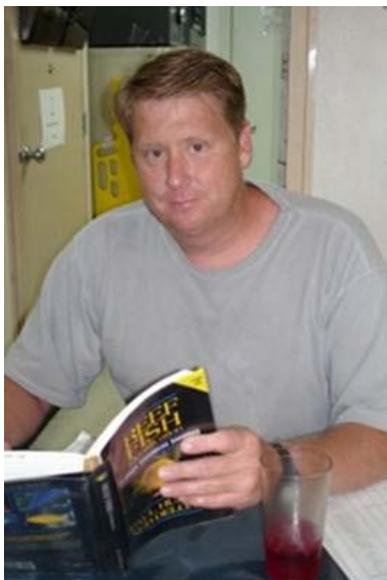
Moises, which is Spanish for Moses, is the first captive-reared manatee to be released successfully into the wild. Moises will be 15 years old this year. He remains healthy and continues to interact with other manatees. He remains loyal to the east coast of Puerto Rico where he can be found regularly amongst the mangroves and seagrass. And as we found out today, he is a welcoming host.



Amy Uhrin and Brian Degan

compare notes while Moises nudges them underwater. (Photo by Mike Judge)

Many thanks to fish counter, Mike Judge, for capturing some great footage of our encounter with Moises.



Mike Judge brushing up on his fish identification

Photo: Amy V. Uhrin

Puerto Rico Cruise Day 5



Brian Degan and Sean Meehan operate the SCUBA seine
Photo: Abby Poray

Today the fish survey teams focused on collecting specimens from vegetated areas, mainly seagrass, near reefs and mangroves to examine differences in habitat use. Our gear of choice - the SCUBA seine. The SCUBA seine is a modified beam trawl net that is pushed along the substrate by divers. The mouth of the net is held open by a rectangular PVC frame. The net tapers off in the back to what is termed the cod end. From casual observation of our hauls today,

it appears that more fish were caught in seagrass near mangroves versus seagrass adjacent to low-relief reef areas.



Scuba Seine in tow
Photo: Abby Poray



Fishes collected with the scuba seine
Photo by Abby Poray

Our catch was typically dominated by parrotfish. You might be wondering how we choose our samples sites and how we are able to accurately navigate to the sites day after day. We use a piece of equipment called the GPS Pathfinder® System. GPS stands for Global Positioning System which is a satellite-based positioning system operated by the US Department of Defense. Over 24 operational NAVSTAR satellites orbit Earth every 12 hours, providing worldwide, all-weather, 24-hour time and position information.



Pathfinder logger
Photo: Amy V. Uhrin

The Pathfinder System consists of an interconnected beacon antenna, receiver, and logger. The antenna is held upright and collects satellite broadcasts, filtering out any unwanted signals and amplifying the necessary ones. The broadcasts are transmitted from the antenna to the receiver which decodes the broadcasts and uses specialized corrections to provide sub-meter position accuracy. The corrected positional information is then sent to the logger. Using this system, we are able to collect extremely accurate single point locations (latitude and longitude) from where the antenna was held. So, once we find an area that meets our criteria for sampling, we erect the beacon antenna and collect a coordinate. The coordinates are saved in the logger and can be recalled at a later date when we wish to return to the same site. To do this, we erect the beacon, and open the coordinate file in the logger. The system again uses the satellite broadcasts to determine where the beacon is currently erected in reference to the saved coordinate. The system then indicates how far away from the point we are and in which direction we need to head in order to reach the point. The system continually updates the information as you move closer and closer to the target.



Nancy Foster's Operations Officer
Tracy Hamburger and Scientist Abby Poray
navigate to a site using the Pathfinder System
Photo: Amy V. Uhrin

Puerto Rico Cruise Day 6

About the *Nancy Foster*



NOAA Ship RV Nancy Foster
Photo: Amy V. Uhrin

NOAA Ship *Nancy Foster* was originally built for the U. S. Navy as a yard torpedo test craft. The vessel is 187 ft long, 40 ft in breadth, and drafts 10 ft. In 2001, the ship was transferred to NOAA and converted to conduct marine research along the Atlantic and Gulf coasts of the United States and the Caribbean. The ship was commissioned in 2003 and is named for Dr. Nancy Foster in tribute to her outstanding contributions in advancing NOAA's mission. The vessel is capable of remaining at sea for 14 days before returning to port to refuel. The *Nancy Foster* home ports in Charleston, South Carolina. [Learn more about *Nancy Foster*](#)

Life at Sea



Typical stateroom aboard the RV Nancy Foster
Photo: Amy V. Uhrin

In addition to withstanding the rolling of the ship, inclement weather, equipment malfunctions, and other typical incidents at sea, spending 14 days on a research cruise requires patience, flexibility, and consideration for others. Scientists must remember and respect that the *Nancy Foster* is home for the crew. Imagine being inundated with 14 crazy relatives all coming to stay at your house for a couple of weeks!

Scientists bunk in staterooms consisting of two sets of bunk beds (racks), a sink, and four lockers. A typical stateroom on *Nancy Foster* berths four scientists comfortably. If you didn't know your roommates before the cruise, you will certainly get to know them intimately, living in such close quarters! Bathrooms (heads) are same-sex, with

separate stalls with lockable doors for showers and toilets. Everyone eats together in the mess hall during established meal times.



The theater aboard ship
Photo: Amy V. Uhrin

For entertainment, there is a “theater” with a library of over 600 movies, a small area with board games and books, and a small workout room with some exercise equipment and free weights.



Accommodations aboard the RV Nancy Foster
Photo: Amy V. Uhrin

When not in the field, scientists spend the majority of their time in the wet and dry labs, prepping equipment, processing samples, logging data, and organizing the Plan of the Day.



Fish sampling off the fantail of the RV Nancy Foster
Photo: Amy V. Uhrin

Perhaps the most important part of the ship for scientists and crew alike is the fantail. This is where the big game hunters come to test their skills at wrangling in “the big one”! Not only is there competition among the scientists and crew, but some top fish predators are reluctant to let their own dinner get away! (Fish on! Onlookers gather as Brian Degan reels in a trophy - or so he hopes!



Steve Williams with half a fish
Photo: Lecia Salerno.

Nancy Foster crew member Steve Williams can't believe his luck, both good and bad. He hooked into a nice size cero mackerel only to have the tail end chomped off by a greedy barracuda as he was reeling in!

Puerto Rico Cruise Day 7

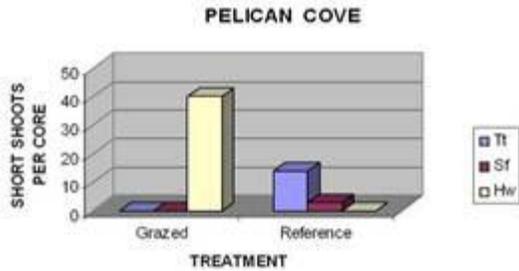


Pelican Cove, Puerto Rico
Damage done by manatees

Data photos and figures provided by Jud Kenworthy

Based on past observations of aerial surveys and data from tracking Antillean Manatees by satellite and radio, it was believed that Pelican Cove, Puerto Rico was an important feeding area for manatees. Recently, as part of the Sirenia Project, the U.S. Geological Survey has been tracking individual manatees by tagging them with GPS receivers. Data from these tracks indicate a heavy use of Pelican Cove. The light colored area in the center of the photo is where manatees are intensively grazing seagrass. The

areas around the grazing site (darker signature) are dominated by *Thalassia testudinum*, the tropical climax seagrass species.



Comparison of grazed and undisturbed seagrass

Pelican Cove was one of our primary sites for seagrass core sampling on this cruise. We completed sampling there on the second day. We've been able to examine a portion of our data and have found that the grazed area is almost exclusively composed of *Halodule wrightii*, a smaller, faster growing, opportunistic seagrass species. It appears that by continuously grazing Pelican Cove, the manatees have altered the local seagrass species composition by disturbing the climax species and promoting conditions more suitable for *H.wrightii*. [Learn more about the manatee tracking project.](#)



Great barracuda
Photo: Amy V. Uhrin

Ciguatera poisoning is a tropical disorder caused by bioaccumulation of ciguatoxins in human tissues from ingestion of fish tissue that is highly concentrated with the toxins. The most common symptoms are gastrointestinal, including nausea, stomach cramps and severe diarrhea. Neurological symptoms often include numbness in the lips and extremities, hot and cold reversal (hot things feels cold and vice versa), severe headache, dizziness, and low blood pressure. Ciguatera poisoning is often marked by an extensive itchy or burning rash or strange tingling or crawling feelings on the skin. A group at our lab is examining the occurrence of ciguatera-related toxins within Atlantic and Caribbean fishes as well as the dinoflagellates (microscopic, photosynthetic organisms that live in the water column) that may produce the toxins.



Nancy Foster's Chief Engineer Tim Olsen removes the hook from a smaller barracuda in order to release it.

Photo: Amy V. Uhrin

Typically, higher trophic level predator reef fishes such as moray eels, hogfish, and groupers, as well as more pelagic fish such as barracudas, jacks and amberjacks, tend to accumulate ciguatoxins. This group's goal is to extract and purify ciguatoxins from muscle tissue and viscera of reef fishes to use as standards in their research. So, in addition to hunting down white grunts, we have been asked to collect great barracuda (*Sphyraena barracuda*). Colleagues often help each other out by collecting samples or gathering other data for teams who do not have the opportunity to conduct a field excursion in a particular locale due to time, budget, and/or personnel constraints. In this case, our "great white hunters" are happy to oblige.

While *Nancy Foster* is in transit between sites, the whirl of rod and reel can be heard from the fantail. The water's surface becomes dappled with colorful lures, like miniature windsocks straining in the breeze. Today the fishermen were taunted by a small barracuda that kept chomping on the lures. But persistence paid off, and Bob Ellis (Junior Engineer) landed a larger fish that could be kept for analysis.

Puerto Rico Cruise Day 8 - Meet the Science Party

There are five scientists aboard *Nancy Foster* from NOAA's Center for Coastal Fisheries and Habitat Research (CCFHR) in Beaufort, North Carolina.



Dr. John Burke is the Chief Scientist aboard the ship. John's research interests include fish behavior and ecology. John is leading the fish-habitat surveys on the cruise.



Amy Uhrin is the lead scientist for the seagrass blowout project. Amy is a diver on the fish team, conducting habitat surveys. In addition, she has been responsible for preparing and submitting web page content for the cruise, including harassing scientists and crew for photographs!



Brian Degan and Abigail Poray are the Field Party Chiefs for this cruise. It is their job to assist the Chief Scientist in scheduling the Plan of the Day, to log all data in the appropriate spreadsheets at the end of the day, and to make sure that all of our GPS and camera equipment are well-maintained. Brian and Abby are both divers on the fish team as fish and habitat surveyors respectively.



John Hackney is part of the seagrass core sampling team. In the absence of Dr. Jud Kenworthy, the lead scientist on the project, John has been tasked with organizing the seagrass core teams and ensuring that the day's sampling plan is carried out.

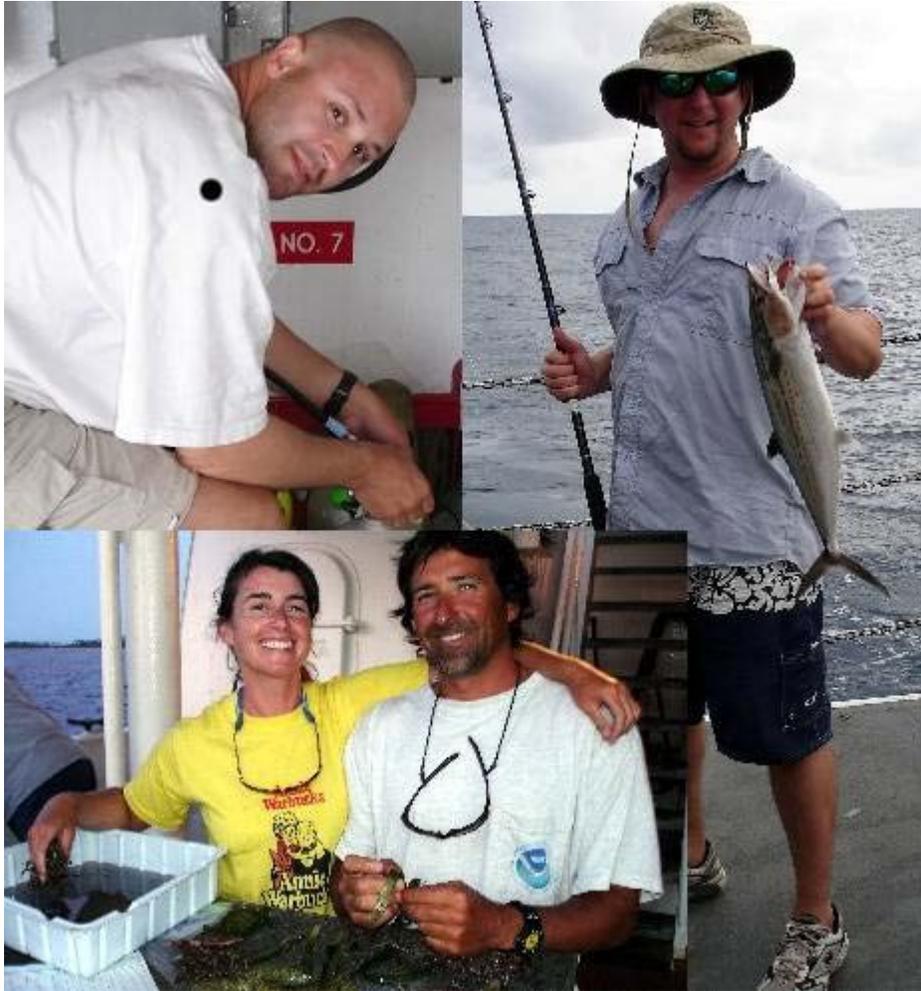
In addition, we have several colleagues joining us from other branches of NOAA, the State of Florida, and two universities:



Sean Meehan and Kevin Kirsch are from NOAA's Office of Response and Restoration (ORR), specifically, the Damage Assessment Center. Sean focuses on habitat restoration and is involved with community outreach while Kevin deals with oil spill injury assessment and also plays a role in ORR's Vieques project (see Day 3). On the cruise, Sean is chief spear-fisher and Kevin is part of the seagrass core team.



Mike Judge is with NOAA's National Marine Fisheries Service in Miami, where he runs the fishing logbook program. Mike is a diver with the fish team and has done a great job of photographing our underwater exploits, especially our encounter with Moises!



Clockwise (from top left) Marc Julian, Kevin Madley, Manuel Merello, and Jennifer Kunzleman, and are with the Florida Fish and Wildlife Conservation Commission (FWC) in St. Petersburg. Manuel is assisting with the organization of the seagrass core sampling effort and Jennifer, Marc, and Kevin are participating in that sampling as well. Marc also has kept us well stocked with air, by filling SCUBA tanks at the end of each day.



Brooke Landry is part of the seagrass core sampling. She recently completed her Master's degree at the University of North Carolina, Wilmington (UNC-W) and has remained there as a technician, creating and maintaining a web site for the UNC-W Fisheries Habitat Assessment Program's 10-year data set.



Giuseppe Di Carlo is the final member of the seagrass core team. He is a post-doctoral researcher at the Horn Point Laboratory of the University of Maryland where he is studying the importance of sand bar systems in creating and maintaining seagrass habitats in the Chesapeake Bay. In July, Giuseppe will depart Maryland to begin a post-doctoral position at CCFHR.

Puerto Rico Cruise Day 9

Habitats

To date, we have conducted fish surveys on a variety of habitats. In addition to fish distributions on the reef and in the mangroves themselves, we are examining fish utilization of vegetated substrates (seagrass and algae) adjacent to mangrove and reef areas.

Seagrasses



Mixed Thalassia and Syringodium seagrass meadow
Photo: Giuseppe Di Carlo

The coastal waters of Puerto Rico are home to a number of seagrass species, including

- *Thalassia testudinum* (turtle grass),
- *Syringodium filiforme* (manatee grass),
- *Halodule wrightii* (shoal grass), and
- *Halophila decipiens* (paddle grass).

Yes, turtles do eat turtle grass and manatees do eat manatee grass! Manatees will feed on any vegetation present in an area, including other seagrasses and algae. Manatees are very destructive during foraging (see Day 7 photo of manatee grazed area), bull-dozing through an area and removing not only green blades and stalks, but also below-ground root material. You can see how this behavior has the capacity to alter the marine landscape. Turtles are a bit more refined in their eating habits. Turtles crop seagrass blades at the base of the shoot leaving behind a meadow that looks as if someone ran over it with a lawn mower! It is easier for a seagrass meadow to recover from turtle grazing than from manatee grazing. The undisturbed root and rhizome system stores nourishment to aid new blade production. We have observed a number of turtle-grazed meadows during our surveys.

Mangroves



Submerged prop root community
Photo: John Burke

Mangroves are salt tolerant flowering trees that grow along sheltered coasts on muddy bottoms. Mangroves may also form islands in the tidal regions of shallow lagoons and estuaries. Mangrove trees are supported by dense prop roots that curve outward and downward from the base of the tree and extend several meters down into the substrate. The submerged prop roots often support a dense community of algae in addition to sponges and other

small colonial invertebrates.

Algae



Algae Field
Photo: Mike Judge

The algae fields that we have encountered have been primarily dominated by three species of green algae,

- *Udotea flabellum* (mermaid's fan),
- *Peniculus capitatus* (mermaid's shaving brush), and
- *Halimeda incrassata* (three-finger leaf alga).

These three species of green algae are stalked and calcified, producing a rigid and erect plant. It is common to find these species mixed in with seagrass.



Caulerpa sertularoides
Photo by John Burke

We have found several species of green alga of the genus *Caulerpa* mixed in with seagrass. These algae are composed of upright fronds connected by a runner.

The two most common species of *Caulerpa* we have encountered were:

- *C. sertularoides*
- *C. cupressoides*

although we have also spotted *C. prolifera* and *C. mexicana* on occasion.



Syringodium seagrass meadow.
Photo: John Burke

At one of our sites, a brown algae, *Lobophora variegata* was found in high densities amongst a predominantly *Syringodium* seagrass meadow.

Reefs



Padina boergesenii
Photo: Amy V. Uhrin

Padina boergesenii is a brown alga that attaches to rocky substrates in most reef environments. Perhaps the most notable feature on this species is the concentrically banded blades. *P. boergesenii* is quite common at our reef sites. The majority of our reef sites have been low relief, mixed reefs where the seafloor is colonized by small stony corals, gorgonians, sponges, and algae.



Stony Coral *Montastraea annularis*
Photo: Kevin Kirsch

Stony corals secrete a hard calcium carbonate skeleton, forming the basic building blocks of tropical coral reefs. The lobed star coral, *Montastraea annularis*, grows in long, thick, clustered columns with dome-like tops. This species is a common reef-building species.



Amy Uhrin poses next to a large gorgonian
Photo: Mike Judge

Puerto Rico Cruise Day 10

The Bad Guys



Cyphoma gibbosum consuming a sea rod

Cyphoma gibbosum is one of several species of snail that feed on gorgonians. Commonly known as the Flamingo Tongue, this snail grazes a trail across the colony, consuming live tissue along the way, and exposing the skeleton of the gorgonian.



Cyphoma gibbosum on sea fan
Flamingo tongue
Photos: Amy V. Uhrin

These little snails appear to be flourishing along the southeastern coast of Puerto Rico. We have observed them on just about every reef dive made during this cruise. On one occasion, a diver reported eight snails on a sea rod colony that was barely 25 cm tall and possessed only 5 - 6 branches!

The Elkhorn Coral, *Acropora palmata*, once flourished in the Caribbean and the Florida Keys. Perhaps one of the most majestic stony corals, this species has suffered mass mortality since the early 1990's due to White-band disease. White-band disease affects branching corals, typically beginning at the base of the colony and working its way toward the tips. Infected colonies exhibit a slowly advancing front of tissue decay that exposes the skeleton at a rate of $\sim 1/4$ inch per day! Although the exact cause of White-band disease has yet to be determined, a number of bacteria, fungi, and protozoans are often found at the site of infection.

Due to its extreme branching morphology, and somewhat fragile nature, Elkhorn Coral is highly susceptible to hurricane damage. This species expresses various branching morphologies depending upon the level of water motion in its habitat. Colonies in unprotected areas of high water motion tend to develop rounded, stout branches, while colonies in deeper water or protected shallows develop long, wide, flattened branches.



Acropora palmata Form I
Photo by Kevin Kirsch

A few colonies of *A. palmata* have been observed on our dives. Judging from the photos, can you guess the environment that each colony might be found in?



Acropora palmata Form II
Photo: Kevin Kirsch



Acropora palmata Form III
Photo: Giuseppe Di Carlo

Final Countdown

Today was our final full field day. For a job well done, at the end of the day, we all made a fun dive on a small patch reef, where we became fast friends with a southern stingray who thought he could give us the slip by covering up with sand!

With no surveys to conduct and no seagrass to extract, we could unwind, free our minds, and take in the sights. As they say, “All work and no play...”



The Southern Stingray
Photo: Kevin Kirsch



*The "Three Amigos" - Kevin Madley,
Giuseppe Di Carlo, and Manuel Merello*
Photo: Kevin Kirsch

Puerto Rico Cruise Day 11

The End of the Road

Bright and early, two teams headed off to retrieve the seagrass shoots that had been hole-punched on Day 1. Then we bid a fond farewell to Moises and all of our fish friends below, and it was anchor's aweigh and full steam ahead for port. The smooth steam back allowed everyone to catch up on some much needed rest to prepare for a grand celebration upon our return to Viejo San Juan.

It was a successful cruise, to say the least. We were able to complete all of our cruise objectives. Seagrass shoots from three blowout features were marked, allowed to grow for 10 days, and retrieved at the end of the cruise. Once back in the lab at CCFHR, growth rates for the shoots will be calculated, enabling us to determine how long it takes seagrass to recover from this type of disturbance.



Seagrass core team hard at work on the fantail
Photo: John Burke

The seagrass core team worked diligently to collect, prep, and store a total of core samples. Five separate seagrass injury sites were sampled including two manatee grazing areas. At CCFHR, these samples will be dried and weighed to determine above and below-ground biomass. These component biomasses will be compared between the injuries and the undisturbed seagrass beds. The goal is to use this data to refine our seagrass recovery model by including below-ground growth in recovery calculations.



Amy Uhrin, armed with her quadrat and clipboard, prepares to begin her habitat survey.
Photo: Mike Judge

A total of 99 fish/habitat transects were completed, including 14 mangrove, 43 reef, and 42 seagrass/algae. In addition, two small patch reefs along the northwest coast of Vieques were surveyed. Fish abundance and distribution data from these surveys will be tallied at CCFHR and will be used to determine fish-habitat associations in this region, specifically the interactions between adjacent habitat

types (i.e., seagrass-reef interface).

We at CCFHR would like to thank all of our visiting scientists for their hard work, patience, and persistence and to acknowledge the crew of *Nancy Foster* for their dedication to making the cruise as safe and productive as possible. Until next year, **adios!**



John Burke examines every nook and cranny in the reef for hide-n-seek fishes!
Photo by Sean Meehan



Rainbow over Vieques
Photo by Amy V. Uhrin