

**Upcoming Events:**

**RFP-VI: Call for Proposals Now Open**  
 Full Proposals due March 3, 2017

**Restore America's Estuaries Summit**  
 December 10-15, 2016  
 New Orleans, LA  
*Stop by the GoMRI Booth in the Exhibit Hall!*

**Gulf of Mexico Oil Spill and Ecosystem Science Conference**  
 February 6-9, 2017  
 Hyatt Regency Hotel, New Orleans, LA  
*Registration Now Open!*  
*Online registration closes January 27, 2017. Onsite registration at the conference will be available.*



**About the Gulf of Mexico Research Initiative**

The Gulf of Mexico Research Initiative is a 10-year, \$500 million independent research program established by an agreement between BP and the Gulf of Mexico Alliance to study the effects of the Deepwater Horizon incident and the potential associated impact of this and similar incidents on the environment and public health.

**Would you like to know more about the GoMRI-funded research?**

*Check out our Research page on the website:*

<http://research.gulfresearchinitiative.org/research-awards/>

**CARTHE Partners with Local Organizations and Community in Bay Drift Study**

The Consortium for Advanced Research on Transport of Hydrocarbon in the Environment (CARTHE) was recently approached by the Vizcaya Museum and Gardens with a question they hoped CARTHE could help with. Museum members had been noticing large amounts of marine debris and pollution along the shoreline of Biscayne Bay near Miami, FL and wanted to know why. CARTHE, which is funded by GoMRI, has been studying currents in the ocean to better track the fate of oil during oil spills and was eager to help. They partnered with the Vizcaya Museum and Gardens, Frost Science, and the University of Miami to develop a large scale, year-long drift card study focused on better understanding currents, and therefore the marine debris problem, in Biscayne Bay. This effort is called the Bay Drift Study.



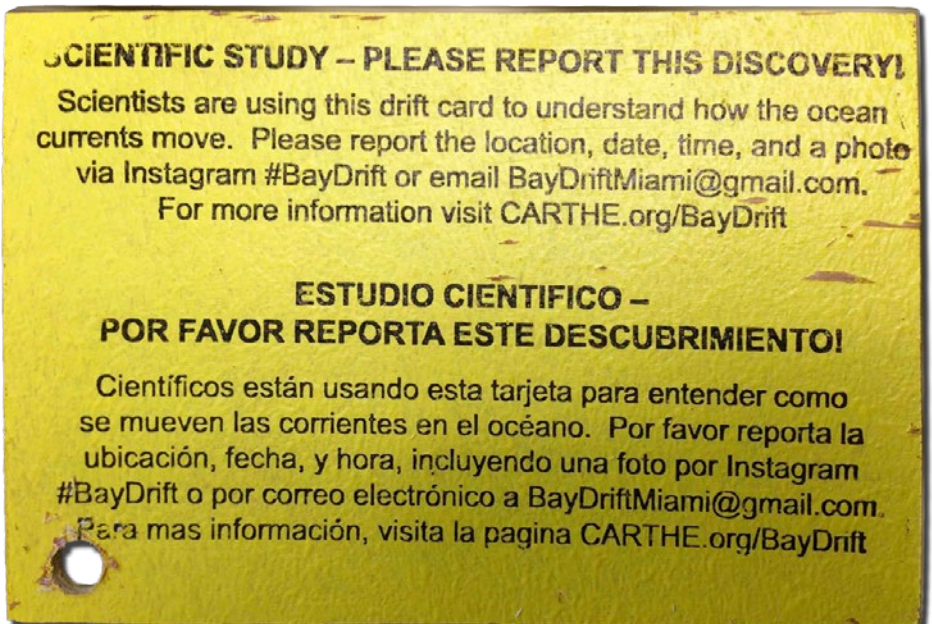
*Above: Members of the local community and school kids came together to help make drift cards for the Bay Drift Study.*

*Below: An example of a Bay Drift Study drift card.*

*Left: Students prepare to release their drift cards into Biscayne Bay.*

*Photos courtesy of CARTHE.*

*continued on next page...*

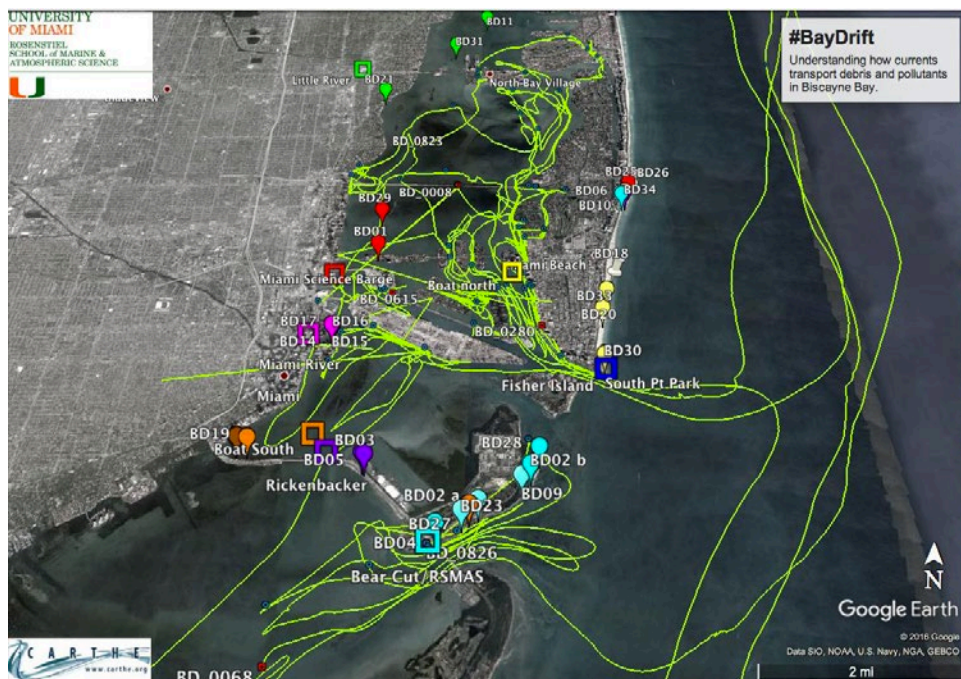




continued from previous page...

The Bay Drift Study will use drift cards, drift plates, and GPS-equipped, biodegradable drifters to track currents in Biscayne Bay through quarterly deployments from September 2016 to June 2017. The team hopes that the information collected through the project will help add much-needed resolution to models of currents in the area, which can help resource managers and responders address concerns such as marine debris and pollution. The Bay Drift Study is also working to encourage the local community to get involved, by helping to make and release drift cards and also report on drift cards they find along the shoreline. The project officially launched with several local schools and organizations coming together to create and release their very own drift cards! Recently, the project expanded further to an area west of Miami Beach, where new pumps have been installed to clear water from the streets during extremely high tides and during storm events. There is concern that this water may be contaminated, so the Bay Drift Study released six additional drifters to track where currents from these pumps are going.

To learn more about this exciting project, visit the CARTHE website [here](#) and the GoMRI website [here](#). View photos from their first drift card release in September 2016 [here](#). You can also follow along on social media using the hashtag #BayDrift and on CARTHE's Vimeo page [here](#), where they will be sharing updated videos throughout the year on the drift cards' tracks.



Maps of Bay Drift Study launch sites and current tracks. All photos courtesy of CARTHE



## GRIIDC Stories

GoMRI's data management program, the Gulf of Mexico Research Initiative Information and Data Cooperative (GRIIDC), has begun sharing stories and updates on their website highlighting their data management activities. Recently, they shared an article on their [presentation](#) at the Gulf of Mexico Alliance's (GOMA) All Hands Meeting, which included a Tool's Café focused on 20 different tools from around the Gulf. The GRIIDC team presented on the data management tools available to the community through GRIIDC. Be sure to check out this and many other stories featured on the GRIIDC website [here](#)!



# SUMMERTIME & FALL FIELDWORK

To highlight the summer and fall research seasons, we asked the GoMRI-funded consortia to tell us what they've been working on by asking them three questions:

- What did your consortia do during the summer and fall field seasons?**
- What was one of the most exciting or interesting things that happened?**
- What do you hope to discover or learn as a result of this field work?**

## C-IMAGE

*Provided by Ben Prueitt, C-IMAGE Program Manager*

Aboard the R/V *Weatherbird II*, researchers with the C-IMAGE-II Consortium planned the One Gulf Expedition, which collected thousands of bottom-dwelling fish, sediment, water, and plankton samples from the Yucatan Peninsula and Bay of Campeche to the Texas shelf. The 4,000 mile journey circumnavigating the Gulf completed a four-year plan to establish fish samples and sediment cores of baseline data from across the Gulf in Mexican and U.S. waters. While the R/V *Weatherbird II* was circling the Gulf, the *Tunnell Trek* was collecting tar, sediment cores, and tree cores from Mexican coastlines impacted by the 1979 Ixtoc I spill.

Surprisingly, C-IMAGE researchers found buried oil and tar in mangrove forests, rocky shorelines, and beaches of Mexico's Campeche, Tabasco, and Veracruz shorelines – evidence of residual oil. We assume this oil is 37-year-old tar from the Gulf's second largest spill, Ixtoc I. Some of these tar balls still gave off oil sheens in tide pools along the coast. The samples collected will provide insights to the decade-long degradation of oil and tar on shorelines and how the northern Gulf might look in 30 years from the Deepwater Horizon spill.

C-IMAGE conducted regular fishing and ROV surveys on fish populations off the Texas, Mississippi, and Florida coastlines. These studies compare the effectiveness of artificial reefs and oil rigs to recruit native reef fish but also the impact of invasive lionfish on reef ecosystems.

## DEEPEND

*Provided by Heather Judkins, DEEPEND Education and Outreach Coordinator*

This summer, DEEPEND continued their multi-vessel surveys of the deep Gulf of Mexico. The main focus of DEEPEND's summer field operations was to continue our time-series analyses of deep-pelagic nekton (fishes, crustaceans, and cephalopods) and oceanic larval fishes (with emphasis on tunas and billfishes). Specific areas of research included deep-pelagic community structure, abundance, distribution, behavior, and biochemical composition. Of special interest during this summer's field season was the discrimination of the types of pelagic habitats of the oceanic Gulf of Mexico, including the loop current and its large eddies, mesoscale

*continued on next page...*

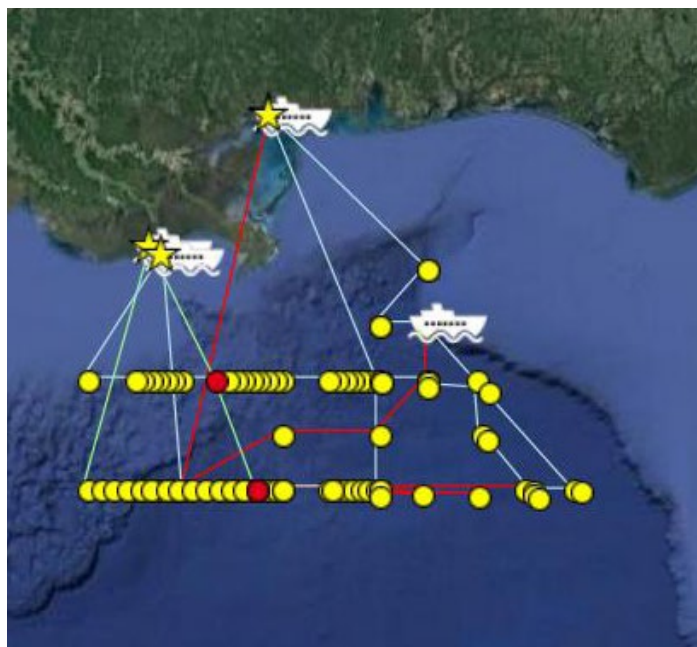


*DEEPEND researchers on the R/V Blazing Seven.  
Photo Credit: DEEPEND*



*continued from previous page...*

eddies, offshore riverine water, and “common water.” Four cruises were conducted, two aboard the R/V *Point Sur* and two aboard the R/V *Blazing Seven*. During *Point Sur* cruises, a net system was used to sample nekton from the surface to 1500 meters, with concurrent hydroacoustic sensing. These samples will be used to quantitatively assess the assemblages and to provide material for lab-based studies (genetics, biochemistry, organismal biology). The *Blazing Seven* cruises sampled two transects from the surface to 100 meters using ichthyoplankton nets. All cruises were updated in real-time on the DEEPEND site, with daily blogs and images. Among the more exciting findings were: a new (undescribed) species of fish and possible new jellyfish; PAH levels in fishes are back to their pre-spill values, but the composition is that of degraded oil, differing from pre-spill composition; PAH levels in fish eggs is three times that of their parents; and larval tuna numbers were higher in offshore filaments of the Mississippi River than in common water. Our acoustical data provided unprecedented evidence that global vertical movements of mesopelagic scattering layers are controlled by fine-scale behavioral mechanisms. Probably the most significant finding, however, was corroborative evidence that the abundance of deep-pelagic nekton has decreased substantially in the last couple of years (2015-2016). This pattern was not obvious immediately after the spill (2010-2011). The DEEPEND team is currently investigating these findings in great detail. In addition to field work, education and outreach was active this summer, including teacher-at-sea participation on research cruises, Creep into the DEEPEND virtual classroom missions, the release of a new learning module (“Pollution”), and new DEEPEND exhibits at the San Antonio Zoo and the Oregon Coast Aquarium.



DEEPEND research cruises in 2016. Stations are indicated by yellow circles. Daily blogs for each station can be accessed by clicking on each station on the DEEPEND homepage. Image Credit: DEEPEND

## ACER

*Provided by Tina Miller-Way, ACER Education and Outreach Coordinator*

ACER is investigating the link between biodiversity and ecological resilience in the coastal areas affected by the oil spill. Diversity is being explored at several scales – genetic, functional, and taxonomic – and in many organismal groups from microbes to sharks. ACER is divided into seven research groups based on this focus.

The wetlands group finished their almost year-long mesocosm experiment looking at the interaction of plant taxonomic and genetic diversity with plant responses to oiling. The microbes group sampled the algal mats that unexpectedly developed in the mesocosms. The microbe group is now looking at the thousands of sequences they have in hand from last year’s sampling. Preliminary data show differences in the genomic diversity between prokaryotes (16S) and eukaryotes (18S), with the latter group showing greater diversity. Field sampling by the oyster group extended from Florida to Louisiana, and they have begun their mesocosm experiments dosing oysters with oil, dispersant, and a combination of the two. They have concluded that oysters are pretty hardy but that it is possible to cause significant mortality with an oil and dispersant mixture. The consumer group has continued their sampling cruises, and their predator-prey mesocosm experiments are continuing. These will likely be finished by the end of the year. The nitrogen cycling group feels that they were able to get a good handle on the seasonal variation in denitrification rates in year one and are now examining the spatial variation among the habitats and sites in the Chandeleurs. The infaunal group has completed sample analysis for diversity and abundance at the Chandeleurs and Tampa Bay sites and have started collection of biomass data that might be important as they interpret rates of bioturbation. The microzooplankton group has some interesting results from their incubation experiments, which have led them to pursue some investigations on transparent exopolymer. They have also submitted a number of algal clones to the National Center for Marine Algae and Microbiota (NCMA), so the Gulf of Mexico presence is increasing there!

Some interesting results have been noted from sites in the Chandeleur Islands (ACER’s primary study area). Sampling in 2015 revealed a layer of highly contaminated sediment 15-20 centimeters below the surface in both marsh and seagrass (*Ruppia*) communities. Microbes associated with oil biodegradation were present at the sites, but the microbial community was not significantly different from other sites or habitats. While the wetlands group noted no significant differences in the macrofauna diversity or abundance at these sites compared to other sites, preliminary data from the infaunal group showed a significant loss of infaunal species diversity and reduced abundances at sites in the region of the buried oil. Interestingly, sampling at these sites in 2016, following several mild storm events, clearly showed mats of oil two to three inches thick on the sediment surface spanning a wide area. The potential resuspension

of oil from deep in the sediment can lead to additional oil exposure after storms over time and perhaps repeatedly reset the temporal trajectory of recovery.

ACER is investigating the link between biodiversity and ecological resilience in the coastal areas affected by the oil spill. The key hypothesis they are testing is whether more diverse ecosystems are more resilient. Given the variety of data ACER is generating with respect to organismal groups and type of diversity, the ACER project will contribute substantially to the robustness of the answer to this question. The answer to this question has profound implications for management of our coastal zones.

## CWC

*Provided by Murt Conover, CWC Associate Director of Education and Outreach*

The Coastal Waters Consortium-II (CWC-II) has had another busy field season conducting research in wetlands of coastal Louisiana with a goal of better understanding the fate and continued degradation of oil, its influence on food web structure, and how the resulting shifts influence populations, individuals, and ecosystem functions during the recovery phase as well as how continued oiling impacts interact with other ecosystem stressors. CWC-II's research activities in 2016 have involved both the continuation of many established field and laboratory activities examining recovery trajectories and the exploration of new ideas and approaches into continued and expanded research areas. The 2016 field season kicked off early, with insect collections beginning in January and extending throughout the year, loons in February through March, and seaside sparrow and marsh rice rat abundance counts in March-June. Some sampling efforts involve year-round field collections and incubations/experiments including plant dynamics and biogeochemical processes, while many others are focused during CWC's "marsh madness" sampling campaigns that take place in May and October of each year, bringing together researchers from across CWC-II in a coordinated effort to examine marsh conditions and communities at unoiled and oiled sites across three regions of the Louisiana coast.

CWC-II researchers have employed several new or expanded approaches in 2016. For example, the Seaside Sparrow group began trial deployments of video monitoring systems at 10 nests to shed light on the main causes of nest failure and gain new insights into what the predominant nest predators might be, with the ultimate hope of expanding this effort to an increased number of nests in order to capture as many predation and/or failure events as possible. In effort to better understand the fate and continued degradation of oil, CWC-II researchers began testing a handheld photoionization detector (PID) and non-invasive soil probe as a less destructive detection method of oil that might not be visible from the surface or detected in regular surface sediment samples (top 5 centimeters). This technique is still being optimized and validated for the vertical and horizontal subsurface distribution of oil along impacted coastal marshes, but preliminary results are promising. The CWC-II



*Salt marsh periwinkle snails on Spartina alterniflora. Photo Credit: CWC*

## Keep up with the Consortia Blog Roll and Social Media!

*Some of the Consortia have updated their blogs, many of which include highlights from their summer cruises. Check them out!*

**[CARTHE's Blog: Measure. Model. Mitigate](#)**

**[C-IMAGE's Blog](#)**

**[CONCORDE's Blog: Concordia Blog](#)**

**[CWC's Blog: Marsh Edge-U-Cation](#)**

**[DEEPEND's Adults Blog and Kids Blog](#)**

**[ECOGIG's Cruise Blogs](#)**

*Many Consortia are active on social media, including Twitter, Facebook, and Instagram!*

**[ACER: Facebook, Instagram](#)**

**[ADDOMEx: Facebook, Twitter, Instagram](#)**

**[CARTHE: Facebook, Twitter](#)**

**[C-IMAGE: Facebook, Twitter](#)**

**[CONCORDE: Facebook, Twitter, Instagram](#)**

**[CRGC: Facebook](#)**

**[CWC: Facebook, Instagram](#)**

**[DEEPEND: Facebook, Twitter, Instagram](#)**

**[Deep-C: Facebook, Twitter](#)**

**[DROPPS: Facebook, Twitter](#)**

**[ECOGIG: Facebook, Twitter, Instagram](#)**

**[RECOVER: Facebook, Twitter, Instagram](#)**



*continued from previous page...*

marsh food web effort continues to have its sampling efforts coordinated with the broader “marsh madness” sampling campaigns in May and October but was expanded in the 2016 field season to include sampling of biomarkers (bulk tissue carbon, nitrogen, and sulphur stable isotopes; compound-specific stable isotopes in amino acids; and fatty acid profiles) of food web components at two additional sites along a salinity gradient to better constrain how carbon flow through food webs is expected to change in response to anticipated shifts in salinity regimes. One important component of the food web, the marsh periwinkle, was the focus of several projects involving CWC-supported research experiences for undergraduates (REU) interns this summer. These projects included an examination of spatial distribution, density, biomass, morphometrics, and grazing pressure on them in marshes across the Louisiana coast and an examination of the foraging preferences of the marsh periwinkle. Additionally, CWC-II researchers have begun examining how shifts in marsh vegetation influence soil microbial communities and the rates of some key biogeochemical processes. It continues to become increasingly difficult to track the impacts of the oil spill in dynamic coastal landscapes impacted by a multitude of stressors. The construction of a large marsh mesocosm facility at LUMCON has been progressing throughout 2016 and is aimed at aiding CWC-II researchers to overcome some of these challenges by allowing us to initiate a large-scale marsh oiling experiment during the 2017 field season.

## CONCORDE

*Provided by Jessie Kastler, CONCORDE Outreach Coordinator*

“When swapping at-sea stories with colleagues, we can all agree that who you share the boat with will easily make or break a research cruise. As a consortium project, there are 18 scientists representing four institutions on board the R/V *Point Sur*, all with different skill sets, levels of experience, and paths that brought them to the CONCORDE team. Remembering that the term “Concordia” is Latin for harmony, this project could not have been more appropriately named.”



*Postdoctoral researcher Hannah Box exemplifies a CONCORDE practice from inside a bin where she collects water to measure radium concentrations that will provide information about sources and movement of water bodies. Photo Credit: CONCORDE*

So begins the final entry in CONCORDE’s informal blog, describing the research cruise undertaken July 23-31, 2016. The daily blog was a team effort of researchers Kelia Axler, Carla Culpepper, and Ali Deary to document life aboard the R/V *Point Sur*. Dr. Deary also provided a daily science update to share research progress. As with blogs written during other CONCORDE cruises, the summer campaign blog was read eagerly by families of those aboard. Facebook introduced the project to nearly 6,000 other people who clicked on one of 50 cruise posts. Popular posts showed images of “charismatic” planktonic organisms and graphics of water conditions. The cruise documented changes in plankton distributions associated with low dissolved oxygen, or hypoxia. Widespread hypoxia is stressful to organisms. The summer CONCORDE cruise documented distributions and types of plankton under these conditions to assist in predicting oil impacts during a spill. An adaptive sampling strategy guided the path of the *Point Sur* using onshore remote sensing interpretation.

Of course, what people really want to know is who’s out on the boat and what are they eating. Blog entries introduced both the accommodating vessel crew and the diversely trained research scientists, providing images of them in their natural ship-board habitats. Get glimpses of exquisitely prepared meals and snacks provided at all hours by the award winning chef of the *Point Sur*... bananas-foster king cake... yum.

## LADC-GEMM

*Provided by Natalia Sidorovskaia, LADC-GEMM Consortium Director*

In October 2015 the LADC-GEMM consortium recovered over 35 Terabytes of passive acoustic data collected by mobile and bottom-moored stationary autonomous platforms in the Northern Gulf of Mexico at the vicinity of the 2010 oil spill site. Data were collected during the summer and fall months of 2015. This dataset contains a wealth of information about the Gulf of Mexico and its inhabitants. LADC-GEMM scientists had a big task for 2016 to sort through these data using sophisticated computer algorithms to understand how the deep-diving whales have fared five years after the oil spill by comparison with data collected at the same sites in 2007 and 2010. It felt very much as a 007-agent eavesdropping on the deep-water world. Beaked whales, most elusive to visual observations and the extreme deep-water divers among marine mammals, endangered sperm whales, and many species of deep-water dolphins populate the area of the Mississippi canyon near the spill site. All of them rely on acoustic sounds to find food and communicate with each other in the deep ocean. Their auditory systems are far more superior than any sonar systems developed by humans. The abundance estimates, based on counting sounds produced by animals, have shown that the beaked whale presence in the area suffered a decrease from 2007 to 2010 but recovered from 2010 to 2015. Overall, the regional population density decreased by 35 percent from 2007 to 2010 and increased by over 300 percent from 2010 to 2015. It is likely that the beaked whales left the study area during and right after the



LADC-GEMM passive acoustic monitoring fleet (EARS buoys, gliders, and autonomous surface vehicle) on the way to collect over 30 Terabytes of data for scientists to analyze. Photo Credit: LADC-GEMM

spill because of decreased food availability caused by the spill. The good news is they are coming back. However, we still do not understand the long-term effects on their health and fecundity. Only continuous acoustic monitoring of the stock over several years can provide reliable answers. The advancement of the automatic computer algorithms allowed LADC-GEMM researchers not only to distinguish beaked whale echolocation clicks among other ocean sounds but also to separate different species of beaked whales. LADC-GEMM scientists are learning more about these mysterious Gulf animals by developing more sophisticated computer programs to process acoustic data. For example, Cuvier beaked whales dominate two deep water sites (over 1500 meters) while the Gervais prefer shallower waters of the continental shelf (approximately 1000 meters), perhaps explained by ecological niche model. The processing results also point to other factors, which impact day-to-day movements of these animals, such as industrial acoustic noise, weather conditions, fishing, etc. Researchers clearly see that the acoustic activity of beaked whales drops when there is an increased level of seismic exploration noise in the area. LADC-GEMM will continue monitoring the sites into the winter months of 2016 and through the summer and fall of 2017 to obtain more reliable information about the long-term oil spill impact. The analysis of data relevant to endangered sperm whales and dolphins is currently underway.



LADC-GEMM consortium scientists and students on UL Lafayette campus during the 2016 annual meeting (September 28-29). Photo Credit: LADC-GEMM

## Science Corner

### Published Science Highlights from the GoMRI Program

#### [Study Suggests Wider Range of Mahi-Mahi's Genetic Responses to Oil Exposure](#)

E.G. Xu, E.M. Mager, M. Grosell, C. Pasparakis, L.S. Schlenker, J.D. Stieglitz, D. Benetti, E.S. Hazard, S.M. Courtney, G. Diamante, J. Freitas, G. Hardiman, D. Schlenk  
Environmental Science and Technology, 2016, Vol. 50(14), pgs. 7842-7851

#### [Study Finds Natural Sunlight Affects Oil-Degrading Bacteria Composition and Dynamics](#)

H.P. Bacosa, Z. Liu, D.L. Erdner  
Frontiers in Microbiology, 2015

#### [Study Details Underwater Oil Plume Formation and Droplet Size Distribution](#)

L. Zhao, F. Shaffer, B. Robinson, T. King, C. D'Ambrose, Z. Pan, F. Gao, R.S. Miller, R.N. Conmy, M.C. Boufadel  
Chemical Engineering Journal, 2016, Vol. 299, pgs. 292-303

#### [Study Compares Natural Sunlight Effects on Macondo and Surrogate Oil](#)

P.P. Vaughan, T. Wilson, R. Kamerman, M.E. Hagy, A. McKenna, H. Chen, W.H. Jeffrey  
Marine Pollution Bulletin, 2016, Vol. 104(1-2), pgs. 262-268

#### [Study Investigates Oil Spill Impacts and Recovery of Salt Marsh Fiddler Crab Populations](#)

S. Zengel, S.C. Pennings, B. Silliman, C. Montague, J. Weaver, D.R. Deis, M.O. Krasnec, N. Rutherford, Z. Nixon  
Estuaries and Coasts, 2016, Vol. 39(4), pgs. 1154-1163

#### [Study Uses Gulf Science Data to Analyze Water Chemistry near Deepwater Horizon](#)

T.L. Wade, J.L. Sericano, S.T. Sweet, A.H. Knap, N.L. Guinasso, Jr.  
Marine Pollution Bulletin, 2016, Vol. 103(1-2), pgs. 286-293

#### [Study Uses ROV Imaging System to Measure Gas Bubble Size, Velocity, and Diffusion](#)

B. Wang, S. A. Socolofsky, J.A. Breier, J.S. Seewald  
Journal of Geophysical Research: Oceans, 2016, Vol. 121(4), pgs. 2203-2230

#### [Study Examines Sediment East of the Deepwater Horizon for Oil-Associated Marine Snow](#)

G.R. Brooks, R.A. Larson, P.T. Schwing, I. Romero, C. Moore, G. Reichart, T. Jilbert, J.P. Chanton, D.W. Hastings, W.A. Overholt, K.P. Marks, J.E. Kostka, C.W. Holmes, D. Hollander  
PLOS One, 2015, Vol. 10(7): e0132341

#### [Study Shows Dispersants Did Not Improve Oil Biodegradation](#)

S. Kleindienst, M. Seidal, K. Ziervogel, S. Grim, K. Loftis, S. Harrison, S. Malkin, M. Perkins, J. Field, M. Sogin, R. Dittmar, U. Passow, P. Medeiros, S. Joye  
Proceedings of the National Academy of Sciences of the United States of America, 2015, Vol. 112(48), pgs. 14900-14905

#### [Study Observes Mobile Bay Plume Dynamics on Coastal Circulation](#)

B. Dzwonkowski, K. Park, R. Collini  
Journal of Geophysical Research: Oceans, 2015, Vol. 120(9), pgs. 6145-6163

**To see all GoMRI publications, please visit the [GoMRI Publication Database](#).**





## Note from the Research Board Chair

*Dr. Rita Colwell, University of Maryland & Johns Hopkins University*

### Announcing the Release of GoMRI's Special Issue of *Oceanography*

The Research Board is pleased to announce the release of the special issue of the journal *Oceanography* featuring the GoMRI scientific team and research.

The special issue is titled "GoMRI: Deepwater Horizon Oil Spill and Ecosystem Science" and reflects the excellent efforts of our Research Board members, GoMRI scientists, and our Management Team. John Shepherd, Ken Halanych, Debi Benoit, and Richard Shaw from the Research Board and GoMRI's Chief

Scientific Officer Chuck Wilson served as guest editors. The issue is the first compilation of research accomplished to date and represents a synthesis of the science GoMRI has funded over the past six years. I am pleased to share this publication with you.

The special issue focuses on several of the scientific questions GoMRI scientists are seeking to answer: What happens to oil post spill? What role(s) do dispersants play in mitigation? How did the Deepwater Horizon oil spill impact the ecosystem of the Gulf of Mexico? Are the beaches and seafood safe?

The articles in this issue provide an overview of the GoMRI program and research model, and cover data management and education and outreach, as well as efforts to engage with public health agencies and the issue of risk perception.

This special issue is the first of several being prepared to provide the widest audience possible a view of the research accomplished and underway and information of findings to date. In addition to this and subsequent special issues, GoMRI has supported documentary films, media releases, and more formal communication through scientific publications in peer reviewed journals, books, and press releases. The objective is to work closely with a fully informed public.

We are indebted to those who worked diligently on this special issue and wish to thank the editors of *Oceanography* for their assistance and guidance in the preparation of this special issue of the journal. Please view the journal on the [Oceanography website](#) and also on the GoMRI website [here](#).



Screenscope, Inc., in partnership with GoMRI, recently released fifty short videos complementing the *Dispatches from the Gulf* documentary film. The videos include highlights from the film, interviews with GoMRI scientists and graduate students, and more. An associated Educators Guide provides detailed descriptions and keywords for each video. The videos were generated as an extension of the film, to be used in classroom curriculum and in other educational efforts.



The shorts are available on the *Dispatches from the Gulf* website [here](#), and the Educators Guide can be found [here](#). If you are an educator, or know someone who is, you can request a free copy of the *Dispatches from the Gulf* DVD to use in your classroom [here](#).

GoMRI launched a social media campaign in collaboration with Screenscope in October 2016, using the hashtag #50shorts. Follow along on GoMRI's Twitter page [here](#)!

Screenscope also recently launched a new podcast series based on the *Dispatches from the Gulf* documentary, called "Gulfcast." The podcasts will feature interviews and stories with GoMRI scientists. Check them out [here](#)!



# GoMRI Interview with Dr. Scott Grayson

Dr. Scott Grayson from Tulane University answered a few questions about his RFP-II project, [Development of Cost-Efficient and Concentration-Independent Dispersants for Improved Oil Spill Remediation](#).



Dr. Scott Grayson

## 1. Thank you for talking with us! Tell us a bit about your research. What are the goals of your project?

The goal of the research is to find a cheap and effective alternative to existing dispersants by pursuing a completely different approach. The vast majority of dispersants work by self-assembling amphiphiles into a form that stabilizes oil/water emulsions. However, such aggregates are inherently susceptible to disaggregation and destabilization. Therefore traditional dispersants have to fight a tug of war between the active species (assembled) and inactive species (individual molecules). The dilution that occurs in large bodies of water eventually disfavors the active species, though dispersants may exhibit stability in the short-term.

Our design is to construct a “single nanoparticle micelle” that is covalently tethered together in the active form and therefore will not disaggregate/destabilize, regardless of concentration, temperature, salt concentration, etc.

## 2. What is your background, and how did you get involved with this kind of work?

My background is in synthetic polymer chemistry with a focus on tuning molecular and nanoscale architecture. The concept of “unimolecule micelles” has been explored for delivery of drugs in vivo, but there has been little work that translates this concept to oil dispersants. I felt that combining the unimolecule micelle concept with a nanoparticle substrate, and applying these carriers for dispersant technologies, held much promise.

## 3. Can you talk a little more about what “unimolecule micelles” or “single nanoparticle micelles” are and how they work in this application?

When in a biphasic oil and water system, traditional amphiphiles can assemble at the interface of the two phases. This encourages the oil to break up into microdroplets which can then be more easily dispersed and undergo bioremediation. The amphiphiles effectively form a spherical shield around each oil microdroplet to stabilize them. However, when diluted below an inherent value, their critical micelle concentration (CMC), these dispersants are too depopulated to stabilize the micelles. As a result, the oil microdroplets can then recombine, potentially forming a slick. Because most oil spills occur in large bodies of water, dilution is an unavoidable problem.

*continued on next page...*

# GoMRI Scholars in Action

The Gulf of Mexico Research Initiative (GoMRI) is recognizing the graduate students whose vital research contribute to improving understanding about the damage, response, and recovery of the Deepwater Horizon oil spill. Candidates for this program must be graduate students who have participated in a GoMRI-funded project for at least one year, whose work is primarily funded by GoMRI, and who are working on a dissertation or thesis based on GoMRI-funded science.

**Learn more about the scholars' research and career paths on the GoMRI website!**

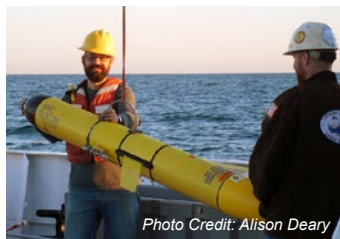


Photo Credit: Alison Deary

[Grad Student Boyette Maps Plankton to Better Understand the Nearshore Environment](#)

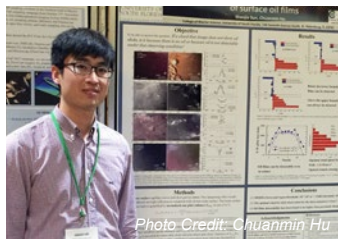


Photo Credit: Chuanmin Hu

[Grad Student Sun Uses Sun Glint to Assess Oil Spills](#)

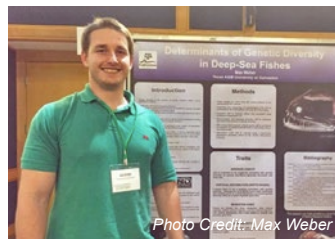


Photo Credit: Max Weber

[Grad Student Weber Fishes for Insight into Deep-Pelagic Fish Taxonomy](#)



Photo Credit: Jacqueline Fiore

[Grad Student Fiore Investigates Oil Spill Impacts on Gulf Economy and Fisheries Resiliency](#)

The first “unimolecular micelles” were single-nanometer amphiphilic dendrimers. Their structure resembled a porous sphere with a hydrophobic interior and a hydrophilic surface. Detailed characterization verified that these structures could encapsulate hydrophobic compounds, yet unlike the simple amphiphiles used as surfactant and dispersants, these dendrimers had no critical micelle concentration. Because the three-dimensional structure of dendrimers is covalently bound together, they can encapsulate oil at any concentration, even under extreme dilution, without being destabilized. Although these dendrimers have many attractive features as dispersants, their single-nanometer size and low encapsulation volume makes them unrealistic for large-scale use. Our target for this research project was to make a much larger, cheaper analog, a “single nanoparticle micelle” that was approximately 100 nanometers in size and exhibited an encapsulation capacity (by weight) similar to traditional dispersants.

**4. What are some of the most significant or exciting findings from your RFP-II project?**

We are excited to be able to report that we have confirmed the proof of concept for this alternative design. By grafting amphiphilic polymers onto the surface of a nanoparticle, we have made “single nanoparticle micelles” that exhibit long-term stability when encapsulating oil, even at high dilution.

**5. If funding were not an issue, what would you have added to your project?**

Although we are excited to have demonstrated the concept of single nanoparticle dispersants, the meaningful long-term goal is finding a design that is cheap enough, non-toxic in marine environments, and sufficiently scalable to offer a competitive technology relative to existing dispersants. Though I believe this is possible, this is a very demanding goal that will require a rather significant investment of time, resources, and funding.

**6. Your response to the previous question points to the challenges in further developing this technology for real-world application. What would the next steps be to make this possible?**

The application of single nanoparticle micelles as dispersants is sufficiently different than existing commercial technologies that it could be considered a disrupting technology. Like all disrupting technologies, the first step is proving the concept, and I believe the research from our initial GoMRI support confirmed this. The next steps include: 1) demonstrating that it has a sufficiently superior performance with respect to existing technologies to justify its development (thorough side-by-side comparisons), 2) verifying that the technology is commercially feasible (scalability and price) and 3) confirming it can be designed to exhibit a reduced environmental impact relative to existing technologies (biodegradation and toxicity studies). These concerns are the focus of our continued research efforts.



**Sea Grant Partnership**

The Gulf Sea Grant team hosted several seminars throughout the summer and fall. On August 30<sup>th</sup>, they hosted a seminar in Miami, Florida called *Technology and Deepwater Horizon*, which highlighted new technologies that have resulted from studying the impacts of the Deepwater Horizon oil spill. Tours of some laboratories on the University of Miami-Rosenstiel School of Marine and Atmospheric Science campus were provided for in-person attendees. Additional information on this seminar, including a recording, can be found [here](#).

On September 27<sup>th</sup>, the Gulf Sea Grant team hosted a seminar called *Building Resilient Communities: Lessons Learned from the Deepwater Horizon Oil Spill* at the University of Southern Mississippi Park Campus. Panelists spoke about programs available to communities following disasters and lessons learned in increasing community resilience. More information about the seminar, including a recording, is available [here](#).

The Gulf Sea Grant team hosted a workshop on November 8<sup>th</sup> at the Gulf and Caribbean Fisheries Institute (GCFI) annual conference in Grand Caymen called *Oil Spill Science and Information Needs for Gulf and Caribbean Regional Stakeholders*. The workshop focused on discussing information needs in response to oil spills. The team also collected information from workshop participants that will help guide the development of new products and resources going forward. More information on this workshop can be found [here](#).

The Gulf Sea Grant team also released a new publication called *Skin Lesions in Fish: Was There a Connection to the Deepwater Horizon Oil Spill?* Following the 2010 oil spill, many fishermen began noticing lesions on the skin of offshore fishes and wanted to know if they were in connection with the Deepwater Horizon oil spill. This publication summarizes what fish skin lesions are, if they are a cause for concern when eating seafood, and if they were caused by the Deepwater Horizon oil spill. Read the publication [here](#).

Finally, the Gulf Sea Grant team attended the 2016 Clean Gulf conference in Tampa, Florida from November 1-3 in partnership with GoMRI Management Team members. A full summary of that conference can be found on page 12.





Just in time for Halloween, Smithsonian's Ocean Portal published their most recent article called "*Meet the Tiny Bacteria that Give Anglerfishes Their Spooky Glow*" in partnership with [DEEPEND](#). The article describes the symbiotic relationship between anglerfish and Photobacterium. Photobacterium live inside anglerfishes' esca, or lure, where they create a bioluminescent glow that helps the anglerfish catch prey. In return the Photobacterium receive protection and nutrients as the anglerfish swims through the water. Check out the amazing story [here](#)!



Photo Credit: Disney Pixar's Finding Nemo

## Education Spotlight

**ECOGIG:** ECOGIG recently launched this season's Science and the Stadium events. This year, ECOGIG is traveling with their Ocean Discovery Zone exhibit to other institutions within their consortium, and their first event of the fall season took place at Penn State in early September. In October, they attended the University of Georgia vs. Tennessee football game at UGA and traveled to Florida State University for the FSU vs. Wake Forest football game. To learn more about ECOGIG's Ocean Discovery Zone and their Science at the Stadium series, visit the ECOGIG website [here](#). Check out photos from the September event at Penn State [here](#) and a short video [here](#)!

**LADC-GEMM:** Kendal Leftwich is a physics teacher at Warren Easton High School in New Orleans, Louisiana. He is also pursuing a PhD in physics at the University of New Orleans and is currently a graduate student with the LADC-GEMM consortium. Taking advantage of this unique connection, Mr. Leftwich is working with students from his physics class to analyze LADC-GEMM acoustic data from the 2015 field season. The goal of the partnership is to help the students learn how to analyze and interpret data from the field and also provide them an opportunity to communicate and share their results. Learn more about this collaboration [here](#)!



Above: Visitors check out the ROV tank at the Ocean Discovery Zone exhibit at the Penn State vs. Kent State Football game in September. Photo Credit: ECOGIG

Left: Kendal Leftwich and Warren Easton high school students analyze LADC-GEMM acoustic data. Photo Credit: LADC-GEMM

## GoMRI Attends 2016 Clean Gulf Conference in Tampa, FL



Members of the GoMRI Management Team, as well as members of the Gulf Sea Grant Team and the Gulf of Mexico Research Initiative Information and

Data Cooperative (GRIIDC), attended the 2016 Clean Gulf Conference from November 1-3, 2016 in Tampa, Florida. The goal of the conference was to bring together members of the oil spill prevention, preparedness, and response communities to “establish and build relationships [needed] in place before an incident on water or land occurs.” GoMRI and Sea Grant were interested in participating in this conference to learn how GoMRI can continue to provide oil spill science and products to this community to help aid in preparedness and response efforts.

Sherryl Gilbert from the Center for the Integrated Modeling and Analysis of the Gulf Ecosystem (C-IMAGE) Consortium and Dave Palandro from ExxonMobile organized a workshop called Oil Spill Responses 101 and Exploring the Role of Environmental Research During Response and more than 100 conference participants attended. The workshop featured presentations from GoMRI's Program Manager, Kevin Shaw, who provided an overview of the program, and several GoMRI-funded consortium directors and Principal Investigators, including Steve Murawski (C-IMAGE), Tamay Ozgokmen (CARTHE), and Terry Wade (ADDOMEx) who shared some of the science GoMRI is producing. Monica Wilson discussed GoMRI's partnership with the four Gulf Sea Grant Programs. The second panel included presentations from several members of government and industry including representatives from the National Oceanic and Atmospheric Administration, the Natural Resources Damage Assessment (NRDA), Shell, and the Net Environmental Benefit Analysis (NEBA), sharing the current methods of oil spill response. The final session included a discussion from the participants on the role of scientific research in the response process and how these relationships can be expanded for improved spill response.



Members of the GoMRI Management Team, GRIIDC, Sea Grant, and GoMRI-funded consortia attend the 2016 Clean Gulf Conference. From left to right: Katie Fillingham, Sherryl Gilbert (C-IMAGE), Dave Reed (GRIIDC), Leigh Zimmermann, and Monica Wilson (Sea Grant). Photo Credit: Katie Fillingham

GoMRI also hosted a booth in the exhibit hall, which saw many visitors. Staff from the Management Team, GRIIDC, the Gulf Sea Grant Team, and the C-IMAGE consortium all participated in staffing the booth and distributing materials and hot sauce. A brief survey was also available for visitors to complete, seeking input on what types of materials or products featuring oil spill science would be most useful to them in their work.



**RECOVER** recently shared a video of their efforts to satellite tag wild Mahi. The goal of this experiment is to track wild Mahi over a course of 90 days to record their position, depth, and acceleration. RECOVER hopes that this information will help scientists better understand how wild Mahi move, hunt, and spawn. Check out the [video here!](#)

Also check out a previous [video](#) posted by **RECOVER**, featuring PhD student Lela Schlenker, who leads this experiment. The video discusses the concept behind the tagging of the Mahi and how the data is collected.



**RECOVER**  
CONSORTIUM



## Frequently Asked Questions by Dr. Chuck Wilson

*Dr. Chuck Wilson, Chief Scientific Officer for the Gulf of Mexico Research Initiative (GoMRI), answers a few frequently asked questions about the program.*

**Question:** GoMRI recently announced a call for research proposals (RFP-VI). What are the goals and objectives of RFP-VI?

**Answer:** GoMRI is seeking proposals that represent continuation of previously designated research themes and topics that have emerged, data integration from various sources, scientific synthesis across themes and consortia, and/or other overarching scientific and technological products exploiting the GoMRI scientific legacy. More information can be found in the [RFP](#).

The ultimate goal of all GoMRI investments are to improve society's ability to understand, respond to, and mitigate the impacts of petroleum pollution and related stressors of the marine and coastal ecosystems, with an emphasis on conditions found in the Gulf of Mexico. Knowledge accrued will be applied to restoration and to improving the long-term environmental health of the Gulf of Mexico.

**Question:** What makes RFP-VI unique?

**Answer:** This will be the sixth and final call for research proposals for the GoMRI program. To date, GoMRI has awarded over \$350 million that has touched over 250 institutions, thousands of investigators, and over 750 graduate students.

RFP-VI is different than previous RFPs because this competition is open to both consortia (proposals that involve three or more institutions) and individual investigators (Principal Investigator with up to 3 co-PIs).

RFP-VI also invites proposers to include objectives that lead to scientific synthesis and/or data integration. GoMRI will end in 2020, and it is important to capture, integrate, and preserve the scientific research and technology of all of the investments to date.

**Question:** What is the timeline and application process for RFP-VI?

**Answer:** RFP-VI was released on October 3, 2016, and Letters of Intent were due on November 14, 2016. Full proposals will be due March 3, 2017. The deadline to submit questions is February 17, 2017. Award announcements will be made in September 2017 after a formal review process. For more information on RFP-VI, visit the GoMRI website [here](#).

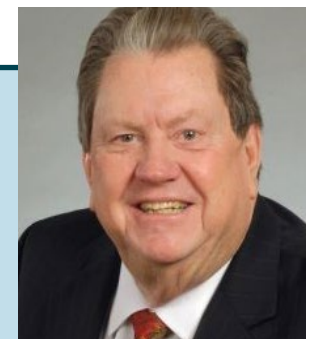


## GoMRI Newsmakers

GoMRI would like to extend congratulations to Dr. Rita Colwell, Chair of the GoMRI Research Board, on serving as founding author of a *new journal* set to be released jointly by the American Geophysical Union (AGU) and Wiley called *GeoHealth*. *GeoHealth* "will disseminate research relating Earth and environmental sciences to human, agricultural, and environmental health." More information on the development of the first issue can be found [here](#). Congratulations to Dr. Colwell on being a part of this exciting new endeavor, connecting the earth and environmental sciences with human health!



*Dr. Rita Colwell*



*Dr. Bill Hogarth*

The GoMRI community would like to congratulate Dr. Bill Hogarth, a member of GoMRI's Research Board, on [receiving](#) the Carl R. Sullivan Fishery Conservation Award. He was honored with the award in recognition of his many achievements in the marine sciences. Dr. Hogarth recently retired after a distinguished 51-year career. Congratulations to Dr. Hogarth!