

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/>

Upcoming Events:

American Geophysical Union (AGU) 2019 Fall Meeting

December 9-13, 2019
San Francisco, California
Visit the GoMRI Booth (#1244) in the Exhibit Hall!

2020 Gulf of Mexico Oil Spill and Ecosystem Science (GoMOSES) Conference

February 3-6, 2020
Tampa, Florida
Submit an Abstract! Deadline is September 30, 2019.
Registration is now open! Early bird registration ends November 27, 2019.

Synthesis and Legacy Workshops

Core Area 3 – Vulnerability and Resilience of Species and Ecosystems to Large-Scale Contamination Events: Lessons from Deepwater Horizon

October 9-11, 2019
Washington, District of Columbia

Core Area 7 – Operational Oil Spill Monitoring

October 15-17, 2019
Washington, District of Columbia



Photo Caption: Scientists conducted mesocosm studies on fiddler crabs to understand how crude oil impacts them. Read more in the Science Corner on page 5 of this issue and on the GoMRI website [here](#). Image Credit: Marco E. Franco, University of Louisiana, Lafayette.

Screenscope Films Releases

Dispatches from the Gulf 3



“The most common question is, Has the Gulf of Mexico recovered from the oil spill?”

Dr. Chuck Wilson,
Dispatches from the Gulf 3

Contributing Author: Rebecca Howland

Screenscope Films, the Gulf of Mexico Research Initiative (GoMRI), and the GoMRI Research Board are pleased to announce the release of *Dispatches from the Gulf 3: Ten Years After the Deepwater Horizon Oil Spill*, the third documentary film in the *Dispatches from the Gulf* series.

Dispatches from the Gulf 3 focuses on the legacy of GoMRI as the program comes to an end in 2020. The film features scientific highlights from GoMRI-funded research in the areas of ecology, physical oceanography, and chemistry. GoMRI researchers, graduate students, and Research Board members also share their experiences and reflections on the value of collaborative science and investment in outreach as exemplified by GoMRI, the creation of the next generation of scientists through the program, dealing with public skepticism of science, and the challenges faced by women in the sciences.

Dispatches from the Gulf 3 is the sixteenth episode in Screenscope Films' [Journey to Planet Earth](#) series

and is narrated by Matt Damon. Upcoming screenings of the film will be shared on the *Dispatches from the Gulf* website [here](#). To accompany the third film, Screenscope Films has released a series of new short videos, bringing the total short videos in the *Dispatches from the Gulf* series across all three films to one hundred. All shorts are available on the *Dispatches from the Gulf* YouTube Channel [here](#). Digital streaming versions of all three films are available free of charge to educators, librarians, homeschoolers, and community activists. Educational resources and podcasts are also available; visit the *Dispatches from the Gulf* [website](#) for more information.

“The most important lesson that comes from the Gulf of Mexico Research Initiative is that it has proven to be an enormously successful collaboration among industry, academia, government, and non-governmental organizations. It provides a model for the future; when funding sources are reduced from the federal government or from state governments, it is a way to mobilize society constructively to address a very important societal problem.”

Dr. Rita Colwell, *Dispatches from the Gulf 3*

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“When the big spill occurred in the Gulf of Mexico, the Deepwater Horizon spill, I received a phone call from the chief scientist, Dr. (Ellen) Williams, at BP asking if I would consider being in charge of a program to do basic research on the spill and how it could be dealt with. I agreed that it would be interesting to do this, but I said look, it really has to be independent. Fully independent. And there was no question; Dr. Williams said of course it would be independent. This would be an opportunity to carry out basic research applied to a very important national problem – namely dealing with the aspects of oil spills that were really critical to the nation. What happens to the ecology? What happens to the people who are working and living in the shore areas? And especially, what happens to those who are the fishermen, whose lives and livelihood depend on having fish, shellfish available for market and for the public as a food source. These were the kinds of questions that we wanted a curious mind of investigators to address and provide the best information that could be made available for the public. So, I agreed to form the Gulf of Mexico Research Initiative and its Research Board.”

Dr. Rita Colwell, Dispatches from the Gulf 3



Collage Credit: Screenscope

Dispatches from the Gulf 1 and 2 have been screened several times in recent months. *Dispatches from the Gulf 1* was screened on June 8 as a part of World Oceans Day at the Mote Marine Laboratory and Aquarium in Sarasota, Florida. *Dispatches from the Gulf 2* was screened at the Brookfield Zoo Discovery Center in Brookfield, Illinois on June 18 in partnership with the Consortium for Advanced Research on Marine Mammal Health Assessment (CARMMHA). Nearly 160 people attended the screening, and researchers from CARMMHA participated in a panel and answered audience questions following the film. Visit the CARMMHA website for a summary of the event [here](#). CARMMHA also hosted a screening of *Dispatches from the Gulf 2* in Charleston, South Carolina in August. Congressman Joe Cunningham and the National Oceanic and Atmospheric Administration’s National Ocean Service Acting Assistant Administrator Nicole LeBoeuf attended and participated in a panel discussion. Charleston’s mayor John Tecklenburg attended the event as well. Read more on the CARMMHA website [here](#) and on their Facebook page [here](#).

GoMRI Newsmakers

Dr. Joel Kostka, professor in the Schools of Biological Sciences and Earth and Atmospheric Sciences and associate chair of research in the School of Biological Sciences at the Georgia Institute of Technology, has been [elected](#) as an American Academy of Microbiology (AAM) Fellow. AAM Fellows, an honorific leadership group within the American Society for Microbiology, are elected annually “through a highly selective, peer-review process based on their records of scientific achievement and original contributions that have advanced microbiology.” [Dr. Kostka](#) is a co-principal investigator with the [Center for the Integrated Modeling and Analysis of the Gulf Ecosystem \(C-IMAGE\)](#) and was a co-principal investigator with the [Deepsea to Coast Connectivity in the Eastern Gulf of Mexico \(Deep-C\)](#) consortium. He is also a co-principal investigator on the RFP-V project [A Systems Approach to Improve Predictions of Biodegradation and Ecosystem Recovery in Coastal Marine Sediments Impacted by Oil Spill](#). The GoMRI community [congratulates](#) Dr. Kostka on this distinction and recognition of his many scientific contributions!



Photo Caption: Dr. Joel Kostka. Photo provided by Dr. Kostka.

The [Dispersion Research on Oil: Physics and Plankton Studies \(DROPPS\)](#)

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consortium partnered with the University of Texas Marine Science Institute (UTMSI), Texas A&M University Corpus Christi (TAMUCC), and the Smithsonian Institution's MarineGEO program to host a Texas Coastal Bend BioBlitz from May 28 through June 6. The goal of the event was to conduct an in-depth biodiversity survey in both Corpus Christi and Port Aransas, Texas to expand and synthesize knowledge of the marine life in the area in order to have a robust baseline against which to track environmental change and impacts from future oil spills. Samples, which included both invertebrates and fishes, were collected and analyzed by scientists, graduate students, and volunteers - some as young as 11! Sixty-eight locations were sampled during 131 sampling events, and 1,441 individual organisms across 310 unique invertebrate taxa were collected. Read more about the event on the Smithsonian Institution's National Museum of Natural History website [here](#). An interview with DROPPS director Ed Buskey about the campaign is available [here](#).



Sea Grant

Texas • Louisiana • Florida
Mississippi-Alabama

The Gulf of Mexico Sea Grant Oil Spill Science Outreach team recently released a new eight-page publication titled *Birds of a Feather – Coping with Oil*. The publication summarizes the ways birds can

be impacted during oil spills. Oiling of birds' feathers can make it difficult for them to fly, potentially reducing their ability to find food, reproduce, and migrate. Impacts to migration can affect bird populations all over the world. Oiling can also reduce birds' ability to maintain their body temperature, potentially leading to hypothermia and death. They can ingest oil through preening and eating contaminated food; ingestion of oil can cause the heart to weaken and enlarge, damage red blood cells and the liver, and reduce the birds' ability to produce antioxidants. The publication also summarizes the estimations of bird losses following the Deepwater Horizon oil spill, determined through the Natural Resource Damage Assessment, and the effects of chronic oiling on birds. Read the publication [here](#). The team also recently re-released the eight-page publication *Top 5 Frequently Asked Questions About the Deepwater Horizon Oil Spill*, which was updated to include recent peer-reviewed research and findings. Read the updated publication [here](#). Read all of the Gulf of Mexico Sea Grant Oil Spill Science Outreach Program publications [here](#).

The team hosted two oil spill science seminars in recent months. *Impacts of Oil Spills on Estuaries* took place on July 1 and was hosted by the Grand Bay National Estuarine Reserve in Moss Point, Mississippi. The goal of the seminar was to discuss the impacts of oil on estuarine habitats, including impacts on circulation, phytoplankton, submerged aquatic vegetation, and fish. Presenters included Monica Wilson from Florida Sea Grant, Brian Dzwonkowski from the University of South Alabama and Dauphin Island Sea Lab, James Pinckney from the Belle W. Baruch Institute of Marine and Coastal Sciences at the University of South Carolina, Charles Martin from the University of Florida's Institute of Food and Agricultural Sciences Nature Coast Biological Station, Chelsea Hess from Louisiana State University, and Jill Awkerman from the Gulf Ecology Division of the Environmental Protection Agency. More information, including an agenda, speakers' biographies, and presentation recordings, is available [here](#). *'Underdogs' and Oil Spills: Impacts, Recovery, and Restoration* took place on August 13 at the U.S. Fish and Wildlife Services Refuge Complex in Lacombe, Louisiana. This seminar discussed oil spill impacts to organisms that are less common outside of the scientific community, but that provide vital information to researchers about the health of the ecosystem. Examples of these organisms include foraminifera, periwinkles, larval fish, and insects. Presenters included Emily Maung-Douglass from Louisiana Sea Grant, Patrick Schwing from the University of South Florida and Eckerd College, Frank Hernandez from the University of Southern Mississippi, Kayla Kimmel and James Harris from the U.S. Fish and Wildlife Service, Scott Zengel from Research Planning Inc., Linda Hooper-Bui and Michael Polito from Louisiana State University, and Gina Muhs Saizan from the Louisiana Oil Spill Coordinator's Office. Visit the Sea Grant website [here](#) for more information about this seminar. Summaries of all of the Gulf of Mexico Sea Grant Oil Spill Science Outreach Program's previous seminars and workshops are available [here](#).



Image Credit: Gulf of Mexico Sea Grant Oil Spill Science Outreach Program.

Keep up with the GoMRI-Funded Consortia on Social Media

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

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

CARMMHA: [Facebook](#)

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

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

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

CRGC: [Facebook](#)

CSOMIO: [Facebook](#), [Twitter](#)

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

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

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

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

LADC-GEMM: [Facebook](#)

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

**Check out the Gulf of Mexico
Research Initiative Information and
Data Cooperative's (GRIIDC) recent
stories:**

GRIIDC Article in Current

**GRIIDC Attends GOMA All Hands Meeting in
Gulf Shores**

**HRI and GRIIDC are Featured on ESIP
Website as "Partner Highlight"**

**Follow the Gulf of Mexico Oil Spill
& Ecosystem Science (#GoMOSES)
conference on social media!
[Facebook](#), [Twitter](#)**

The [Littoral Acoustic Demonstration Center](#) – [Gulf Ecological Monitoring and Modeling](#) (LADC-GEMM) consortium co-sponsored a special issue of *ECO Magazine* on ocean sound. The special issue highlights recent

advancements in technologies used to monitor ocean sound and some of the scientific discoveries that have been made. LADC-GEMM consortium director Natalia Sidorovskaia authored an article in the special issue called *Eavesdropping on the Gulf of Mexico*. It summarizes LADC-GEMM's passive acoustic data collection efforts in the Gulf, including research funded by the Gulf of Mexico Research Initiative (GoMRI) to understand the impacts of the Deepwater Horizon oil spill on deep-diving marine mammals utilizing passive acoustic monitoring. Read the special issue, and the article, in digital format [here](#).

M. Mitchell Waldrop authored a news feature in *Proceedings of the National Academy of Sciences of the United States of America* (PNAS) titled *The Perplexing Physics of Oil Dispersants* highlighting the research efforts of several GoMRI-funded scientists to understand the effects of dispersant use following the Deepwater Horizon oil spill. In the article, Tamay Özgökmen ([Consortium for Advanced Research on Transport of Hydrocarbon in the Environment](#) (CARTHE)), Eric D'Asaro (CARTHE), Scott Socolofsky ([The Center for the Integrated Modeling and Analysis of the Gulf Ecosystem](#) (C-IMAGE)), Claire Paris (C-IMAGE and [Relationships of Effects of Cardiac Outcomes in Fish for Validation of Ecological Risk](#) (RECOVER) consortium), Michel Boufadel (CARTHE and [Dispersion Research on Oil: Physics and Plankton Studies](#) (DROPPS) consortium), and Joseph Katz (DROPPS) share the complexities of oil and dispersant interaction. To more thoroughly investigate these intricacies, in June 2018, they collaborated on an experiment to simulate the spill and subsequent introduction of dispersant in a large salt water tank at the [Ohmsett Facility](#) in New Jersey. The experiment concluded with a second phase in July 2019. Read the news feature [here](#), and read more about the article on the GoMRI website [here](#).

Science Corner

Published Science Highlights from the GoMRI Program

[Study Tests STARRS Imaging of Short-Lived Small-Scale Dispersion on Ocean's Surface](#)

D.F. Carlson, T. Özgökmen, G. Novelli, C. Guigand, H. Chang, B. Fox-Kemper, J. Mensa, S. Mehta, E. Fredj, H. Huntley, A.D. Kirwan Jr., M. Berta, M. Rebozo, M. Curcic, E. Ryan, B. Lund, B. Haus, J. Molemaker, C. Hunt, S. Chen, L. Bracken, J. Horstmann

Frontiers in Marine Science, 2018, Vol. 5, Article Number 479

[Study Provides New Way of Looking at Energy Exchange at the Air-Sea Boundary Layer](#)

A.W. Smith, B.K. Haus, J.A. Zhang

Journal of the Atmospheric Sciences, 2019, Vol. 76(3), pgs. 689-706

[Study Finds Slick Oil has Greater Impact than Source Oil on Fish Development](#)

G. Diamante, E.G. Xu, S. Chen, E. Mager, M. Grosell, D. Schlenk

Environmental Science and Technology Letters, 2017, Vol. 4(12), pgs. 523-529

[Study Tracks Ocean Methane Dissolution with Environmental Data and Computer Models](#)

M. Leonte, B. Wang, S.A. Socolofsky, S. Mau, J.A. Breier, J.D. Kessler

Geochemistry, Geophysics, Geosystems, 2018, Vol. 19(11), pgs. 4459-4475

[Study Finds Oil Exposure Reduces Cardiorespiratory Function in Cobia Fish](#)

D. Nelson, J.D. Stieglitz, G.K. Cox, R.M. Heuer, D.D. Benetti, M. Grosell, D.A. Crossley II

Comparative Biochemistry and Physiology Part C: Toxicology and Pharmacology, 2017, Vol. 201, pgs. 58-65

[Study Improves Drifter-Based Estimates of Near-Surface Ocean Currents](#)

L.C. Laurindo, A.J. Mariano, R. Lumpkin

Deep Sea Research Part 1: Oceanographic Research Papers, 2017, Vol. 124, pgs. 73-92

[Study Finds Oil Impacts on Fiddler Crabs May Also Affect Broader Marsh Health](#)

M.E. Franco, B.E. Felgenhauer, P.L. Klerks

Environmental Toxicology and Chemistry, 2018, Vol. 37(2), pgs. 491-500

[Study Finds Dispersed Oil, But Not Oil Alone, Negatively Affects Phytoplankton](#)

L. Bretherton, M. Kamalanathan, J. Genzer, J. Hillhouse, S. Setta, Y. Liang, C.M. Brown, C. Xu, J. Sweet, U. Passow, Z.V. Finkel, A.J. Irwin, P.H. Santschi, A. Quigg

Aquatic Toxicology, 2019, Vol. 206, pgs. 43-53

[Study Describes Six-Year Evolution of Gulf Sediments Following Deepwater Horizon](#)

R.A. Larson, G.R. Brooks, P.T. Schwing, C.W. Holmes, S.R. Carter, D.J. Hollander

Anthropocene, 2018, Vol. 24, pgs. 40-50

[Study Compares 2D and 3D Model Simulations of Oil Plume Behavior](#)

A.T. Fabregat, B. Deremble, N. Wienders, A. Stroman, A.C. Poje, T.M. Özgökmen, W.K. Dewar

Ocean Modelling, 2017, Vol. 119, pgs. 118-135

[Study Gives Snapshot of Key Microbial Oil Biodegradation Mechanisms](#)

S. Joye, S. Kleindienst, T.D. Peña-Montenegro

Cell, 2018, Vol. 172(6), pgs. 1336-1336.e1

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



Photo Credit: LSU Media Relations.

Frequently Asked Questions with Dr. Chuck Wilson

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

Question: Please tell us about your role as Chief Scientific Officer for GoMRI.

Answer: It has been an honor and privilege to work with a remarkable Research Board, a highly professional GoMRI Management Team, and an incredible community of scientists. Together we built the processes and engine for awarding and managing the best science, tracking the results, and preserving the data from GoMRI's investment. From the development of Request for Proposals (RFPs) through the proposal solicitation, review process, and execution of scientific

investigation, I have had the fortune of meeting new people and learning about science way outside my personal sphere of experience. I guess my primary duty has been communication; I work with the GoMRI Management Team to keep the Board, research community, and public informed about what we have learned, what it means, and how we can use it.

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Question: How do you think the outcomes of GoMRI's Synthesis and Legacy effort (an update on Synthesis and Legacy activities can be found on page 8 of this issue) will benefit the oil spill community after the end of GoMRI?

Answer: The Research Board thinks about that question a lot and two thoughts come to mind. The obvious piece is application of the basic and applied science that has been published in various scientific journals (currently in excess of 1,300 research publications). The use of some GoMRI results are more obvious now than others; the more basic and exploratory science in chemistry, physics, and biology will likely prove useful to oil spill preparedness, response, and recovery for years to come. The second benefit relates to mutual understanding and appreciation. The oil industries' scientific communities have historically operated somewhat independent of the academic science community; there are some exceptions, but that is the nature of corporations. GoMRI's presence has facilitated a mutual understanding and built stronger ties between both research engines; that too should persist for years to come.

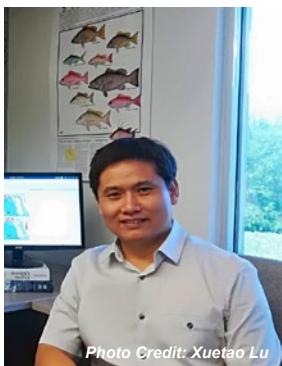
Question: From your perspective as GoMRI's Chief Scientific Officer, what do you think the legacy of GoMRI will be?

Answer: When I think about GoMRI's legacy I reflect on the scientific advances and [archived data](#) made possible through GoMRI's investments over the past nine years. GoMRI-funded research teams have explored the bottom of the ocean, tracked currents, discovered new species, explored how oil and dispersants work and affect a variety of organisms, and gained insights into the impact and recovery of the Gulf of Mexico post-Deepwater Horizon. I am also very proud of and excited for the undergraduate and graduate students that have been part of GoMRI. Nearly 1,600 graduate students and post docs have or will enter the workforce; they will remain united as products of GoMRI. The third element of GoMRI's legacy is the research capacity created by BP's \$500,000,000 investment. Teams of researchers from around the United States and various parts of the world came together to explore the Gulf of Mexico and the Deepwater Horizon oil spill. Those teams and relationships will continue for decades to come.

GoMRI Scholars in Action

GoMRI recognizes the graduate students whose vital research contributes to improving understanding about the damage, response, and recovery from the Deepwater Horizon oil spill. Candidates for the GoMRI Scholars program must be graduate students who have participated in a GoMRI-funded project for at least one year, whose research 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!](#)



[How Grad Student Lu Uses Statistics to Monitor Reef Fish Populations](#)

[Grad Student Pruzinsky Uses Morphological Patterns to ID Young Tuna for Population Assessments](#)

[Grad Student Aker Counts on Insects to Assess Marsh Health](#)

[How Grad Student Niles Gets to Know Crude Oil at a Molecular Level](#)

[Grad Student Grossi Uses Artificial Intelligence to Map Ocean Flows](#)



In June 2019, Deep Pelagic Nekton Dynamics in the Gulf of Mexico (DEEPEND) consortium director Tracey Sutton and co-principal investigators Tammy Frank, Heather Judkins, Heather Bracken-Grissom, and Dante Fenolio participated in a National Oceanic and Atmospheric Administration (NOAA) Office of Ocean Exploration and Research (OER)-supported expedition called *Journey into Midnight: Life and Light Below the Twilight Zone*. The expedition took place in the Gulf of Mexico, and the goal was to study bioluminescence and vision capabilities of organisms living between 3,750 and 4,384 meters (12,303 and 14,383 feet) below the surface. During the expedition, the Medusa camera system the team was using captured video of a giant squid. This was the first time a giant squid has been filmed in the Gulf of Mexico and only the second time one has ever been recorded! Be sure to visit the DEEPEND website [here](#) to check out the incredible video, and visit the NOAA OER website [here](#) for more information on the discovery!

Don't forget to check out GoMRI's YouTube Channel [here](#).

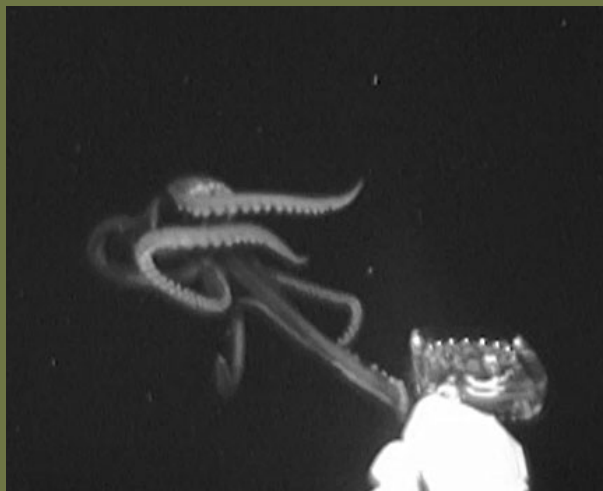


Photo Caption: Image of a giant squid captured by the Medusa camera system during the NOAA OER expedition Journey into Midnight. Photo Credit: NOAA's Office of Ocean Exploration and Research. Original image available [here](#).

Education Spotlight

The Consortium for Simulation of Oil-Microbial Interactions in the Ocean (CSOMIO) hosted a summer outreach program in partnership with the Florida State University (FSU) Center for Ocean-Atmospheric Prediction Studies (COAPS) in July, where students learned about ocean and atmospheric sciences. The program was led by Lucia Gil Morales, an undergraduate marine ecology student in the FSU Department of Biological Sciences and a member of the COAPS outreach team. Visit the CSOMIO Facebook page [here](#) for photos from the events, and visit the COAPS website [here](#) for more information about their education and outreach initiatives.

The Ecosystem Impacts of Oil and Gas Inputs from the Geosphere (ECOGIG) consortium hosted their fourth Ocean Discovery Camp in June in partnership with the University of Georgia's Summer Academy. Students, ages 11 to 14, participated in the camp and learned about the deep ocean, ocean ecosystems, plastic pollution, climate change, and the impacts of oil spills. They also designed and built their own Remotely Operated Vehicles (ROVs) and created public service announcement videos based on the topics they learned about during the camp. Visit the ECOGIG Facebook page [here](#) for photos from the camp, and visit the ECOGIG website [here](#) for more information.

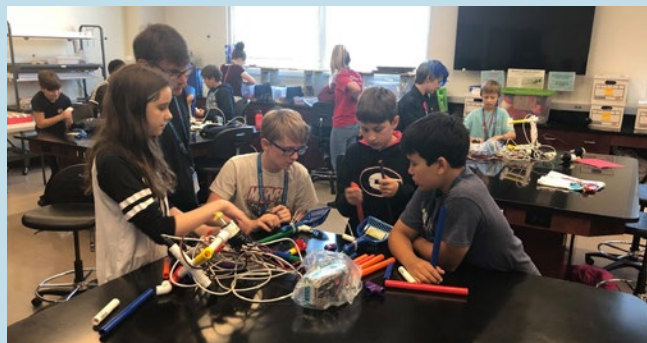
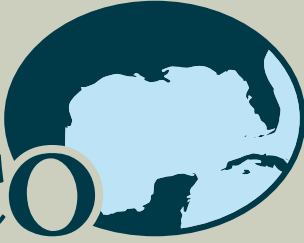


Photo Captions: (top) FSU undergraduate student Lucia Gil Morales instructs students during the CSOMIO summer outreach program. Photo Credit: CSOMIO/Original photo via CSOMIO's [Facebook page](#). (bottom) Students build an ROV during the ECOGIG Ocean Discovery Camp. Photo Credit: ECOGIG/Original photo via ECOGIG's [Facebook page](#).

GULF OF MEXICO



RESEARCH INITIATIVE

SYNTHESIS & LEGACY

Contributing Author: Callan Yanoff

Two workshops took place during the summer months to further synthesize the Gulf of Mexico Research Initiative's (GoMRI) research across two topics. The ***Living on the Edge: Enhancing the Sustainability of Coupled Human-Environment Systems in the Gulf of Mexico Region*** (Core Area 5) workshop took place from July 10-12 in Mobile, Alabama. More information on this workshop, including the goals, a participant list, and the agenda, is available [here](#). The ***Ecosystem Impacts of the Deepwater Horizon Event: Assembling the Record of Species and***

Community Change (Core Area 3 Workshop I) workshop took place from July 23-25 in St. Petersburg, Florida. More information on this workshop, including the goals, a participant list, and the agenda, is available [here](#). The Ecosystem Impacts workshop was recorded and can be viewed on the Center for the Integrated Modeling and Analysis of the Gulf Ecosystem (C-IMAGE) website [here](#).

Looking forward to the fall, two additional Synthesis workshops will bring researchers together to share knowledge and increase understanding across the following GoMRI Synthesis Core Areas:

- ***Vulnerability and Resilience of Species and Ecosystems to Large-Scale Contamination Events: Lessons from Deepwater Horizon*** (Core Area 3 Workshop II) will take place from October 9-11 in Washington, District of Columbia. This workshop aims to prepare a high-level quantitative synthesis of longitudinal (time series) information indexing the population and ecosystem trajectories of marine species and ecosystems impacted by the Deepwater Horizon (DWH) accident. The workshop will evaluate life history and associated scale effects that are implicated in the decline and potential recovery of ecosystem components, including life span, fractions of populations impacted by the spill, population connectivity among potential source populations, and sensitivity of various life stages to oil contaminants. Correlations among time series will be evaluated and compared with ecotype specific food webs to evaluate species interactions potentially affected by the spill. Vulnerability and susceptibility of various impacted resources will be evaluated.
- ***Operational Oil Spill Modeling*** (Core Area 7) will take place from October 15-17 in Washington, District of Columbia. The main objective of this workshop is to examine operational aspects of oil spill modeling, review the state of knowledge that preexisted GoMRI as well as the new knowledge or technical solutions developed in the past 10 years. All required modeling components of an "integrated oil spill system" will be addressed, such as ocean circulation models, wave forecast models, numerical weather prediction and oil fate (weathering), and transport modeling. The workshop will focus on short timescale mechanisms that are relevant for operational oil spill modeling and how these mechanisms are, can, or cannot be implemented in operational oil spill prediction systems.

As 2020 and the conclusion of the GoMRI's investment in research approaches, Synthesis and Legacy efforts have begun to focus on products, legacy pieces, and outreach activities to more broadly share the results of the Synthesis workshops and highlight the importance of investing in collaborative science. Please continuously visit the Synthesis and Legacy [Products page](#), as there are many products currently in development.



Photo Caption: Participants in the Ecosystem Impacts of the Deepwater Horizon Event (Core Area 3) workshop held in St. Petersburg, Florida from July 23-25, 2019. Photo Credit: Sean Beckwith/C-IMAGE.

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GoMRI will have a presence at many upcoming conferences and venues across the country to share results of the Synthesis efforts through proposed sessions, posters, and events, including:

American Geophysical Union (AGU) 2019 Fall Meeting

December 9-13, 2019, San Francisco, California

The Core Area 3 leaders will chair an eLightening session entitled *GoMRI/C-IMAGE: Lessons Learned and Global Applications from Deepwater Horizon*. GoMRI and C-IMAGE will also collaborate to host a Story-Collider event on December 12.

National Council for Science and the Environment (NCSE) Annual Conference

January 6-9, 2020, Washington, District of Columbia

A general synthesis session was submitted by the GoMRI Research Board, with an overarching title of *Ten years since DWH – Lessons learned from the Gulf of Mexico Research Initiative*.

American Association for the Advancement of Science (AAAS) Annual Meeting

February 13-16, 2020, Seattle, Washington

Advances in Understanding Oil Spills and Mitigating Impact and Consequences, a GoMRI Research Board-motivated session, was submitted and accepted. This session will aim to build interest in GoMRI Synthesis results.

Ocean Sciences Meeting 2020

February 16-21, 2020, San Diego, California

Core Area 6 leadership will be hosting a session entitled *Microbial Genomics to Improve Predictive Understanding of Disturbance in the Global Ocean System*.

International Oil Spill Conference (IOSC) 2020

May 11-14, 2020, New Orleans, Louisiana

GoMRI leadership has collaborated with IOSC to create a GoMRI Special Session to integrate synthesized GoMRI science into IOSC 2020.

Opportunity: IOSC 2020 Scholarships

The [International Oil Spill Conference \(IOSC\) 2020](#) will take place from May 11-14, 2020 in New Orleans, Louisiana. The conference provides needs-based scholarships to members of the oil spill response community to help support registration and travel expenses. The deadline to apply is November 15, 2019. More information, and a link to submit an application, is available [here](#).



Photo Credit: CC 4.0, no changes made.

Note from the Research Board Chair

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

The Gulf of Mexico Research Initiative (GoMRI) Research Board is pleased to announce the release of Screenscope Film's *Dispatches from the Gulf 3*, the third and final film in the *Dispatches from the Gulf* series.

In addition to sharing research highlights from the program, the film shares the story of how GoMRI was initiated after the Deepwater Horizon oil spill. The intent of GoMRI was to create an independent, collaborative research program to address complex questions arising after the spill. The proposal process was modeled after that of the National Science Foundation, and all data generated was to be made publicly available. Sharing results with the general public, educators, and those whose livelihoods depend on the Gulf, in addition to the scientific community through peer-reviewed publications, was prioritized. Now, almost ten years later, GoMRI achieved those objectives...and much more. GoMRI exemplifies the value of collaborative science and serves, successfully, as a model for the scientific research enterprise, notably at a time when funding for research is becoming severely constrained. GoMRI funding has made possible the education and training of more than 1,000 students. They will carry on the collaborative spirit and instill the legacies of GoMRI for generations to come. This makes me optimistic about the future.

The film also discusses important topics society will need to address: challenges faced by women in the sciences, concerns of the community about sources of funding to support oil spill research, and a deepening skepticism of science by society.

The Research Board and I thank Screenscope Films for partnering with us to share GoMRI research with a broader and global audience. The three films and accompanying supplemental materials, including a series of short videos, leave a much-appreciated story of the decade-long work of GoMRI and its thousands of participants and fans. I am deeply grateful to each and every member of the GoMRI community who participated in the films and shared their stories. I hope you enjoy the film.

GoMRI Researcher Interview with Dr. Danielle McDonald

Dr. Danielle McDonald from the University of Miami's Rosenstiel School of Marine and Atmospheric Science (RSMAS) Department of Marine Biology and Ecology answered a few questions about her RFP-VI project, *The Impact of Deepwater Horizon Oil Exposure on the Vertebrate Stress Response*.

1. Please tell us about your RFP-VI project, “*The Impact of Deepwater Horizon Oil Exposure on the Vertebrate Stress Response*.” What are the goals of the project?

In 2014, Lori Schwacke and coworkers reported that bottlenose dolphins that were exposed to Deepwater Horizon (DWH) oil were found to have an impaired stress response and didn't secrete as much cortisol, a stress hormone, as dolphins that were not exposed to oil. This is a bad thing, since the secretion of cortisol helps dolphins to overcome stressors. Since fish have a similar stress axis as marine mammals and have the same stress hormone, cortisol, we followed up their study with some work looking at the stress response of Gulf toadfish (Reddam et al., 2017). In our study, we found that toadfish also have problems with their stress response and the secretion of cortisol. Thus, the goal of our GoMRI work is to further study the Gulf toadfish and determine where along the stress axis the problem is occurring. We also want to know if the impairment is due to a hyperactivation and then subsequent fatigue of the stress axis and/or if the impact was mediated by the aryl hydrocarbon receptor (AhR). Our findings in toadfish could lend some insight into what is going on in bottlenose dolphins.

2. What are the stress axis and the aryl hydrocarbon receptor, and what role do they play in stress response?

The stress axis, and more specifically the glucocorticoid stress axis, refers to the brain and two endocrine glands working together to respond to an environmental stressor. Essentially, the brain hypothalamus perceives an environmental stressor and in response secretes a hormone called corticotropin-releasing hormone, CRH (also called corticotropin-releasing factor, CRF). CRH then binds to receptors in the pituitary gland which tells the gland to secrete a second hormone, called adrenocorticotropic hormone (ACTH). ACTH then travels in the bloodstream and binds to a receptor that, in fish, is located on the kidney interrenal cells and in mammals, is located on the adrenal gland and tells the interrenal cells (or adrenal gland) to secrete the hormone cortisol. Cortisol then travels through the blood and binds to cortisol receptors in various tissues that will turn genes on or off and result in a response to the environmental stressor.

The aryl hydrocarbon receptor (AhR) responds to PAHs by changing the transcription of different genes including upregulating cytochrome P4501A1 (often referred to as CYP1A). This pathway is essentially an organism's way of trying to detoxify some types of toxicants. CYP1A can then go on to affect other processes and so the upregulation of CYP1A is often used as a biomarker of PAH exposure. It is possible that the downregulation of the stress response may start with the activation of the AhR and upregulation of CYP1A and part of our study is determining whether the downregulation of the stress axis is via the AhR.

3. Why is the toadfish specifically a good comparison species for the bottlenose dolphins?

Toadfish, like other fish, have a similar stress axis and the same main stress hormone, cortisol, as mammals. That in of itself is an interesting thing because not all animals use cortisol as their stress hormone. Fish, dolphins, and humans do but rats, for example, use something called corticosterone. Another reason why we thought that toadfish would make a good comparison species for bottlenose dolphins was because they have a very pronounced stress response. Toadfish secrete cortisol at levels that are at least twice as high as other fish and many times higher than dolphins. We believed that this pronounced response would allow for an enhanced sensitivity when looking for disturbances in the function of the stress axis.



Photo Caption: A Gulf toadfish. Photo Credit: Dr. Maria C. Cartolano.

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

I am a fish physiologist and have been studying stress physiology for a lot of my career. The Reddam et al. (2017) study was part of the Deepwater Horizon Natural Resource Damage Assessment (NRDA) investigation (in collaboration with Dr. Martin Grosell) - that was the first time I linked my research on stress with oil pollution.

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5. What are some of the most significant or exciting findings so far in your GoMRI-funded research?

We are still analyzing and interpreting a lot of our results. We have completed both a 7-day and a 28-day DWH oil exposure using a saltwater flow-through exposure system that we have developed. This system maintains steady polycyclic aromatic hydrocarbons (PAH) concentrations in tanks for up to one month. In our 7-day experiment, Gulf toadfish, *Opsanus beta*, were exposed for 7 days to 4 different total PAH concentrations (actual 0.006, 0.009, 0.06, 2.8 µg/L) and then allowed to recover for 7 days. In our 28-day experiment, toadfish were exposed for 28 days to total PAH concentrations similar to the acute experiment and then allowed to recover for 28 days. In both experiments, there was a second group of toadfish that were subjected to a standardized simulated predation stress before being sacrificed to determine if PAH exposure compromised the ability to mount a stress response.

Our most significant findings are:

(1) Toadfish that are exposed to DWH oil have difficulties in mounting a stress response in response to a simulated predator after 7 days of oil exposure and this effect persists even after 7 days of recovery. So, toadfish do not appear to be able to recover from this impact.

(2) We have evidence that these fish are not perceiving the oil as a stressor, as exposure itself does not result in elevated stress hormone levels. So, impairment due to hyperactivation followed by fatigue has been ruled out.

(3) There is a significant upregulation in CYP1A mRNA expression (which indicates AhR activation) within the stress axis (the brain hypothalamus, the pituitary gland, and the kidney interrenal tissue) as well as in the liver in response to fairly low PAH concentrations (0.06 µg/L or higher) after 4 hours of exposure that persists even after 7 days of exposure. However, CYP1A mRNA expression returns to control levels by 7 days of recovery (even

though the impairment in the stress response persists).

(4) We have not found the mechanism of impairment yet. After 7-days exposure, there is no significant change in the mRNA expression of key proteins that are involved in cortisol production (StAR, P450scc, and 11-beta hydroxylase). We are still analyzing samples to determine whether cholesterol levels are an issue (which is the precursor to cortisol) and whether a particular receptor may be involved. We are also still analyzing the data from our 28-day exposure experiment; however, one result that has come to light with respect to the 28-day exposure is that simultaneous exposure to a chronic stressor during DWH oil exposure exacerbates the impact of PAHs on the stress response. We are currently doing further experiments to clarify that result.

6. Please tell us about some of your outreach activities (visit Dr. McDonald's [Toadfish Lab Facebook page!](#)).

Most of our outreach involves talking to children about our research on toadfish, fish stress, using fish as models for mammal health, and pollution in the environment. We do presentations to kids that are passing through the lab (on tours with RSMAS in general), we bring our toadfish on the road to talk to elementary school kids (G.W. Carver Elementary), underprivileged kids (Ocean Kids), or kids at summer camp (Miami Seaquarium, Frost Science Summer Camp). I have also given several lectures to faculty, staff, and students at RSMAS, as well as to the general public (John Pennekamp Delicate Balance of Nature Lecture Series).

7. If funding were not an issue, what would you add to your GoMRI-funded project?

This is a really good question!! We are intrigued by the fact that fish (and bottlenose dolphins) are not appearing to recover once the exposure has ended. We would really love to look at potential epigenetic impacts of PAH exposure on genes related to either cholesterol production or stress hormone synthesis to see if they could explain the lack of recovery.

Reminder: C-IMAGE-led Oil Spill Books Now Available

The two text books focused on oil spill science and response, led by the [Center for the Integrated Modeling and Analysis of the Gulf Ecosystem \(C-IMAGE\)](#) and published by Springer Nature Publishing Company, are now available for purchase. *Deep Oil Spills – Facts, Fate, and Effects* and *Scenarios and Responses to Future Deep Oil Spills – Fighting the Next War* synthesize a large part of the GoMRI-funded research that is directly related to risk reduction, oil spill preparedness, and ecosystem health assessment. The goal of the books is to use this new body of knowledge to project how the research and response communities might better respond to future spills. Both volumes include contributions from GoMRI scientists as well as researchers beyond the GoMRI community that work for the federal government, in academia, and in private industry. They identify remaining key research questions and how these unknowns could impact decision making in light of production trends in the oil and gas industry. The books are available on the Springer website [here](#) and [here](#), and are also linked on the Synthesis and Legacy Products page on the GoMRI website [here](#).