



Le Sang Noir

Brandon Ballengée

Florida State University Museum of Fine Arts

Exhibition Organization

Le Sang Noir (Black Blood) was organized by the Florida State University Museum of Fine Arts. Organization Project Staff in 2018: Allys Palladino-Craig, Director, Editor and Grant Writer; Jean D. Young, Assistant Director, Registrar and Book Designer; Viki D. Thompson Wylder, Curator of Education. Exhibition Project Staff in 2019: Preston McLane, Director; Jean D. Young, Assistant Director, Registrar and Book Designer; Meredith Lynn, Education and Director of Galleries; Wayne T. Vonada, Jr., Exhibitions Preparator and Designer; Elizabeth McLendon, Archivist and Communications Coordinator; Tiffany Ward, Fiscal Officer. Special thanks to Zachary Briscoe and Nick Parparian for *Collapse* installation logistics.

Sponsorship

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Acknowledgments: On That First Glimpse

Unanticipated experiences. Pre-conditioned through the language of science, enlightened by visual literacy, the reaction to *Collapse* can be both complicated and simple. A sense of perplexity, a sense of wonder. The ziggurat of entombed jewels, formaldehyde and biological remnants, represents transition, once living organisms transformed through deformities, threatened with extinction...rare.

Brandon Ballengée's works are about manifest changes, and the mysteries of species altered and obliterated. He and colleagues in the sciences proceed with thorough and painstaking experimentation in their laboratories and in the analyses of data. Bringing such results visually to the museum, Ballengée creates an objective correlative: visitors look at his prints, sculptures and field projects to gain an understanding of the moving parts of a narrative of change, and sometimes of impending loss. Or a narrative of the human impact in the recently-christened "Anthropocene Era" that has resulted in the editing of abundance. The literary notion of man against the elements has become the model of millennial man altering the elements.

Ballengée would like to have our help in stepping back from the brink, in meeting new challenges with stalwart and positive action: identify the danger, start remedial actions, never give up.

With a multitude of partners in the real world of the Gulf, Ballengée's selection of unusual media have conferred upon his exhibitions the significance of wistful and hopeful statement. Science is measurement invoked by mankind: we research circumstances to be informed so that we can adopt a proper response. Those who live with the outcome of ecological disaster, or, conversely, with their actions of positive impact on biological diversity, are true confrères. To err is human; to overcome is divine.

Ronald Feldman Fine Arts in New York—and the welcoming staff—have not only supported Ballengée's trenchant statements but have shown professional courtesies to the many museums enlisting in the crusade. Brandon Ballengée and his colleagues—both artists and scientists—espouse causes that justify nearly universal support. Were that not so, MoFA would be unable to thank three granting agencies: the Division of Cultural Affairs of the State of Florida; the Council on Culture and Arts of Tallahassee (the City and Leon County); and the Council on Research and Creativity at Florida State University. These grant agencies awarded funding to the Museum because individual panelists

recognized the serious imperative of Ballengée's commitment to ecological research and activism. They also recognized that *Collapse* is that singular work of art that transcends boundaries of aesthetics to become a testament. *Collapse* and the works undertaken by Ballengée and his partners signify indisputable facts. If there is a redolent poetry about the objects, it comes from the viewers' understanding and knowledge of the truths about our botanical and biological environment.

MoFA is first of all indebted to the Artist for sharing his work with us, and more than grateful to authors and researchers who have described the circumstances of these works and provided a context. Edward Lucie-Smith has given us the international perspective of his career. In 1999 he lectured at Florida State University about the contemporary art on display in his "hometown" of London; we thank him for that highpoint in the Museum's past and for his contribution to this current publication.

A catalyst for Ballengée, the article written by Carl Safina, places us on the shoreline in 2010, watching the tar balls and the oil slicks roll to the land, at the same time sinking unseen to the ocean floor. It's a sobering observation from the initial shock to what became the tolling of a dirge. We are still following that lament, evaluating the aftermath of an historical event, one we hope is never repeated.

Professor Ian MacDonald invites us to a subterranean depth in his paper on corals that flourish without the glittering sunlight that we associate with shallow reefs. On the rim of the Gulf, he and his colleagues at Florida State University and other institutions were mobilized for action after the catastrophe in 2010. Through their widespread collaborations and research data, Gulf communities continue to chart the impact of a manmade disaster.

Florida State University was a partner in the Oil Spill Academic Task Force—the entity working with the Department of Environmental Protection and other state and federal agencies during a dire scenario. It is a privilege to recognize the community that was established in that time, the legions of volunteers who participated, and the work that continues.



Detail of *Collapse* installed at the Bemis Center for Contemporary Art, Omaha, Nebraska. Photo credit: Colin Conces, 2015.

—Allys Palladino-Craig, PhD, MFA
Director, Fall 1982-Summer 2018
Museum of Fine Arts

Come and See

Counterintuitively, in an exhibition so dialogic with natural history, Brandon Ballengée proves John Berger's postulate that "all images are man-made." As Berger sees it, "An image is a sight which has been recreated or reproduced. It is an appearance, or a set of appearances, which has been detached from the place and time in which it first made its appearance and preserved—for a few moments or a few centuries." Locked in jars, suspended in alcohol, posed in vitreous petri dishes, Ballengée's forms entered the world as nature's microscopic issue before becoming images, before becoming victims of the macro-artistry of human intervention, before the hand of man made them into distorted, wounded variations on the source of the image. Although Eugène Delacroix spoke specifically of art critics in his *Revue de Paris* note from 1829, these now muted creatures avow an equivalent, equivocal sentiment about people who cause oil spills and the artists who pick up the pieces and turn them into something powerful and beautiful: "Even while wounding you, they tell the world of your existence."

Ballengée invites us not only to come and see what he has done, but to come and see what we have done. We admire Ballengée's objectivity as a scientist, his ethic as an ecologist, his tirelessness as a cataloguer, his precision as a designer, his talent as a maker of images, but are dismayed by what we see. His work implicates us: our urges to consume in vast viscous quantities that adhere to everything, the great plastic ubiquity and the engines that move it, our indifference to the consequences.



We have wounded that for which we must care. Chastened, we look at the consequences of our actions. These are images that should never have occurred. These are images of legless frogs and blinded shrimp and an emptiness where a Mardi Gras wrasse belongs, detached from the place and time in which it first made its appearance, and then lost. A liter of preservation fluid is evidence of absence.



Ballengée's images, the culmination of years of collaborative effort, will appear at MoFA for only a moment. It is an important moment, and it is a moment for which we are grateful. We are grateful to the artist and his partners for enabling us to see what is shrouded under the surf and in the darkness of the Gulf of Mexico, images that, in containing and framing and staining the appearance of each departed subject, are emphatic and tragic in their man-madness. We are grateful to MoFA's many supporters and underwriters without whom the sights of *Le Sang Noir* would remain unseen. And we are grateful to you for seeking in these sights the meanings that these ghosts of the Gulf convey.

—Preston McLane, PhD, JD
Director, Museum of Fine Arts

▲Brandon Ballengée, *DFA 203: Skeiron*, 2013, unique Iris print on Arches watercolor paper, 46 x 34 inches. Cleared and stained Squirrel Tree Frog collected in Devil's Garden, Florida, in scientific collaboration with Peter Henry Warny.

◀[facing page] Brandon Ballengée, Detail of *Styx: Variation XI*, mixed media installation with five cleared and stained Pacific Tree Frog on a sculptural light-box. In scientific collaboration with Dr. Stanley K. Sessions, installed at Georg-Kolbe-Museum, Berlin, Germany. Photo credit: Dr. Marc Wellmann, 2012.

In Gratitude

The Gulf of Mexico is a special part of the world. For those of us living in the US, it is our Amazon rainforest: a nursery filled with life and shrouded in deep mystery, yet, dwindling from the thousand wounds we continue to subject her and her children to. In April of 2010, I watched in shock the news of the *Deepwater Horizon* explosion and the beginning of the oil spill from a café in London. Later that afternoon, I made arrangements to come home and get down to Louisiana to offer any support I could. It took a few weeks but I arrived while the oil was still spewing, thousands upon thousands of birds were smothering in oil, and countless amounts of marine life washed dead upon the shores and marshes. The fragrance alone of crude oil, infused with death for endless miles, forever etched my way of seeing and still lingers in my dreams. Within this book are my visual responses, as an artist, scientist and human being, to this tragedy. My hope is that, in some tiny way, it may inspire us towards avoiding future such scenarios.

These projects were not generated alone but had many collaborators over the years to whom I am truly thankful and also to those who offered support and inspiration. Among these are: my family, Aurore, Victor and Lilith Ballengée; Peter R. Warny, Ben Dubansky, Stanley K. Sessions, Jack Rudloe, Todd Gardiner, Carl Safina, Helen and Newton Harrison, Suzaan Boettger, Brian Schiering, Michael Madden, Phillip Henken, Gillian Wilson, Prosanta Chakrabarty, Sean Owen Miller, Rachel Mayeri, Suzanne Fredericq, Monique Michelle Verdin, Senator Norbert “Norby” Noltz Chabert, Cherri Foytlin, Josh Baumgardener, Edward Chesney, Alexander Kolker, Linda Hooper Bui, Blaise Daniel Pezold, Randon Dufrene, Bob Chateaulin, Keith Broussard, Jonathan Foret, Link Morgan, Stacey Leah Scarce, Frayda and Ronald Feldman, Marco Nocella and the wonderful staff of Ronald Feldman Fine Arts, Orio Vergani and Nowhere Gallery, many Gulf residents, activists and others including John Amos, Erika Blumenfeld, Lori Borsage, Capt. Lori DeAngeles, Shane Elrod, Darlene Martin Eschete, Sarah Evanko, Susan Forsyth, P.J. Hahn, Lisa Hollis, Basia Irland, Trisha James, Jacquée Markel Jorgensen, James H. Kirby, Laurel Lockamy, Christina Markris, Ro Mayer; Ashley McCrea Strub, Mary Mobley, Denise Rednour, Kim Schultz, Charles Taylor, Shirley Tillman, Trisha Peters Williams, Lisa Osborn, Herbert Leavitt, Gulf Restoration Network, Krewe of Dead Pelicans, members of the Pointe-Aux-Chenes tribe, several other folks who would wish to remain anonymous; Robb Brumfield, Tammie Jackson, Valerie Derouen, Paige Jarreau and other LSU Museum of Natural Science and Biology Department staff; Joanna Marsh, Lynn Parenti, Sandra Raredon, Kris Murphy, and other Smithsonian staff members; Susan B. Moldenhauer and staff of the University of Wyoming Art Museum; Andrea Inselmann and staff of the Herbert F. Johnson Museum of Art at Cornell University; J. D. Talasek, Alana Quinn, Ken Fulton and staff of the National Academy of Sciences; Amanda Crowley, Nicole Caruth and other staff at Bemis Center for Contemporary Arts; Mary Salvante and the staff of the Rowan University Art Gallery; Roel Arkesteijn and the staff of Museum het Domane; Lauranne Germond and the staff of the Chateau du Domaine de Chamarande; Brian Guidry, Mary Beyt and the staff of the Acadiana Center for the Arts; Amy Lipton, Terry Platz and the staff of the Beacon Institute for Rivers and Estuaries; the Nature Conservancy and the National Audubon Society, and Audubon Louisiana; everyone who has made my family and me so welcome since we moved to Louisiana in 2015. Also very much gratitude to the hard work and their contributions to this publication and exhibition to Allys Palladino-Craig, Jean Young, Preston McLane, Edward Lucie-Smith, Ian R. MacDonald, and the staff of the Museum of Fine Arts at Florida State University.

—Brandon Ballengée, July 2018, Arnaudville, Louisiana

Artist and biologist Dr. Brandon Ballengée creates multi-media artworks inspired from his ecological field and laboratory research. Ballengée's art has been exhibited internationally in over 20 countries and in the summer of 2013 the first career survey of his work debuted at the Château de Chamarande (Essonne, France), which travelled to the Museum Het Domein (Sittard, Netherlands) in 2014. In the fall of 2016, the first US mid-career retrospective of his work opened at the University of Wyoming Art Museum (Laramie, Wyoming). He has received numerous awards and fellowships, including a Smithsonian Artist Research Fellowship (2017) and Awards from the National Academies Keck Futures Initiative. He holds a PhD in Transdisciplinary Art and Biology from the University of Plymouth (England). Currently, he is Postdoctoral Researcher at the Louisiana State University Museum of Natural Science (Baton Rouge, Louisiana) studying the impact of the 2010 oil spill on Gulf of Mexico fish species.



Le Sang Noir—our life and death

In Louisiana, the Native American 'Water Keepers' are calling the new Atchafalaya gas pipeline the Black Snake and crude is referred to sometimes as the black blood. Oil, here, is the economic lifeline for the state, but also our demise with impacts from over 2000 spills since the *Deepwater Horizon* and the cutting of channels into coastal marsh habitat accelerating erosion and land loss, which increases hurricane and sea-level rise damage. *Le Sang Noir*, our life and death.

—Brandon Ballengée, 2018

Between the Realms of Art and Science

Edward Lucie-Smith

Brandon Ballengée enjoys a unique situation. He is both artist and environmentalist, but his two identities overlap to an extent where it is difficult to find an exact parallel in the work of any other artist.

The world of art and science have of course overlapped in previous epochs. The most famous example of this, certainly in Western art, is one of the greatest of all artistic names: none other than Leonardo da Vinci. Leonardo's explorations of the structures of the human body, and also his fascinated contemplation of the forces of nature, as represented in the series of Deluge drawings made late in his career, are as much the foundation of his immortality as anything he achieved in painting. He seems relevant today in a way that is not fully rivalled by any of his contemporaries, however great their achievement as artists.

What differentiates Ballengée from this kind of contemplation is, however, his obsession with a particular kind of morality.

Leonardo had much to discover. He was constantly, in the two series of drawings I have just cited, pushing forward into territories till then unknown. These fields of exploration are not open to the 21st century artist. Modern science has hugely expanded our knowledge of the physical world we inhabit.

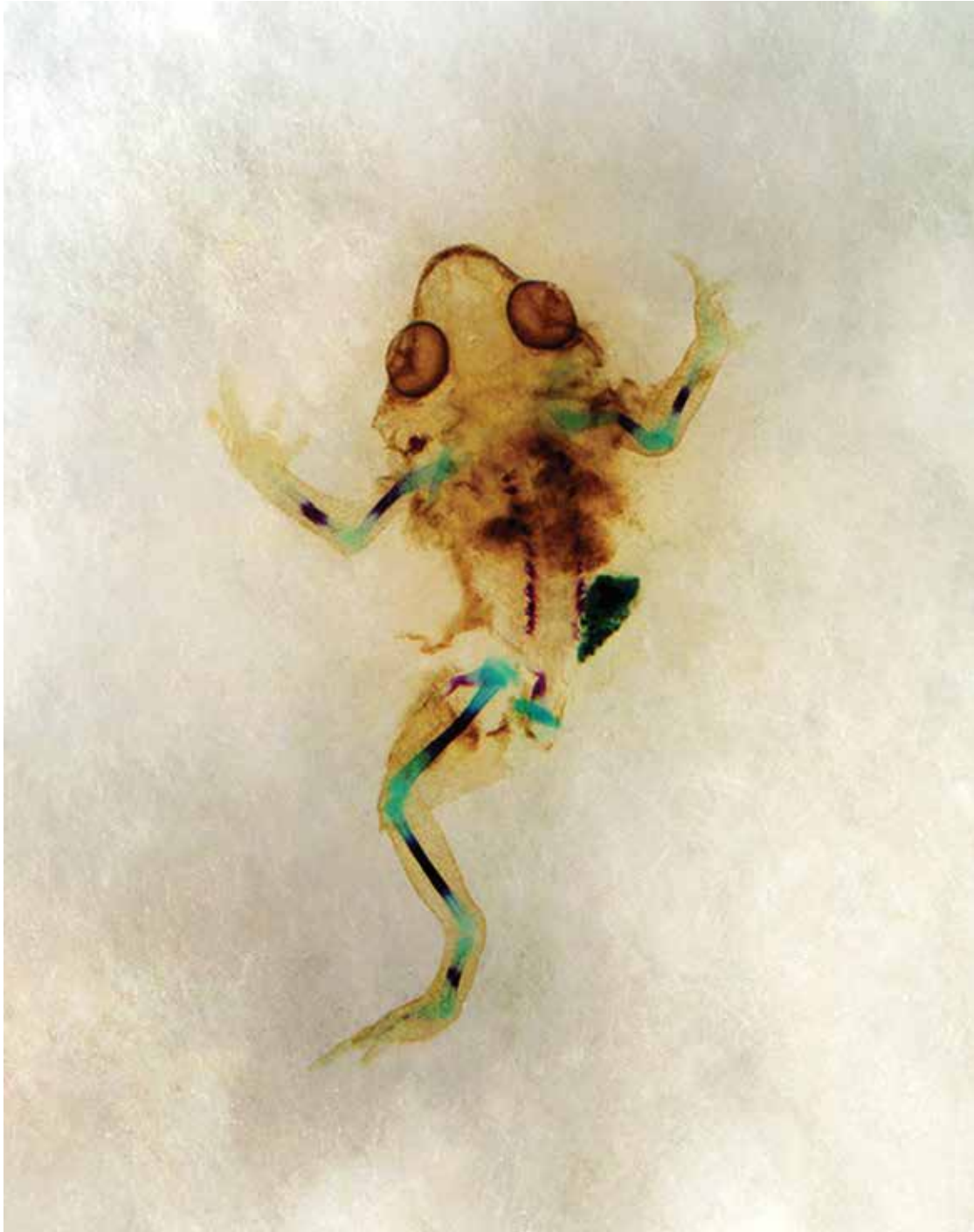
What the progress of science, and the progress of industry linked to this, have in recent years brought with them, is an uneasy consciousness that 'progress' of this kind (if we can, in fact, continue to call it that) seems to be bringing with it irreparable damage to the physical environment.

That is, the more thoroughly we learn as human beings to master our surroundings, to submit to what seem to us our practical needs, the more we ruthlessly damage them.

And the corollary to this, in turn, is that we may, in fact, little by little, be destroying the future of our own species. This is a new kind of crisis, peculiar to our own epoch, and Ballengée, whose major subject is precisely this dilemma, is recognisably a pioneer, a new kind of artist.

In a statement available on the web, he has this to say:

As an artist, biologist and environmental activist, my concerns are for communities both human and non-human affected by climate



Brandon Ballengée, *DFBB: Khaos*, 2009/10. Unique IRIS print on watercolor paper, 47 x 35 inches. Cleared and stained English toad with missing limb deformity from Yorkshire, England, in scientific collaboration with Richard Sunter. Title by the poet KuyDelair.



▲ Brandon Ballengée, *RIP Atlantic Lookdowns* from the *Ghosts of the Gulf*, 2014. Giclée print on handmade Japanese rice paper in an edition of 13.

► [facing page] Brandon Ballengée, *RIP Florida Pompano* from the *Ghosts of the Gulf*, 2014. Giclée print on handmade Japanese rice paper in an edition of 13.

change and other ecological impacts of the Anthropocene. Today's environmental problems are global in scale and complex. To face this milieu of issues, we need the creativity of artists, scientists and those focused on other disciplines combined to address such challenges as we and other species creatively face.

For my projects I collaborate with diverse communities of varied age groups, specialists (in art and science) and locals to create trans-disciplinary works through participatory science programs resulting in actions and installations. Such works are collectively researched by interdisciplinary groups and often physically built from collected biological and other materials.

This offers a very clear definition of what this current exhibition sets out to achieve. It focuses on one region, the Gulf of Mexico, and on problems specific to this region. It also focuses on a single catastrophic event—the 2010 BP

Deepwater Horizon oil spill, which was, as Ballengée points out “the largest environmental disaster in the history of the United States.”

How is what describes itself as art—not as reportage, not as propaganda—to focus effectively on an event of this kind?

We know how 19th century artists might have attempted to deal with it. A number of celebrated practitioners attempted compositions of this sort. There is, for example, Francis Danby’s *The Deluge* (1840), now in the collection of Tate Britain. There is Gustave Doré’s print with the same title (1866) made as a frontispiece for a new edition of the Bible. Both offer an image of a single, overwhelmingly dramatic event, in which human participants are overcome by the unleashed forces of nature. The implication is that the trigger for this has been their own unrepentant sinfulness, their breaches of a moral code handed down to them from on high.

None of this is to be found in the works presented here. Human representations are entirely absent. The intention of what is shown is nevertheless openly moralistic, and this is perhaps the thing that divides the



presentation most sharply from any simple scientific demonstration of the near-irreversible ecological damage brought about by a major oil-spill in a particularly vulnerable region of the globe. What the viewer is presented with is a series of moral emblems, collected together in ways that increase their force.

If one thinks of the way in which the visual arts have been developing in recent years, there is, I think, one major shift that has excited remarkably little commentary.

One way of telling the story of Modernist art, as this developed from circa 1905 to—let us say—the late 1970s or even the 1980s, was to emphasize the tendency to move away from the moral commentary that underlay so much of the art of the 19th century. This was particularly true of the kind of artistic activity that was determined to create objects that were free from the need to represent, which existed in their own right, freed from any such obligation. This impulse reached a climax in the movement that came to be called Minimal Art. Purified from any need to represent, art was also freed from any kind of moralistic duty. That is, with the exception to preserve its own purity, its complete separation from the surrounding contingent world of recognisable images.

Since that moment, there has been an uneasy shift—a return to imagery, which has frequently taken the paradoxical form of ‘appropriation,’ that is, the more closely a work of art followed an existing model, the more it was held to guarantee its own essential originality. In these circumstances, what counted for a great deal was the context within which the appropriated image was placed.

Looked at in this light, one can see that there is much that can be described as appropriation here—one is confronted with the actual bodies of creatures distorted and deformed by the pollutions that modern society, modern greed, modern industry have between them inflicted on nature. They are presented as they are. The literalness of the presentation is a large part of their impact.

However, it is also clear that the presentation is at the same time a confrontation—a moral lesson, a polemic. Morality has been reintroduced into the realm of art, from which the Minimal impulse strove to banish it. It speaks through objects—louder than through words.

—EL-S

Edward Lucie-Smith was born in 1933 at Kingston, Jamaica. He moved to Britain in 1946, and was educated at King's School, Canterbury and Merton College, Oxford, where he read History. Subsequently he was an Education Officer in the R.A.F., then worked in advertising for ten years before becoming a freelance author. He is now an internationally known art critic and historian, who is also a published poet (winner of the John Llewellyn Rhys Memorial Prize), an anthologist and a practicing photographer. He has published more than one hundred books, served as a curator at institutions in Europe and the United States and has photographic work in the collections of the National Portrait Gallery, London, the Reina Sofia Museum, Madrid, the New Orleans Museum of Art and other American collections, as well as the Herzog August Bibliothek, Wolfenbüttel, the Frisiras Museum, Athens, the Museum of Contemporary Art, Skopje, and the City Art Gallery, Helsinki.



Brandon Ballengée, *RIP Triggerfish* from the *Ghosts of the Gulf*, 2014. Giclée print on handmade Japanese rice paper in an edition of 13.

Collapse: Artist's Notes

Collapse is a response to the global crisis for the world's fisheries and the threat of unraveling the Gulf of Mexico's food-chain following the 2010 *Deepwater Horizon* oil spill. The pyramid of 26,162 preserved specimens represents 370 species of fish and other aquatic organisms collected from the Gulf Coast, a region of diverse fish species and of socio-economic importance.

The 2010 BP *Deepwater Horizon* (*DWH*) oil spill was the largest environmental disaster in the history of the United States. Physically, *Collapse* was a pyramid display of hundreds of preserved fish, other aquatic organisms and *DWH* contaminants in gallon jars. It was meant to recall the fragile inter-trophic relationships between Gulf species, and the way the spill has altered this. Here is an attempt to see diversity of life impacted—from huge deep sea roaches (isopods), to oil-stained shrimp with no eyes, to jars packed with tiny sea snails. The work is really meant as a sketch, literally representing less than 2.3% of the known biodiversity of the Gulf and a tiny fragment of the life that was lost.

Empty containers represented species in decline as a result of the disaster—visually this was a way to frame absence and suggest the potential future ecosystem collapse. The piece was made in collaboration with fellow biologists Todd Gardner, Jack Rudloe, and Peter Warny and with my former student artist Brian Schiering. It took us two years to gather data, Gulf specimens and other samples. British Petroleum claims all is well with Gulf ecosystems, however, numerous species continue to show the devastating effects of the *DWH* disaster.

Allegory was an important component to the *Collapse* installation. On one hand I wanted to tell the story of the *DWH* disaster visually through the organisms themselves. Yet, aesthetics was an important means to reach audiences to deliver this message. Hundreds of specimen jars metaphorically recalled glass coffins stacked to create a massive pyramid. This pyramid attempted to represent both the biological reality of trophic Gulf interconnection and visually recall the structures of ancient Egyptian and other tombs.

Although my work is inspired by scientific study, it is fine art and not meant to be read as science visualization. Fundamental to my thinking is that the work must be open to interpretation and be aesthetically engaging to move beyond just illustration of a scientific phenomenon. In terms of content the works are informed from actual ecological and biological studies, however, while making works, traditional aesthetic decisions are made such as the use of space, how the eye will move through the work, use of color and materiality. There is also



Collapse, Brandon Ballengée, et al. (Brandon Ballengée with Todd Gardner, PhD, Jack Rudloe, Brian Schiering and Peter Warny), 2010/2012 mixed-media installation including 26,162 preserved specimens representing 370 species, glass, preservative solutions, 10 x 15 x 15 feet. Photo: Varvara Mikushkina, Courtesy of Ronald Feldman Fine Arts, New York.

the aspect of self-expression in my artworks. In my scientific studies I must stay objective and let the results speak for themselves, yet through making art I am able to explore the emotional and physiological complexity of working directly in degraded landscapes with impacted organisms. In this way the art is often my form of ecosystem activism.



Brandon Ballengée, detail of *Collapse* installed at the Herbert F. Johnson Museum of Art, Cornell University, Ithaca, New York. Photo credit: David O. Brown, 2014.



Brandon Ballengée, detail of *Collapse* installed at Ronald Feldman Fine Arts, New York. Photo credit Varvara Mikushkina, 2012.



Brandon Ballengée, detail of *Collapse* installed at Ronald Feldman Fine Arts, New York. Photo credit Varvara Mikushkina, 2012.



Brandon Ballengée, detail of *Collapse* installed at Ronald Feldman Fine Arts, New York. Photo credit Varvara Mikushkina, 2012.

Ghosts of the Gulf: Artist's Notes



The Gulf of Mexico is one of the most important and biologically-diverse environments in the world. It is a nursery for thousands of marine species, and numerous endemic organisms inhabit these warm waters. Gulf seafood is an important source of food for millions of people in North America, and, as marine species migrate following the Gulf Stream, people throughout Europe rely on these fish for protein. As such, the *Deepwater Horizon* spill could not have occurred at a worse place, from an ecological and economic standpoint.

The tremendous amount of oil itself (estimated at 206 million gallons) created an immediate kill zone greater than 200 kilometers wide, wiping out enormous amounts of marine life. Even worse, BP utilized upwards of 2 million gallons of chemical dispersants such as Corexit 9500, which made the effluents as much as 52% more toxic than the oil itself and much more wide-spread. According to the Material Safety Data Sheets (MSDSs) for Corexit 9500, produced by the chemical manufacturer Nalco, no prior toxicity studies had been conducted before its use in the Gulf. However, numerous toxicology studies had previously found such dispersants teratological to marine wildlife and carcinogenic to humans. Regardless, BP applied dispersants in deep sea as well as surface water and, because of normal currents, spread contaminants throughout the Gulf, eventually coating thousands of kilometers of the Gulf floor with toxic sludge while, on shore, impacting over 1000 miles of fragile estuary ecosystems and beaches. A recent United States Congressional Report estimates that, after clean up efforts, almost half the oil (over 100 million gallons) remains in the Gulf.

These images were made by chemically clearing and staining species collected in the Gulf after the *Deepwater Horizon* disaster. These species, once common, may now be in decline and are meant to be seen as apparitions. The clearing and staining process involves firstly preserving specimens then placing them in an acid bath with blue stain, which adheres to cartilage. Next the specimens are masticated in a digestive enzyme called trypsin, which begins the clearing of other tissues. Then the specimens are bathed in an alkaline solution with red dye which bonds with bone. The final stages transition the specimens through a series of baths from potassium hydroxide to glycerin whereby the specimen tissues become transparent except for the bones and cartilage, which are vividly dyed red and blue. The final specimen looks like a brightly colored x-ray revealing the complex architectural anatomy of these beautiful and disappearing species.

▲ Brandon Ballengée, *RIP Gulf Silver-sides* from the *Ghosts of the Gulf*, 2014. Giclée print on handmade Japanese rice paper in an edition of 13.

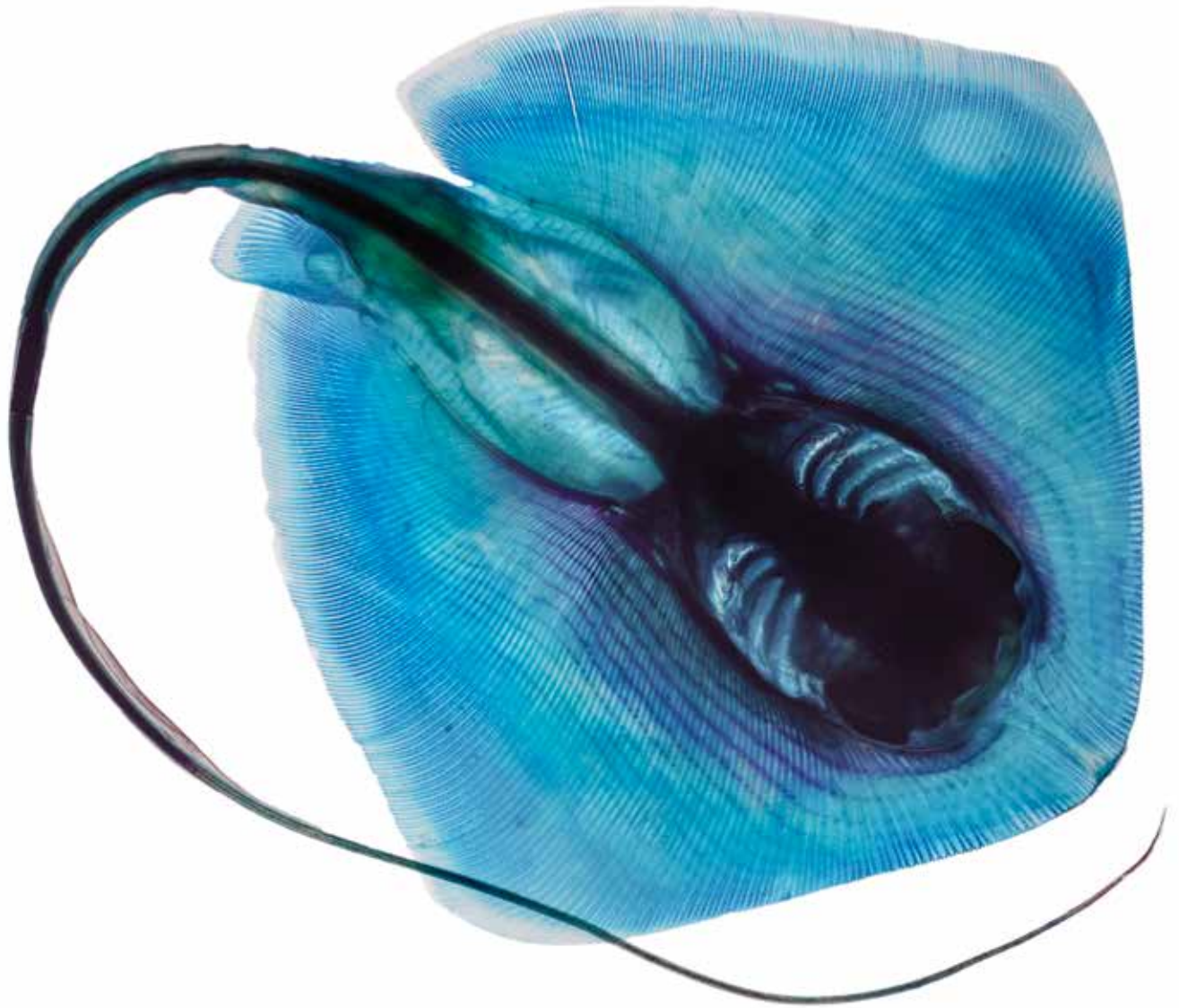
► [facing page] Brandon Ballengée, *RIP African Pompano* from *Ghosts of the Gulf*, 2014. Giclée print on handmade Japanese rice paper in an edition of 13.





▲[top] Brandon Ballengée, 2016 installation of the *Ghosts of the Gulf* at the University of Wyoming Art Museum, Laramie, Wyoming. Photo credit: WM Services, 2016.

◆Brandon Ballengée, *RIP Atlantic Guitarfish* from the *Ghosts of the Gulf*, 2014. Cliche print on handmade Japanese rice paper in an edition of 13.



Brandon Ballengée, *RIP Bluntnose Stingray* from the *Ghosts of the Gulf*, 2014. Giclée print on handmade Japanese rice paper in an edition of 13.

Tears of Ochún: Artist's Notes



The 2010 *Deepwater Horizon* oil spill had impact on billions of organisms. Two years after the *Deepwater Horizon* spill clean-up efforts began, shrimp and other seafood with lesions, missing eyes, or other abnormalities were found in the catches of fishermen and shrimpers. The majority of these were reported in coastal areas directly exposed to the oil spill contaminants in Louisiana, Mississippi and Alabama.

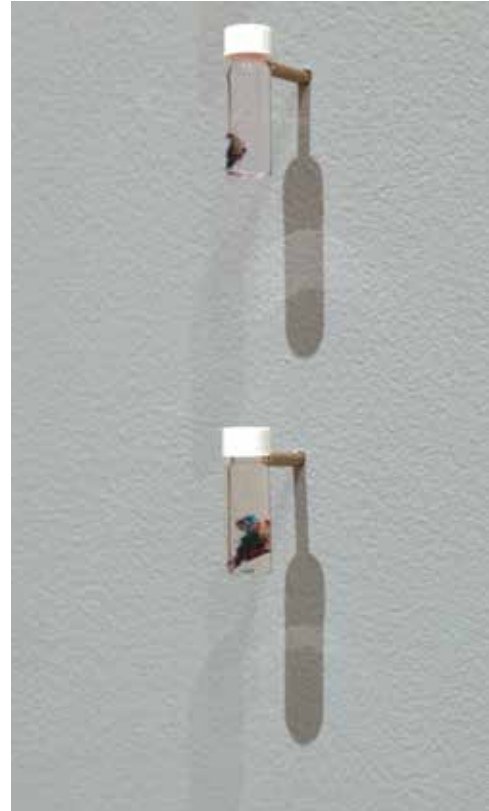
For this pilot project, we examined and compared 688 grass shrimp (*Palaemonetes* species) collected in the fall of 2012 from sites in Louisiana that were heavily exposed to *DWH* effluents compared to those sampled from sites in Florida with minimal exposure. All shrimps were analyzed for obvious developmental abnormalities and 500 were cleared and stained to further examine morphologies.

The results of this pilot study showed that shrimps sampled from areas with direct exposure to British Petroleum pollutants had a ten-fold increase (79.4%) in abnormalities compared to those collected at sites with minimal exposure (7.6%). The Louisiana populations showed the most severe abnormalities, including a single shrimp, which appears to have developed ectopic limbs growing from the abdomen. Further research is needed to better understand the far-reaching impact of the BP spill, resultant high levels of deformities among Gulf wildlife and the potential impact they have for humans consuming them as seafood.

At the conclusion of this study, 500 cleared and stained specimens were gifted to individuals not living along the Gulf Coast, with the hope that these tiny biological sculptures might connect them to the region.

▲ Brandon Ballengée, *Tears of Ochún*, 2012, cleared and stained Grass Shrimp (*Palaemonetes* species) collected from the Gulf of Mexico in Fall 2012 by Brandon Ballengée in scientific collaboration with Benjamin Dubansky, PhD, and Jack Rudloe, and with the assistance Michael Madden. Photo credit: Laurence Godart.

► [facing page] Installation of *Tears of Ochún* at the University of Wyoming Art Museum, Laramie, Wyoming. Photo credit: WM Services, 2016.



Committed

Committed offered rebuttals to claims made in BP advertisements. Here, scientific studies, government documents and other published materials factually contradict what BP has said in their commercials and other public relation attempts. Through the piece you see a complete collision of “realities.” On one hand, you have the reassuring words of the caring and apologetic former CEO Tony Hayward promising to “make this right” followed by visions of white sands with vibrant blue water, thrilled sunbathing tourists, thriving revitalized Gulf communities and wildlife, even a recipe for succulent shrimp gumbo. On the other, the world of scientists, analysts and Gulf residents, you see a different picture reported, with damaged beaches with sands used to cover oil, delays in clean up and restoration efforts, cover up attempts for loss of wildlife, *Deepwater Horizon* effluents bio-accumulating into different trophic layers of the Gulf food chain, health threats from consuming contaminated seafood, and an ongoing environmental catastrophe that has lacked systemic large-scale remediation.

▼ Video image capture from *Committed*, 2012, by Brandon Ballengée with Aurore Ballengée, Phillip Henken, Michael Madden and Gillian Wilson. Video: 16 minutes and 13 seconds; BP advertisements with running texts in rebuttal. Online at <https://vimeo.com/41591937>.



Dedicated



John Amos, President of SkyTruth: “Deepwater Horizon Oil Spill—Cumulative Oil Slick Footprint April 25 – July 16, 2010.”

Dedicated, 2012-2018, a collection of photographs and illustrations by Gulf Coast participants following the 2010 *Deepwater Horizon* oil spill. Curated by Brandon Ballengée with Aurore Ballengée, Phillip Henken, Mike Madden and Gillian Wilson. Participants included: John Amos; Anonymous Shrimper, Alabama Gulf Coast; Erika Blumenfeld; Lori Borsage; Capt. Lori DeAngeles; Benjamin Dubansky, PhD; Shane Elrod; Darlene Martin Eschete; Sarah Evanko; Susan Forsyth; P.J. Hahn; Lisa Hollis; Basia Irland; Trisha James; Jacquee Markel Jorgensen; James H. Kirby; Laurel Lackamy; Christina Markris; Ro Mayer; Ashley McCrea Strub; Mary Mobley; Denise Rednour; Kim Schultz; Charles Taylor; Shirley Tillman; Trisha Peters Williams and several other contributors who wished to remain anonymous.

John Amos: “Graphic showing the cumulative oil slick footprint for the BP / *Deepwater Horizon* oil spill in the northeast Gulf of Mexico. Created by overlaying all of the oil slicks mapped by SkyTruth on satellite images taken between April 25 and July 16, 2010. Cumulatively, surface oil slicks and sheen observed on satellite images directly impacted 68,000 square miles of ocean—about as big as Oklahoma.”



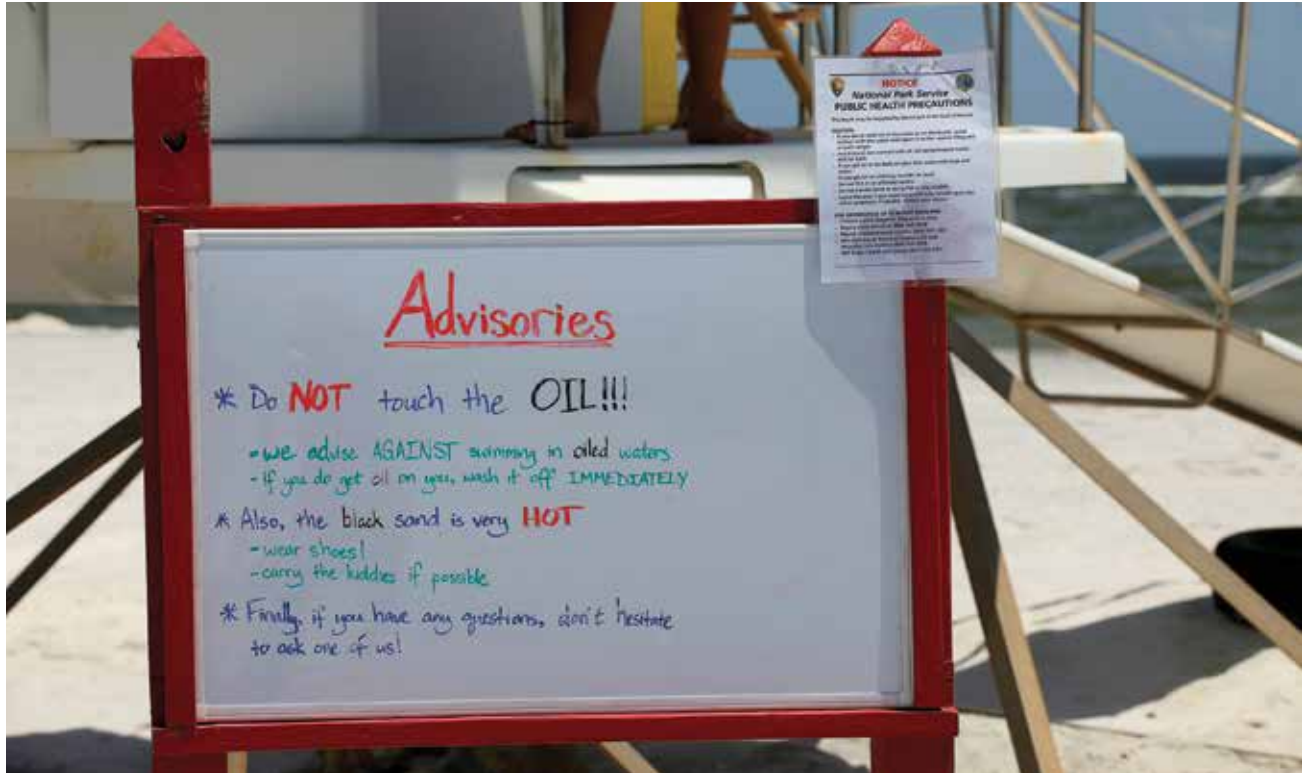
Dedicated: [top] Photo by artist Erika Blumenfeld: “The source of BP’s *Deepwater Horizon* oil spill on July 12, 2010, as response crews continue to burn off gas just hours before the new cap is installed to seal the oil leak.” [bottom left] Darlene M. Eschete, Bayou Belle Photography: “during the oil disaster in and around Grand Isle, Louisiana.” [bottom right] Anonymous photographer.



Dedicated: [top] Photograph by Shirley Tillman. [bottom left] Photograph by Christina Markris. [bottom right] Photo by artist Basia Irland: "clean up."



Dedicated: [top] Photo by artist Basia Irland: "The tribe of the region was hit hard, first by Katrina which wrecked their houses and then by the spill which wiped out their livelihood." [bottom left] Erika Blumenfeld, artist: "Residents of Grand Isle, Louisiana, express the impact that the *Deepwater Horizon* oil disaster is having on their livelihood." [bottom right] Anonymous Shrimper, Alabama Gulf Coast: "Shows two shrimp, one with no eyes and one with only one eye, both caught near Horn Island, MS, November 2011."



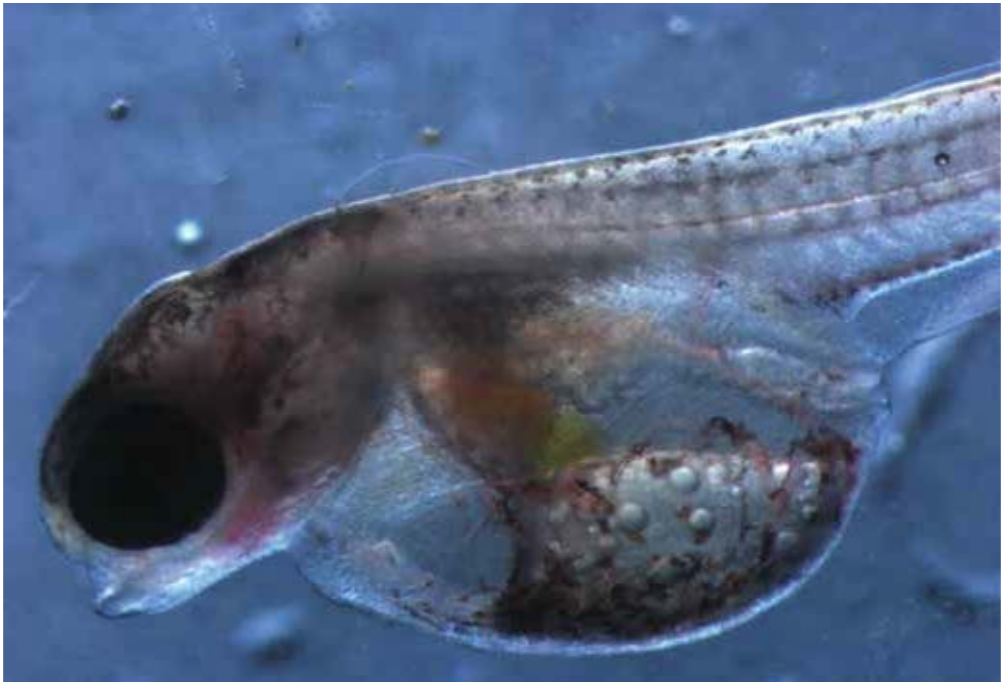
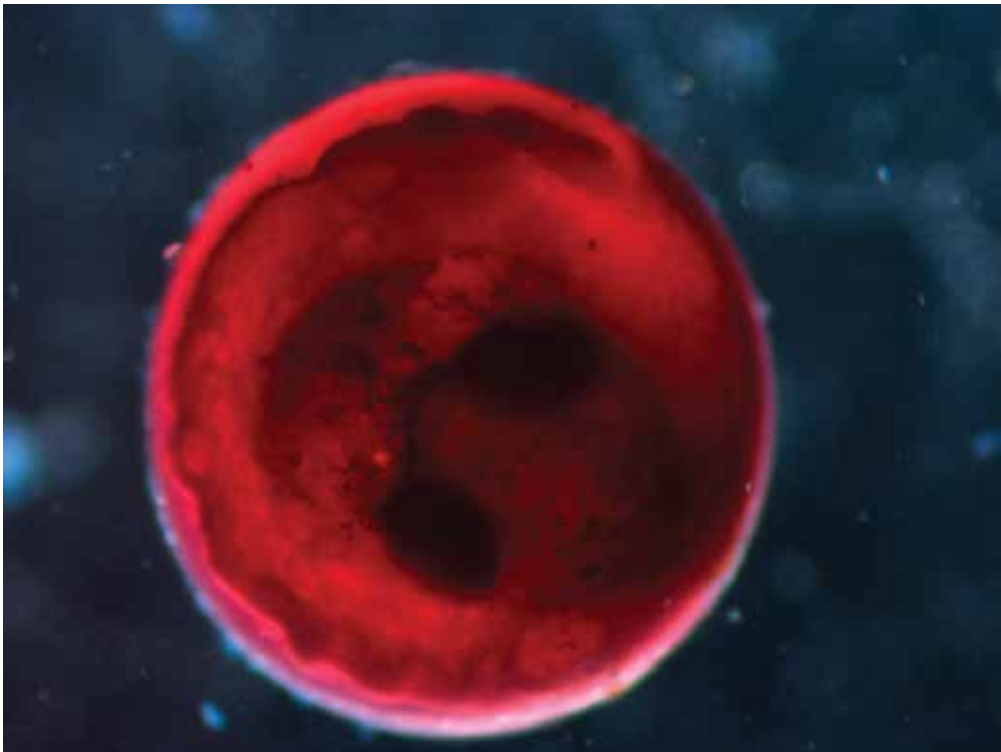
Dedicated: [top] Photo by artist Erika Blumenfeld: “State and Federal governments declared the Gulf safe for recreation and fishing despite independent scientists confirming the presence of toxic chemicals from oil and dispersants in the water, seafood, soil, air and human blood.” [bottom] Laurel Lockamy, photographer, Gulfport MS, “so many dead dolphins, turtles, birds, fish and it’s still happening here,” 2011.



Dedicated: [top] Photo by Laurel Lockamy, wildlife photographer, 2011. [bottom] Photograph by Shirley Tillman, 2011.



Dedicated: Three photographs by Denise Rednour, 2011, Long Beach, MS. [bottom right] Lisa Phillips Hollis: "Attached are two pictures I took on the beach in Gulf Shores, Alabama. My favorite beach in the world, Little Lagoon Pass. Unfortunately, every time I visit my happy place now, I'm faced with BP's mess. BP promised 'pre-spill conditions.' BP can't uphold that promise to the residents along the Gulf Coast. Therefore, I will continue to find BP's tarballs and send a message through them."





▲ Benjamin Dubansky, PhD, Department of Biological Sciences, University of Texas, Denton. Research: Gulf killifish (*Fundulus grandis*) embryo exposed to field-collected sediments contaminated by the *Deepwater Horizon* oil spill. Prior to hatch, edema (fluid accumulation) can be seen in the pericardial cavity between the head and the yolk sac. Also evident is hemorrhaging, appearing here with a red cloudy appearance.

◀ [facing page] Benjamin Dubansky, PhD, Department of Biological Sciences, University of Texas, Denton. Research: Gulf killifish (*Fundulus grandis*) larvae. Hatched after exposure to field-collected sediments contaminated by the *Deepwater Horizon* oil spill. Evident in these organisms after sublethal exposures is intracranial hemorrhage (pink/red posterior and ventral to the eye) and a pronounced edema (fluid accumulation) in the pericardial space, yolk sac and viscera. Concomitant with these effects morphological and physiological cardiovascular defects.

Crude Life: A Citizen Art and Science Investigation of Gulf of Mexico Biodiversity after the *Deepwater Horizon* Oil Spill

Crude Life (2016-ongoing) is an interdisciplinary art, science and outreach project focused on gathering data on endemic fishes affected by the 2010 Gulf of Mexico oil spill. The scientific focus of the project seeks to find fourteen missing species of endemic Gulf fishes that have not been found following the spill. With the help of Gulf residents we hope to find them!

To reach communities, a portable art-science museum of Gulf of Mexico biodiversity was created that aims to inspire people about local species, ecosystems, and regional environmental challenges through temporary “pop-up” exhibitions along with community “citizen science” surveys of Gulf species. The art-science museum’s “galleries” were created from repurposed sea chests/ steamer trunks retrofitted with preserved specimens, pirate artifacts, interactive new media art, with “talking” Gulf species, drawings, field guides and other curiosities from and related to the Gulf.


As the museum has traveled, public and youth “Eco-Action” educational and research field trips have happened where we sampled local fishes and other aquatic species while encouraging participants to make their own art about the discovered animals. Data on these species is being utilized as part of a scientific study and participant artworks have become included in the museum. The combination of the curiosity of a mobile museum, interactivity of citizen science, and one-on-one discussions occurring as a result of the project has stimulated ongoing dialogues about the complex socio-ecological issues we face in the Gulf region.

Core Collaborators: Brandon Ballengée, PhD (Louisiana State University); Prosanta Chakrabarty, PhD (Louisiana State University); Sean Owen Miller (University of Florida); Rachel Mayeri (Harvey Mudd College); Suzanne Fredericq, PhD (University of Louisiana at Lafayette); Aurore Ballengée (Atelier de la Nature); Monique Michelle Verdin (My Louisiana Love); Benjamin Dubansky, PhD (University of Texas Denton). Other collaborators: Senator Norbert “Norby” Nolty Chabert (Louisiana State Senate); Cherri Foytlin (Bold Louisiana); Josh Baumgardener (Haliburton); Edward Chesney, PhD (Louisiana Universities Marine Consortium / LUMCON); Alexander Kolker, PhD (Louisiana Universities Marine Consortium/ LUMCON); Linda Hooper Bui, PhD (Louisiana State University); Blaise Daniel Pezold (Louisiana Department of Agriculture and Forestry’s Coastal Re-Vegetation Project); Randon Dufrene (Tee Jug’s Shrimp Company); Bob Chateaulin (La Jardin Francaise); Keith Broussard (Louisiana Fish and Wildlife); Jonathan Foret (South Louisiana Wetlands Discover Center); Link Morgan (Louisiana State University); Stacey Leah Scarce (Acadiana Park Nature Station); Members of the Pointe-Aux-Chenes Tribe + Students and residents of the Louisiana coast regions.


Support Received: Interdisciplinary Projects Grant Award, National Academies Keck Futures Initiative (NAKFI), a project of the National Academies of Sciences, Engineering and Medicine, Washington, DC; Artspark Grant, Acadiana Center for the Arts (ACA) and Lafayette Economic Development Authority (LEDA), Lafayette, LA; and University of Florida, Gainesville, FL.

WANTED

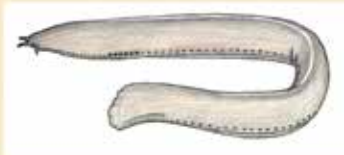
fish species missing since the 2010 Oil Spill




Mexican goby or Blackfin goby




Spreadfin Skate




**Unnamed hagfish/
*Eptatretus minor***




Saltmarsh topminnow



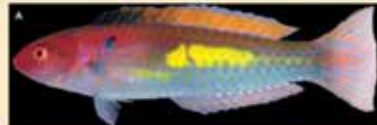
Irkstone eel




Fringefin lanternshark




Yucatan flagfish




Mardi Gras wrasse




Yucatan killifish




Yucatan or Golden silverside




Redface moray eel



Black driftfish




King snake eel



Key Brotula

**If you find please contact
Brandon Ballengée and Prosanta Chakrabarty at
the Museum of Natural Science, Louisiana State University
119 Foster Hall
Baton Rouge, LA 70803
email: bballengee@lsu.edu
phone: 646-726-1387**



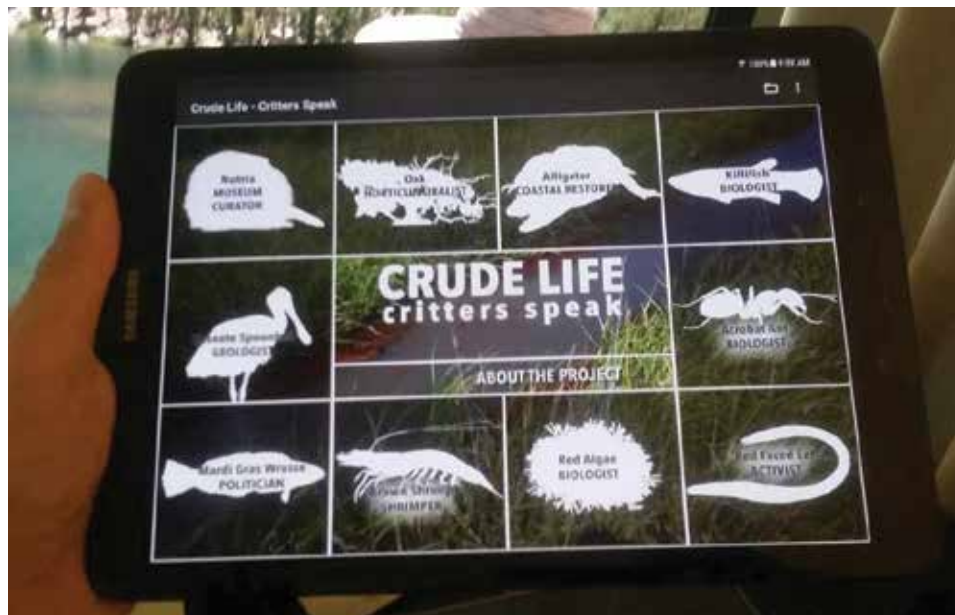
Gulf of Mexico endemic fishes “missing” since the 2010 spill. This poster has been given away during outreach events and posted in marinas, schools, groceries, the Louisiana State Senate and other public venues.



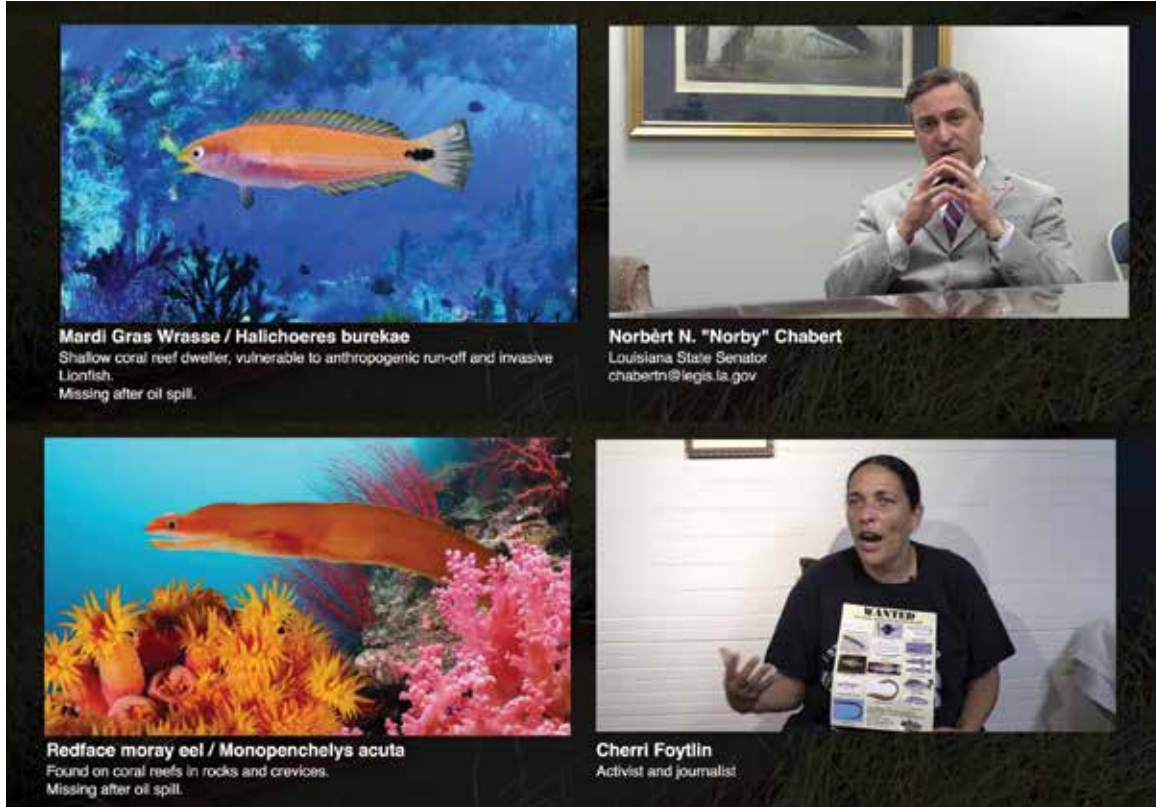
[top left] LSU researchers sampling for missing species in Fall 2016 during *Crude Life* public *Eco-Action* at Grand Isle, Louisiana: pictured are Prosanta Chakrabarty, PhD, Diego Elias, PhD, and Seth Parker, PhD. [top right] *Eco-Action* outreach event at Studio in the Woods, New Orleans, Louisiana, Fall 2017. [bottom] Detail of *Crude Life* portable museum "Fishes Chest" created in collaboration with Prosanta Chakrabarty, PhD, Sean Owen Miller, Benjamin Dubansky, PhD, Jack Rudloe, Charles Verdin, Peter R. Warny, and others. Background wallpaper by Mark Dion. Photographed at the National Academy of Science Beckman Center, Irvine, California, November 2017.



[top] Detail of *Crude Life* portable museum “Spineless Chest” created in collaboration with Sean Owen Miller, Benjamin Dubansky, PhD, Jack Rudloe, Peter R. Warny, Victor Ballengée, and others. Background wallpaper by Mark Dion. Photographed at the National Academy of Science Beckman Center, Irvine, California, November 2017. [bottom left] *Eco-Action* outreach event at Pointe-Aux-Chenes, Louisiana, Spring 2017. [bottom right] *Eco-Action* outreach event at Louisiana Museum of Art and Science, Baton Rouge, Louisiana, Spring 2017. Photo credit: Aurore Ballengée.



[top] *Crude Life* "Critters Speak," by Rachel Mayeri, interactive mixed media artwork with interviews by Benjamin Dubansky, PhD, Senator Norbert "Norby" Noltz Chabert, Cherri Foytlin, Alexander Kolker, Linda Hooper Bui, PhD, Randon Dufrene, Bob Chateaulin, Jonathan Foret, and Anonymous, each animated into talking marsh species of their choice. 2017. <http://rachelmayeri.com/blog/2018/05/26/critters-speak/>. [bottom] *Eco-Action* outreach event with Link Morgan and Victor Ballengée at Lafayette Farmers Market, Lafayette, Louisiana, Summer 2017.



[top] Detail from "Critters Speak" by Rachel Mayeri, interactive mixed media artwork, 2017. [bottom left] Eco-Action outreach event at Pointe-Aux-Chenes Blessing of the Fleet, Louisiana, Spring 2017. [bottom right] Eco-Action outreach event at NUNUs Artists Collective community potluck, Arnaudville, Louisiana, Fall 2016.



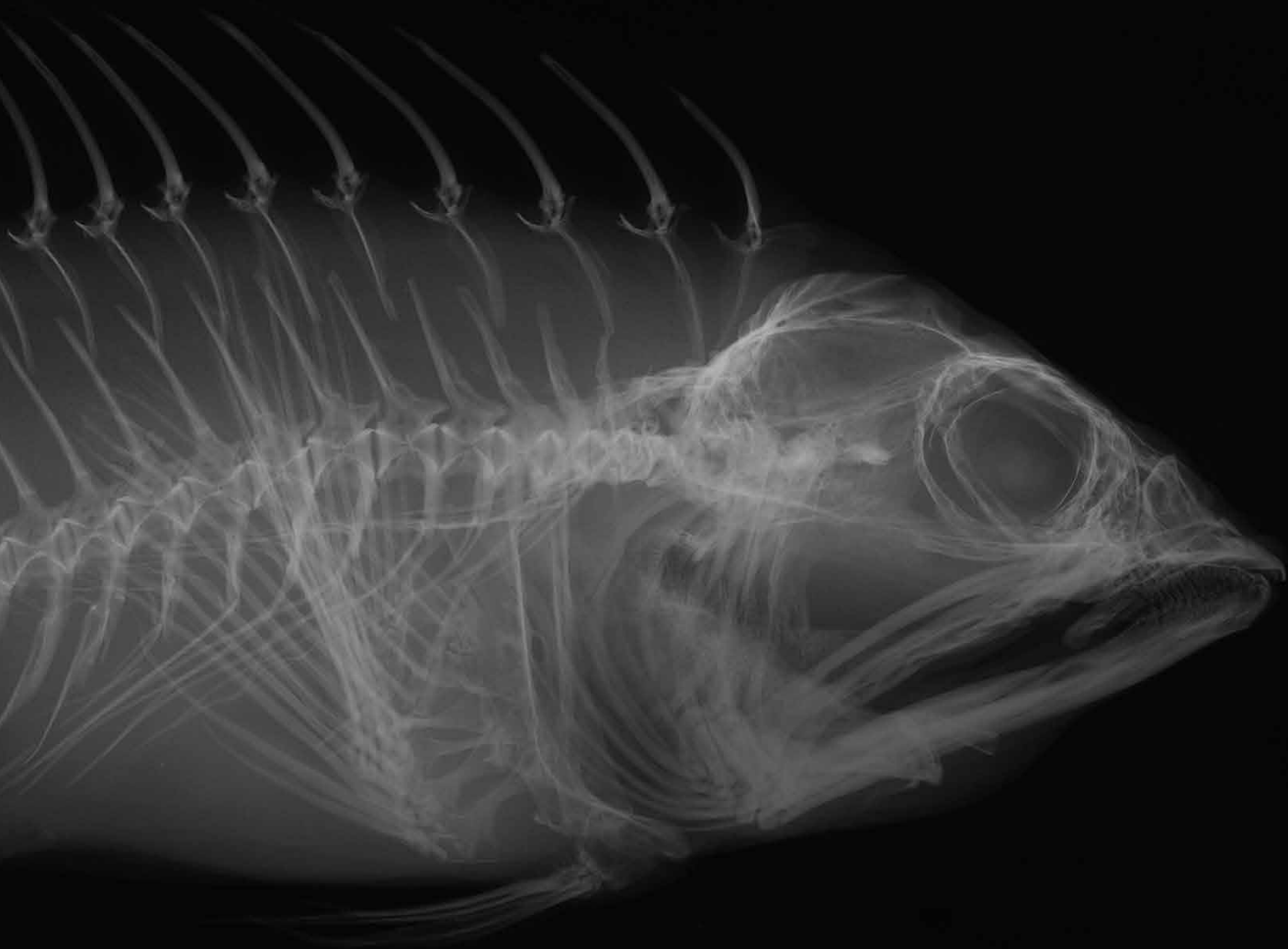
[top] *Crude Life* Portable Museum “Disappearing Cultures” featuring “Rosalie’s Treasure” by Monique Verdin and Sharon Linezo Hong with artifacts from Pirate Jean Laffite’s island donated by Stacey Lee Scarce. Anonymous portrait of Jean Lafitte, early 19th century, Rosenberg Library, Galveston, Texas. Installed at the Museum of Natural Science, Louisiana State University, Baton Rouge, Louisiana, January 2018. Photo credit: Paige Jarreau. [bottom] Still from “Rosalie’s Treasure” by Monique Verdin and Sharon Linezo Hong, 2017. Video: 4 minutes 51 seconds.



[top] *Crude Life* Portable Museum installation at the Museum of Natural Science, Louisiana State University, Baton Rouge, Louisiana, January 2018. Photo credit: Paige Jarreau. Pictured are the “Algae,” “Flora,” and “Herptiles (Amphibians and Reptiles)” chests in collaboration with Sean Owen Miller, Suzanne Fredericq, PhD, Benjamin Dubansky, PhD, Peter R. Warny, Aurore Ballengée, Victor Ballengée, and others. [bottom left] *Eco-Action* outreach event at Indian Bayou, Saint Martin Parish, Louisiana, Spring 2017. [bottom right] *Crude Life* Portable Museum installation at the Museum of Natural Science, Louisiana State University, Baton Rouge, Louisiana, January 2018. Photo credit: Paige Jarreau. Detail of the “Herptiles (Amphibians and Reptiles)” chest in collaboration with Sean Owen Miller, Benjamin Dubansky, PhD, and Peter R. Warny.



Brandon Ballengée, *RIP Stretchjaw Blenny*, species last reported in 1983. Radiograph of National Museum of Natural History (NMNH) at the Smithsonian specimen USNM 219830 *Chasmodes longimaxilla* (holotype).



La Mer des Enfants Perdus

La Mer des Enfants Perdus

Brandon Ballengée

The Sea of Lost Children: La Mer des Enfants Perdus

Life is the most exceptional form of poetry, albeit complicated, messy, fragile and quickly dwindling. Biodiversity is nature's art, and what will become of this art as we continue to extinguish life in the name of monetary growth?

For many of us, and over 10 thousand other species, the Gulf of Mexico is a special place, our sanctuary, our home, our mother, provider and perhaps destroyer. From the science side, the Gulf is among the most important and biologically diverse marine environments in the world with an estimated 600-1000 species of fishes, 77 of which are endemic and found nowhere else on Earth. From the art side, the Gulf is a constant source of inspirational color, form, intrigue, tranquility and fear. She is resilient, powerful, seductive but also dangerous, damaged and suffocating in her own *sang noir*.

For the "Yankee" child I was, visiting the deep Gulf south, she was vivid, mysterious, rich, nurturing, confusing and teeming with fantastic varieties of life. But she has changed. Factually, the 2010 *Deepwater Horizon* (DWH) oil spill was the largest industrial petrochemical accident in the history of the United States and its long-term impact on fishes, other biota and Gulf ecosystems is still not well understood. The fate of the Gulf and her children remains precarious.

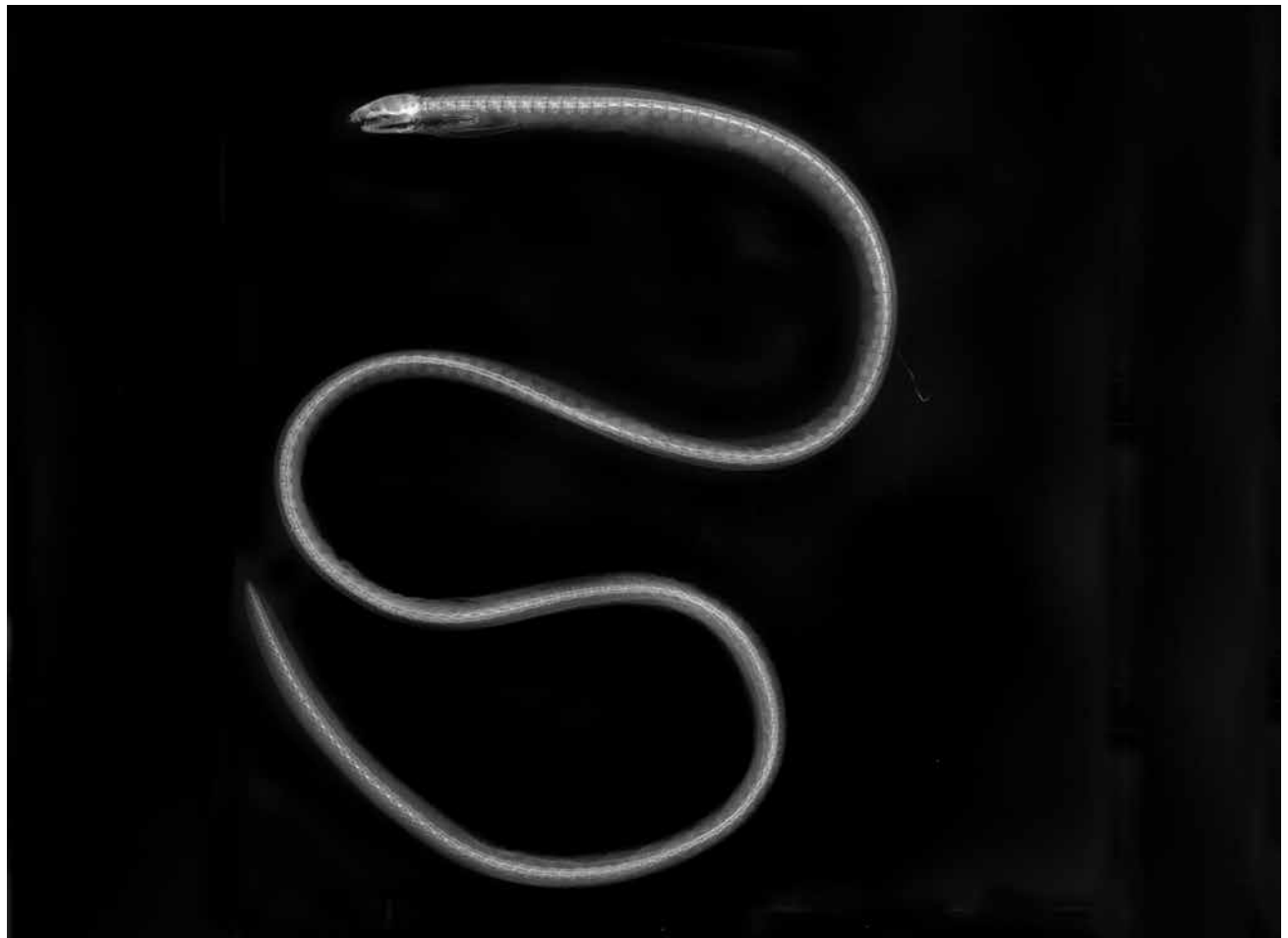
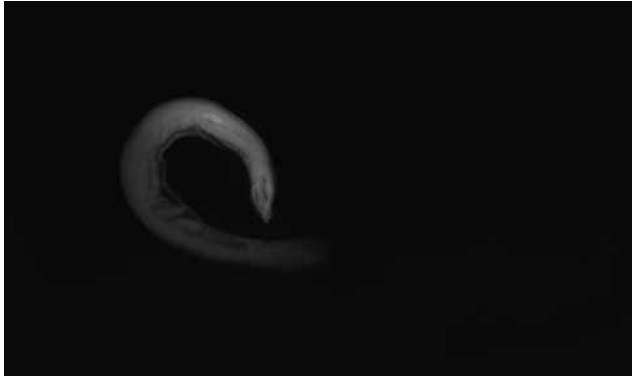
Since the spill, much of my art has focused on the perilous environmental state of the Gulf. In 2016, I was also part of an interdisciplinary LSU research team (where I am a currently a postdoctoral researcher) that reported that 14 endemic fish species were missing since the spill.¹ Additionally, the compass of the oil has been difficult to assess: as much as 100 million gallons remains in the Gulf sediment and recent evidence suggests it continues to impede ecosystem recovery.²

Even prior to the spill, several Gulf fishes remained elusive and had not been found in decades (1950 through 2005). Little is known about these species and the only records we have of their existence is a handful of preserved specimens scattered among natural history collections.³ As an artist I am inspired to portray and to tirelessly search for the Gulf's lost children, and as a scientist to unravel this ecological mystery.

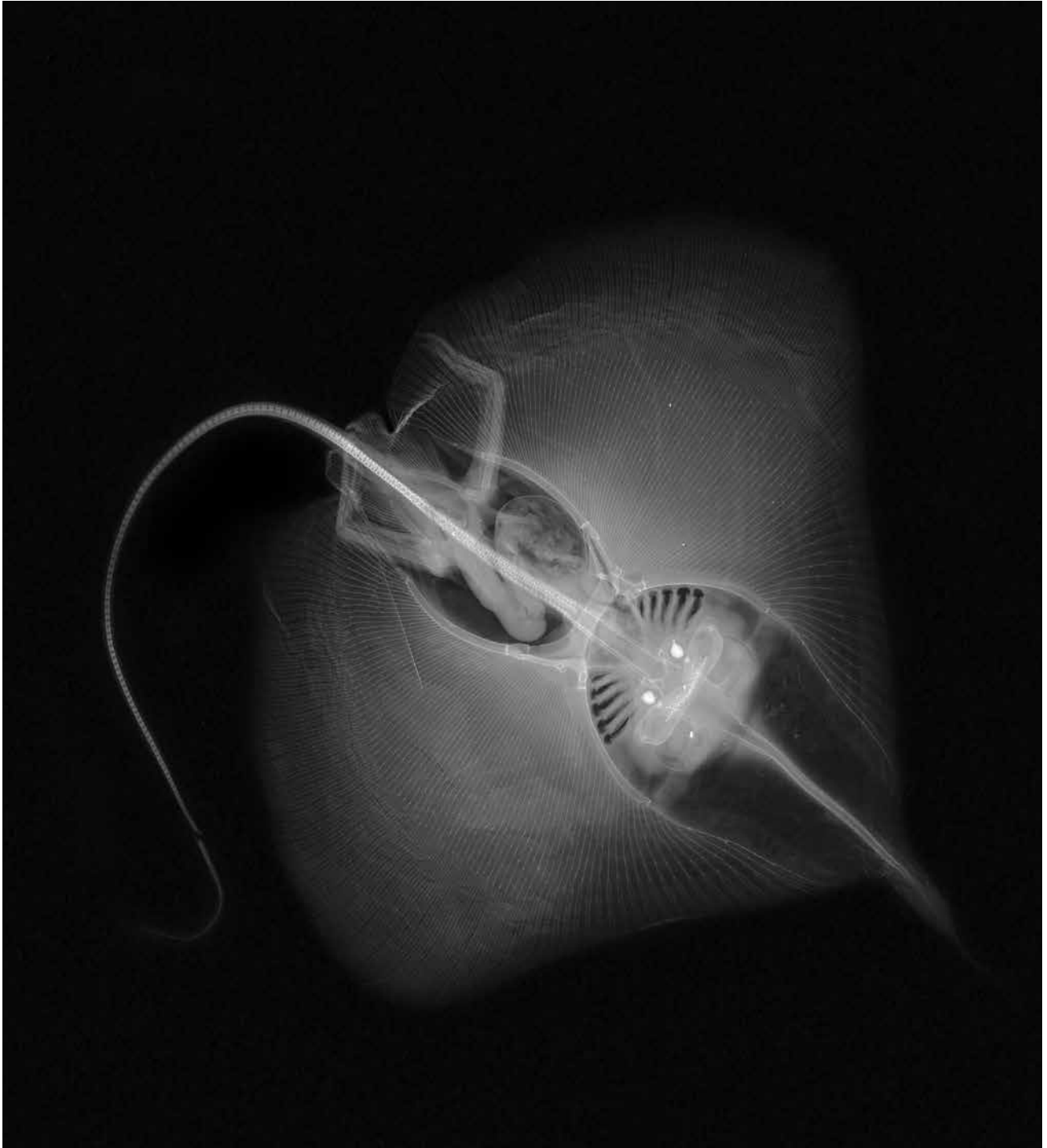
¹ Of the 14 endemic missing fish species, all were recorded in the Gulf of Mexico between January 2005 and January 2010. These 14 species have not been reported following the spill, which occurred between April and September, 2010. Please see: Chakrabarty P., O'Neill G., Hardy B., Ballengee B. (2016) "Five Years Later: An Update on the Status of Collections of Endemic Gulf of Mexico Fishes Put at Risk by the 2010 Oil Spill," *Biodiversity Data Journal* 4: e8728.

² Please see: Ballengée, B. (2015) "Ghosts of the Gulf," *Cultural Politics*, 11(3), 346-360.

³ Up to 44 of the 77 known Gulf endemic fishes are rare, have not been reported or recent data is insufficient to understand their population status (Chakrabarty, et al., 2016).



[top left] Brandon Ballengée, *RIP Unnamed Deep Water Hagfish*, species last reported in 2005. Radiograph of National Museum of Natural History (NMNH) at the Smithsonian specimen USNM 218399 *Eptatretus minor*. [top right] Brandon Ballengée, *RIP Fringelin Lanternshark*, species last reported in 2006. Radiograph of National Museum of Natural History (NMNH) at the Smithsonian specimen USNM 220379 *Etmopterus schultzi*. [bottom] Brandon Ballengée, *RIP String Eel*, species last reported in 2004. Radiograph of National Museum of Natural History (NMNH) at the Smithsonian specimen USNM 263571 *Gordiichthys leibyi*.

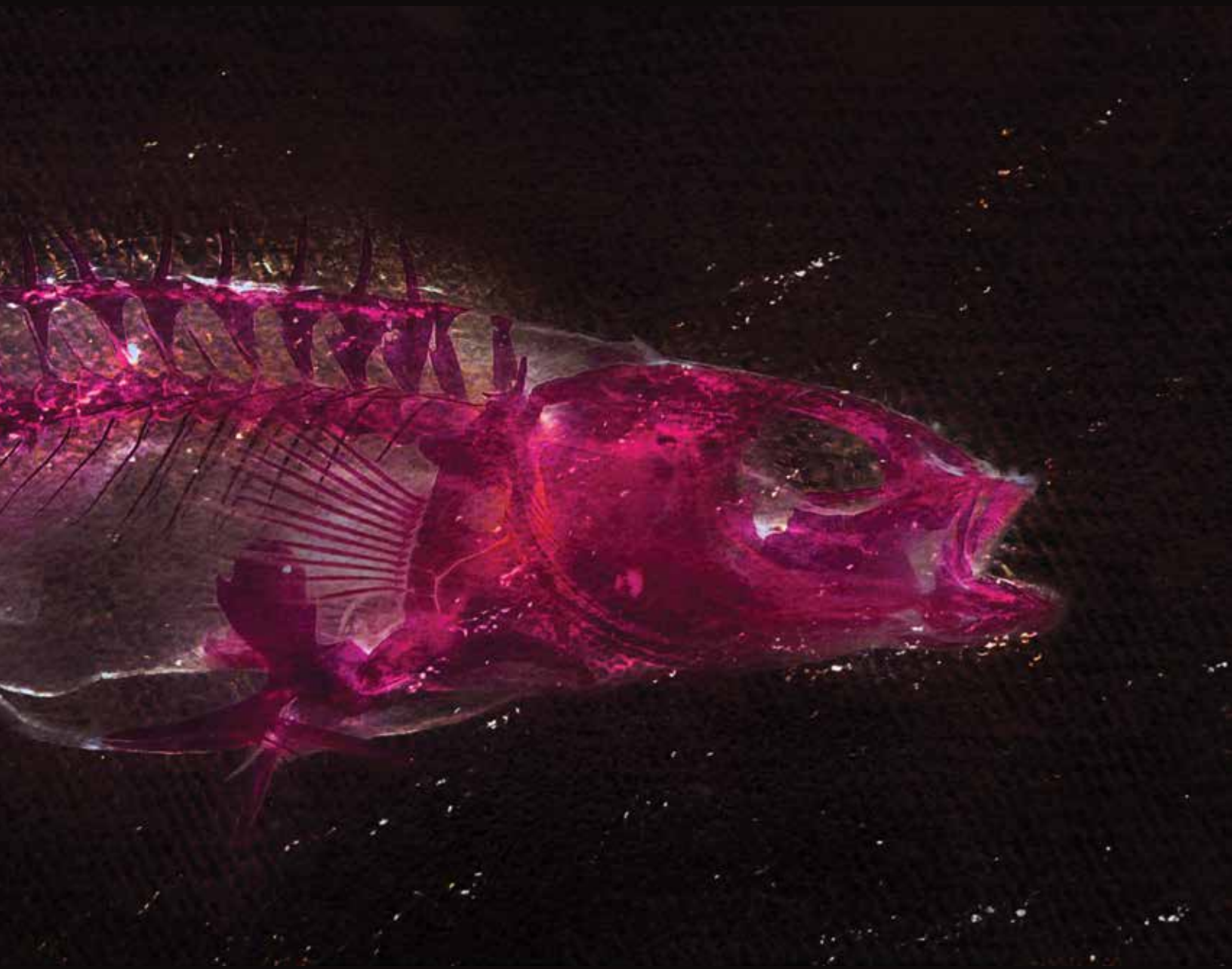


Brandon Ballengée, *RIP Leaf-nose Leg Skate*, species last reported in 2004. Radiograph of National Museum of Natural History (NMNH) at the Smithsonian specimen USNM 158971 *Anacanthobatis folirostris*.



Brandon Ballengée, *RIP Unnamed Deep Water Dragonfish*, species last reported in 1960. Radiograph of National Museum of Natural History (NMNH) at the Smithsonian specimen USNM 222026 *Eustomias leptobolus*.





Water Chronology with Artist's Notes, 1998-2015

Ti-tânes, 2012/2013

“Verily at the first Chaos came to be, but next wide-bosomed Earth, the ever-sure foundations of all.”

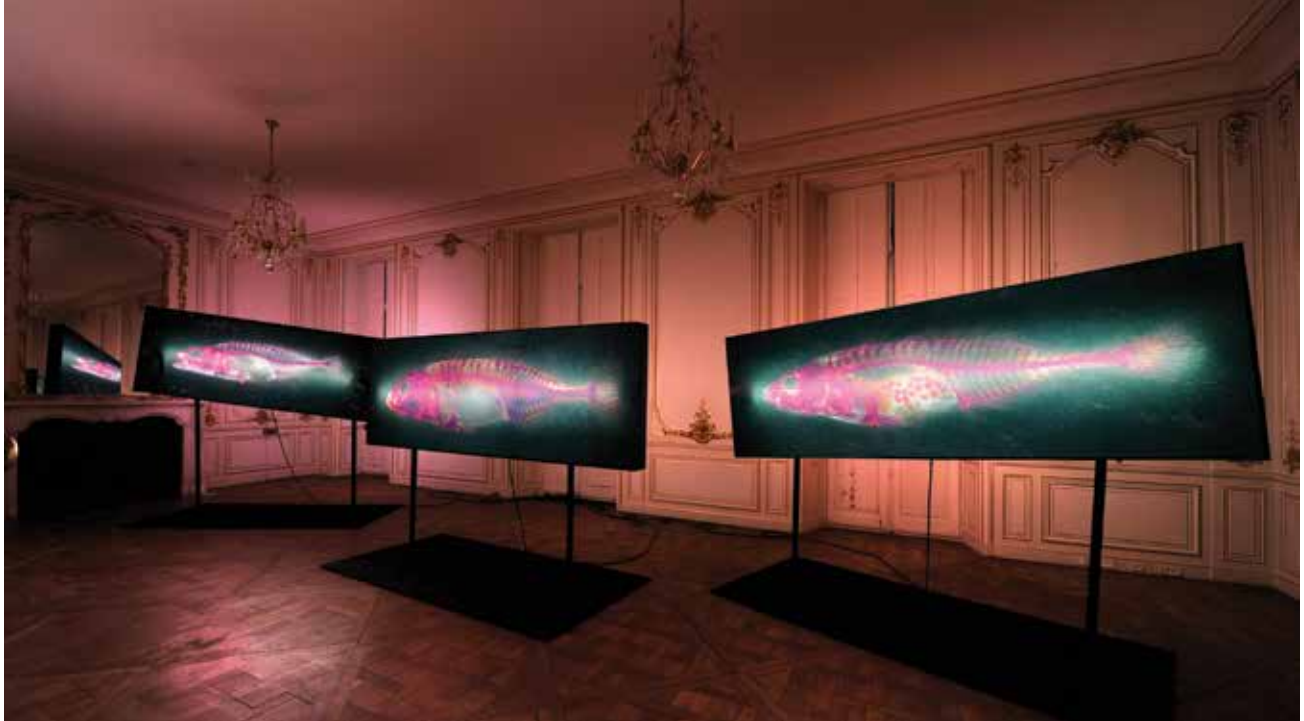
—Hesiod (ca. 700 BC; translated by H.G. EvelyIn-White, 1914)

In Greek mythology the *Ti-tânes* or Titans, were the ancient primordial deities born from Gaia or Gaiê (Earth) and Ouranos (Sky). The Titans, in a sense, were products of primordial nature and eventually overthrown by the Olympians (the more human-like gods represented in classical Greco-Roman mythology). This paradigm shift is a strong metaphor for our Western approach towards nature and the environment, a change from revering the natural world to anthropomorphic adoration which continues to drive human-centric exploitation of natural resources and other organisms. Although the *Ti-tânes* were defeated by the new human-like gods, they survived, banished to austere lands.

With the *Ti-tânes* series, I aim to portray ancient animal species, which are able to survive (perhaps even thrive) in habitats environmentally impacted by human activity. Such organisms have endured millions of years and are now adapting to today’s ecological degradation. Symbolically, the series is meant to link such animals to archaic lingering nature deities surviving, banished, in now degraded environs. It also references time in the ecological sense through species who have existed for much longer and perhaps will survive much longer than our own.

As artworks, this series began in 2012, when I selected a species that was ancient (in the evolutionary sense) and able to survive in habitats environmentally degraded by human activity. For these works, three Nine-spined Stickleback (*Pungitius*





pungitius) collected from a polluted canal in Chamarande (France) were chosen as subjects and carefully stained using Alizarin red dye, which adhered to bone then cleared using digestive enzymes to make surrounding tissues transparent. From the biological research side this was done to analyze specimens for any developmental abnormalities that in life we could not have seen. This treatment was performed as an artistic choice—because clearing and staining is a way to change the way we are able look at such organisms, how we perceive them—they are abstracted yet made clearer. Next, they were photographed on coal (literally fossilized carbon) meant to recall ancient life as well as changes to today's climate made through the continued burning of such fossil fuels.

These artworks are meant as portraits of the individual fish, since each is as unique as each of us. Through size (making them larger than life) they are scaled so the human viewer sees them at a magnitude beyond our ordinary bodily scale—grandiose and sublime like nature herself. Metaphorically, they are meant to recall the ancient lingering nature deities surviving in banished, now degraded, environs. Viewed as skeletons they are not meant to represent death, but instead life persisting in ecosystems made preternatural by human activity.

▲Installation view of *Ti-tânes* in the 2013 Brandon Ballengée retrospective exhibition *Augures d'Innocence*, held at the Chateau de Chamarande, Essonne, France. *Ti-tânes* images are Duratrans prints on double sided light-boxes, 1 meter by 3 meters each. Photo credit: Laurence Godart.

◀[facing page] Brandon Ballengée, *lape-tos - SB2_2*, 2012/2013, from *Ti-tânes*, 2012/2013, Duratrans prints on double sided light-boxes, 1 meter by 3 meters.

Malamp: The Occurrence of Deformities in Amphibians, with Reliquaries, Styx, and A Requiem for Injured Snowflakes

Malamp: The Occurrence of Deformities in Amphibians, 1996–Ongoing. For more than a decade, a central praxis of my primary biological research and subject of my artworks has been the declines and potential causes of deformities among amphibian populations. As an artist and biologist, I have studied amphibians internationally involving collaborations with numerous other researchers and hundreds of participating members of the public.

Reliquaries, 2001–Ongoing. These reliquaries are created by chemically “clearing and staining” terminally deformed frogs found in nature. This process obscures direct representation. I do not want to exhibit large images of “monsters,” which would be frightening and exploitative to the organisms. This process is followed by high-resolution scanner photography of each specimen to create individual portraits. These portraits are printed as unique watercolor ink prints (never made into editions) and each individual frog is centered, appearing to “float” in what looks to be clouds. This otherworldly quality is reinforced by the titles, individual images named after ancient characters from Greco-Roman mythology. In an attempt to invoke empathy in the viewer instead of detachment or fear, they are scaled so that the frogs appear approximately the size of a human toddler: if they are too small they will be dismissed, but if they are too large they will become monsters. Each finished artwork is unique and never editioned in order to recall the individual animal and become a reliquary to a short-lived non-human life.

Styx, 2007–Ongoing. Named after the legendary river from Greek mythology that moved between the worlds of the Living and the Dead, *Styx* is a sculptural expression of complex sensations derived from finding the abnormal frogs in nature. To create *Styx*, tiny deformed frog specimens are carefully chemically cleared and stained then displayed on large dark structures to resemble fallen obelisks. The specimens are small, out of our normal human-scale for bodily association, but through precisely illuminated glass dishes they become the “light” and focal point. Viewed up close they resemble gems or the stained-glass windows found in some cathedrals. There is something familiar about them, enchanting but terrible.

A Requiem for Injured Snowflakes, 2009/2012. This video is free for download and exhibition. I ask though that once begun, the video should be played for infinity, until the extinction of our species or until someone chooses to turn it off at which point the file should be deleted. Original musical score:

►[facing page] Brandon Ballengée, *DFB 45: Arès*, 2008, unique digital-C print on watercolor paper, 46 x 34 inches. Cleared and stained Pacific Tree Frog collected in Aptos, California, in scientific collaboration with Stanley K. Sessions, PhD. Title by the poet KuyDelair.





Ariel Benjamin and Andrew Diluvian. In scientific collaboration with Stanley K. Sessions, PhD, Hartwick College (USA) and David M. Green, PhD, McGill University (Canada). Photography under the direction of Brandon Ballengée by: Marissa Nolan, Frédérique Paquin and the artist/ biologist. Post photography montage: Brandon Ballengée. Post video production: Philip Henken, Gillian Wilson.

A Requiem for Injured Snowflakes: 21 individual portraits of short-lived beings (tiny metamorphic American toads found in Southern Quebec). Each was born into a hostile universe of predators, parasites and ecological degradation. Like all beings, these young creatures represent a particular moment in history and carry the environmental marks of their birth place. In the case of these individuals, trauma during development resulted in terminal abnormalities. As they emerged to begin life on land severe deformations fated them to early death. This finite/infinite artwork is meant to be a memorial to these small creatures and in honor of the countless number of beings coming into this world and passing without our notice.

Acknowledgments: Society for Art and Technology (SAT); Redpath Museum, McGill University (Canada); 2009/2010 “Frog Team” volunteers (Canada); Peter R. Warny, New York State Museum (USA); Ethan Bright, PhD, University of Michigan (USA); Tagny Duff, PhD, and the students of the Flux Media Laboratory @ Concordia University (Canada); SunRiver Oregon Nature Center (USA); Bruce Pauli, PhD, Environment Canada (Canada).

▲ Brandon Ballengée, still from *A Requiem for Injured Snowflakes*, 2009/12, online video of tiny metamorphic American toads found in Southern Quebec.

► Brandon Ballengée, Detail of *Styx*, cleared and stained Pacific Tree Frogs on a sculptural light-box. In scientific collaboration with Stanley K. Sessions, PhD.

► [facing page] Installation of *Malamp Reliquaries* and *Styx*. Brandon Ballengée, *Styx: Variation II*, 2008, mixed media installation with 9 cleared and stained Pacific Tree Frogs on a sculptural light-box. In scientific collaboration with Stanley K. Sessions, PhD, installed at Gallery 400, University of Illinois at Chicago. Photo credit: Tom Van Eynde.







Brandon Ballengée, *DFA 175: Ikaros*, 2013, unique Iris print on Arches watercolor paper, 46 x 34 inches. Cleared and stained Pacific Tree Frog collected in Aptos, California, in scientific collaboration with Stanley K. Sessions, PhD.



Brandon Ballengée, *DFA 186: Hadēs*, 2012, unique digital-C print on watercolor paper, 46 x 34 inches. Cleared and stained Pacific Tree Frog collected in Aptos, California, in scientific collaboration with Stanley K. Sessions, PhD.



Brandon Ballengée, *DFA 155: Morpheus*, 2013, unique Iris print on Arches watercolor paper, 46 x 34 inches. Cleared and stained Pacific Tree Frog collected in Aptos, California, in scientific collaboration with Stanley K. Sessions, PhD.



Brandon Ballengée, *DFB 44: Pandora*, 2013, unique Iris print on Arches watercolor paper, 46 x 34 inches. Cleared and stained Pacific Tree Frog collected in Aptos, California, in scientific collaboration with Stanley K. Sessions., PhD.

Temple of Akeso



“We stand guard over works of art, but species representing the work of aeons are stolen from under our noses.”
—Aldo Leopold

Asklēpiós was the ancient Greek god of medicine, while his daughter Akeso (or Ακεσο) was the goddess of the healing process. Depicted are birds that were brought to the rescue center that were not able to be healed from their illness and injury. These portraits were printed on thin easily damaged recycled paper. This paper is fragile and not normally used to print objects deemed to have significant value, such as art. Where do we place value, the life of nonhuman life-forms or cultural objects such as art?

The prints were placed in boxes, which were utilized to bring injured birds to VOC (Wildlife Rescue Center, Ostend, Belgium) inside an ochre colored room (a color allusion to temples during antiquity as symbolic of high status among Flemish master painters of the 16th and 17th centuries). The prints were a gift to visitors, in return they were asked to recall these lost individuals. Taxidermy specimens stood above: did their glances appear as thankfulness, judgment or merely the instinctive eyes of those that struggled to survive?

Each year, tens of millions of migratory and non-transitory birds perish in the greater North Atlantic and North Sea regions without most of us realizing they existed in the first place. The causes are sometimes natural from storms and illnesses, though these birds also face a milieu of human-induced (anthropogenic) challenges such as petrochemical spills, reduction of available food sources, poaching, motor vehicle and boating accidents and our increasing impact on climate. Our cities and homes (often based directly in migratory routes) may also hold treacheries to wild avifauna like seductive artificial light, deceptive mirrored glass, feral and pet cats, contaminated foods and on and on.

This project was created for us to recall these lost individuals (as each is as unique as each one of us) that attempted to exist in an environment made increasingly difficult by the actions (and non-actions) of our own species. VOC works to try to save as many of these birds as they can. For the injured coming into VOC may they be blessed by Akeso to live, for those less fortunate let us not forget.

▲ Brandon Ballengée, *Temple of Akeso*, 2015-16, dimensions variable. Offset prints on archival newsprint, specimen operating table, historic taxidermy specimens, boxes used to rescue injured birds, ochre paint.

► [facing page, top] *Temple of Akeso* installation at VOC (Ostend, Belgium), Spring 2016.

► [facing page, bottom] Detail photograph of VOC specimen freezer with birds that were not able to be saved during late Winter / early Spring 2016.



Eco-Displacements

Within a museum vitrine, originally made to protect precious art and other cultural objects, organisms (plants, animals, plankton) and found materials (detritus, water) form a displaced but functioning ecosystem. Once displaced within the vitrine, aquatic organisms acclimate to become characters in a displayed theatre of life: eating, breeding, living, struggling and dying as they would in the wild. *Eco-Displacements* are part performative works, where participants join in *Eco-Actions* to collect specimens, artifacts and polluted water, part sculptural installations, that show a living cross-section of a wetland and often the degradation found within. This creates a tangible way for people to physically engage and visually access the normally hidden inner life of wetlands.

My hope is for viewers to become inspired to learn more about the ecology of these complex and often fragile ecosystems and the animals living there. It is important we begin to recognize that these wetlands are not separate from their daily lives but are integral to our biological communities. From the phytoplankton that helps to create the air we breathe, to the fish and shellfish that we eat, we're connected to the water and its inhabitants.

Following the exhibitions of the *Eco-Displacements*, participants are invited to release the organisms to their wetland homes.

►[right and facing page, bottom] Brandon Ballengée, *Sittard's Industrial Canal Eco-Displacement*, 2014, aquatic organisms, detritus, 7 x 9 x 2 feet, installed in 2014 at Museum Het Domein, Sittard, Netherlands.

►[facing page, top] Brandon Ballengée, *Mississippi Delta Eco-Displacement*, 2014, aquatic organisms, detritus, 8 x 16 x 2 feet, installed in 2014 at Acadiana Center for the Arts, Lafayette, Louisiana.





Losing Ground: The Rapidly-Changing Ecology of Jamaica Bay, 2000-2004



The marsh islands of Jamaica Bay may disappear in less than 20 years. These islands filter water and create habitat for numerous species. Restoration efforts are under way, but the future ecology of New York City's Jamaica Bay is uncertain. In response to this important environmental issue, I collaborated with local New York participants to conduct artist-led public field trips and created ecological artworks about the Bay beginning in 2000. These activities culminated in a collection of installations exhibited at the Jamaica Center for Arts in Queens, New York, in 2004. Each sculptural component represented a different ecological aspect of the Bay. Throughout the exhibition, the metaphor of "shadows" symbolized species extinction as well as human degradation to the Bay. Installations included:

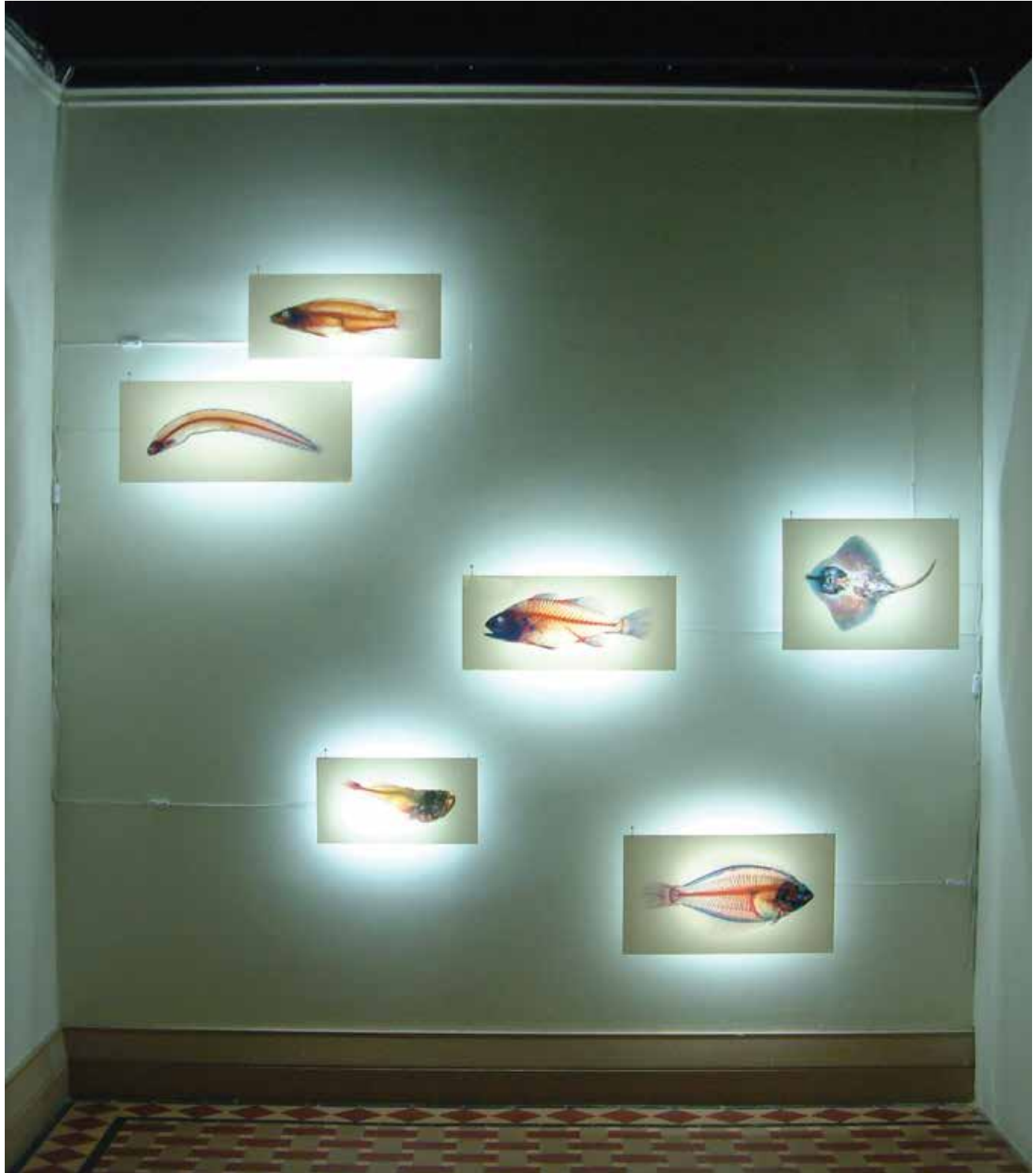
Water of Life / Water of Death a Map of the Present and The Uncertain Future of Jamaica Bay, 2004. This drawing was created by juxtaposing nautical shipping charts with topographical maps to examine the connection between human dredged channels and deteriorating natural formations in the Bay. Tidal mud flats and beaches (the dotted areas) and the surrounding marsh islands that are rapidly sinking into the Bay at a startling rate of 40-60 acres a year! At this rate most of the Bay's islands will be underwater in less than 20 years. Wetland habitats such as these are declining globally because of sea level rise

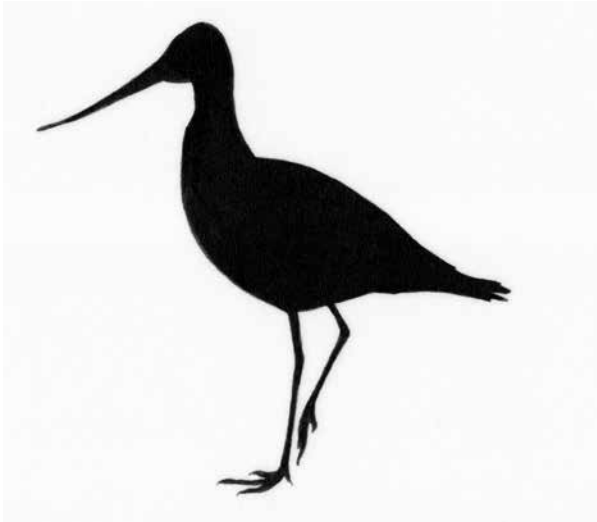
▲ Brandon Ballengée, *Plankton Diary*, 2002-2003. Projection, Artist's Proof from an edition of 100 DVDs.

► Brandon Ballengée, *Losing Ground*.

► [facing page] Brandon Ballengée, *School of Fish*, 2002-2004. Duratrans transparencies, plexiglas, lights and fixtures.







Brandon Ballengée, *A Field-Guide to the Birds of Jamaica Bay*, ca. 1952- 2024 AD, assembled 2002-2004: 326 ink drawings on recycled plastic, wood, recycled plastic trays.

from climate change, geologic movement, alteration and loss from industrial and residential development, as well as changes in water flow from activities such as dredging and high pressure output from sewage treatment plants.

Plankton Diary, 2002-2003. Over the course of a year, weekly samples of Bay water were surveyed for microscopic plants and animals. Samples were photographed and animated in chronological or seasonal order—creating a kind of plankton diary. The animation runs from spring to winter capturing the life-cycles of numerous micro-organisms. Follow the visual transition that occurs from spring with isolated shapes moving towards the highly saturated greens seen in chlorophyll-producing algae in the summer and transitioning towards a more red and earth tone palette in the fall and winter.

School of Fish, 2002-04. The creation of this piece involved the “clearing” and “staining” of several species of preserved fish through chemical alteration. The red areas are dyed calcified tissue such as bone, and the blue is cartilage. Just as every being is different, each individual fish and species has its own unique “biological architecture.” The fish float in space as though swimming in a loose school, yet they are placed tracing fish evolution.

An Illustrated Key to the Fishes of Jamaica Bay, ca. 1974-2024 AD, 2000-2004. In this piece, preserved fish are placed in Phylogenetic or Evolutionary order beginning on the right from the most ancient primitive species moving left with more recent adaptations. Specimens in natural history collections are preserved to last for decades perhaps even centuries. If species continue to go extinct at the current accelerated rate such specimens and DNA samples in scientific collections may be the only records of we take into the century.

Island of Life, 2004. Marsh islands like this filter water, produce oxygen, and are home to countless species of plants and animals. Environmental efforts to curb marsh island habit loss at Jamaica Bay is currently under way. With public support and future scientific solutions important marsh islands like this may still be protected for future generations to appreciate.

Phragmites Clone Experiment, 2003-2004. Many species of plants and even animals naturally clone themselves as a form of reproduction. Phragmites Reed is such a plant and appears to be out competing several species of native wetland plants. At Jamaica Bay an enormous Phragmites field may contain thousands of plants yet be genetically all one plant!

Field-Guide to the Birds of Jamaica Bay, ca. 1952-2024 AD, 2002-2004. In natural history collections dried bird specimens or “skins” are kept in trays and grouped according to evolutionary relationships. Related species are grouped into Genus and further grouped into larger Families. In this piece viewers are invited to examine drawings of Jamaica Bay birds as though they are actual specimens. Trays represent Families and are stacked in Phylogenetic or Evolutionary order from the most ancient species on the bottom moving up with more recent adaptations. Bird diversity at Jamaica Bay is impressively high with over 326 species reported so far. Yet global biodiversity (different types of plants and animals) appears to be rapidly declining. According to some statistics as many as 40% of all the world’s bird species may be in threat of decline. Unless we re-examine our approach towards other species sharing this planet many of the species we see today may only be shadows in the future.

Primary naturalist and scientific collaborators: Don Riepe, Jamaica Bay Wildlife Refuge; Hong Suk Michael Oh, LaGuardia College; David Rosane, Queens College; Michelle Osorio, Queens College; Peter R. Warny, New York State Museum; Chrissy Word, New York Botanical Garden.



Living Gems: The Evolution of Aesthetic Design and Genetic Engineering in Fish, 2002/2003



From decorative pets to a food staple, few types of organisms have been as manipulated as fish: they have been sculpted according to our every need, desire and fantasy for centuries. This project explores the origin, growth and contemporary practice of artificial selection/genetic engineering in fish through a series of field-trips and a resulting installation. The unconscious selection of our ancient ancestors shifted to selective breeding or artificial selection and has now evolved into the manipulation of individual genes to create entirely new species. By visiting archaeological sites, pet stores, urban parks, seafood markets and biotech laboratories, I attempted to trace the history of humankind's struggle for dominance over natural evolutionary forces. Using traditional 35mm photography and neo-digital techniques such as scanner photography, I generated numerous images of manipulated species/breeds.

As a beginning to the visual journey, photographs of neolithic fish containers made from stone, may demonstrate early attempts at aquaculture. Colorful gourami and carp represent early manipulated species from Asia. Images of Middle-Eastern, African and American species reflected the urge to keep exotic species in Europe during the Renaissance. By the Victorian Era, goldfish were commonly kept as pets throughout Europe and North America. By the twentieth century, hundreds of types of engineered fish existed in the pet and fish farming trade. Today the manipulation and harvesting of genes in fish, have created numerous transgenic species—types that have never existed in nature and may have unknown environmental consequences if released.

In collaboration with scientific advisors Hong Suk Michael Oh and Peter Warny.

Brandon Ballengée, *Living Gems*, and *Salmofan* exhibited at The International Center for Photography, New York, 2003. In scientific collaboration with Hong Suk, Michael Oh, and Peter Warny.





Brandon Ballengée, Double-Bubble Eyed Goldfish, 2002, Aquatech, Manchester, England, exhibited at The International Center for Photography, New York, 2003. In scientific collaboration with Hong Suk Michael Oh, and Peter Warny.



2003 Installation at the International Center for Photography, New York.

Breathing Space for the Hudson: Charting the Biodiversity and Pollutants of the Hudson River



Breathing Space involved aquatic biodiversity public surveys of the Hudson River in proximity to pollution sources. This work culminated with an installation that attempted to portray Hudson River biological diversity and the effects of pollution. Installed in 2003 at WaveHill's Glyndor Gallery (Bronx, New York), the exhibition contained three interrelated components:

Eco-Displacements, 2003, in which each sculpture represented a different salinity gradient point of the river (fresh, estuary and marine) and contained numerous species collected at those locations.

Imaging Biodiversity, 2001/03, comprised five large-scale high-resolution scanner photographs portrayed uncommon underwater creatures native to the river. Two of the specimens had been "cleared and stained" prior to imaging. This biological procedure enabled viewers to see the abstract and intricate skeletal structure of the specimens.





Hudson River Pollution Maps, 2002/03, an interactive component allowed viewers to research their local polluters via a searchable Environmental Protection Agency database. Four suspended maps identified varied sources of pollution from the New York Harbor to Troy. To create the maps, information was compiled from the federal EPA's Enviromapper database and afterwards combined with topographical data from the United States Geological Survey. The title for this work was in homage to *Breathing Space for the Sava River* (1989/90) by Helen Mayer and Newton Harrison.

Primary scientific collaborators: Hong Suk Michael Oh, LaGuardia College; Stanley K. Sessions, PhD, Hartwick College; Peter R. Warny, New York State Museum.

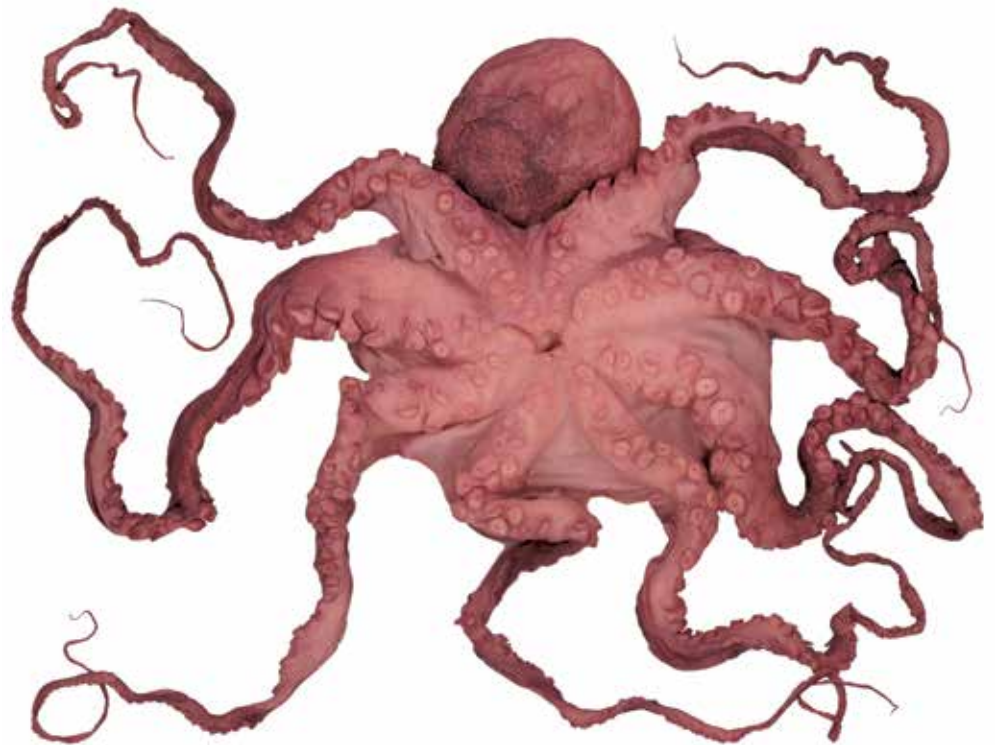
▲ Brandon Ballengée, Room # 1 with Freshwater and Brackish Water Aquariums, Hudson River pollution maps and digital C-prints mounted on plexiglas, room dimensions ca. 27 x 17 x 10 feet.

◀ [facing page, top left] Brandon Ballengée, *Cleared and Stained Clearnose Skate, *Raja eglanteria**, 2002-2003, unique digital C-print mounted on plexiglas, 60 x 48 inches. In scientific collaboration with Stanley K. Sessions, PhD.

◀ [facing page, bottom left] Brandon Ballengée, *Horsehair Worm, *Gordius species**. 2003, unique digital C-print mounted on plexiglas, 35 x 31 inches.

◀ [facing page, bottom right] Brandon Ballengée, Detail of "Water Discharge" site from Hudson River Pollution Map: Croton-on-Hudson to New York City, 2001-2003, unique off-set print on velum.

The Ever Changing Tide: The Ecological Dynamics of the Earth's Oceans as Exemplified through the Biodiversity of the Flushing New York Seafood Markets



▲ Brandon Ballengée, installation at the Queens Museum of Art, Queens, New York, 2001.

▶ Brandon Ballengée, Atlantic Shore Octopus, Queens Museum of Art, Queens, New York, 2001.

▶ [facing page] Brandon Ballengée, Hong Kong Supermarket, Queens, New York, 2001.



The project involved the collection, identification and imaging of over 400 aquatic species found between 2000 and 2001 at several Queens, New York, seafood markets and focused on recent population declines and commercial extinctions. For one year, I led public surveys with collaborating biologists to search markets for new species.

Through public participation and installations at host seafood markets, the work attempted to inform viewers (shoppers) on ecological sustainable seafood choices. The work culminated in a large installation at the Queens Museum of Art consisting of multi-lingual texts, photographic prints of selected species, preserved specimens as well as installations in several participating markets.

Primary scientific and research collaborators: Carl Safina, PhD, National Audubon Society, Living Ocean Program (USA); Todd Gardiner, PhD, Hofstra University (USA); Mercedes Lee, National Audubon Society, Living Ocean Program (USA); Peter Warny, New York State Museum (USA).



Photo credit: Erika Blumenfeld. A fleet of ships and rigs at the source of the leaking Macondo well 93 days after the explosion of the BP *Deepwater Horizon* drilling rig.

Transdisciplinary artist Erika Blumenfeld, who participated in the *Dedicated* project, documented the oil disaster's impacts on the environment, wildlife, human health and people's way of life along the Gulf from July 2010 through March 2012. More of her work appears at www.erikablumenfeld.com.



Aftermath of the Disaster

Toxic Brew

Carl Safina, PhD, Stony Brook University

Compared with a similar stretch of American coast or area of open ocean, the Gulf of Mexico has an unusually rich concentration of wildlife. Certain species that roam the open Atlantic stream into the Gulf to breed; some breed there exclusively. Many others winter on the Gulf's shores or in its warm waters. Year-round residents, such as shrimp and oysters, support wildlife up the food chain, forming the base of the region's vibrant seafood industry. The Gulf is of hemispheric importance to fisheries—its bounty has made the United States the world's third-largest seafood producer, and it generates about 20 percent of our commercial seafood. I've visited the region several times since the oil eruption began, seeing the effects firsthand, speaking to fishermen and others affected by the disaster.

At present, the most accurate assessment of marine wildlife is: No one really knows anything. At this writing, we don't even know the problem's dimensions. Millions and millions of gallons of crude remain in the waters, and dispersants have irretrievably dissolved oil into the sea, where it can't evaporate or weather as it would in the heat and sunlight of the surface. Nor can it be seen or quantified. Furthermore, the main deployed defenses, booms and dispersants, work at cross-purposes. Booms along the coast have many gaps, and they are not designed to work in open water. As bird protection they're pointless, because birds fly, and the whole idea behind booms—that oil floats—is defeated by dissolving the oil into the water with dispersants, creating a toxic brew.

In that water, of course, lives an extraordinary range of wildlife. While laboratory tests show dispersants, oil, and a mixture of the two kill fish, fish larvae, and shrimp, sedentary creatures are perhaps most at risk from these substances. Oysters and coral reefs—and the people and other wildlife that depend on them—are essentially defenseless. Crude has reportedly come up on fishing nets and crab traps in places where little or none has been visible on the surface. Everyone understands that the troubled wildlife we observe is a small fraction of what is being affected. How big is the problem? How long till recovery? The dose makes the poison. The entire system and its wildlife can—and do—withstand natural oil seeps and chronic oil spills from boat engine exhaust, fuel leaks, bilge pumping, and road runoff. It's a matter of how much oil will enter the Gulf (unknown), where it will go and in what concentrations (unknown), and for how long (unknown).

The Gulf's species, of course, recover at greatly varying rates. Shrimp, fishes, corals, crabs, molluscs, cetaceans, and turtles have quite different rates of maturation, reproduction, and potential population growth. Some can withstand more stress and some bounce back better. Others may feel the consequences

Toxic Brew appeared in *Audubon Magazine's Special Report: The BP Gulf Oil Spill (2010)* and is reproduced with permission. Dr. Carl Safina is president and co-founder of the nonprofit Blue Ocean Institute and the author of seven books, including *Song for the Blue Ocean*, a *New York Times* Notable Book of the Year, and *A Sea in Flames* about the 2010 *Deepwater Horizon* oil spill. Dr. Safina holds the endowed chair for nature and humanity at Stony Brook University in New York.



for decades. Oil from the *Exxon Valdez* killed more than a third of the killer whales in Alaska's Prince William Sound. Their numbers have never recovered. The effects of temperate and sub-Arctic spills have lasted decades. In the Gulf the heat will likely speed weathering and evaporation of surface oil, raising the possibility that recovery will occur sooner than it has in some other oil incidents. It all remains to be seen.

Animals that breathe at the surface, like dolphins, whales, and sea turtles, are especially vulnerable to oil in the water. Whale sharks, the world's largest fish, often use a mode of feeding that almost seems designed to skim floating oil from the surface. Many of these fish have been concentrated not far from the blowout and the main surface slick, and if they get into the gummy, sticky crude, it's likely to clog their gills. During an aerial survey in June, Hurricane Creek Keeper John Wathen and author David Helvarg photographed a sperm whale and dolphins swimming through long floating streaks and dark, discolored slicks of oil, and another pod of dolphins in distress, with several dead and dying members.

▲Artist Erika Blumenfeld: "White foam continued to appear in the waters along the Gulf Coast for months after the Macondo well was capped. Samples, like the one being taken here, were found to contain chemicals from both the oil and dispersants." Photo credit: Erika Blumenfeld.

Leatherback, green, loggerhead, hawksbill, and Kemp's ridley turtles—five of the world's seven sea turtles—range into the Gulf of Mexico. The Kemp's ridley is the world's most endangered sea turtle. In the 1980s its numbers were so low that several experts feared it was doomed to extinction. Exhaustive conservation efforts brought it back from the brink and put the species on firmer footing. The number of nesting females, which lay eggs on only a few Gulf of Mexico beaches, rose from fewer than 300 in 1985 to approximately 5,500 in 2009. Breeding adults, juveniles, and hatchlings are highly vulnerable to oil slicks. In July turtle conservationists exhumed eggs from hundreds of nests around the Gulf and incubated them. They then released the hatchlings on Florida's east coast (which, at this writing, remains free of oil). I'm sure similar relocation plans for oyster reefs, coral reefs, seabirds, and cetaceans would be under discussion, too, were that possible. But sea turtles, because they come ashore to nest and require no parental care, are perhaps the only wildlife that lend themselves to mass evacuation. Yet such a plan would not save existing turtles transiting the Gulf. Nor—because they are thought to home to the beaches from which they first enter the sea—would such displaced hatchlings return as adults to breed on their native Gulf shores.

The Atlantic bluefin tuna, already beleaguered from decades of overfishing, spawns only in the Mediterranean and in and near the Gulf of Mexico. Although individuals from the two populations mix throughout the North Atlantic, they never interbreed. The spawning area for the western Atlantic bluefin tuna significantly overlaps the spreading oil, which makes the entire western breeding population quite vulnerable during the egg, larval, and breeding stages of their long lives (they can survive 30 years and exceed half a ton). Adults are high-performance athletes, and any oil fouling their gills would likely put them in jeopardy. As yet the extent of oil-related adult mortality is not known, nor is mortality to eggs and larvae. Adults might have been repelled by the oil and remained in safer waters, but the spill began at the peak of spawning in April, thus devastating already-laid eggs and larvae. I spoke to several sportfishermen who had gone offshore for yellowfin tuna, wahoo, and mahi-mahi in areas that were still open. They reported dismal fishing when it should have been excellent, as if the fish had moved away. What's more, they saw unusual concentrations of sharks, dolphins, and other animals near shore, as if they, too, were avoiding plumes of oil.

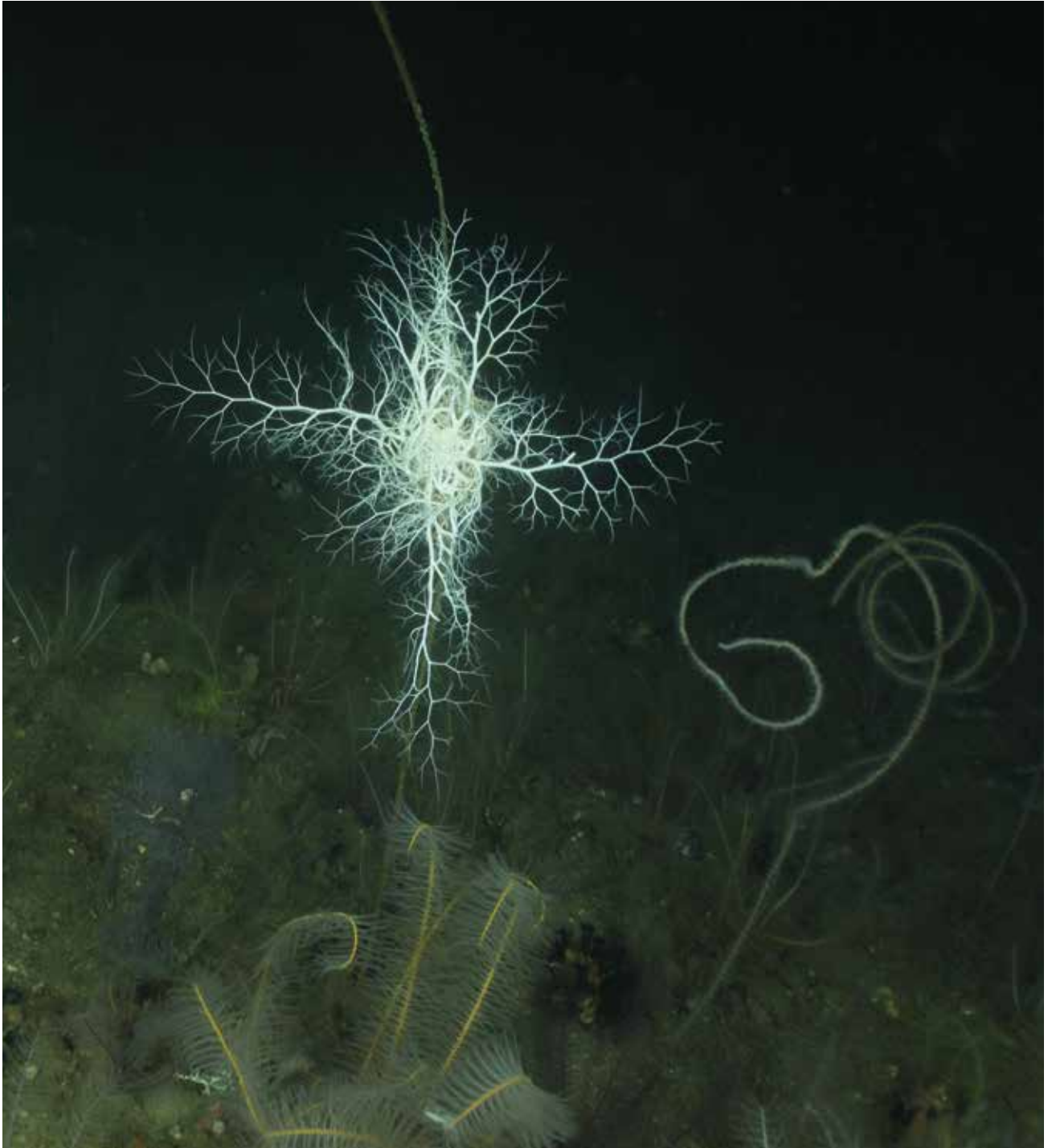
The deep sea contains a galaxy of planktonic animals—everything from jellies to billions of small fishes called lanternfishes (myctophids)—that live in a layer of life. Twice a day this is the scene of the greatest animal migration on earth, when life moves from the darkness of deep daytime waters to the darkness of shallow nighttime waters, and back again. This zone is like a flying carpet that extends throughout an astonishingly large portion of the world's oceans. On a moving ship, it is extraordinary to watch it slowly rise and dive over the course of the day, even while covering hundreds of miles. Those who defend the use of dispersants contend that by dissolving the oil, microbes can more easily feed on it. But before that happens, these billowing toxic clouds will roll through this zone of life in the Gulf, and it's unlikely the damage they cause will ever be adequately assessed.



The bottom line is that this oil spill is a very bad thing that cannot be reversed. How it will play out remains a great unknown. It was caused by reckless operators and scandalously lax government oversight. A federal appeals court determined that the US government was unprepared for a major marine oil spill, calling the environmental analysis of the risks “irrational” months before the blowout. In the ensuing months we’ve learned about a stunning lack of preparedness and an inability to respond effectively. But the blowout is only the most acute threat to the people and wildlife who rely on the Gulf’s seashore and seafood. The same fossil fuels are causing temperatures to rise, melting Arctic ecosystems, and killing coral reefs. On top of that, they’re acidifying the world ocean so rapidly that it is already affecting the growth of shellfish and corals.

The good news? A great many birds with no trace of oil can still be seen, especially away from the Louisiana coastline, but on the shore as well. There are plenty of adult brown pelicans in Alabama that retain their white heads, and many unstained egrets are visible in bays and marshes that remain free of heavy oiling. At Pensacola Beach, where oil has arrived ashore mostly in the form of weathered tar-balls, most birds looked clean to me on the early July day I wrote this. One can only hope that out in open water some semblance of refuge remains, and that many fish and marine mammals are avoiding rather than succumbing to the copious amounts of oil leaked into the Gulf.

▲ Benjamin Dubansky, PhD, photograph taken on Grande Terre Island, Louisiana, from the *Dedicated* project.



Basket stars curl up during the daylight hours and look like fibrous balls. (See pictures on following pages.) When darkness comes, they unfurl their arms and feed on suspended particles in the water.



Corals in Twilight: The Gulf's Deep Treasure

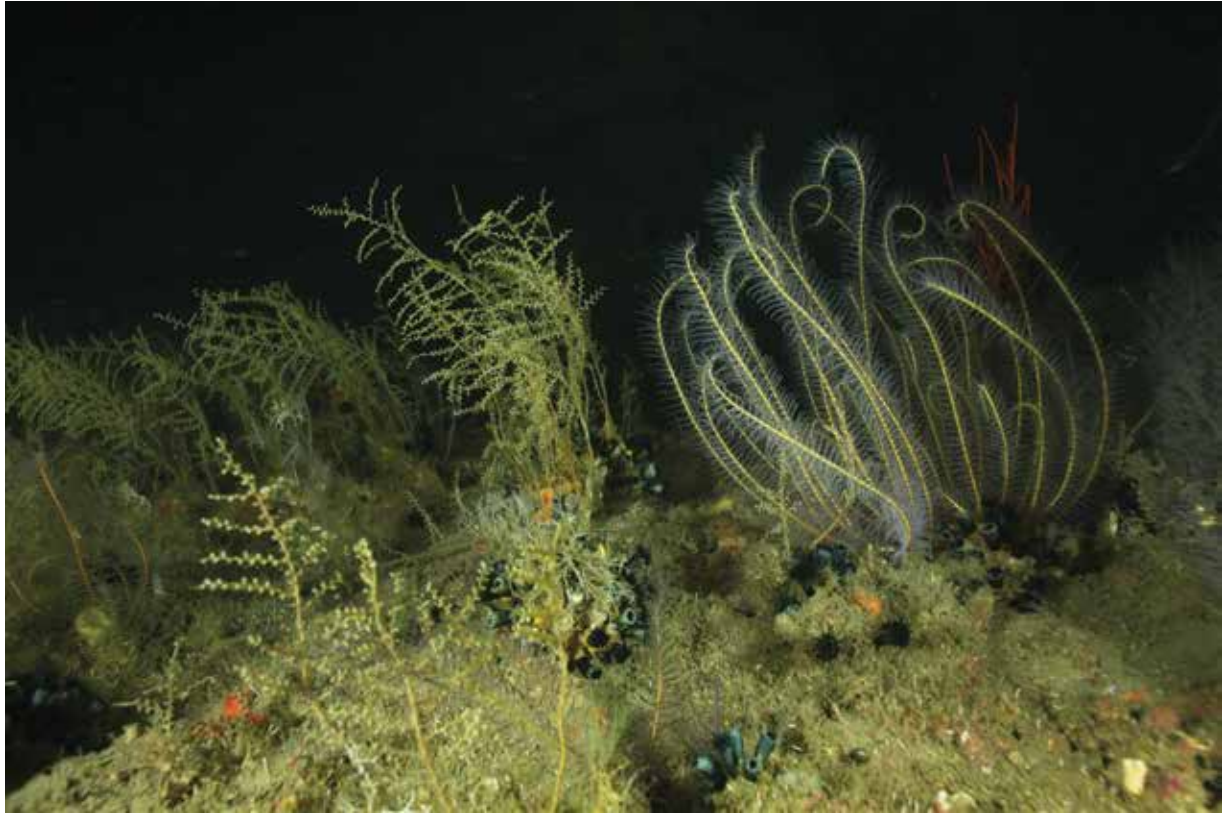
*Ian R. MacDonald, PhD, Florida State University
Department of Earth, Ocean & Atmospheric Science*

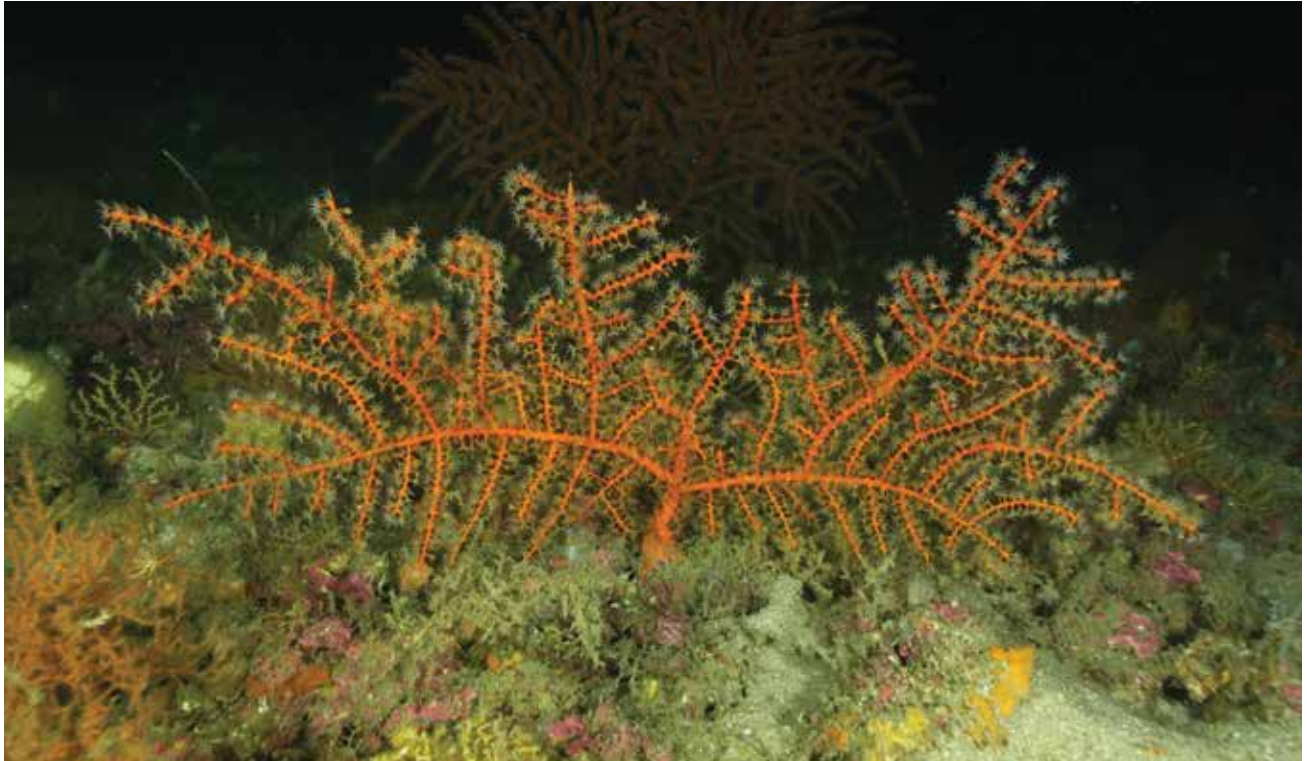
In Florida, when we think of corals, the gin-clear waters of the Keys probably come first to mind. These days, the reefs of south Florida are under stress from global warming, water quality, and a host of other factors, which raise real concerns about the future of coral reefs in Florida. However, there are other coral ecosystems off our coast, less well-known, but more widespread. They face their own special challenges, but they could be a refuge for marine organisms that are in jeopardy elsewhere.

They are the ecosystems formed by corals that live at depths where sunlight dims—the *mesophotic* zone—or darkens totally in the deep sea. Twilight corals live at depths from about 150 to 300 ft. Along Florida's Gulf and Atlantic coasts, they colonize rocky bottoms that formed during the last glacial age, when sea-level was 50 to 100 ft lower than it is today. They are prime destinations for fishing, but their diversity and beauty are valuable just by continuing to exist.

Marine protected areas, like Madison Swanson reefs off Destin Beach, limit fishing activities in areas of high productivity. Fishing advocates have come to recognize the value of restrictions, however, because spawning populations that enjoy this protection can boost catches in neighboring areas. Potentially, the fish and crustaceans displaced when shallow reefs are degraded, could replenish from populations living at greater depths.

No artificial boundaries can keep out oil pollution that arrives from tanker accidents or well blow-outs that happen far away. My colleagues and I at FSU and other institutions have been investigating the impacts of the BP oil spill on the twilight corals of the Florida Panhandle, Alabama, and Mississippi.





As scientists scrambled to assess damage to offshore ecosystems, an early discovery was the devastation wrought among deep-sea corals—those living 4000-plus ft. down in the vicinity of the Macondo blow-out. Forewarned by this, MacDonald began noticing injured corals during a 2011 cruise that assessed impacts in the NE Gulf coral ecosystem known as the Pinnacle Trend.

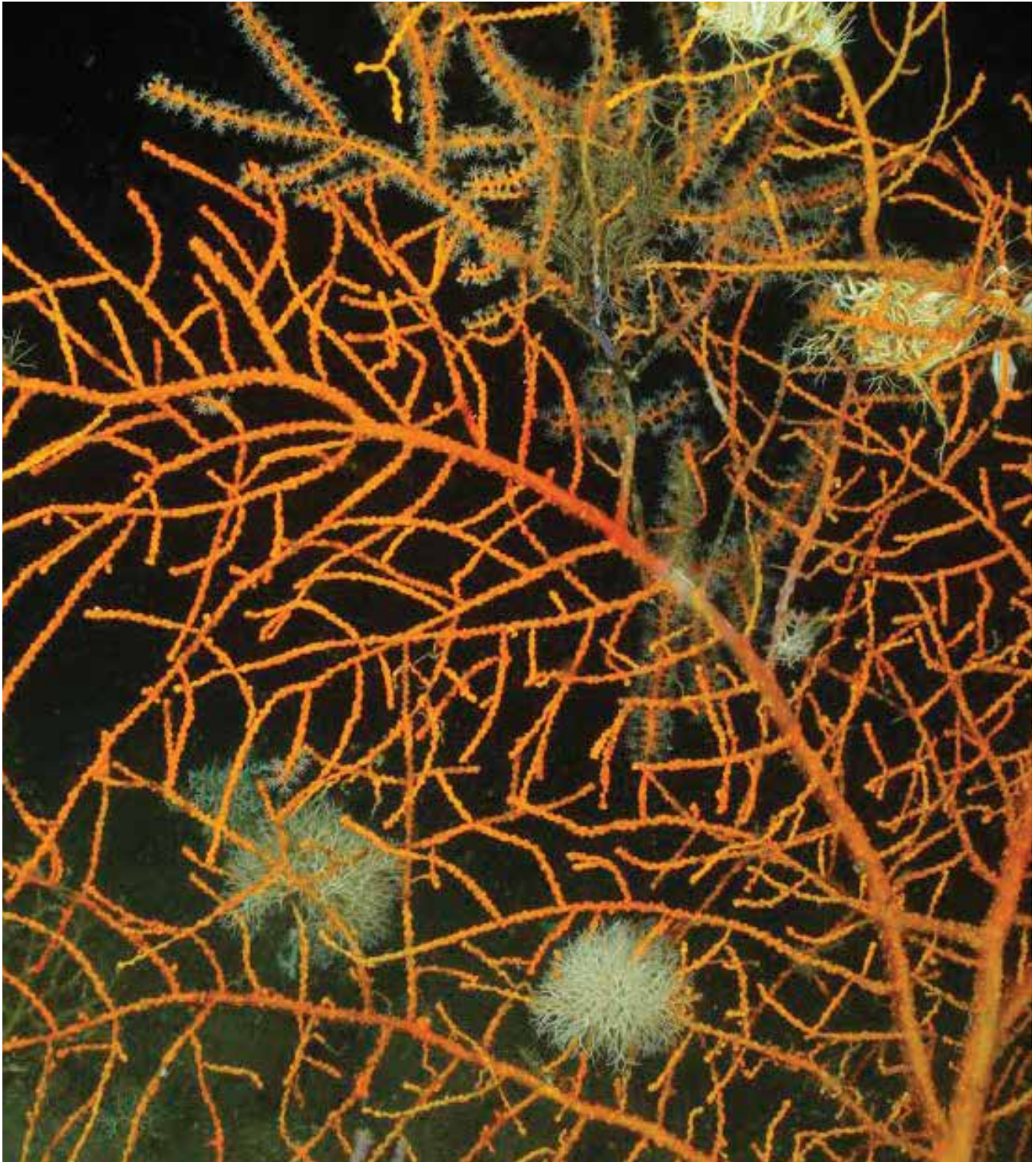
The Pinnacle Reefs are a vital ecosystem in the Gulf; they stretch from Mississippi to the Florida Panhandle. Oil that reached these coasts during the spill passed right over these reefs. Some of it sank to the bottom more than 200 ft. below. Using rigorous underwater survey methods, my then PhD student Mauricio Silva would quantify hundreds of injured coral colonies, some damaged very severely. These findings showed that oil floating on the surface could impact corals hundreds of feet below. Sadly, there have been few signs of recovery among injured corals that they were able to mark and monitor.

In other work, the FSU scientists used survey results to estimate the extent of the twilight corals in the Pinnacles area. They documented over 150 sq. miles of likely reef habitat. Only a fraction of this resource has been surveyed or monitored for ecosystem health. Hopefully, increased public awareness could improve this situation. The twilight corals are a vital part the Florida's marine heritage. Understanding and protecting this ecosystem is an important task for FSU's marine scientists.

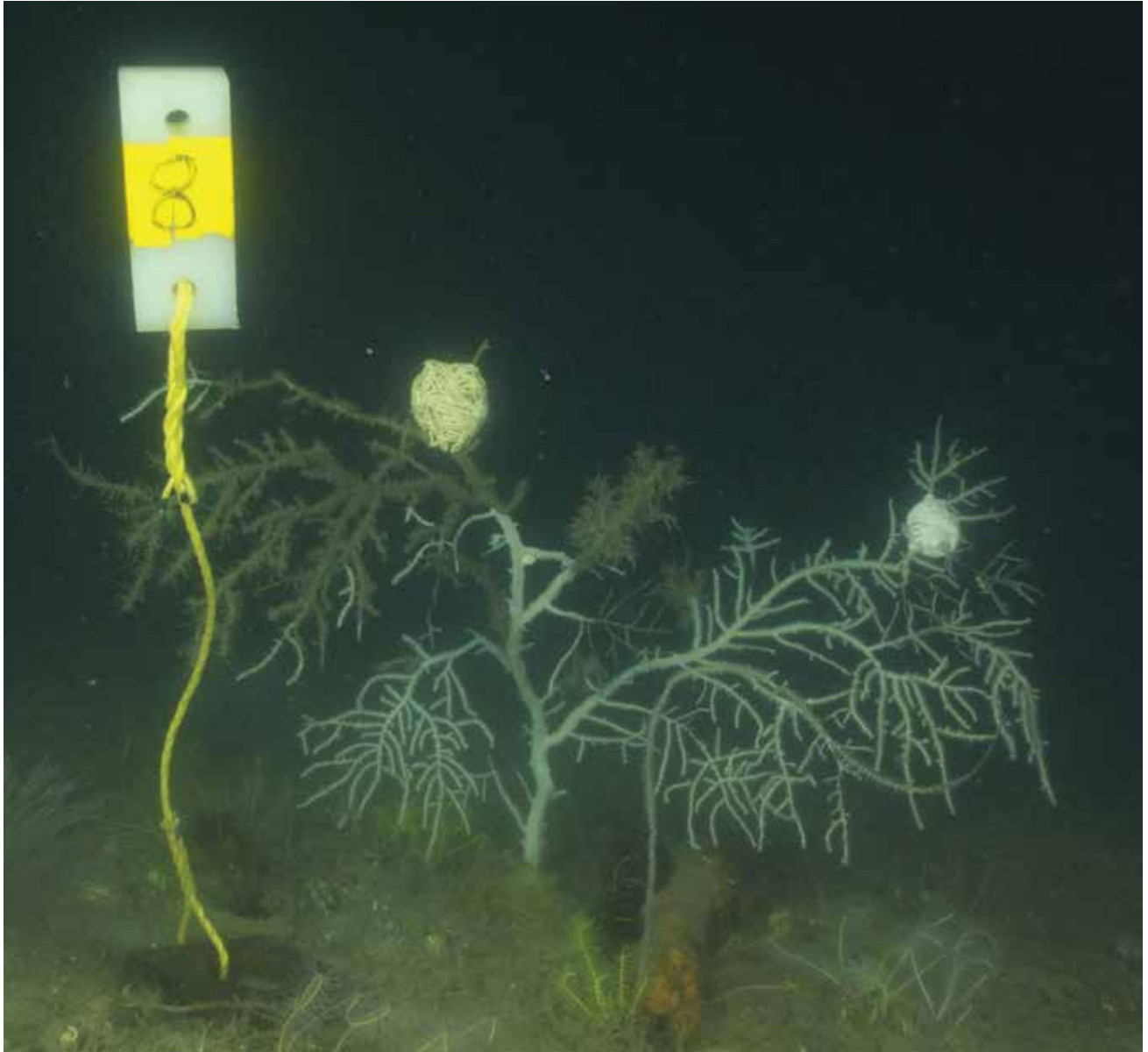
▲ Seafans like this *Swiftia* sp. are called octocorals because each polyp has eight tentacles used to capture floating food particles. This colony appears healthy with all its polyps extended.

◀ [facing page, top] Mixed assemblage of small soft coral and brisingid sea stars on a rocky substratum.

◀ [facing page, bottom] Reef scorpionfish camouflaging itself needs the base of a coral colony.



Mucus, retracted polyps, and dead tissue in this *Swifitia* sp. colony indicate stress.



Severe injury to this *Hypnogorgia* sp. colony, photographed in 2011, is attributed to impact from the *Deepwater Horizon* oil spill. The marker was revisited in 2014 to check on recovery, but the colony had disappeared.

Dr. Ian R. MacDonald is an expert on the natural sources of oil and gas in the ocean, the vulnerability of the deep-sea ecosystem of the Gulf of Mexico and was the first to successfully challenge federal estimates of the initial rates of discharge from the well of the Deepwater Horizon. "In the aftermath of this catastrophic blowout, we have the strongest impetus to enforce the highest standards of safety for offshore drilling and energy production. And we clearly see the imperative to raise our capacity for safeguarding the health of the Gulf of Mexico ecosystem. The rhetoric may be in place, but the present funding and enforcement are not adequate to get the job done. Failure to follow through on these requirements creates a moral hazard that will make another offshore disaster inevitable."



National Aeronautics and Space Administration (NASA) image of the plume of smoke from the burning Deepwater Horizon on April 21, 2010, the day after the explosion.

The *Deepwater Horizon* oil spill is an industrial disaster that began on 20 April 2010, in the Gulf of Mexico at the site of the British Petroleum oil-well drilling platform. It is considered the largest marine oil spill in the history of the petroleum industry. The US government estimated the total discharge at 4.9 million barrels (210 million US gal.; 780,000 m.). After several failed efforts to contain the flow, the well was declared sealed on 19 September 2010. Reports in early 2012 indicated that the well site was still leaking. The main federal statute governing liability for oil spills in water is the Oil Pollution Act of 1990 (OPA), enacted shortly after and in response to the *Exxon Valdez* oil spill in Alaska in 1989; this statute largely replaces the oil spill provisions in the federal Clean Water Act.

Research at Florida State University and the Oil Spill Academic Task Force (OSATF)

Institutions coordinating with the Florida Department of Environmental Protection (DEP) and other state and federal agencies during the BP oil disaster

Within a few days after the blow-out and ongoing oil spill was announced, FSU scientists convened to consider the potential threats to Florida and the other Gulf Coast states. They had reason to believe that the magnitude and impact of the spill were being understated by authorities still grappling with the emergency. And they were concerned that state authorities and other entities should have access to the best scientific knowledge. Communication with other institutions garnered an immediate response: everyone was concerned and wanted to help. The Oil Spill Academic Task Force was formed literally overnight (<http://oilspill.fsu.edu>) with the following mission statement:

“The Oil Spill Academic Task Force (OSATF) is a consortium of scientists and scholars from institutions in the State University System as well as from five of Florida’s private universities and two marine laboratories working in collaboration with the Florida Department of Environmental Protection (DEP). The OSATF brings together expertise and resources to assist the state of Florida and the Gulf region in responding to and studying the *Deepwater Horizon* oil spill.”

The number of participating scientists and other experts grew quickly. Over the course of the spill, concerned parties were able to use the links provided to get up-to-date information on vulnerable resources, basic ocean science, and research techniques. In the years that followed, the core group of experts who responded to the initial call would form research consortia that conducted ground-breaking research on the fate and effects of the largest oil spill in US history. They would go on to publish hundreds of scientific papers, reports and presentations, while dozens of students would earn graduate degrees for their original research. One such consortium was the four-year Deep-C Consortium, an interdisciplinary study of deep sea to coast connectivity in the northeastern Gulf of Mexico. The study, which began in 2011, investigated the environmental consequences of petroleum hydrocarbon release in the deep Gulf on living marine resources and ecosystem health. Deep-C examined the geomorphologic, hydrologic, and biogeochemical settings that influence the distribution and fate of the oil and dispersants released during the *Deepwater Horizon* accident and used the resulting data for model studies that support improved responses to possible future incidents.

Florida State University
Eckerd College
Florida Agricultural and Mechanical University
Florida Atlantic University
Florida Gulf Coast University
Florida Institute of Technology
Florida International University
Jacksonville University
Mote Marine Laboratory
New College of Florida
Nova Southeastern University
Smithsonian Marine Station
University of Central Florida
University of Florida
University of Miami
University of North Florida
University of South Florida
University of West Florida



On April 29, 2010, the MODIS image on the Terra satellite captured a wide-view natural color image of the oil slick just off the Louisiana coast. The oil slick appears as dull gray interlocking comma shapes, one opaque and the other nearly transparent. Sunlight enhances the oil slick's visibility. The northwestern tip of the oil slick almost touches the Mississippi Delta. Photo credit: NASA / Earth Observatory / Jesse Allan, using data provided courtesy of the University of Wisconsin's Space Science and Engineering Center MODIS Direct Broadcast System.



May 24, 2010, image from NASA's Terra satellite shows the lingering oil slick off the Mississippi Delta.

As Dr. Ian MacDonald has stated, “the reefs are important destinations for commercial and recreational fishing with diverse invertebrate and fish fauna. Oil slicks can be traced to natural seeps that do occur beneath the ocean, but with the *Deepwater Horizon* disaster, both the amount of surface oil and the amount of oil following abatement procedures had to be carefully examined in order to reach accurate evaluations of what had happened. He and his colleagues at Florida State University are engaged in multiple research initiatives focused on the aftermath *Deepwater Horizon* disaster as they evaluate the abatement methods that were used: skimming surface oil; burning floating oil; and using chemical dispersants.¹

¹ Dr. MacDonald and co-authors published a report in 2015 in the *Journal of Geophysical Research* and an article in 2016 in *Deep-Sea Research II*. In the first report oil slicks were examined to determine and separate the natural leakage from the unnatural. In the second, the damage to corals was examined in the Pinnacles Reef region of the Gulf of Mexico that extends from offshore Mississippi east toward the Florida Panhandle. I. R. MacDonald, O. Garcia-Pineda, A. Beet, S. Daneshgar Asl, L. Feng, G. Graettinger, D. French-McCay, J. Holmes, C. Hu, F. Huffer, I. Leifer, F. Muller-Karger, A. Solow, M. Silva, and G. Swayze, “Natural and unnatural oil slicks in the Gulf of Mexico,” *Journal of Geophysical Research: Oceans*, 120, doi:10.1002/2015JC011062 (1 December 2015). Mauricio Silva, Peter J. Etnoyer, Ian R. MacDonald, “Coral injuries observed at Mesophotic Reefs after the *Deepwater Horizon* oil discharge,” *Deep-Sea Research II* (2016) 129:96–107.



Professor MacDonald addresses deep sea life forms in his essay “Corals in Twilight,” also noting that “The best geophysical researchers from the Gulf Coast region needed to tackle this unprecedented impact that the spill produced on our wildlife, our food resources, our coral reefs. After the initial devastation and methods of treatment applied to that active event, we had to pursue the oil—find out where it had gone once it left the surface of the ocean and record the damage in its wake. In May 2016 we had to contend with

Tropical Storm Bonnie adding another element to the tracking and results of the model for analyzing the data.” Since 2010, MacDonald and associates have published the findings from a number of studies funded by awards secured to carry out important research.²

- 2 Oil Spill Research Contracts & Grants Awarded to Ian R. MacDonald and Colleagues: • MacDonald, Ian R (PI), Bourassa, M. A., Morey, S. L., Dukhovskoy, D. S., & Garcia-Pineda, O. G. (Aug 2012–Aug 2016). Remote Sensing Assessment of Surface Oil Transport and r. Funded by Bureau of Ocean Energy Management. (M12PC00003). Total award \$800,000. • MacDonald, Ian R (PI), & Garcia-Pineda, O. G. (Jan 2012–Dec 2012). Bahamas SAR Oil Slick Study. Funded by Statoil. (4502391521). Total award \$30,000. • Chanton, Jeffrey P (PI), & MacDonald, I. R. (Sep 2011–Dec 2013). Scope of Work for University of Mississippi GRI. Ecosys. Funded by University of Mississippi. (SA 12-04/GoMRI-001). Total award \$608,642. • MacDonald, Ian R (PI), & Garcia-Pineda, O. G. (Sep 2011–Aug 2012). Implementation and Enhancement of Neural-Net Based Oil S. Funded by National Oceanic and Atmospher. (DG133E11SE2357). Total award \$44,556. • MacDonald, Ian R (PI). (Jun 2011–May 2014). Characterization of CH₄ Emissions from High Latitude. Funded by University of Alaska Fairbanks. (UAF 12-0034). Total award \$60,000. • MacDonald, Ian R (PI). (May 2011–Dec 2012). Seeps Database Access and Support. Funded by SkyTruth Inc. (NONE). Total award \$19,999. • MacDonald, Ian R (PI). (Dec 2010–Nov 2011). Support For NRDA Photo Survey of BP Well Area. Funded by Statoil. (NONE). Total award \$40,000. • MacDonald, Ian R (PI). (Oct 2010–Dec 2010). Support for NRDA Photo Survey of BP Well Area. Funded by TDI-Brooks International Inc. Total award \$19,000. MacDonald, Ian R (PI). (Aug 2010–Aug 2012). Coast Watch: Remote Sensing and Verification Sampling. Funded by University of South Florida. (4710-1101-00-L). Total award \$258,157.

▲ 28 April 2010, 19:25 US (Aqua Modis). Albers conic equal area projection centered at 30° North by 90° West. Standard parallels: 32° North and 28° North.

In the Fall of 2017, the University announced that a team of research institutions led by Florida State University has been awarded a \$2.8 million grant to expand our understanding of how the 2010 *Deepwater Horizon* oil spill affected the ecology of the Gulf of Mexico. Eric Chassignet, director of Florida State University's Center for Ocean / Atmospheric Studies (COAPS), will lead the team of scientists who will use the grant from the Gulf of Mexico Research Initiative to study the role that microbes play in determining the fate of oil and its impact on marine ecosystems. In September 2017, Chassignet said, "The Consortium for Simulation of Oil-Microbial Interactions in the Ocean is an interdisciplinary group consisting of experts in physical oceanography, ecology, biology, chemistry and marine sediments. Our work will investigate how microbes influence the biodegradation and accumulation of petroleum in the water column and marine sediments of the deep ocean and shelf."



Photograph by artist Erika Blumenfeld: "Decades of the Oil and Gas Industry's exploitation of the Gulf Coast has contributed to ongoing environmental degradation. The Brown Pelican, Louisiana's state bird, suffered heavy losses because of the *Deepwater Horizon* oil disaster."

Florida State University

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