RPI

Adriana C. Bejarano **Research Planning, Inc.**
Senior Aquatic Eco-Toxicologist

Dr. Bejarano is an environmental scientist with broad experience in applied ecology and aquatic eco-toxicology. She has studied the ecological and toxicological effects of organic pollutants on marine and estuarine invertebrates, and has developed skills in applied ecology, modeling, and ecological risk assessments of contaminated sediments and complex contaminant mixtures, and statistical data analysis.

Since joining RPI, Dr. Bejarano has been heavily involved with the oil spill community providing technical and scientific support to various inland and marine oil spills. Her work at RPI includes performing toxicological analyses of contaminated water and sediments; characterizing biological responses to contaminant body burdens in benthic estuarine and marine invertebrates; and responding to chemical and oil spills in aquatic habitats by assessing ecological risks to biological resources based on available toxicity data. Dr. Bejarano is an Adjunct Professor at the Department of Environmental Health Sciences at the University of South Carolina, an active member of the Society of Environmental Toxicology and Chemistry, and a reviewer of numerous scientific journals. She has written several articles in peer-review journals, as well as book chapters and technical documents.

EDUCATION

PhD., Aquatic Toxicology, Department of Environmental Health Sciences, Arnold School of Public health, University of South Carolina (2004)
Dissertation Title: Toxicological evaluation of urban-related contaminants in estuarine ecosystems : 1. Effects of contaminants on the development and reproduction of the estuarine copepod *Amphiascus tenuiremis*; and 2. the role of sediment constituents on pesticide bioavailability to the estuarine bivalve *Mercenaria mercenaria*.

M.Sc., Marine Science Program, College of Arts and Sciences, University of South Carolina (2000)
Thesis Title: Uptake and fate of Trichloroethylene (TCE) in *Spartina alterniflora* Loisel.

B.Sc., Marine Biology, Department of Biology, Universidad del Valle, Colombia (1997)

PROFESSIONAL EXPERIENCE

2008 to Present: Environmental Toxicologist and Marine Ecologist, Research Planning, Inc., Columbia, SC

2005 to 2007: Ecological Risk Analyst- Postdoctoral Researcher, NOAA/NOS, Charleston, SC, USA

2005: Visiting Scientist, Department of Applied Environmental Science (ITM), Stockholm University, Stockholm, Sweden

2004 to 2005: Research Associate, University of South Carolina, Columbia, SC

1998 to 2004: Graduate Research Assistant, University of South Carolina, Columbia, SC

Dr. Bejarano's experience is outlined separately on the following pages in four main areas:

1) Oil and Hazardous Material Spill Response/Assessment
2) Environmental Damage Assessment
3) Ecological Risk Assessment
4) Literature Synthesis and Environmental Assessments

OIL AND HAZARDOUS MATERIALS SPILL RESPONSE/ASSESSMENT

Emergency Response: Dr. Bejarano has been part of the Scientific Support Team to the U.S. Coast Guard provided by the National Oceanic and Atmospheric Administration's Emergency Response Division (NOAA-ERD) for oil and chemical spills since 2008. She has provided on-site and off-site emergency consultation and scientific support related to the potential environmental consequences associated with oil and hazardous chemical incidents, including risk characterization and potential toxicological effects to aquatic receptors, and quantitative reports and analyses of potential levels of concern. As part of this work, Dr. Bejarano actively participates in routine oil and hazardous chemical spills drills and related exercises, and has contributed to the strengthening of NOAA-ERD's risk assessment tools. In 2010, she provided on-scene support for NOAA-ERD during the *Deepwater Horizon* (DWH), Louisiana as a team member of Shoreline Cleanup Assessment Technique (SCAT) assessments.

Technical and Scientific Support Consultations: Dr. Bejarano has provided technical and scientific support to the Environmental Protection Agency for the Enbridge Pipeline oil spill in the Kalamazoo River, MI since 2011. She played a key role in the development of a Net Environmental Benefit Analysis (NEBA) framework for oil recovery in the River, a process that involved consultations with local experts. Dr. Bejarano conducted data analyses and interpretation, and helped in the preparation of reports summarizing methods, findings and recommendations. The NEBA document has guided the 2012-2013 oil recovery strategies in tactical areas of the Kalamazoo River with persistent oiling conditions.

In 2010-2012 and as part of NOAA-ERD's team, Dr. Bejarano played numerous roles during the DWH oil spill. She served as one of the toxicologists on the Operational Science Advisory Team (OSAT), a Unified Command lead effort focused on assessing the potential environmental consequences of lingering oil on sand beaches impacted by the DWH. She also served as an external reviewer of the first OSAT effort related to surface and subsurface detection and monitoring of oil and dispersants. Dr. Bejarano was heavily involved in the preparation of a report by the Coastal Response Research Center, University of New Hampshire, and co-authored a report for the U.S. Coast Guard where she contributed to the assessment of the toxicological effects of chemically dispersed oil during the DWH's aerial dispersant operations.

Emergency Preparedness: Since 2010, Dr. Bejarano has actively participated in expert workshops and open-houses with focus on the offshore use of chemical dispersants in oil spill response. Other preparedness efforts include the development of guidelines for ephemeral data collection in the event of an oil spill in the Arctic, and the development of a user-friendly tool containing information on the acute toxicity of dispersants and chemically dispersed oil. The latter effort is being sponsored by a grant from the Coastal Response Research Center, University of New Hampshire.

ENVIRONMENTAL DAMAGE ASSESSMENT

Natural resource Damage Assessments: Since 2009, Dr. Bejarano has supported NOAA's Assessment and Restoration Division (ARD) as well as other federal agencies. Dr. Bejarano has provided technical support for preliminary assessment of the ecological damages associated with several oil spills, including:

Deepwater Horizon oil spill, Gulf of Mexico.
Silvertip oil spill in the Yellowstone River, Billings, MT.
M/V *Cosco Busan* oil spill, San Francisco, CA.
M/V *Selendang Ayu* grounding, Unalaska Island, AK.

Dr. Bejarano played major roles in developing damage assessment metrics, and assisted with data compilation, analysis and interpretation, and preparation of reports summarizing methods, findings and recommendations.

Climate Assessment and Proactive Response Initiative (CAPRI), NOAA-ARD: In 2009-2010 Dr. Bejarano identified and collected spatial data on potential contamination sources, and helped develop contaminant and site-specific hazard assessments for the CAPRI project in Puget Sound. This and related information were used to develop a vulnerability index of coastal and marine resources to oil spills and releases of hazardous substance resulting from changes in sea level rise.

ECOLOGICAL RIKS ASSESSMENT

Dr. Bejarano has extensive experience in developing site-specific ecological risk assessments.

Brookley AFB Landfill: 2011 Dr. Bejarano prepared for The Louis Berger Group, Inc. a preliminary ecological risk assessment for the Brookley AFB Landfill. As part of this assessment, she characterized the risk to aquatic invertebrates, fish, and other aquatic wildlife species from exposures to chemicals of potential ecological concern found in surface water and sediments.

Abu Dhabi- Habitat Vulnerability: In 2011 Dr. Bejarano and other RPI scientists identified and collected information on resources at risk, and ecosystem vulnerability in support of environmental changes along the coast of Abu Dhabi. This information was later integrated into the Abu Dhabi Coastal Resource Atlas and Vulnerability Index for the Environmental Agency of the Emirate of Abu Dhabi.

Richard P. Kane Mitigation Bank: In 2009 Dr. Bejarano prepared for The Louis Berger Group, Inc. and EarthMark NJ Kane Mitigation, LLC, a baseline ecological risk assessment of methylmercury at a wetland mitigation bank, with emphasis on acute and chronic risks to avian and mammalian receptors, New Jersey Meadowlands, NY.

Burton Island Ash Landfill: In 2008 Dr. Bejarano performed a toxicity assessment of metal mixtures from landfill sources on benthic estuarine and marine invertebrates, and helped develop preliminary damage assessment and Habitat Equivalency Analysis for Burton Island Ash, DE.

LITERATURE SYNTHESES AND ENVIRONMENTAL ASSESSMENTS

Dr. Bejarano has extensive experience identifying, collecting, reviewing and interpreting information in support of environmental assessments.

Wind Turbines on the Atlantic Outer Continental Shelf: Dr. Bejarano is currently working with a team of RPI and outside experts on an analysis of the environmental risks, fate, and effects of chemicals associated with wind turbines on the Atlantic Outer Continental Shelf (OCS) for the Bureau of Safety and Environmental Enforcement. Her primary role is to conduct a toxicological assessment of the effects of accidental releases of chemicals used in offshore wind turbines on marine resources, and to develop threshold levels of concern for selected chemicals. This information will be used in environmental assessments related to wind farms.

Worldwide Synthesis of the Impacts of Offshore Sand Resources: In 2012-2013 Dr. Bejarano worked with a team of RPI and outside experts on a synthesis of the state of knowledge of the impacts of offshore sand dredging on biological resources for the Bureau of Ocean Energy Management. Her primary role was to conduct a comprehensive synthesis on the effects of these activities on fish and habitats in this area. She also contributed to the identification of data gaps and helped develop recommendations for future studies.

Synthesis of the Resources of the South Atlantic Bight: In 2010-2011 Dr. Bejarano worked with a team of RPI and outside experts on a synthesis of the biological and physical resources of the South Atlantic Bight for the Bureau of Ocean Energy Management. Her primary role was to conduct a comprehensive literature synthesis of what is known about fish and habitats in this area. She also contributed to the identification of data gaps.

Lake Wabamun Spill: In 2008, Dr. Bejarano wrote a comprehensive literature review in support of assessments undertaken by Environment Canada, Fisheries and Oceans Canada in response to the 2005 Bunker C spill in Wabamun Lake, AB, Canada. This synthesis focused on the toxicity of bunker oil to freshwater fish species and fish communities in sub-arctic lotic systems.

SELECTED PUBLICATIONS

Bejarano, A.C. and J. K. Farr. 2013. Development of Short Acute Exposure Hazard Estimates: A Tool for Assessing the Effects of Chemical Spills in Aquatic Environments. Environmental Toxicology and Chemistry. In Press.

Dávalos, L.M., A.C. Bejarano, M. Hall, H.L. Correa, A. Corthals, OJ Espejo. 2011. Forests and drugs: coca-driven deforestation in global biodiversity hotspots. Environmental Science and Technology. 45 (4): 1219–1227

Bejarano, A.C. and J. Michel. 2010. Large-scale risk assessment of polycyclic aromatic hydrocarbons in shoreline sediments from Saudi Arabia: Environmental legacy after twelve years of the Gulf War oil spill. Environmental Pollution. 158 (5): 1561-1569.

Dávalos, L.M., A.C. Bejarano, and H.L. Correa. 2009. Disabusing cocaine: pervasive myths and enduring realities of a globalized commodity. International Journal of Drug Policy. 20(5):381-386.

Bejarano, A.C., F.M. Gulland, J. St Leger, M. Hunter, L.H. Schwacke, T.K. Rowles and F.M. VanDolah. 2008. Temporal and spatial signature of the biotoxin domoic acid in California sea lion (*Zalophus californianus*) stranding records. Marine Mammal Science 24(4): 899-912.

Bejarano, A.C., L.H. Schwacke, F.M. Gulland, T.K. Rowles and F.M. VanDolah. 2008. Production and toxicity of the marine biotoxin domoic acid and its effects on wildlife: A review. Human and Ecological Risk Assessment. 14(3): 544- 567.

Dávalos, L.M. and A.C. Bejarano. 2008. Conservation in conflict: Illegal drugs versus habitat in the Americas. In: State of the Wild 2008-2009: A global portrait of wildlife, windlands, and oceans. pp 218-225. Washington, D.C., Island Press.

Bejarano, A.C., F.M. VanDolah, F.M. Gulland and L.H. Schwacke. 2007. Exposure assessment of the biotoxin domoic acid in California sea lions: application of a bioenergetic model. Marine Ecology Progress Series. 345:293-304

Bejarano, A.C., G.T. Chandler, L. He, T.L. Cary and J. Ferry. 2006. Risk assessment of the NIST petroleum crude oil standard water accommodated fractions (WAFs) on a meiobenthic copepod: Further application of a copepod-based full life-cycle bioassay. Environmental Toxicology and Chemistry. 25 (7): 1953-1960.

Bejarano, A.C., G.T. Chandler, L. He and B.C. Coull. 2006. Individual to population effects of South Louisiana crude oil water hydrocarbon accommodated fraction (WAFs) on a marine meiobenthic copepod. Journal of Experimental Marine Biology and Ecology 332: 49-59.

Bejarano, A.C., P.L. Pennington, M.E. DeLorenzo and G.T., Chandler. 2005. Atrazine effects on the meiobenthic assemblage of a modular estuarine mesocosm. Marine Pollution Bulletin 50 (11): 1398-1404

Chandler, G.T., T.L. Cary, A.C. Bejarano, J. Pender, and J.L. Ferry. 2004. Population consequences of fipronil and degradates to copepods at environmental concentrations: An integration of lifecycle testing with Leslie-matrix population modeling. Environmental Science and Technology. 38 (23): 6407-6414.

Bejarano, A.C., Maruya K.A., Chandler G.T. 2004. Toxicity assessment of sediments associated with various land-uses in coastal South Carolina, USA, using a meiobenthic copepod bioassay Marine Pollution Bulletin. 49 (1-2): 23-32.

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SELECTED ABSTRACTS

Bejarano et al., 2012. Bridging Oil Spill Response and Scientifically Supported Information: A Net Environmental Benefit Analysis for the Kalamazoo River Oil Spill. SETAC. Long Beach, CA, USA. (Invited Talk)

Bejarano et al., 2011. Effectiveness and effects of sea surface dispersants used during the Deepwater Horizon oil spill and their future in spill response. SETAC. Boston, MA, USA. (Oral)

Thoms, S.R., A.C. Bejarano, and U. Kipka. 2011. The EPA aquatic life benchmarks and beyond: improving toxicity assessments with predictive models and empirical data. SETAC. Boston, MA, USA. (Poster)

Bejarano et al., 2010. Chemical Aquatic Fate and Effects (CAFÉ): a database for rapid response to chemical spills in aquatic environments. SETAC. Portland, OR, USA. (Oral)

Michel, J. And A.C. Bejarano. 2010. The Deepwater Horizon Oil Spill: Shoreline Cleanup Assessment Technique as a Key Data Source in Habitat Equivalency Analysis. SETAC. New Orleans, LA, USA. (Oral)

Bejarano et al., 2007. The marine biotoxin domoic acid and its impacts on the California sea lion population: optimization of a population model by evaluating nine years of stranding records. SETAC. Milwaukee, WI, USA. (Poster)

Bejarano et al., 2006. Evaluating the effects of domoic acid in California sea lions through the integration of an exposure assessment with an individual-based population model. SETAC. Montréal, Québec, Canada. (Oral).

Bejarano et al., 2005. OECD-sanctioned evaluation of meiobenthic copepods as Tier II lifecycle screening tools for putative endocrine disruptive chemicals. SETAC. Baltimore, MD, USA. (Interactive Platform)

Bejarano, A.C. and G.T. Chandler. 2005. Utility of a NIST crude oil Water Accommodated Fraction (WAF) as a benchmark for copepod reproductive and population-level toxicity. SETAC. Baltimore, MD, USA. (Poster)

Bejarano, A.C. and G.T. Chandler. 2003. Photo-induced toxicity of PAH-contaminated sediments to the copepod *Amphiascus tenuiremis*. SETAC. Austin, TX, USA. (Poster)

Bejarano et al., 2002. Reproductive and hormonal effects of urban contaminants on laboratory, mesocosm and field miobenthic copepods. SETAC. Salt Lake City, UT, USA. (Invited Talk)

SELECTED NON PEER-REVIEW PUBLICATIONS

Michel, J., A.C. Bejarano, C.H. Peterson, and C. Voss. 2013. Review of Biological and Biophysical Impacts from Dredging and Handling of Offshore Sand. U.S. Department of the Interior, Bureau of Ocean Energy Management, Herndon, VA. OCS Study BOEM 2013-0119. 236 pp.

Bejarano, A.C. 2013. Fish and Fish Habitats. In: South Atlantic information resources: data search and literature synthesis. U.S. Department of the Interior, Bureau of Ocean Energy Management, Gulf of Mexico OCS Region, New Orleans, LA. Michel, J. (ed.). June, 2013.

Levine E., A. Mearns, G. Shigenaka, S. Miles S, A.C. Bejarano, B. Magdasy, K. Bond. 2012. Review of SMART Data for Aerial Dispersant Operations. Prepared for the US Coast Guard Federal On-Scene Coordinator Deepwater Horizon MC252. January, 2012.

Tjeerdema, R., A.C. Bejarano, S. Edge S. 2012. Biological Effects of Dispersants and Dispersed Oil on Surface and Deep Ocean Species. In: The Future of Dispersant Use in Oil Spill Response Initiative. Coastal Response Research Center, Research Planning, Inc., National Oceanic and Atmospheric Administration. February, 2012.