

MARINE POLLUTION BULLETIN

Sammarco, P.W., et al. Article

F-A-C-T S-H-E-E-T



Contents lists available at SciVerse ScienceDirect

Marine Pollution Bulletin

journal homepage: www.elsevier.com/locate/marpolbul



Distribution and concentrations of petroleum hydrocarbons associated with the BP/Deepwater Horizon Oil Spill, Gulf of Mexico [☆]

Paul W. Sammarco^{a,*}, Steve R. Kolian^b, Richard A.F. Warby^c, Jennifer L. Bouldin^d, Wilma A. Subra^e, Scott A. Porter^{f,a,b}

^a Louisiana Universities Marine Consortium (LUMCON), 8124 Hwy. 56, Chauvin, LA 70344, USA

^b EcoRigs Non-Profit Organization, 6765 Corporate Blvd., Suite 1207, Baton Rouge, LA 70809, USA

^c Dept. Natural Sciences, Assumption College, 500 Salisbury St., Worcester, MA 01609, USA

^d Ecotoxicology Research Facility, Dept. of Biological Sciences, Arkansas State University, PO Box 599, State University, AR 72467, USA

^e Subra Company, Louisiana Environmental Action Network (LEAN), and Lower Mississippi Riverkeeper, PO Box 9813, New Iberia, LA 70562, USA

^f EcoLogic Environmental, Inc., PO Box 886, Houma, LA 70361, USA

Please cite the article in press as: Sammarco, P.W., et al. Distribution and Concentrations of Petroleum Hydrocarbons Associated with the BP/Deepwater Horizon Oil Spill, Gulf of Mexico. *Mar. Pollut. Bull.* (2013), <http://dx.doi.org/10.1016/j.marpolbul.2013.05.029>

ARTICLE KEY NOTES:

- We recommend that oil concentrations continued to be monitored in these media [sediment, seawater, biota and seafood] well after the spill has ceased, to assist in defining re-opening dates for fisheries; closures should be maintained until hydrocarbon levels are deemed within appropriate limits.
- The spill began on April 22, 2010. US-Department of Commerce – National Oceanic and Atmospheric Administration (NOAA) began closing fisheries on May 2, 2010. It began reopening them, with various spatial and other limits, on June 23. The BP Macondo MC-252 well was capped on July 15.
- Crude oil is composed of up to 17,000 organic compounds, each with its own volatility. Polycyclic aromatic hydrocarbons (PAHs) represent some of the most toxic constituents of light crude oil and can bio-concentrate in marine invertebrates, and including seafood resources.
- PAHs are of concern to federal regulatory agencies responsible for human health and welfare because they are among the most toxic and carcinogenic compounds within crude oil.

- Gohlke et al. (2011) study noted that ‘current protocols [to assess levels of concern] need to be expanded and extended’ although mentioning that PAHs from the BP/DWH spill were at lower levels than previous spills ...others claim (Kaltofen, 2012) that low levels of PAHs at the surface may be due to the use of Corexit[®] dispersant, which draws the crude oil back into the water.’
- The study demonstrated that the spatial scale of the distribution of crude oil in four different media during and after the spill event, extended from western Florida through western Louisiana to the northern coast of Texas indicating that BP petroleum hydrocarbons apparently reached 500 km from the spill source.
- The concentrations of the compounds considered in seawater in this study were higher than those reported in other studies....and particularly higher than data published by Ylitalo et al. (2012), who reported that all of their measurements were within acceptable limits for human exposure and consumption.
- Various impacts extended from June 2010 to November 2010. Most samples were collected post-capping (July 15, 2012); thus, geographic patterns of compounds in general represent post-spill distributions.
- Sixty percent of the sediment samples from the Atchafalaya wetlands had concentrations of up to 18 PAHs which exceeded standards for Marine Sediment Screening Levels.
- It was evident that marine biota such as sponges, coral, bryozoans and other sessile, epibenthic [living on the surface of offshore platforms] organisms clearly exhibited high petroleum hydrocarbon concentrations to <18m depth.
- Recommendations...it would appear that more complete testing, both technically and quantitatively (using GC/MS) after a spill would help provide variance estimates for concentrations in the field. Achieving a more complete understanding of such variance would, of course, help managers in decision-making regarding opening of fisheries, helping insure seafood safety.

☆ This is an open-access article distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike License, which permits non-commercial use, distribution, and reproduction in any medium, provided the original author and source are credited.

* Corresponding author. Tel.: +1 985 851 2876; fax: +1 985 851 2874.

E-mail addresses: psammarco@lumcon.edu (P.W. Sammarco), stevekolian@hotmail.com (S.R. Kolian), ra.warby@assumption.edu (R.A.F. Warby), jbouldin@astate.edu (J.L. Bouldin), subracom@aol.com (W.A. Subra), Ecologic2020@aol.com (S.A. Porter).

SUPPLEMENTAL KEY NOTES—Not part of the Sammarco et al. paper

- **Corexit dispersant applied to the 100-300 million gallons of oil partially dissolved the crude oil, dispersing it and preventing a portion of it from reaching the surface. Reports indicate deep-water sediments and plumes at depths of 400 – 1000 meters.**
 - **Under natural conditions [not dispersed with hydrocarbon and detergent based chemicals] the lighter molecular weight oil compounds remain at the surface and volatilize or degrade in a short period of time. Heavier compounds are deposited to sediments; these can retain some toxic properties for years.**
 - **Other recent scientific studies have indicated that applying chemical dispersants increases the toxicity of an oil spill by up to 52Xs. Including that factor within the context of this Sammarco study, which has clearly shown that persistence of toxicity levels, longevity and distance the Macondo spill traveled throughout the Gulf of Mexico were apparently greater than earlier estimates and reports, and calls for a review of government/NOAA monitoring protocols in oil spill response planning and methodology.**
-