

Efficacy and Effects of Dispersants in Oil Spill Response: Progress Since the 2005 NRC Report

Tying it All Together – Biological

May 4, 2008

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Coastal Response Research Center

Rationale for Biological Field Guide

- Water column threat assessment within 96 hours of dispersant application or oil spill
 - Properly evaluate response trade-offs, including dispersant use
 - Synthesize acute toxicity data in graphics useful for decision-makers
- Improve predictive capabilities for estimating biological effects of dispersed oil in water column
 - Major oil types (mixtures) or individual aromatics
 - Time of exposure
 - Species-specific impacts



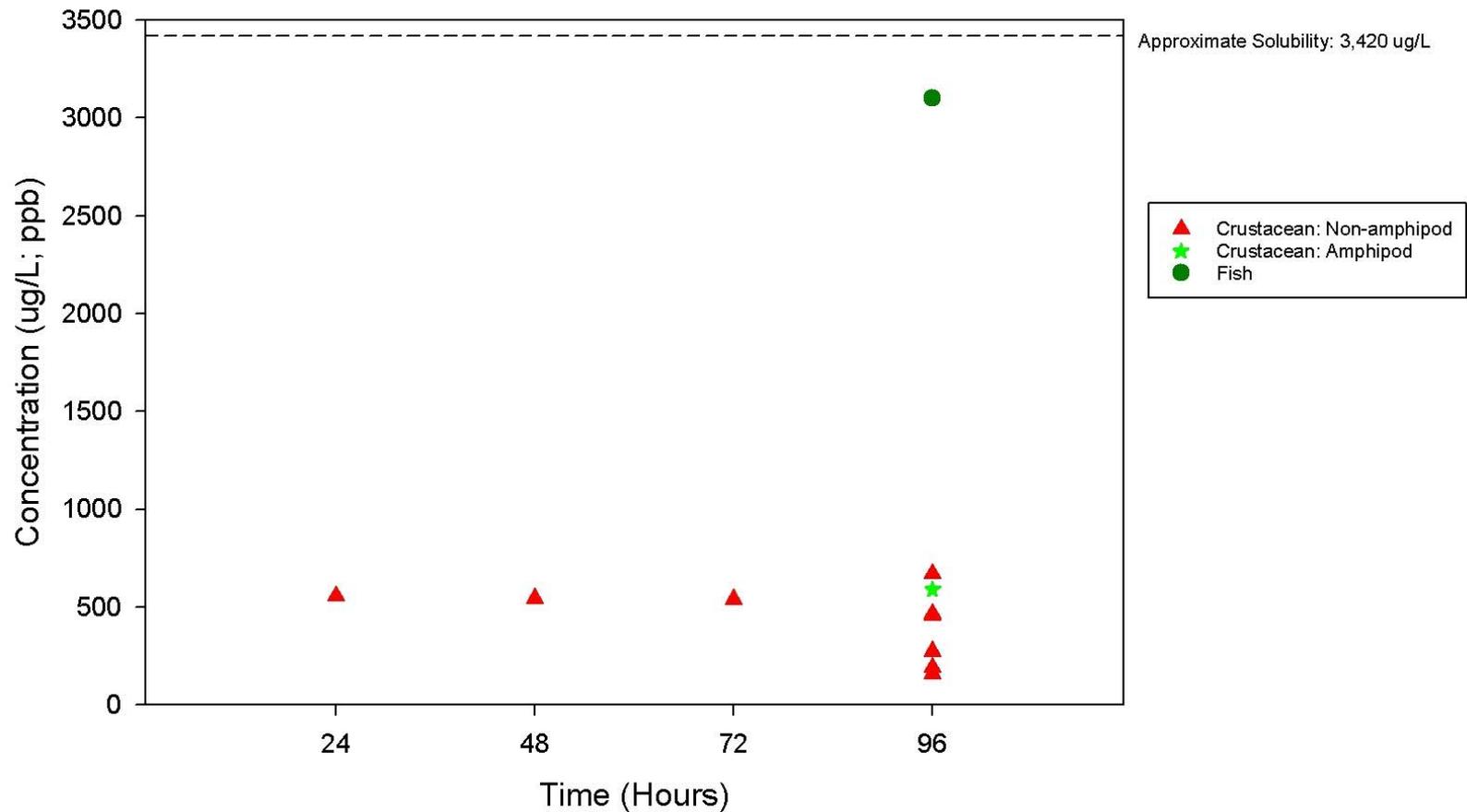
Relationship of Field Guide to Outcomes Described in CRRC Workshops and NRC Reports

- Supports technical recommendation to enhance data mining efforts and literature synthesis for efficacy and effects of dispersants
- Supports the development of integrated models to improve decision-making when dispersant use is considered



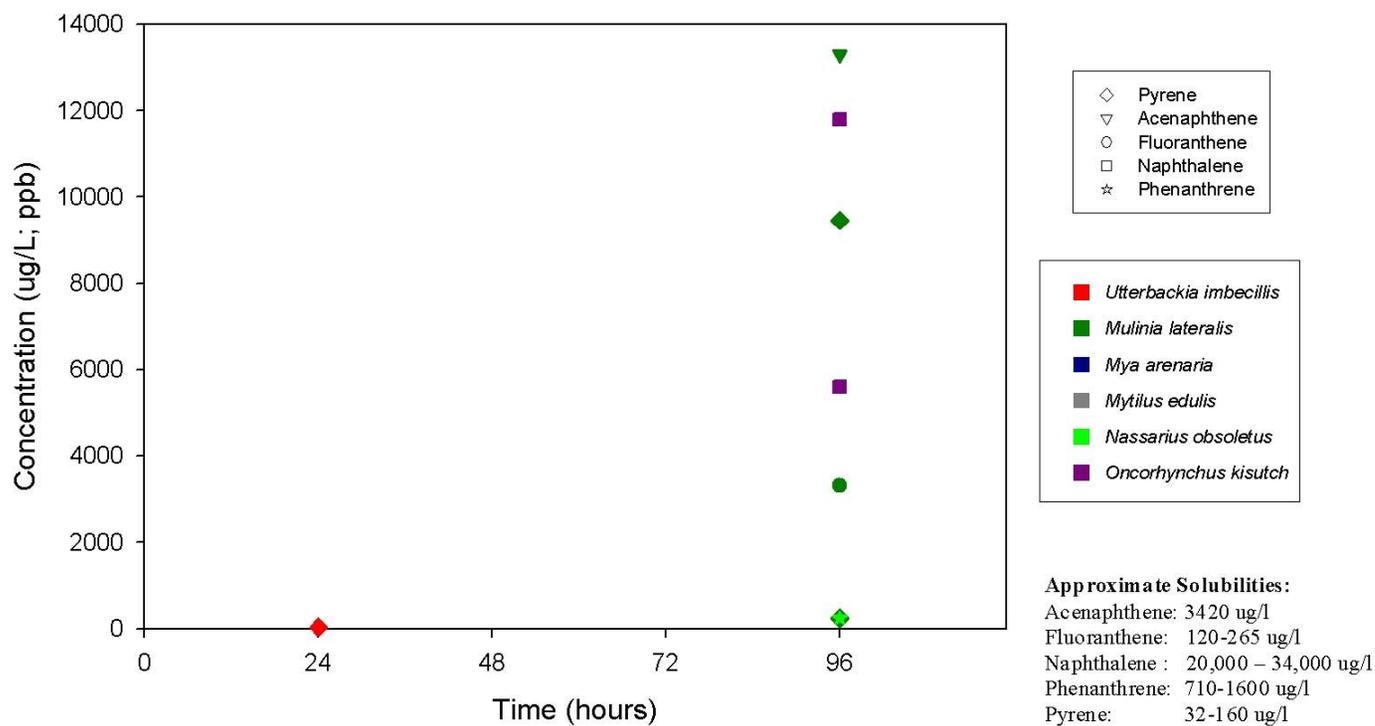
Example Toxicity Plot in Field Guide

Graph 2: Toxicity of Acenaphthene in Saltwater



Example Toxicity Plot in Field Guide (2)

Graph 18: Toxicity of PAH's to Saltwater Molluscs



Note: Species with chemicals that are over the approximate solubility:
Mulinia lateralis with Pyrene @ 96 hours – 240 and 9454 ug/L
 (Approximate Solubility is 32 ug/L)
Mulinia lateralis with Fluoranthene @ 96 hours – 3310 ug/L
 (Approximate Solubility is 120 ug/L)
Mulinia lateralis with anthracene @ 96 hours – 13,330 ug/L
 (Approximate Solubility is 75 ug/L)



Field Guide Contents

- About 50 toxicity plots using data for nine PAHs, six species groupings, and ten species
- Source data for toxicity plots from previous CRRC-funded projects¹ and peer-reviewed literature; only measured concentration data used in toxicity plots
- Toxicity plots paired with interpretive guidance and Microsoft Excel™ spreadsheet with source data



¹ McGrath and Di Toro (2005). Impacts of Low Level Residual Oils on Toxicity Assessments of Oil Spills

Field Guide Contents (2)

- Microsoft Excel™ spreadsheet templates automatically calculate toxicity of oil mixtures
 - Toxic Units or LC_{50∞} (McCay 2002; OilToxEx)
- Several common data inconsistencies addressed
 - Measured vs. Nominal concentrations
 - TPH vs. PAH
 - Species-specific data presentation
 - Solubility of PAH in water
 - Source data not paired with tables or figures



Final Thoughts

- Future coordination with diverse group of scientists and modelers, including ongoing CRRC projects¹
- Documentation of limitations and capabilities equally important. This job aid will not fully address:
 - dissolved vs. particulate concentrations
 - phototoxicity
 - sublethal or chronic endpoints
 - oil weathering and water temperature
 - Physical, chemical, toxicological, and biological uncertainties



¹ McCay, D. (2008). Guidance for Dispersant Decision Making: Potential for Impacts on Aquatic Biota

Final Thoughts (2)

- For species and chemicals addressed, field guide informs biological risk assessment efforts immediately after a spill or dispersant application
- Field guide supports cross-training of modelers and scientists
- Field guide informs responders and stakeholders about timeliness of water column monitoring or field data collection
 - After dispersant application
 - After oil spill

