The Effects of the Macondo Oil Spill on Coastal Ecosystems

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GULF OF MEXICO RESEARCH INITIATIVE
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Where is the oil now and how has it changed since 2010?
What are its impacts and how have these impacts evolved since 2010?
Have parts of the ecosystem been resilient, recovered, or been compromised?
How do the spill-related stressors interact with other stressors?
What indicators of stress and recovery can be developed to manage future stressors?
What data or tools or perspectives need to be applied or developed to improve our understanding?
How has the use of the ecosystem been modified by these stressors and have ecosystem services recovered?
Oxygen-depleted ‘dead zone’ in Gulf of Mexico

Nitrogen-based fertilizer used on farms in the Midwest leaches into the Mississippi River and the Gulf of Mexico, where it feeds giant algae blooms. As the algae dies, it settles on the ocean floor and decays, consuming oxygen and suffocating marine life. Scientists have identified a “dead zone” where seasonal oxygen levels drop too low to support most life in bottom and near-bottom waters.

Sources: Professor Nancy Rabalais, Louisiana Universities Marine Consortium; Associated Press

Todd Trumbull / The Chronicle
• Long-term Data Bases
• Deployed oxygen meters
CSI-06  CSI-09

(archived samples and data)
Fluorescence data from July 2010 indicated high oil presence at many stations directly to the west of the Mississippi River delta (A’3); yet dissolved oxygen levels at the same depths were typical for summer and often supersaturated (Rabalais et al. unpubl. data).
Estuary
Core Stations

- Vegetation clip plots
- Biomass
- Insect and biomass

- Insect sweep

- Sediment and water for micro under Forams
  - Forams (2 depths)
  - Dinoflagellates (surface)
  - Pore water (100 ml)
  - Belowground biomass
    - A: 0-10, 10-20, 20-30
    - B: 0-10
  - Soil strength
    - 0-10, 10-20, 20-30, 30-40
  - Surface sediment
    - Grain size,
      Micro-respiration
      Archive
  - Surface sediment hydrocarbon

- BD Bulk density (2 cores)
- T Leaf tissue (5 leaves)
- OY Oysters (5 live),
  Water sample (2 bottles)
  Surface sediment
- MO Mollusks (5 live)
  Littoraria (5 live)
  Geukensia (5 live)

Site info
- Site number
- Date/time
- Latitude/longitude
- Salinity/temperature
- Water level on marsh
- Canopy height
- Sulfide smell
12 CORE Stations: 6 paired oiled and non-oiled sites in 3 basins to this (plus individual efforts)
What is the baseline?

Lake Pontchartrain

Barataria Bay

Barataria Transect
EMPACT Transect
oil in the marsh
Post-spill assumptions about oil in the marsh:
What does the SCAT analysis tell us?
Has the shoreline eroded faster?
Are the soils weaker?
Has the vegetation been restored?
Has the profile of the marsh/water interface been altered?

Summer 2010
Oysters

L.C. Anderson and colleagues

Pathways and rates of crude in coastal food webs
<table>
<thead>
<tr>
<th>Taxa</th>
<th>Non-oiled</th>
<th>Oiled</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green seed bugs</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Spiders</td>
<td>Med</td>
<td>Low</td>
</tr>
</tbody>
</table>

Sept 2010 data

Few large spiders total in oiled areas

Ants suppressed in oiled saltmarshes and coastal dunes
Particles released: May 13 12:00 UTC
Tracking period: May 13 12:00 to May 23 16:00 UTC

Initial Position

Justic & Wang, Louisiana State University, FVCOM experimental product (do not cite or release)
Outcomes - science

• Long-term data based to measure impacts
• Insightful tools to investigate future stressors
• Data archived
• Educational materials and interactions
• Publications - lots of them
• Insightful analyses of the impacts from the DWH disaster
• Comparisons with other spills
• Geographic-specific knowledge
• Synthesis of efforts
Improvements in Society, Understanding and Collaboration - examples

• Collaborative engagement with fishing community (oysters/fish)
• Evaluation of short- and long-term change in salinity (from river diversion opened during spill)
• Evaluation of consequences of various mitigation measures
• Context in which to evaluate the effects of the physical removal of oil
Thank you