The Effects and Impacts of Hypoxia on Production Potential of Ecologically and Commercially Important Living Resources in the Northern Gulf of Mexico

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To assess the full impact of hypoxia on living resources of the Northern Gulf of Mexico (NGOMEX) requires a multi-scale (both time and space) and multi-stressor approach. This project proposes a framework to simultaneously account for direct and indirect effects of hypoxia, including their interactions on key organisms to support ecosystem-based management in the NGOMEX. A battery of modeling approaches of varying complexity (individual - to ecosystem-level), spatial configuration (near-field plume to fine-scale spatial pelagic to entire NGOMEX), and temporal duration (hourly to inter-annual) will be employed to provide both understanding and forecast capabilities to the management community of the NGOMEX.

Multiple models will be used to evaluate:

- What is the effect of the spatial extent and seasonal timing of hypoxia on fish growth, recruitment and production potential?
    - How does hypoxia affect food web interactions in the pelagic zone? Specifically:
        - How will hypoxia affect the spatial distribution and predator-prey interactions of mobile organisms and zooplankton?.
        - How does hypoxia affect habitat quality and suitability for economically and ecologically important fishes?
    - How will management decisions on loadings affect fisheries through its impact on the timing and extent of hypoxia?
    - What is the potential of strong wind events (and their relationship to climate change) to re-aerate the water column and alter the interactions of fish and their prey?
    - What are the most effective tools to forecast food-web interactions, habitat suitability, and fish production in relation to hypoxia?

It is hypothesized that hypoxia in the NGOMEX can strongly impact pelagic food webs and production through unexpected, indirect pathways, potentially leading to changes in production potential (both positive and negative) of economically and ecologically important fishes. Our overall goal is to provide quantitative tools to probabilistically forecast the effects of hypoxia on the living resources in the NGOMEX. Direct linkages to fisheries management will ensure continued interaction with, and attention to, the critical management issues.