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TITLE: Aggregation on the edge: effects of hypoxia avoidance on the spatial distribution of brown shrimp and demersal fishes in the Northern Gulf of Mexico

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ABSTRACT:

MEPS Marine Ecology Progress Series Contact the journal Facebook Twitter RSS Mailing List Subscribe to our mailing list via Mailchimp HomeLatest VolumeAbout the JournalEditorsTheme Sections MEPS 445:75-95 (2012) - DOI: <https://doi.org/10.3354/meps09437> Aggregation on the edge: effects of hypoxia avoidance on the spatial distribution of brown shrimp and demersal fishes in the Northern Gulf of Mexico J. Kevin Craig* Florida State University Coastal and Marine Laboratory, 3618 Highway 98, St. Teresa, Florida 32358-2702, USA Present address: Southeast Fisheries Science Center, NOAA National Marine Fisheries Service, 101 Pivers Island Road, Beaufort, North Carolina 28516-9722, USA *Email: kevin.craig@noaa.gov ABSTRACT: The northwestern Gulf of Mexico shelf experiences the largest seasonal hypoxic (dissolved oxygen, DO \leq 2.0 mg l⁻¹) zone in the western hemisphere. This study uses bottom trawl and hydrographic surveys over 3 yr to quantify low DO avoidance thresholds, patterns of aggregation in nearby oxygenated refuge habitats, and spatial overlap of brown shrimp *Farfantepenaeus aztecus* and several finfishes on the nearshore Louisiana shelf. On average, DO avoidance thresholds were low (1 to 3 mg l⁻¹) and near incipient lethal levels for similar species, suggesting organisms avoid the lowest, lethal DO levels on the shelf. Avoidance thresholds varied both within and among years, indicating that behavioral responses to low DO are context-dependent and vary in relation to the severity of hypoxia and possibly other factors. Despite the absence of physical barriers to movement, evading organisms aggregated at short distances (1 to 3 km) just beyond the margins of the hypoxic zone, indicating that sublethal and indirect effects of hypoxia are probably most intense within a relatively narrow region along the hypoxic edge. DO avoidance thresholds and patterns of aggregation were similar between brown shrimp, the primary target of the commercial shrimp trawl fishery, and several juvenile and small adult finfishes that comprise most of the bycatch. In addition, spatial overlap between brown shrimp and finfishes was highest in the years when hypoxia was most severe, and this effect was stronger for benthic fishes than for pelagic fishes. These results suggest the potential for enhanced harvest and bycatch interactions along the margins of the hypoxic zone as an indirect effect of hypoxia-induced shifts in spatial -patterns. Such spatially mediated indirect effects are an important means by which hypoxia -influences mobile species in the Gulf. KEY WORDS: Eutrophication · Spatial statistics · Avoidance behavior · Bycatch · Catchability · Fishery interactions · Dead zone · *Farfantepenaeus aztecus* · Mississippi River plume Full text in pdf format PreviousNextCite this article as: Craig JK (2012) Aggregation on the edge: effects of hypoxia avoidance on the spatial distribution of brown shrimp and demersal fishes in the Northern Gulf of Mexico. Mar Ecol Prog Ser 445:75-95. <https://doi.org/10.3354/meps09437> Export citation RSS - Facebook - Tweet - linkedIn Cited by Published in MEPS Vol. 445. Online publication date: January 20, 2012 Print ISSN: 0171-8630; Online ISSN: 1616-1599 Copyright © 2012 Inter-Research.

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