Supplement of

Effects of spatial variability on the exposure of fish to hypoxia: a modeling analysis for the Gulf of Mexico

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Part I

Results for 3-D simulations

Vertical movement was added to the NS, CCRW, and CRW algorithms as described in LaBone et al. (2019). The 2-D horizontal NS (tactical avoidance) algorithm was expanded by adding triangles from 5 m above and below the fish’s location to the neighborhood searched. There was no vertical aspect added to the other tactical avoidance algorithm of Sprint. A random movement up or down was added to the horizontal movement calculations for CRW (strategic avoidance) and a biased downward random vertical movement was added to CCRW (default movement).
### Hypoxia exposure (d)

|         | Good | Poor |
|---------|------|------|
| Min-1   | 0.0  |      |
| Min-2   |      |      |
| Mean    |      |      |
| Max     |      |      |
| Dynamic |      |      |

**Figure S1.**

**AUC**
- Min
- Mean
- Max
- Dynamic
Figure S2.
Figure S3.
Figure S4.
Figure S5.
Figure S6.
Part II

Cumulative exposure to hypoxia (box plots, individual fish) and cumulative exposure to 2–3 mg L\(^{-1}\) (box plots) for days 3 through 10 in 2–D simulations of minimum, mean, and maximum AUC values in high sublethal area and in moderate sublethal areas.
Figure S7.
Figure S8.
Figure S9.
| Cumulative sublethal (2–3 mg L\(^{-1}\)) days | Good | Poor |
|------------------------------------------------|------|------|
| (a)                                            | (b)  |      |
| (c)                                            | (d)  |      |
| (e)                                            | (f)  |      |
| (g)                                            | (h)  |      |
| (i)                                            | (j)  |      |

Figure S10.
Figure S11.
Figure S12.
LaBone, E., Justic, D., Rose, K., Wang, L., and Huang, H.: Modeling Fish Movement in 3-D in the Gulf of Mexico Hypoxic Zone, Estuaries and Coasts, 42, 1662–1685, https://doi.org/10.1007/s12237-019-00601-6, 2019.