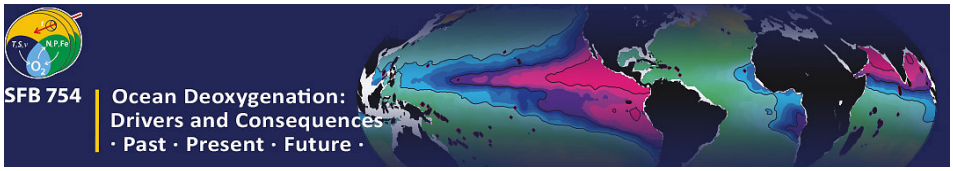

Contribution ID : **162** Type : **Oral**

Variable yet predominantly additive effects of concurrent hypoxia and elevated pCO2 on marine biota

Wednesday, 5 September 2018 15:15 (15)

O2 depletion in marine ecosystems often occurs concomitantly with elevated pCO2. On a global scale, this coupling is attributed to the concurrent processes of ocean acidification and reduced O2 solubility as a by-product of rising ocean temperatures and enhanced stratification of the deep-sea. On a more local-scale, however, this inherent link is driven mostly by metabolic processes; where biological respiration outweighs primary productivity to consume O2 and produce CO2. Here we used a meta-analytical approach to assess the impacts of hypoxia and elevated pCO2 on biological responses of marine biota. We further test the relative responses of biota obtained in the analysis against the Respiration Index (RI) as a potential predictor of biological responses for a wide range of pO2 and pCO2 conditions. Analysis of the dataset, comprised of 363 experimental comparisons, revealed predominantly additive effects (71.9%-additive, 19.0%-synergistic, 9.1%-antagonistic) of hypoxia and elevated pCO2 on marine taxa. Results of our RI analysis support previous criticisms of its defined thresholds for limits of marine life. Even so, we demonstrate that the RI may hold power as a valid predictor of biological responses to hypoxia and elevated pCO2. Our findings demonstrate heterogeneity of responses among taxa but highlight the importance of assessing the concurrent impacts hypoxia and elevated pCO2 on marine organisms.

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Session Classification : 06 Physiological Effects of Oxygen & Interactions with Multiple Stressors

Track Classification : 06 Physiological Effects of Oxygen & Interactions with Multiple Stressors