Response of the Bloom-Forming *Noctiluca Scintillans* to Rising Atmospheric CO_2

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Noctiluca scintillans, or *Noctiluca,* is a large (500 - 1,000 µm in diameter) mixotrophic phytoplankton that has caused major restructuring of the Arabian Sea (AS) marine ecosystem since the year 2000. Annual outbreaks of intense and widespread *Noctiluca* blooms in the AS have been linked to the spread of hypoxia and the intensifying effects of global warming. However, little is known about the effects of enhanced seawater CO_2 concentrations on the growth of this organism. Thus, the purpose of our study was to determine how increasing atmospheric CO_2 concentrations, which generally accompany hypoxia and warming, would impact the physiology and growth of *Noctiluca.* The concentrations tested represent pre-industrial levels of atmospheric CO_2 (150ppm), current levels (400ppm), and projected turn-of-the-century levels (800ppm). Our central hypothesis was that *Noctiluca* would perform best at 800ppm because its endosymbiont, *Protoeuglena noctilucae*, evolved 1.2b years ago in a low-oxygen, high CO_2 environment of the past ocean. Our results, while consistent with this hypothesis, raise the intriguing possibility that *Noctiluca* will overtake diatoms as the dominant bloom-forming organism as the size of the Oxygen Minimum Zone (OMZ) magnifies. Furthermore, because *Noctiluca* is not a preferred food for zooplankton, a microorganism vital to supporting healthy fisheries, the spread of *Noctiluca* is expected to have long-term socio-economic implications for the millions of people that rely on fisheries as their main source of food and income along the AS coastline.