Population growth and transport of the red tide dinoflagellate, Noctiluca scintillans, in the coastal waters off Sydney Australia, using cell diameter as a tracer

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ABSTRACT: Spatial abundance patterns of the heterotrophic dinoflagellate, *Noctiluca scintillans*, were investigated along the southeast coast of Australia to address the hypothesis that population growth of *Noctiluca* is driven by anthropogenic eutrophication. Abundance patterns were related to the immediate physical flow field and not the conditions conducive to growth. *Noctiluca* cells were advected southward with the East Australian Current, which was the dominant transport vector for the cells in this region. Areas of population growth of *Noctiluca* were identified by variations in cell-size distributions. Small cells (<525 µm) were considered to be capable of population growth, in contrast to red tide cells, which are known to be large (>600 µm), senescent, and the end result of a long series of biological and physical processes occurring in temporally and spatially distant water masses. Small cells were therefore considered to be located closer to the region in which growth was stimulated. The proportion of small cells in the samples was significantly correlated with relatively high concentrations of chlorophyll a. Consequently, this relationship was used to show that population growth of *Noctiluca* may be stimulated by an increase in chlorophyll a due to sewage discharge, although the prevailing hydrological conditions determine the likelihood of such impacts. High chlorophyll a concentrations within estuaries were also found to sustain a stable but low standing stock of *Noctiluca*, which may seed oceanic stocks. Thus, by examining cell size rather than abundance distributions, we identified and interpreted the variance in the spatial abundance patterns of *Noctiluca* within a dynamic hydrological environment.