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## **Influence of Physical-biochemical Coupling Processes on the *Noctiluca scintillans* and *Mesodinium* red tides in October 2019 in northern Yellow Sea, China**

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Red tide has always been an environmental issue with global concern. A *Noctiluca scintillans* red tide and a *Mesodinium* red tide occurred successively in northern Yellow Sea, China, where is important shallow sea aquaculture base, in October 2019. The initiation of the red tides was the result of both biotic (e.g. food) and abiotic factors (e.g. currents and nutrients availability). The maximum *N. scintillans* and *Mesodinium* abundance reached  $124.92 \pm 236.84 \times 10^3$  cells/L and  $1157.52 \pm 1294.16 \times 10^3$  cells/L respectively. The fast growth of *N. scintillans* was due to increasing abundance of phytoplankton after the harvest of cultured scallops. Appropriate temperatures also increased the growth of *N. scintillans*. Water dynamics played a key role in the formation of the red tides. The steady southward current from the Bohai Sea and northern Yellow Sea was instrumental in the accumulation of *N. scintillans* along the coast. The accumulation of *Mesodinium* was attributed to the neap tide and weak current on October 19 to 22. Water turbulence from a strengthened current on October 24 eventually destroyed the *Mesodinium* red tide. The red tides significantly redistributed the nutrients in the red tide patches and regulated the dominant species in phytoplankton community. Our study illuminates the influence of physical-biochemical coupling processes on red tides, and suggests that ocean dynamics such as currents and tidal factors deserve more attention when considering the ecosystem health problems of coastal zones.