



## Review

## A review of the green tides in the Yellow Sea, China

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## ABSTRACT

The recurrent green tide of *Ulva prolifera* caused serious ecological problems in the Yellow Sea and attached substantial scientific study. The bloom originated in the Subei Shoal area and drifted to the coast of Shandong Province during the period from May to July, driven by a series of physical processes. Here we reviewed advances in the understanding of green tides in the Yellow Sea and elucidate the developmental model of this phenomenon. This knowledge will help resource managers to take reasonable measures to mitigate the impacts to the Yellow Sea.

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## 1. Introduction

Since 2007, macroalgal blooms occurred annually in the Yellow Sea, referred to as green tides. Especially, the green tide appeared in the coastal waters of Qingdao before the 2008 Olympic Sailing Competition in China, attracted attention of scientists and officials. The scale of green tides in the Yellow Sea was the world's largest macroalgal bloom (Liu et al., 2009), which maximum distribution area exceeded 20,000 km<sup>2</sup> (Fig. 1) and persistent period lasted up to

76–110 days, from May to July, 2008–2014 (COIN).

Green tides in the Yellow Sea is characterized by seasonal occurred, wide distribution, huge biomass, long-distance transport, etc, which aroused wide concern, including biologists, ecologists, physical oceanographers, hydrological dynamics specialists, and so on. The understanding of the green tide will help us to control the massive macroalgal bloom and warn to all algae farmers worldwide: make sure to prevent spreading of green-algae.

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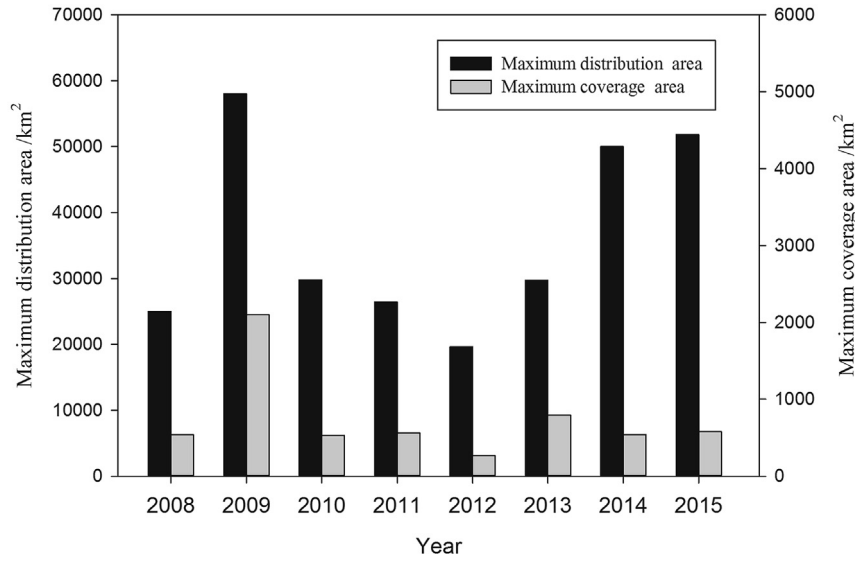


Fig. 1. Maximum distribution area and coverage area of green tides in the Yellow Sea from 2008 to 2015 (data from the China Ocean Information Network, <http://www.coi.gov.cn/gongbao/huanjing>, 2008–2015).

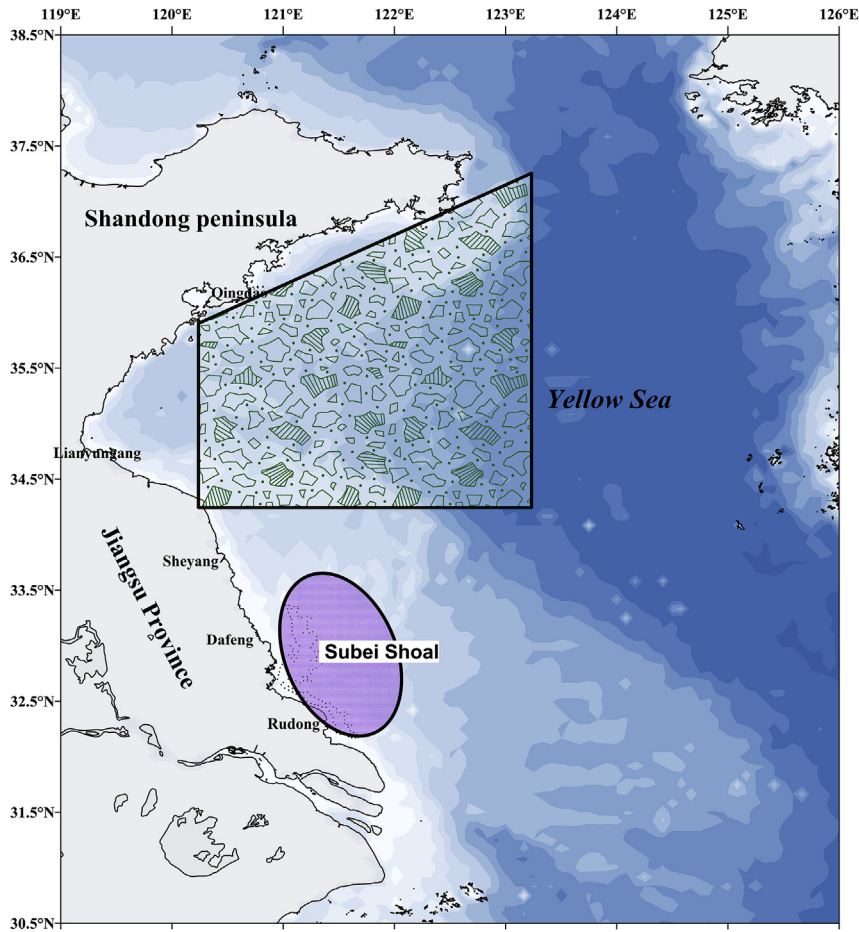


Fig. 2. The sketch map of green tide in the Yellow Sea. Purple area is the Subei Shoal, where were used for *P. yezoensis* aquaculture. The trapezoidal area is the green-tide influenced area. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

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