

## Jellyfish Blooms in Enclosed Coastal Seas: Cause and Consequence

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Over recent decades, expanding influence of human activities has caused many changes in marine ecosystems, such as hypoxia, red tides, loss of biodiversity, etc. In response to some of the cumulative effects of these impacts, it is currently argued that jellyfish (Cnidaria and Ctenophora) populations are increasing in the coastal waters, such as the Black Sea, Chesapeake Bay, northern Gulf of Mexico and the Bering Sea. This phenomenon is also happening in the Inland Sea of Japan, where fishermen have observed the recent increase of the common jellyfish *Aurelia aurita* and the ctenophore *Bolinopsis mikado*. However, the issue is not simple since in most cases there is little data to support our perception. I will present the most recent data on the seasonal and regional occurrence, biomass, and some physiological rates of *A. aurita* and *B. mikado* to demonstrate their important roles to control the mesozooplankton (i.e. their main food) abundance and the population size of planktivorous fish (i.e. their main food competitor). Causes for the increase in jellyfish populations in the Inland Sea of Japan may be associated with 1) increase in their food by eutrophication, 2) increase in polyp attachment area by water front construction, 3) increase of their overwintering populations by warming of winter seawater temperature, and 4) overfishing of planktivorous fish. Total fish catch from the Inland Sea of Japan is declining from the maximum level (mean annual catch: 420,000 metric ton) in 1970-80s to 240,000 metric ton in 1998. To account for this ecosystem shift from planktivorous fish-dominating community to jellyfish-dominating one, I propose the mechanism of “jellyfish spiral”. Once the ecosystem falls into this spiral, the more the growth of jellyfish populations, the less the production of planktivorous fish. In order to understand this mechanism in detail, we need not only to accumulate more information about their life history, physiological rates and interactions with other organisms, but also to monitor the populations both jellyfish and finfish.