

Biogeochemical conditions for paralytic shellfish poisoning (PSP) outbreak in Jinhae-Masan Bay, Korea

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We measured the concentrations of dissolved inorganic nitrogen (DIN), dissolved organic nitrogen (DON), humic-like fluorescent dissolved organic matter (FDOM_{HI}), and *Alexandrium* cell density from 2018 to 2023 in Jinhae-Masan Bay, Korea, to investigate the environmental conditions causing paralytic shellfish poisoning (PSP) associated with the blooms of toxic dinoflagellate *Alexandrium* species. We also measured total hydrolyzed amino acids (THAA) to determine the bioavailability of DON fueling the PSP outbreak. Throughout the study periods, PSP outbreaks consistently occurred under low DIN and high DON and FDOM_{HI} concentrations, leading to rapid increase in *Alexandrium* cell densities and PSP toxin concentrations. The PSP outbreak occurs when a significant amount of DIN, originating from stream waters in the innermost sites, is biologically converted to DON before reaching the outbreak area. The produced DON is characterized by high bioavailability based on various AA-derived indices. In addition, the intensity of PSP outbreaks is mainly dependent on the conversion stage of DIN to DON and enhanced FDOM_{HI}. We found that strong PSP outbreak occurred consistently under low DIN (<1.0 µM) and high DON (>9.0 µM), and FDOM_{HI} (>1.5 R.U.) levels. These results provide valuable insights into the environmental conditions triggering PSP outbreaks in coastal waters worldwide.