Reduction in seasonal pH extremes as a result of increase in net community production in coastal environments

KITACK LEE[1]*, JA-MYUNG KIM[1], IN-SEONG HAN[2], YANG-HO CHOI[3], JU-HYEON LEE[1], AND JI-YOUNG MOON[1]

[1]Pohang University of Science and Technology (POSTECH), Pohang, Gyeongbuk, 37673, Republic of Korea (*correspondence: ktl@postech.ac.kr) (jamyung@postech.ac.kr, jhl329@postech.ac.kr, todaud@postech.ac.kr)

[2]National Institute of Fisheries Science, Busan, 46083, Republic of Korea (hisjamstec@korea.kr)

[3]South Sea Fisheries Research Institute, National Institute of Fisheries Science, Yeosu, Jeonnam, 59780, Republic of Korea (plumechoi@korea.kr)

We estimated the seasonal extremes in pH and aragonite saturation state (Ω_{arag}) for the Yellow Sea for the past 35 years using historical datasets of surface nitrate (N) and bottom dissolved O_2 concentration and recent (2015–2019) carbonate datasets. In this retrospective analysis the rate of surface N increase was assumed to set the post-bloom surface dissolved inorganic C concentration resulted from the complete consumption of increased N by phytoplankton, whereas that of seafloor O_2 decrease was assumed to reflect the pre-bloom surface C by bringing C-rich seafloor water to the surface. In the Yellow Sea receiving increasing loads of anthropogenic N, the N-driven net community metabolism led to the concurrent increase in organic matter production at the surface and subsequent remineralization at the seafloor, and eventually lowered seasonal pH amplitude by 0.2 but increased the amplitude of Ω_{arag} by 1.0 over the past 35 years.