

Effect of high-CO₂ environment on growth and shell structure of juvenile Pacific oyster *Crassostrea gigas* during a mesocosm experiment

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High-CO₂ ocean induced by uptake of anthropogenic carbon dioxide threatens the viability of calcifying and young marine organisms due to decrease of calcification and increase of environmental stress. The Pacific oyster *Crassostrea gigas* provides the largest mass production among industries of coastal shellfish aquaculture in Korea, with annual production of about 2.8×10^5 ton and 200 billion KW in 2011. The survival and growth of juvenile oysters are the keystone for an abundant harvest in oyster industry and has serious consequences on one of important marine food resources.

To discover effects of ocean acidification on marine invertebrates, we compared growth and shell structure of Pacific oyster *Crassostrea gigas* reared in different pH conditions. We set up artificial mesocosm facilities that were made with frames and polypropylene film at the most important oyster spawning area of Korea on Nulcha Island, located at Nakdong River estuary, from April to May 2013 (about 50 days). During this mesocosm experiment, mean pH_{NBS} values (\pm SD) of controlled environments (M1, M2) were 7.71 ± 0.28 and 7.72 ± 0.28 , respectively, while that of reference was 8.20 ± 0.12 . Juvenile oysters, with mean (\pm SD) shell length and weight of 29.21 ± 6.30 mm and 4.08 ± 2.36 g ($n=90$), respectively, were detached from shells of scallop (a device for settling spat), and exposed to three mesocosm treatments. The mean growth rates of oyster weight and shell length were significantly different (ANOVA, $p=0.01$). The weight and length growth rate of reference (19.5 ± 17.6 mg day⁻¹ and 0.143 ± 0.121 mm day⁻¹) were higher than those of low pH controlled (M1: 13.5 ± 14.3 mg day⁻¹ and 0.100 ± 0.076 mm day⁻¹, M2: 14.9 ± 14.6 mg day⁻¹ and 0.124 ± 0.133 mm day⁻¹). These results indicate that high-CO₂ ocean can seriously affect population and production of oyster and thus, shellfish aquaculture industry in the near future.