

Evaluation and prediction of the influences of ocean acidification to the subarctic coast

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Global warming and ocean acidification are in progress all at once due to anthropogenic CO₂ emissions associated with human activities. As ocean acidification proceeds, it is concerned difficult for calcium carbonate and magnesium carbonate to be produced in the ocean, and calcifying organisms such as corals and shellfish having these skeletons and shells may be adversely affected. Moreover, the diurnal, seasonal and interannual fluctuation are all considered more prominent in coasts than in the open ocean, because of relatively larger amount of sea grass beds and more direct and significant terrestrial impacts. On the other hand, in the subarctic coastal region, it is difficult to maintain observation due to stormy weather in winter, which yields paucity of observational data. In this study, long-term continuous monitoring of physical and biogeochemical parameters was conducted in Oshoro Bay, Otaru City, Hokkaido.

Our results show that the timing of increase and decrease of pH and dissolved oxygen (DO) almost coincided with each other, and the diurnal variation of pH was larger in spring and summer than in fall and winter. The diurnal variation of pH was 0.1 or more on average from May to August. The variation was 0.15 on average and 0.26 at the maximum, respectively, in August. That was less than 0.1 on average, and was 0.03 on average and 0.07 at the maximum, respectively, in November. Thus, the seasonal difference in the diurnal variation was clear, suggesting significant effects of the photosynthesis in the daytime and the respiration in the nighttime by primary producers including algae and seaweeds. The results suggest relatively predominant biological effects with larger biomass and higher solar radiation in summer compared to those in winter.

Keywords: ocean acidification, coastal ecosystem, subarctic region, diurnal variation