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First report on the elemental and isotopic compositions (Ni, Cu, Zn, and Pb) of bay scallop (*Argopecten irradians*) transplanted in different water depths

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Stable metal isotopes are valuable tools for understanding the origin and transport of metals and are therefore used in pollution source tracking and metal bioaccumulation studies. Since the first application of Zn isotopes to the "Mussel Watch Program" for metal pollution monitoring, countries such as France, Korea, and Brazil have contributed to the management of marine metal pollution by elucidating the biological mechanisms underlying coastal bivalve metabolism. These studies provide new scientific information on the causal relationship with anthropogenic pollution, but most of them focus on oysters and mussels. Scallops are a high-value aquatic resource attracting attention as a sustainable food source because they filter out marine pollutants and improve water quality. Scallops could be studied for their ability to accumulate contaminants, but have not yet been studied.

This study is the first to investigate the accumulation of metal elements and isotopic fractionation in the bodies of scallops (*Argopecten irradians*), a species widely consumed in Korea, through a 5-month field transplantation experiment. After transplantation, 5-10 individuals were collected monthly, and their biometric measurements were recorded to assess scallop growth over time. The collected samples were analyzed for concentration and isotopic composition (Ni, Cu, Zn, and Pb) using a previously developed methodology (Park et al., 2025).

The total body burden of metals continued to increase after transplantation for Ni and Cu, whereas Zn and Pb showed an initial increase followed by a decrease after 5 months. In particular, the greatest metal accumulation was observed at a depth of 15 m, with an increase of at least 55 times (Pb) and up to 129 times (Zn) compared to the control. The isotopic composition of the transplanted scallops showed heavy isotope fractionation in $\delta^{60/58}$Ni for 3 months, followed by a sharp shift to a lighter isotope composition at 4 months. Cu and Zn showed a tendency for the delta value to decrease and then increase, unlike Ni, and the $\delta^{66/64}$Zn value decreased over time. Additionally, the correlation between body burden and isotope showed that as body burden increased, isotope values tended to become lighter, indicating that these organisms preferentially accumulate lighter isotopes.