**Estimation of the Spatiotemporal Characteristics of Spawning Events of Japanese Eels**

Takatoshi Higuchi, Shun Watanabe, Yoshihiro Niwa, Yoshiaki Yamada, Satoshi Arai, Michael J. Miller, Toshiyuki Hibiya, Katsumi Tsukamoto

The spawning area of the Japanese eel is located along the West Mariana Ridge in the western North Pacific, where preleptocephali, eggs and spawning-condition adults have been collected. However, the estimated spawning area is large and the exact timing of spawning events has remained unknown. New approaches are needed to investigate the spatiotemporal characteristics of specific reproductive events. We tested the correspondence between egg collection-points and the distribution of internal-tide energy during 3 *R/V* Hakuho Maru cruises (KH-09-2, KH-11-6, KH-12-2) along the southern West Mariana Ridge. The egg collection locations, observed ADCP current patterns and distribution of simulated internal-tide energy indicated that there were high-energy patches of internal tides upstream of the egg collection points in all cruises. To estimate the spawning times, we used the developmental stages of eggs collected during the 3 cruises, their collection times and presumed elapsed times from fertilization, and the possible experienced temperatures for each egg from equations in Ahn et al. (2012), which showed the relationship between water temperature and development stages. This was combined with CTD temperature data at the depth where the eggs were caught along with an experimental egg rising speed (3 m/h), and the swimming depth of silver eels observed by pop-up tags to estimate the exact spawning times. We could determine the development stages of 53 eggs among the 490 collected eggs (7 eggs: ear-eye vesicle formation; 9 eggs: heart formation; 37 eggs: just before hatching). The experienced temperature estimated from the development rate of the collected eggs was not significantly different from the environmental temperature from CTD data only if spawning occurred at 1:00 in all cases. Therefore, we hypothesize that Japanese eels spawn at about 1:00 a.m. and internal tide patterns may contribute to the mechanisms that determine the places they spawn in the open ocean.

(300/300 words)