耳石酸素安定同位体比分析と個体ベースモデルを用いたマイワシの回遊履歴推定法

A scheme to reproduce migration history of the Japanese sardine; combination use of otolith d^{18}O and an individual-based migration model

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Tracking the movement of migratory fish are of great importance in fisheries science, although it has been technically difficult for small sized fish to which artificial tags cannot be attached. Oxygen stable isotope ratio (δ^{18}O) in otolith is known to record the linear combination of temperature and salinity variation of ambient water, and thus considered to be a potential alternative for conventional techniques such as tagging and electronic loggers. However, the difficulty of separating the two factors have been limiting its application. In this study, we show that the migration history of small pelagic fish, the Japanese sardine, can be individually reproduced by the combination use isotopic analysis and numerical migration simulations. We found that the detailed and reasonable movements can be estimated by searching the routes that should be passed to reproduce the otolith δ^{18}O history, using a simple individual based migration model in a realistically simulated ocean. The scheme will enable researchers to estimate the environment that an individual fish experienced in the early life history for numerous species, which will improve the understanding of how the survival of fish is affected by environmental variabilities.

キーワード：マイワシ、耳石、個体ベースモデル、同化モデル
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