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Dr. Moteki is an Associate Professor, Department of Ocean Sciences, Tokyo University of Marine Science and Technology. His major is ichthyology (fish biology, taxonomy, early life history of fish). In the last decade, he has been facilitating collaboration with researchers of National Institute of Polar Research and other Japanese institutes for the Antarctic ecosystem research. He participated Antarctic voyages by the training vessel Umitakamaru eight times. Principal investigator of the project, “Food web structure and biogeochemical cycling under sea ice in the Southern Ocean”. Dad of a four-year young girl and two-month young boy.



How can we open the black box of the biological dynamics under sea ice?

Mesopelagic fish and krill *Euphausia superba* are key players in the Southern Ocean ecosystem. Of the mesopelagic fish, myctophids are major prey for higher predators linking secondary to higher trophic levels, particularly in waters with fewer krill. We have carried out studies on zooplankton and fish larvae south of 60°S along the 110°E and 140°E transects over the last decade using an open/close net system. These studies revealed that the larval myctophid *Electrona antarctica* was distributed in the specific water mass located between the cold winter water and circumpolar deep water in the upwelling zone (adjacent to the southern boundary of the Antarctic Circumpolar Current). Furthermore, *Notolepis* species (Paralepididae) and *Bathylagus antarcticus* (Bathylagidae) larvae were also found in the same waters at higher abundances, although their distributions did not entirely overlap vertically. Despite their broader distributions in adult stages, it is unclear what factors distribute larvae in these narrower waters. The marginal ice zone (MIZ) is covered with sea ice except during a limited period from January to February and is likely to offer favourable conditions as a nursery ground for larval fish. However, it is impossible in the Japanese research framework to carry out studies by ship in the MIZ except during the limited summer season. Thus, we have just started observations using drifter and mooring systems in the MIZ along 110°E. These systems are equipped with various types of sensors, sediment traps and echosounders (or ADCP) to collect information on the biological dynamics under sea ice. The dynamics under sea ice are a black box. Opening this box may enable us to understand the nursery functions for key mesopelagic fish. Application of the unmanned systems is useful, even in the non-icebreaker *Umitaka-mar*, and could constitute a low-cost monitoring system when combined with satellite information etc.

