Growth rate of larval myctophid fish *Electrona antarctica* in the Southern Ocean

Satoshi Nirazuka[1] and Masato Moteki[1, 2]
[1]*Tokyo University of Marie Science and Technology*
[2]*National Institute of Polar Research*

Myctophid fish is the most abundant mesopelagic fish in the Southern Ocean (SO). Myctophid fish is an important trophic link between zooplankton and higher predators in oceanic ecosystems. Of the 35 myctophids in the SO, *Electrona antarctica* is the most abundant species. Early survival rate of fish, which is involved with the larval growth rate, influences subsequent stock recruitment. Larval period, from hatching to the transformation (before juvenile stage), of this species is estimated to be 30－47 days in the previous study. This study examined otoliths from juvenile and adult stages and inferred larval growth rate. However, growth rate in larval stage is usually different from that in stages after transformation (juvenile and adult stages). Thus, the present study examined growth rate and hatching date in larval *E. antarctica* by larval otolith analysis.

We conducted a multidisciplinary research cruise off Wilkes Land (East Antarctica) during January 2017. Larval *E. antarctica* was sampled by oblique tow of a ring net (mouth diameter: 1.60 m, mesh size: 500 μm) from ca. 200 m depth to the sea surface. Body length (*BL*) of larvae was measured immediately after the collection, and then preserved in 90% ethanol. Sagittal otoliths were extracted from seventy-four larvae. Otolith annuli were counted to determine larval age in days (*Age*) under a polarized light microscope. Growth rate of the larvae was estimated by regression analysis.

The relationship between *BL* and *Age* of larval *E. antarctica* (5.7－16.9 mm *BL*) was expressed by a linear equation: $BL = 5.26 + 0.67 \times Age$ ($R^2 = 0.82$, Fig. 1). Larval period was estimated to be 21－23 days by the equation. Hatching date of larval *E. antarctica* estimated was between late December 2016 to middle January 2017. A previous study showed the growth rate of *E. antarctica* between 37－103 mm *BL* by a linear equation: $BL = 8.869 + 0.063 \times Age$ ($R^2 = 0.946$). The difference in growth rate between the present and the previous studies indicates a decrease in growth rate after the transformation stage (19－21 mm *BL*), which is commonly observed among other myctophids. This pattern is interpreted from an increase of energy requirement due to the transformation and an active feeding behaviour occurring from juvenile stage such as the diel vertical migration. Furthermore, growth rate is influenced by ambient temperature. Previous studies explained that the feature of slow growth rate and long larval period was a specific life history pattern for high latitudinal fishes adapted to low temperature. However, the growth rate in larval *E. antarctica* was higher than those in other larval myctophids from temperate regions. Although larval growth rate is considered to decrease around the transformation stage, estimated larval period of 21－23 days in *E. antarctica* was also shorter than that of myctophids (*Ceratoscopelus warmingii*, *Diaphus theta*, *Symbolophorus californiensis*) known in the western North Pacific (28－71 days). The higher growth rate of larval *E. antarctica* implies higher metabolic rate regardless of the lower ambient temperature.

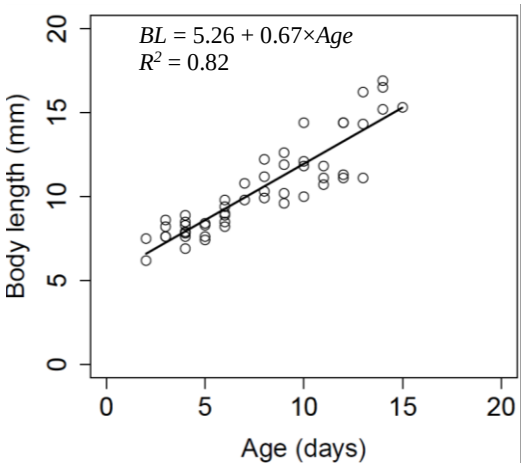

Fig. 1. The relationships between body length (*BL*) and age in days (*Age*) of larval *Electrona antarctica* (5.7－16.9 mm BL)