Seasonal changes in zooplankton community and population structure, body size and lipid contents of small copepods in Ishikari Bay, Sea of Japan

Daichi Arima¹, Atsushi Yamaguchi¹, Yoshiyuki Abe¹, Kohei Matsuno², Rui Saito³, Hiroki Asami⁴, Hiroshi Shimada⁴ and Ichiro Imai¹

1. Graduate School of Fisheries Science, Hokkaido University, E-mail: d-arima@fish.hokudai.ac.jp
2. National Institute of Polar Research, 3. Atmosphere and Ocean Research Institute, The University of Tokyo,
3. Hokkaido Research Organization, Central Fisheries Research Institute

Introduction

- Despite their importance, little information is available for seasonal changes in zooplankton community, especially small copepods in Ishikari Bay.
- The present study aims to evaluate seasonal changes in zooplankton community and population structure, prosome length (PL) and oil sac volume (OSV) of the different species of copepods (Paracalanus parvus, Pseudocalanus newmani and Oithona similis) in the bay.

Material & Methods

- Monthly zooplankton samples were collected by vertical hauls of 100 μm mesh NORPAC nets during March 2001 to May 2002.
- Wet mass (WM) was measured for each sample.
- Samples at St. J3A, J32, and J33 were sorted and counted according to each zooplankton taxonomic group.
- For samples at St. J31, copepod species and copepodid stages were identified and enumerated.
- For adult females (C6F) of small copepods, prosome length (PL), prosome width (PW), oil sac length (OSL) and oil sac width (OSW) were measured at least 50 individual for each sample. Prosome volume (PV) and Oil sac volume (OSV) were calculated using following equations.

\[ PV = \frac{4}{3} \pi \left( \frac{PW}{2} \right) \left( \frac{PL}{2} \right) \]

\[ OSV = \frac{4}{3} \pi \left( \frac{OSW}{2} \right) \left( \frac{OL}{2} \right) \]

Hydrography & zooplankton community

- Influence of river water was observed at the coastal stations (St. J3A, J31).
- Influence of saline Tsushima Warm Current (TWC) was observed during July to December.
- High chlorophyll a recorded at the coastal stations during spring (marked with green circles).
- Zooplankton abundance reached a peak in May.
- Taxonomic composition in abundance was dominated by copepods.
- Dominance of nauplii during winter to spring would be caused by reproduction of copepods from phytoplankton bloom as energy. Dominance of appendicularians during summer to autumn might be transported by TWC.
- Similar seasonal pattern of PL (larger during spring) was observed both warm-water species (Paracalanus parvus) and cold-water species (Pseudocalanus newmani and Oithona similis).
- However, composition of oil containing specimen and OSV showed species-specific seasonal pattern: higher/greater in summer for warm-water P. parvus, while higher/greater in spring for cold-water P. newmani and O. similis.

Species-specific seasonality in lipid accumulation (greater in summer for P. parvus, while greater in spring for P. newmani and O. similis) suggests that small-sized copepods utilize stored lipid not only for overwintering but also for reproduction.