

Species-specific distribution of euphausiids in the waters surrounding Hokkaido, northeastern Japan during May and June 2019

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Euphausiids comprises 86 species and is widely distributed throughout the oceans of the world. In higher latitude sea areas, euphausiids is considered a key species in the marine ecosystems because of their biological and ecological characteristics such as transferring energy and materials of primary and secondary producers to higher trophic producers, and diel vertical migration and daytime surface swarming. Therefore, ecological studies of euphausiids have been conducted all over the world ocean. In the waters surrounding Hokkaido, northeastern Japan, water mass structures are complicated vertically and horizontally. Fishery productivities in these areas are very high. Higher productivity of lower trophic level organisms such as euphausiids could contribute to the higher fishery productivity under the complicated oceanographic conditions. However, available ecological information of euphausiids in the area is very limited. The present study aimed to clarify the species-specific distribution of euphausiids with reference to water masses in the waters surrounding Hokkaido, northeastern Japan during spring. Sampling were conducted at 5 stations (St. A, B, C, D, E) in the coastal area of the Japan Sea and 9 stations (St. O12, S1, S2, S3, S4, N1, N2, N3, N4) in the coastal and off shore areas of the southwestern Okhotsk Sea by RVs Hokko-Maru, Japan Fisheries Research and Education Agency, on 29 May–4 June 2019. Zooplankton samples were collected obliquely with a ring net (with a mouth diameter of 130 cm and mesh aperture of 0.45 mm) from 500 m depth or 10 m above the maximum depth where maximum depth was shallower than 500 m. Collected zooplankton samples were preserved in 5% buffered seawater formalin. Euphausiids was sorted under a dissecting microscope and then classified to species and stages, and then individual numbers were counted. The profiles of temperature and salinity were determined using a CTD at each station. Similarities between sampling stations and euphausiid species based on developmental stages were determined by a Bray–Curtis similarity index and cluster analyses of the species-specific distribution of euphausiids using the software package PRIMER v6. In the present study, 4 euphausiid species, *Euphausia pacifica*, *Thysanoessa inermis*, *T. longipes* and *T. raschi*, were identified. Three sampling groups (X, Y and Z) were recognized at 50% similarity level, and two subgroups of Group Y (Y1 and Y2) and Group Z (Z1 and Z2) were identified at a 62% similarity level. Group X was consisted of sampling stations at northern part of coastal area of the Japan Sea and Okhotsk Sea (St. A, B and O12). All sampling stations included in Group Y were those in the Okhotsk Sea (St. S1, S2, S3, S4, N1, N2, N3 and N4). Group Z was sampling station in the southern part of coastal area of the Japan Sea. Cluster analyses of distributional pattern of euphausiids based on developmental stages isolated to seven groups (G1-G7) at 62% similarity level. Furcilia stage of 4 species was independent group (G1-G4), respectively. Female of *T. raschi* also was independent group (G5). Group G6 was consisted of juvenile and adult (male and female) of *E. pacifica* and *T. longipes*. Juvenile and adult of *T. inermis* and *T. raschi* formed Group G7. Our results suggested that earlier stage (furcilia stage) of four euphausiid species showed different horizontal distribution patterns in the waters surrounding Hokkaido, northeastern Japan and their distributional patterns were different from those of older stages (juvenile and adult).