Nematode community structure and vertical distribution in Lake Nurume

Hiromi Saito[1], Kazuki Ando[1], Kunio T. Takahashi[2], Hiroshi Hattori[1], Satoshi Imura[2]
[1]*Tokai University*
[2]*National Institute of Polar Research*

The existence of many lakes was confirmed in the Antarctic continent (Vincent et al. 2008). These are generally oligotrophic lakes being represented by low primary production and, therefore, these eco-systems contain low biodiversity of faunal communities (Vincent et al. 2008). In spite of this, recent investigations have suggested that the possibility of high abundance of faunal communities was represented by higher abundance of producers of benthic algae and mosses in Antarctic lakes (Imura 1999, Sabbe et al. 2004). Most lake fauna has been thought to consist of no-indigenous species, since the current fauna invaded and colonized the Antarctic continent after the Last Glacial Maximum (LGM) (Pugh et al. 2002). However, there have been a few reports suggested the existence of indigenous species within some faunal communities (e.g. nematode, mite and crustaceans) (Marshall and Coetzee 2000, Gibson and Bayly 2007). The existence of such a species is predicted based on the evidence of survival at refuge habitat among the LGM. However, faunal composition and distribution patterns are still less understood in the Antarctica lake ecosystem.

The present study aimed to examine the relationship between the abundance of three species (*Microlaimus* sp., *Chromadora* sp. and *Anticoma* sp.) of the nematode community and environmental factors (depth, temperature, salinity, pH, oxygen redox potential, turbidity and chlorophyll concentration) at five points on Lake Nurume (69°13′S, 39°39′E, Fig.1) during the summer period of the 49th Japanese Antarctic Research Expedition in 2007–2008 (Kudoh et al. 2008). Nematode abundance was calculated by counting the number of nematodes per 1 mL in the case of not less than 50 individuals of nematode density of sampling matter. To clarify the vertical distribution of both nematode community and each species, an analysis of variance (ANOVA) or Kruskal-Wallis was conducted. Stepwise multiple analysis was used to predict which of the environmental factors in these lakes was expected to affect the abundance of both nematode community and each species.

The abundance of nematode community was highest at the shallow points of the lake (depth of 3.9 m) and lowest at the deepest points (depth of 5.4 m) (ANOVA; $F = 23.67$, $p < 0.001$) accounting for $6.89 \cdot 10^5$ inds L^{-1} and $3.43 \cdot 10^4$ inds L^{-1}, respectively. From the present data, Kito (*unpublished data*) identified three species of nematodes (*Microlaimus* sp., *Chromadora* sp. and *Anticoma* sp.). Morphological characteristics of *Chromadora* sp. showed a coil-shaped body. The abundance of *Chromadora* sp. was higher in shallow points than at the deeper ones (ANOVA; $F = 106.31$, $p < 0.001$) reaching a level of $6.07 \cdot 10^5$ inds L^{-1}. In contrast, the abundance of *Microlaimus* sp. was highest at the deepest points among the five sampling locations (ANOVA; $F = 11.12$, $p < 0.001$) showing $1.79 \cdot 10^5$ inds L^{-1}. *Anticoma* sp. was a subdominant species with no marked depth preference (Kruskal-Wallis; $H = 8.63$, $p = 0.07$). Stepwise regression analysis showed that pH, turbidity and salinity of environment factors correlated with the abundance of nematode community. For each nematode species, the temperature significantly associated with the abundance of *Microlaimus* sp., whilst pH, algae and oxygen redox potential significantly related with those of *Anticoma* sp. However, *Chromadora* sp. revealed no marked environmental inclination. The present result confirms that the diversity of the nematode community in Lake Nurume is low, and suggests that the abundance of nematode species and community structure in Antarctic lakes is sensitive to the prevailing environmental conditions.

Reference

Gibson, J.A.E. and I.A.E. Bayly, New insights into the origins of crustaceans of Antarctic lakes, Antarctic Science, 19, 157‐164, 2007.

Imura, S., Bando, T., Saito, S., Seto, K. and H. Kanda, Benthic moss pillars in Antarctic lakes, Polar Biology, 22, 137‐140, 1999.

Kudou, S., Tanabe, Y. and K. T. Takahashi, Abundance of benthic copepods in a saline lake in East Antarctica, Polar Biology, 31, 1539-1542, 2008.

Marshall, D.J. and L. Coetzee, Historical biogeography of a Continental Antarctic mite genus, Maudheimia (Acari, Oribatida): evidence for a Gondwanan origin and Pliocene-Pleistocene speciation, Zoological Journal of the Linnean Society, 129, 111‐128, 2000.

Pugh, P.J.A., Dartnall, H.J.G. and S.J. Mcinnes, The non-marine crustacea of Antarctica and the islands of the Southern Ocean: biodiversity and biogeography, Journal of Natural History, 36, 1047‐1103, 2002.

Sabbe, K., Hodgson, D.A., Verleyen, E., Taton, A., Wilmotte, A., Vanhoutte, K. and W. Vyverman, Salinity, depth and the structure and composition of microbial mats in continental Antarctic lakes, Freshwater Biology, 49, 296‐319, 2004.
Vincent, W.F., Hobbie, J.E. and J. Laybourn-Parry, Introduction to the limnology of high-latitude lake and river ecosystems, In: Vincent WF, Laybourn-Parry J (eds.) Polar lakes and rivers. Oxford University Press, Oxford, 1‐24, 2008.

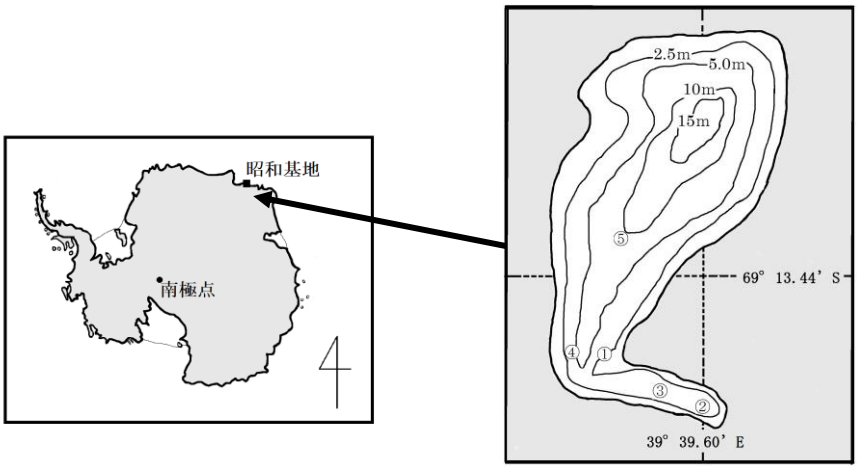

Figure 1. Location of study area, Lake Nurume in Antarctica.