

Article

A Comparative Analyzing of Zooplankton Community Diversity in Surface Layer Water of Reservoir Via eDNA Metabarcoding and Microscopy

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Abstract: We compared two sampling methods, eDNA metabarcoding and microscope identification (MSI), for the analysis of zooplankton diversity in reservoirs with its inflow and outflow streams. The dynamic patterns of Cladocera and Rotifera at different time points were similar between the two sampling methods, but there was a slight difference in the Copepoda. Specifically, the members of the Copepoda subclass could not be easily classified using the MSI method, whereas eDNA metabarcoding could detect minor taxa of Cladocera and Rotifera. Upon comparing the list of zooplankton communities in Korea with the gene database of NCBI, only ~56% of the zooplankton genera reported in Korea could be detected based on the 18S rRNA gene. However, eDNA metabarcoding detected a more diverse range of zooplankton despite the lack of genetic information. As water temperature increased after May, the zooplankton diversity decreased according to the MSI method but increased according to the eDNA metabarcoding method. Although eDNA metabarcoding has some limitations, it was able to detect a wider diversity of zooplankton compared to the MSI. eDNA metabarcoding provides a more reliable means to identify zooplankton.

Keywords: zooplankton; eDNA; microscope identification; community; diversity



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1. Introduction

Zooplankton occupies an intermediate position in the aquatic food web and plays a crucial role in energy transfer to macroinvertebrates or fish. Additionally, zooplankton could be used as an indicator to evaluate aquatic ecosystems due to their short life cycle. Particularly, the species composition, population density, and productivity of zooplankton communities rapidly respond to the direct or indirect influences of abiotic and biotic environmental factors [1,2].

However, despite the importance of zooplankton in aquatic communities, accurate classification of zooplankton species is notoriously difficult due to the occurrence of cryptic sibling species. Because of these ambiguities, the morphological classification of copepods is quite challenging, especially during the larval stage. Therefore, the identification of zooplanktonic species requires taxonomic expertise and extensive datasets [3].

The environmental DNA (eDNA) metabarcoding technique is being used as an alternative and efficient tool for the assessment of community structure and habitat condition [4,5]. This technique was initially utilized in sediments to detect the DNA of animals and plants but has since been applied to various terrestrial and aquatic samples [6]. eDNA sequencing technologies provide several advantages for the assessment of aquatic ecosystems, such as the classification of a broader taxonomic range, high detection sensitivity, and time efficiency, in addition to not requiring vast taxonomic expertise [7,8]. These advantages

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