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Cellulose Decomposing Ability of Intertidal Benthos

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Summary

Until recently, Cellulose had long been believed to be decomposed by quite listed organisms such as bacteria, fungi, protozoa, termite, and herbivorous animals. Especially, it has said that Cellulose derived from terrestrial plants and flown into aquatic environment is exclusively broken down by the activity of microorganisms. However, intrinsic cellulolytic ability has been discovered from marine mollusks, which let us to assume that unexpectedly large population of benthic animals living in tidal flat where substances of terrestrial origin accumulate actually have such ability. According to this hypothesis, we focused on small intertidal benthic fauna called “meiobenthos” and tried to detect their cellulose decomposing ability by biochemical methods.

We sampled tidal mud from five points in Japan and collected meiobenthos from these samples. Cellulase (cellulolytic enzyme) activities of individual meiobenthos or whole mud extracts were measured by zymogram analysis (Electrophoresis-based detection method of enzymatic activity). PCR-RFLP analysis was also carried out to sort out indistinguishable organisms belonging Nematoda or Annelida.

Nematodes were observed dominantly in all flats, and other organisms of Annelida or Althropoda were also found frequently. The cellulase zymographic bands were detected in some species of these three animal phyla, but not in the other ones. On the other hand, the mud extract from all five samples showed the multiple bands, suggesting the involvement of multiple cellulases in the cellulose degradation of each tidal flat. Comparing the band patterns of dominant species and mud extracts of each flat, there seemed to be a trend that both patterns were more identical in the samples from northern, thus cold region located in Hokkaido than that from southern region in Honshu. The PCR-RFLP method, though now in progress, have proved to be applicable for the species identification of Nematoda and Annelida animals. These results suggest that quite a few species of meiobenthos can contribute to the cellulose degradation in tidal flats, especially in that locates in cold region.