（学位第３号様式）

# 学 位 論 文 要 旨

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| 題　目 | Ecological Characterization of Anoxygenic Photosynthetic Bacteria in Eutrophicated Marine Environment and Their Application to Aquaculture<br>（富栄養化海洋環境における酸素非発生型光合成細菌の生態とその養殖分野への応用に関する研究） |


Yamagawa Bay, located in Ibusuki, Kagoshima Prefecture, Japan, is a geographically enclosed coastal marine inlet, and its deteriorating seabed sediments are under an anoxic, reductive, sulfide-rich condition. In order to gain insight into diversity of anoxygenic photosynthetic bacteria (AnPBs) and their ecophysiological roles in the sediments, three approaches were adopted: isolation of AnPBs, PCR-DGGE of 16S rDNA, and PCR-DGGE of *pufM*. Among the bacterial isolates, relatives of *Rhodobacter sphaeroides* were most dominant, possibly contributing to transforming organic pollutants in the sediments. Abundance of *Chlorobium phaeobacteroides* BS1 was suggested by 16S rDNA PCR-DGGE. It could reflect intensive stratification and resultant formation of the anoxic, sulfide-rich layer in addition to extreme low-light adaptation of this strain. Diverse purple non-sulfur or sulfur bacteria as well as aerobic anoxygenic photoheterotrophs were also detected by *pufM* PCR-DGGE, which could be associated with organic or inorganic sulfur cyclings. The outcome of the present study highlights ecophysiologically important roles of AnPBs in the organically polluted marine sediments.

Ciliated protozoa were enriched from the marine environments including seawater and sediment collected from Kuwano-ura Bay, Kamikoshiki Island, Kagoshima, Japan using media containing fish meal with radish leaves (MI and MII) or a medium for microalgal cultivation (MIII). Cultivation in MIII produced the highest number of ciliates, suggesting proliferation of microalgae originated from the sediment sample supported growth of the protozoa. Analyses of 18S ribosomal RNA genes with PCR-DGGE were applied to tentatively identify large-size ciliates as *Euplotes minuta* and *Cyclidium varibonneti*. An anoxygenic photosynthetic bacterium (AnPB), isolated from a sediment sample of Yamagawa Bay, Kagoshima, Japan, was applied for prey of the ciliated protozoa. As a result, the ciliate grew to reach 2,081 individuals·$mL^{-1}$ in 72 h, indicating that AnPBs can be used to promote the ciliate growth.