D-4 Studies on Preservation of Coral Reef Ecosystem

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(1)Growth rates of zooxanthellae were reduced greatly when the light intensity reduced from 6 to 3 $\mu E/m^2/s$. The algae grew in maximumrate at 32℃ but the photosynthetic activities were higher at 28℃ than at 32℃. They had comparable activities at salinity 20 as much as at 35 under moderate temperature and light intensity. Degraded zooxanthellae were selectively expelled by the host when the coral was treated with high temperature or strong light, but the degradation process of zooxanthellae varied depending on the type of stress.
(2)We extracted nucleic acids from coral with Clemmesen's method and considered that RNA/DNA ratio can be used as an nutritional index of coral. After rearing under continuous darkness for 4 days, RNA/DNA ratio, number of zooxanthellae in the coral tissue were statistically low. The relationship between the nutrients concentrations and vegetative density of coral suggested on the whole thea the standard of water quality in reefs for protection of corals shuld be established at $10^0 \mu M$ in DIN and $10^{-1} \mu M$ in DIP. The number of species, the number of colonies, and the coral coverage increased from the coastal side to the offshore reef flat. It is considered that such diversity was caused by the complicated coral reef topography and by the wide sanges of environmental gradients. There were highly positive relationships between live coral cover and mean number of fish species and individuals.
These results suggested that chaetodontid fishes(butterflyfishes), especially obligative coral feeders, are condidates as indicator organisms for the health of coral reef ecosystems. The decrease in coral percent cover at Sesoko Island was due to pradation by crown-of-thorns starfish.
(3)Methods for the long-term changes in the coral reef ecosystem were developed by taking underwater images and archiving them. Furthermore, availableunderwater photographsin the past were collected and processed to C D-ROM archive. It was found that the LNDSAT-TM data are available for the wide range monitoring of coral reefs and underwater coverages by red soil were confirmed on the picture drawn with the defference of the 2 bands ratio. Futhur, the influence of geometrical depth change was eliminated by drawing the picture with ratio of the ratios at different dates. these influences shuld be estimated from in situ observations. Images of aerial color photographs were taken by the degital color scanning camera to the computor, counted ther gray values at each R, B, G channels and then grouped by RGB values pattern. By comparing coral coverage surveyed in the field with the groups, it was suggested that high level of G indicated high coral coverage.