

Reproduction of Ecosystems in Artificial Pebble and Rock Beach

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Recently in Japan, many artificial beaches were constructed to reproduce the lost natural beaches especially along the coasts of Tokyo, Osaka and Ise bays. One substantial question is whether such an artificial beach can reproduce not only its physical conditions but also its ecological systems or not. Near Akashi-Kaikyo-Ohashi suspension bridge, an artificial pebble and rock beach was constructed 3 years ago. Then in every season a survey has been conducted, in which the water quality and species of appearing algae and animal were observed. The purpose of this study is to reply to the above-mentioned question by using the data of this survey.

The beach is located west of Kobe, facing the Akashi strait in the Seto Inland Sea. The area is about 6ha, and the length is about 400m. The front line is protected by a caisson breakwater having two entrances. The beach consists of two parts, a deeper basin (2.0m depth) and a shallow pool (0.5m depth). The bed in the deeper basin is covered with flat stones of about 2m diameters, while the bed in the shallow pool is covered with pebble of about 2cm diameter. In the shallow pool many large rocks are distributed randomly. The survey of algae has been done along one line in the on-offshore direction in the deeper basin, and at the vertical face of two rocks about 100m apart in the shallow pool.

Nakahara(1988) proposed a relationship between the predominant species of algae and three environmental factors, in which the species of algae were classified based on the ecological aspects, short life (ephemeral)(**s.l.**), eclipse (short life with heteromorphic life history)(**e.**), small and large one year life(annual)(**s.a.** and **l.a.**), small, medium and large long life(perennial)(**s.p.**, **m.p.** and **l.p.**) and encrusting type(crustose)(**c.t.**). Following Nakahara's proposal, the appearing algae were classified into above mentioned 8 types. From the classification of appearing algae in the basin during 3 years, a succession process is observed, and the ecosystems seem to become stable already in the 3rd year. The predominant species are small long life (**s.p.**) and encrusting type algae(**s.t.**). Meanwhile, the predominant species in the pool are only short life algae(**s.l.**).

For comparison, the existing survey data in a natural beach along the northeast coast of the Awaji Island and in a rubble mound breakwater in front of Amagasaki rock were also analyzed. The natural beach is a pebble beach. The predominant species of algae are found to be small multi year life (**s.p.**). The small multi year life algae are commonly predominant in the basin and the natural beach. In this sense the deeper basin can reproduce similar ecosystems to those in the natural beach, and the shallow pool can not. In the pool the predominant species are only the short life algae (**s.l.**) which appear also in the rubble mound breakwater. The reasons are discussed based on Nakahara's proposal (1988).