

A TRANSECT STUDY IN THE INFRA-LITTORAL ZONE OF HAKAMAGOSHI— AN ASSESSMENT OF THE IMPACT OF CONSTRUCTION OF A MAN-MADE SAND BEACH

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Abstract

The infra-littoral zone of the Taisho Lava Field at Hakamagoshi, Sakurajima has strong tidal and ocean currents, which, when combined with volcanic rock from the lava flow, result in the presence of an abundance of soft corals and other marine life (ONO & TSUKAHARA, 2000, ONO et al., 2002). To investigate the effects of the new man-made sand beach at Hakamagoshi on marine life in the surrounding marine environment, a transect survey has been conducted, along with core samples. Our results show this abundance is relatively unchanged since the recent construction in the area. Core samples from our survey are also typical of other core samples taken at Hakamagoshi, showing that construction influences on the seafloor were yet to be seen as of the time of this survey. A longer-term study with more data should help clarify the impact of construction on the Hakamagoshi inter-tidal zone.

Key words: Sakurajima, Hakamagoshi, Man-made sand beach, Infra-littoral zone, Transect survey, Sediment composition

Introduction

The infra-littoral zone of the Taisho Lava Field at Hakamagoshi, Sakurajima has strong tidal and ocean currents, which, when combined with the volcanic rock from the lava flow, results in the presence of an abundance of soft corals and other marine life (ONO & TSUKAHARA, 2000, ONO et al., 2002). However, the north part of Hakamagoshi includes a harbor with ferries that connect Sakurajima with Kagoshima City. Recently, construction and add-ons in this area have proceeded at a rapid pace. In June 2000 a new National Resort Inn (Kokumin Shukusha) on the waterfront at Hakamagoshi was opened (Fig. 1), and a complementary man-made sand beach swimming area was opened next to the Inn in March 2002 (Fig. 2).

Similarly, several years ago, across Kagoshima Bay, at Iso Beach in Kagoshima City, a large amount of sand from different areas was brought in to enlarge Iso Beach. Ocean currents carried this extra, "imported" sand to the surrounding infra-littoral area, resulting in the covering, decrease and/or disappearance of large numbers of marine life (Kubota, personal communication). From this experience, it is thought that man-made sand beaches have a drastic and debilitating effect on nearby infra-littoral ecosystems.

To investigate the effects of the new man-made sand beach at Hakamagoshi on marine life in the surrounding marine environment, a transect survey has been conducted, along with core samples.

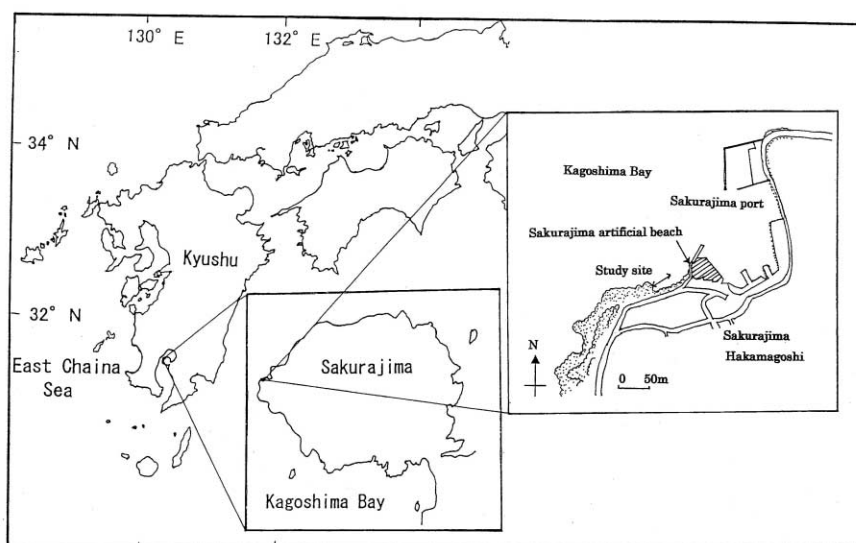


Fig.1. Map of study site: Taisho Lava Field, Sakurajima, Kagoshima, Japan.

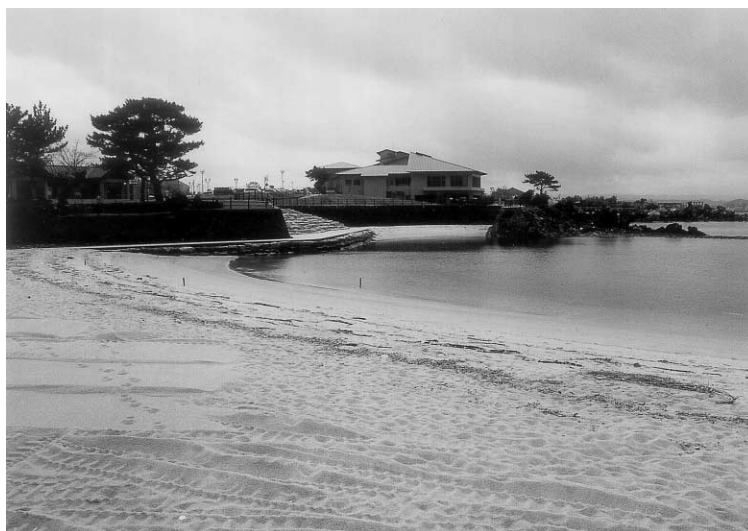


Fig.2. Man-made sand beach swimming area opened next to the National Inn in March 2002.

Materials and Methods

Transect Survey

As shown in Figure 1, the area of study was the beach and infra-littoral area directly in front of the National Resort Inn. This field site is located approximately 200m south of the newly constructed sand beach swimming area. The survey was conducted on April 14, 2001. The line transect survey

was conducted as explained in LOYA and SLOBODKIN (1971) and LOYA (1972). The area of the survey was from the extreme low tide line straight out from shore 40m. Every 10m along this line (at 10, 20, 30, and 40m from shore) a 10m line was drawn centered on the line from shore, extending out perpendicular 5m on either side from the line. All soft coral, anemones, hard corals, and other species present along these lines were noted. As well, seawater temperature, depth, and visibility were noted as the survey was being done. Photographs were taken with an underwater camera to help double check survey results at a later date.

Core Samples and Sediment Composition

To investigate the composition of the seafloor of the survey site, 3 core samples were taken during the survey at three spots along the transect line extending from shore. Core samples at 13m (depth 3m), 27m (depth 6m), and 40m (depth 9m) were taken. Core samples were placed in 5 % formalin seawater, and analyzed by the Emery settling-tube method.

Results

Because the Taisho Lava Field at Hakamagoshi is relatively new (produced in 1914 by the big eruption named Taisho Dai-funka), the terrain of the field site is quite rough, with many grooves and bumps (see Figure 3). Much marine life can be seen on the various outcroppings and rocks.

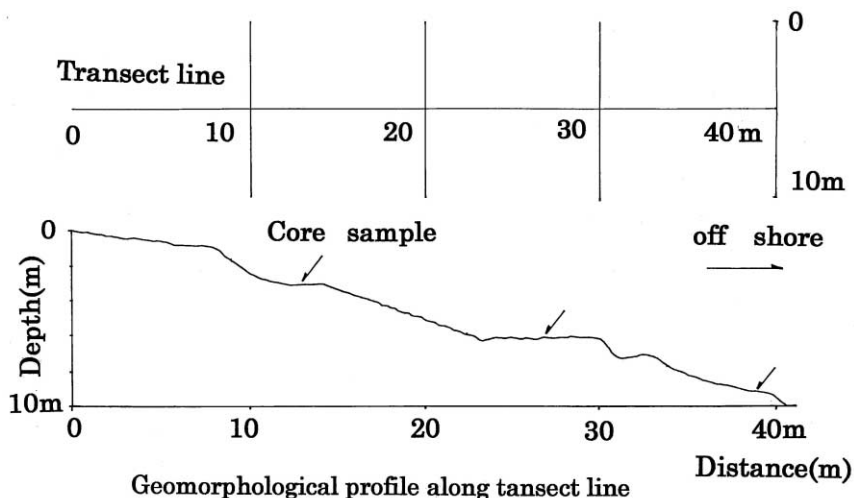


Fig.3. Geomorphological profile along the base line from shore and the profile of the transect line.

(1) Line Transect Study Results

Line transect study results are shown in Figure 4.

From the extreme low tide-line to 10m, the seafloor reaches a depth of 3m. Marine life covered 29% of the transect at 10m, consisting largely of *Antheopsis*, *Entacmaea*, *Zoanthus*, *Stereonephythya*, and *Pavona*.

From 10 to 20m, depth reached 5m, and marine life cover was 27% at 20m, consisting of *Antheopsis*, *Zoanthus*, *Stereonephythya*, *Faviidae*, *Pavona*, and the table coral *Acropora*.

From a distance of 20 to 30m, the ocean floor dropped to 6.5m, and marine life cover reached 35%. *Lithophyllon* cover alone consisted of 13% cover. As well, *Faviidae*, *Pavona*, *Porites*, *Entacmaea*, and *Zoanthus*. *Stereonephytha*, which was extremely common near shore (especially at 10m distance) was not seen at all.

The seafloor between 30 and 40m reached a depth of 9m, and largely consisted of sediment. Accordingly, marine life cover was much lower than the other transect areas at only 17%, with the number of colonies 10 less than any other 10m line. *Faviidae*, *Lithophyllon*, *Montipora*, and *Pavona* were all relatively common.

When compared to data collected by ONO and TSUKAHARA (2000) and ONO et al. (2002) for this field site over the last 20 years, the % cover is generally lower than what is usually seen, but overall the results are quite similar.

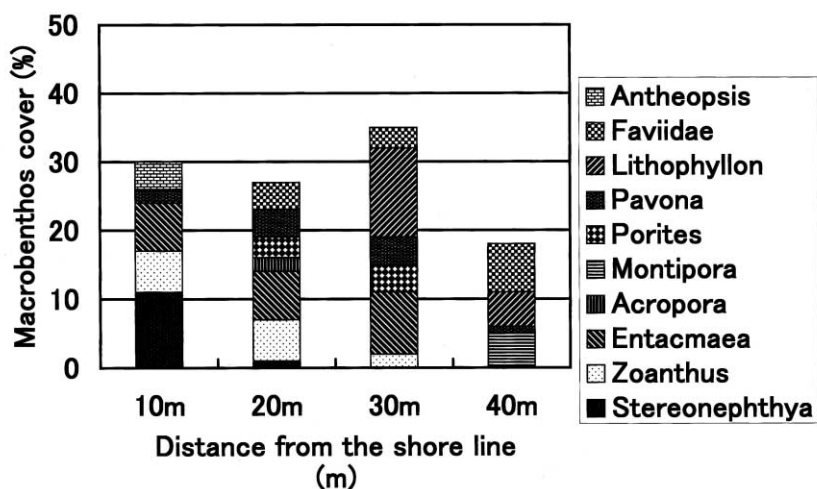


Fig.4. Macrobenenthos cover each transect lines.

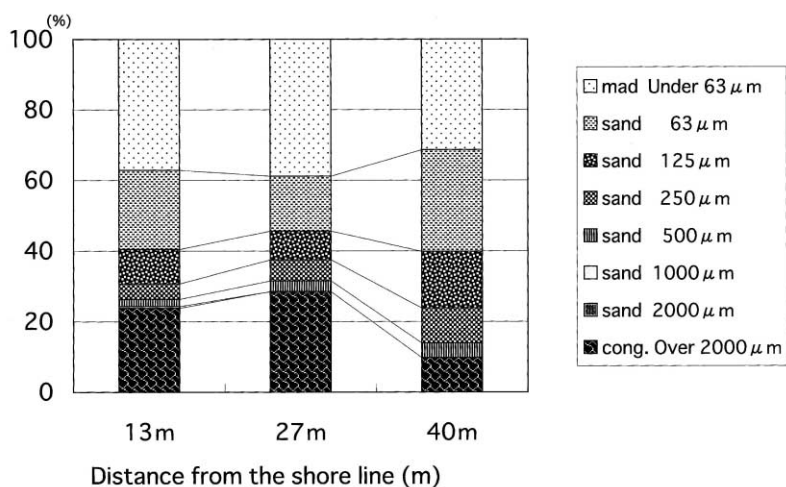


Fig.5. Sediment composition from all three locations. Axis of ordinates is grain size ratios of bottom sediment at each station. cong.: conglomerate

(2) Core Sample and Sediment Composition Results

Core samples from all three locations showed little change in the amount of mud present (see Figure 5). The amount of sand was much greater at the third sampling location (40m from shore) than at either of the two locations closer to shore.

In the future investigation of the influence of typhoons and strong wind and wave action on the sand beach and the surrounding study area is planned.

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