

Spatio-Temporal Variations of Visitors of Recreational Shellfish-Gathering at an Artificial Beach in Tokyo Bay

Ryoichi Yamanaka, Motohiko Murai, Yoshiyuki Inoue & Susumu Fujiwara

Yokohama National University, Japan

yamanaka@ynu.ac.jp

m-murai@ynu.ac.jp

y-inoue@ynu.ac.jp

fujiwara@ocean.jks.ynu.ac.jp

Keywords: Shellfish-gathering, Uminokouen, Ruditapes philippinarum, image analysis, video camera, visitor impact.

Introduction

The Uminokouen is an artificial sand beach located in Tokyo Bay, Japan. A significant number of the people visit this park for shellfish-gathering (seashell-digging) every spring. The present study focuses on the time variations of spatial structure of visitors of recreational shellfish-gathering in the Uminokouen. Field observations using video cameras are conducted and an image analysis technique is applied to quantify the distribution of visitors and to clarify affectors of human procedure in the intertidal zone during the shellfish-gathering.

According to the image analysis, it is found that the people move to more shallow areas appearing in ebb tide as time goes on and it seems that the human procedure during the shellfish-gathering is mainly affected by the tidal condition and topographic features.

The Uminokouen is a shallow artificial sand beach located in Tokyo Bay, Japan, as shown in figure 1. The width of the ebb tide beach from the shore line is approximately 120 m. The dominant species in the intertidal zone is the short-necked clam (*Ruditapes philippinarum*). People can enjoy shellfish-gathering freely in the beach. The high season of the shellfish-gathering is in consecutive national holidays around the beginning of May, as shown in figure 2. Due to this recreational shellfish-gathering, the clam resource is drastically decreased after this season every year (Kudo 2002). Fortunately, the

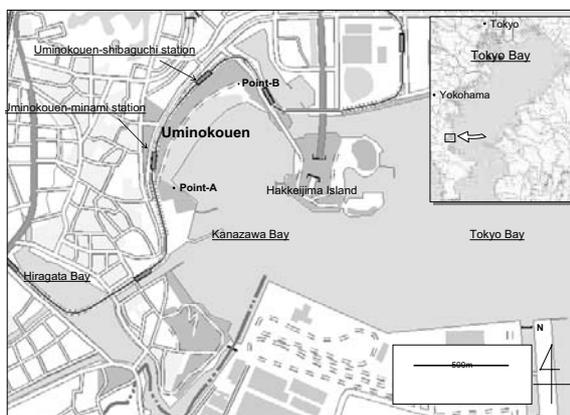


Figure 1: Observation site "Uminokouen".

clam resources have recovered naturally so far. However, there is a possibility that destruction of natural clam resources will occur if such shellfish-gathering is continued. Therefore, it is necessary to quantify the visitor impact of the shellfish-gathering to the clam resources.



Figure 2: Photograph of the shellfish-gathering in the Uminokouen at 9:56 May 8, 2005, which was taken from point-B shown in Figure 1.

Hence, this study focuses on the spatio-temporal variations of visitors during shellfish-gathering in the Uminokouen and an image analysis technique using video camera is applied to quantify the visitor impact and to clarify affectors of human procedure during the shellfish-gathering.

Methods

The field observation was carried out on May 3, 2003. Semidiurnal tide was most predominant and the low tide time was 12:00 pm in the period. Two video cameras were installed at point-A, as shown in figure 3. The left side video camera was fixed in

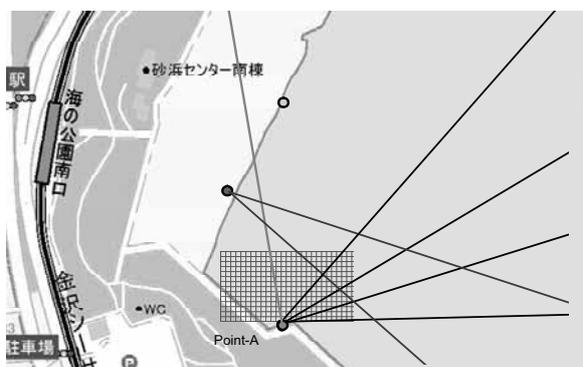


Figure 3: A spatial grid for spatial positioning.

a northern direction. On the other hand, the view direction of the right side video camera was not fixed due to follow the time change of distribution of people. A spatial grid was set near the point-A for spatial positioning, which is denoted by red lines in figure 3. The resolution of the grid is 5 m x 5 m in the horizontal plane. The grid was converted from the ground coordinate to the image coordinate of the video camera, calculated by the collinearity equation. After that, the figure of the converted grid was put on a captured video image using a image processing software to count the number of shellfish-gathering people and identify the land differences in every grid cell.

Results

Figure 4 shows the time change of the landscape recorded by the two video cameas and the distribution of the observed shore line and counted heads in the rightward figure. In the

rightward figure, a wet ebb tide beach area is colored brown, a dried ebb tide beach area is colored yellow and a undersea area is colored blue, and a number of shellfish-gathering people are also plotted on the grid points. According to these figures, it is found that the people move to a shallow area appearing by change of tide level, which denoted by brown color. Therefore, it is found that the water depth is a strong affector of the human procedure during the shellfish-gathering. It is interesting that the human procedure during shellfish-gathering is not decided only by the distribution of the short-necked clam resource. In addition, an aerial photo which was taken at low tide on May 8, 2005, as shown in figure 5, was analyzed using the method described above to clarify the distribution of people in the whole area of the Uminokouen. According to the results, the people distributed in the intertidal zone widely and there were relatively few numbers of people at the central area of the park. One can consider that it occurred because the water depth at the central area of the park is relatively deeper than south and north side and this place is away most from the car parks and the stations. Moreover, there are few people in dried area of ebb tide beach. Consequently, one may consider that the tidal condition and topographic features are the main affectors of the human procedure during the shellfish-gathering in the beach.



(a) at 10:00



(b) at 12:00



(c) at 14:00



(d) at 15:00

Figure 4: Video pictures by two video cameras with the converted grid, and the diagram of counted heads and the observed shore line at every grid cell.



Figure 5: Aerial photo which was taken at low tide in May 8, 2005 provided by The Mainichi Newspapers Co., Ltd.

References

- Kudo, K. (2002). The comparison of biological productivity between a natural beach and an artificial beach. *Kouseisya-kouseikaku. Role of Fisheries in Environmental Management and Remediation*, p 71-85. [in Japanese].