A Prediction of Human Impacts of Seashell-digging on the Ecosystem in a Tideland Park

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ABSTRACT

When we use ocean space for human activities, we should consider sustainability and allowable human impacts. After the 1960’s, we have lost 90 percent or more of the tideland of Tokyo-bay by the reclamation. "Uminokouen" is one of the artificial seashore parks developed in 1988 at the southeast of Yokohama and is well known as a relaxation place for the citizens. Over 20,000 people visit there for seashell-digging (SHIO-HIGARI) in a holiday in the spring. It is easy to understand that the human impact is quite large to an ecosystem of living bivalves in the park. Actually, the most part of living bivalves which are grew up after the last summer or autumn disappeared during the season.

In this paper, we propose a computational model which predicts the human action of seashell-digging at this park using a multi-agent-algorithm. Comparing the simulation result with the actual data, the staying time of the visitors agrees well. Then, we investigate the relation among the initial spatial distributions of the bivalves, the spatial distributions of the amount of the caught short-neck clam and the trace of the visitors. Then we predict the human impact in the best weekend for the seashell-digging and examine the sustainability of the relaxation park.

KEY WORDS: SHIO-HIGARI, human impact, tidal-flat zone, multi-agent-algorithm.

INTRODUCTION

After the 1960’s, Tokyo-bay has been reclaimed rapidly, and 90 percent or more of the tidal flat and alga place have now disappeared. "Uminokouen" is an artificial seashore park developed in 1988 and is located in the southeast of Yokohama city in Tokyo-Bay as shown in Fig. 1. The width of this park is about 800m and a tide flat extends about 200m. Since a large-size amusement park is near the side of the park, there are some parking areas and three railroad stations. This park has been recognized as one of the famous relaxation places for city residents and a lot of the short-neck clams naturally exist in this park.

A SHIO-HIGARI is one of the traditional major marine leisure in Japan. In SHIO-HIGRI, the people dig the sand of the seabed and catch short-neck clams, which live under the seabed in the tidal flat zone, at low tide. The main season of the SHIO-HIGARI is from April to May, especially during the consecutive-holidays (Golden Week): from the end of April to the early of May. The caught short-neck clams are eaten by the people. The SHIO-HIGARI is one of a major purpose of visiting the park for the city residents. The number of visitor is more than 20,000 in a day during the high peak season. The picture in Fig. 2 shows the rushing visitors to the park for the SHIO-HIGARI. Each visitor digs sand on the beach or on tidal flat area and hunts short-neck clams which live under the seabed. As a result, the most part of living short-neck clams which are grown up in this park from the last summer or autumn disappear after the season.