A Study on Quantitative Evaluation for Influence between the Habitats of Clam *Ruditapes Philippinarum* in Tokyo Bay

Fumikazu Ohtsuka
Department of Construction, Nihon University Junior College
Chiba, Japan
Mao Hironaka
Mitsui Consultants Co., LTD
Tokyo, Japan
Koichi Masuda, Tomoki Ikoma
College of Science and Technology, Nihon University
Chiba, Japan

ABSTRACT

Regarding the larvae of clam *Ruditapes Philippinarum* (*asari* clam) in Tokyo Bay, the advection, dispersion and mutual supply of *asari* clam was simulated by using a numerical model. With the supply status of *asari* clam as an index, the influence between the habitats of *asari* clam could be clarified quantitatively.

From these results, several habitats of *asari* clam could be confirmed as places of stable *asari* clam reproduction. We also propose sea areas as possible habitats for *asari* clam in Tokyo Bay. These results could propose important indexes for conserving and establishing the habitats of *asari* clam and for planning and constructing shallow waters and tidal flats.

KEY WORDS: clam; plankton larvae; tidal flats; shallow water; Tokyo Bay; Sanbanse; Banzu

INTRODUCTION

In recent years, such environments constituting the foundation of coastal ecosystems as tidal flats, underwater seaweed beds and coral reefs are in a critical situation due to a drastic decrease of *asari* clam and other bivalve resources and serious deterioration and loss including rocky shore denunciation and coral bleaching.

Regarding Tokyo Bay, almost all coasts in the bay were tidal flats at the beginning of the 20th century. However, 90% or more of the tidal flats have been lost to date by reclamation. The great loss of tidal flats seems to have directly led to the reduction of the habitats of organisms living on tidal flats. While causing the variety of species to diminish, this loss may have also greatly reduced the amount of organisms, the production output, and also the purification function.

The *asari* clam, which represents bivalves on tidal flats, is a shellfish indispensable for dishes in Japan and is also confirmed to play an important role in the purification function of tidal flats.

In their initial stage, the larvae of *asari* clam float in the sea for a period of time and have almost no swimming power. As a result of advection and dispersion by water currents, the larvae move within a wide area for a few weeks. Many larvae are thought to settle and grow in different places from where they were bred. This kind of interlink between habitats is called an ecosystem (*asari* clam) network. For the rehabilitation and conservation of *asari* clam, it is considered essential to grasp and elucidate its existence.

The network of *asari* clam in Tokyo Bay has so far been studied by Kasuya et al.(2003a,b,c), Hinata et al.(2005), Tanaka et al.(2004), and Hironaka et al.(2007). Kasuya et al.(2003a,b,c) carried out the "Asari Clam Project" to observe clam larvae throughout Tokyo Bay and estimate their breeding places and growing speeds. Hinata et al.(2005) created a larva advection model that estimates larva breeding places by numerical simulation, and also studied the larva advection process and the influence of currents and predators on them. Tanaka et al.(2004) studied the source of the larvae supply to the Kanazawa-Hakkei sea area by numerical simulation and confirmed that it could be the Banzu Tidal Flat. In addition, Hironaka et al.(2007) applied the assimilation method to the simulation of flow in Tokyo Bay and also studied the floating routes and patterns of *asari* clam larvae.

These studies only grasp the facts of the appearance of larvae in Tokyo Bay or the estimation and confirmation of larva advection floating patterns in the bay. They are yet to quantitatively evaluate the influence between such habitats as tidal flats and shallow waters.

Therefore, this study aims at a qualitative analysis and evaluation of the influence between the habitats of *asari* clam by using the supply of larvae as an index.

NUMERICAL PROCEDURES

Flow simulation technique

In this study, a multi-level flow model was used. The basic equations are shown below.

At the opening boundary of the bay, the water level was set by synthesizing four tidal constituents (M2, S2, K1, and O1). For calculation in August 2001, the assimilation method was applied.