
Estuaries of the World

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Editor

Eutrophication and Oligotrophication in Japanese Estuaries

The present status and future tasks

 Springer

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Prologue

Human activities on land have expanded enormously since the industrialization became a main stream of economic development. World population which was estimated at 2.6 billion at the middle of the last century reached 6 billion at the end of the century and is expected to become 9.6 billion in 2050 according to medium-variant prospects of Population Division of DESA, United Nations. Furthermore, Gross World Product has increased from 7.0 trillion US dollar (2010, PPP) at 1950 to 77.2 trillion at 2010, more than ten times, according to Earth Policy Institute estimates. Most of the large-scale industries and big cities became located close to the sea, and the coastal sea environments have suffered ecosystem damages from the impacts of expanded human activities.

Japan achieved rapid economic expansion in the 1950s and 1960s, and gross domestic product (GDP) per capita increased almost a hundred times during 50 years starting from 1960. Behind the initial period of the economic growth, however, peoples met with various types of environmental deteriorations including large changes and pollutions in the coastal sea areas.

One example of severe industrial pollutions was found at the Dokai Bay in Kitakyushu City, northern part of Kyushu Island. Expansion of the steel work industries, followed by coal and heavy chemical industries' development around the bay caused severe marine water pollutions. No fish catch lasted for a long period, and at the end of the 1960s chemical oxygen demand (COD) at some part of the bay was reported as high as 70 mg/l resulting in the worst record of the polluted bays in the Asian region. The Dokai Bay has now completely renovated from being once called "The Sea of Death" through the hard endeavors and initiatives by the local community, labor unions, and local government. As a matter of fact, Kitakyushu was cited on the occasion of UNCED (Rio de Janeiro, 1992) as the capital of Sustainable Development of the World.

Economic developments are usually followed by urbanization, migration of population into big cities. Urban population concentrations are found in many countries worldwide, typically at big cities along coasts. Flat plains, if they exist behind inland seas or enclosed seas, provide convenient spaces for city development and attract people by supplying comfortable spaces and job opportunities.

The Tokyo Bay watershed area which covers Tokyo and six prefectures (15,500 km², 4% of the total area of Japan) has about 37 million inhabitants (30% of the total population), and economic activities in this area are expected to cover close to 40% of the total GDP of Japan. The dense population has big impacts to the Tokyo Bay water qualities through the number of rivers emptying into the bay. Natural beaches have been replaced by artificial concrete walls that separate land and sea. The water qualities once deteriorated have been improved mainly due to the implementation of the total pollutant load control system for nutrients to the enclosed seas. In these years, however, the blue tide events are still observed, which are considered to be caused by the deficit of dissolved oxygen in some parts of the bottom of the bay.

Also at the Seto Inland Sea, which is the largest enclosed sea in Japan, the drainage basin consists of 13 prefectures (18% of the total area of Japan). Population in the basin area is about 35 million (28% of the total population), and GDP in this area corresponds to 26% of the total

as of 2008. Fishery has been the important industry in the middle part of the inland sea, but the water qualities were also impaired in the 1960s and 1970s when red tide occurrences were frequently observed. Again, the introduction of the total pollutant load control helped improvement of the coastal water qualities. Current nutrient concentrations have become so low that fishermen are worrying about lowering fish catches due to decreased amount of feeds, such as plankton in coastal waters.

Coastal seas, especially major estuaries in countries under industrial development stages, might face similar situations as what the estuaries in Japan went through. In order not to repeat the same sufferings, the lessons learned from the past events in Japan might be made the most of, which are covered comprehensively by this book. Analyses of coastal water environment affairs, management of human activities in backyards, governing systems including legislation and community activities, water-related technology development, and so on are quite dependent on local characteristics. Hopefully, all the estuaries are to be conserved as healthy spaces which provide full ecological services including sustainable supply of a variety of marine products, providing recreational, cultural, and spiritual values to the people living in the surroundings of estuaries and visitors.

President, International EMECS Center
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Motoyuki Suzuki

Contents

1	Eutrophication and Oligotrophication in Japanese Estuaries: A Synthesis . . .	1
	Tetsuo Yanagi	
2	Eutrophication in Tokyo Bay	5
	Keita Furukawa	
3	Oligotrophication in the Seto Inland Sea	39
	Tetsuo Yanagi	
4	Disappearance of Hypoxia in Dokai Bay	69
	Machiko Yamada	

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Dr. Tetsuo Yanagi is a coastal oceanographer. Tetsuo has about 500 scientific publications. He was awarded a Japan-France Oceanographic Society Award in 1986 and the Uda-Prize of Oceanographic Society of Japan in 2012. Tetsuo was a member of the Scientific Steering Committee of Land-Ocean Interactions in the Coastal Zone (LOICZ) and is a member of the Scientific Planning Committee of Japan's Environmental Management of Enclosed Coastal Seas (EMECS). He discovered the tide-induced residual current and proposed a new concept of Satoumi for integrated coastal sea management.

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