

## **“Health Examination” for the Sea: A New Concept of Marine Environmental Monitoring**

Okawa, Mitsuru<sup>1</sup> Nakata, Hideaki<sup>2</sup> Hirano, Takuro<sup>3</sup>

1 Ship & Ocean Foundation, Tokyo, Japan 2. Nagasaki University 3. Metocean Environment Inc.

The sea provides humans with numerous benefits including aquatic resources through its diversified food web systems. However, its vulnerability to such damages as over-nutrition stemming from land-based human activities has lately claiming increasing attention.

Marine ecosystem has its own specific mechanism comparable to that of a human body, to maintain a material balance. Rivers carry nutrient salts down into, for example, an enclosed bay to be dispersed in the adjacent waters, where food webs effect biological production, decomposition and purification. In a sense, fishing also helps maintain the balance by preventing overpopulation of organisms.

In recent years, the diminishing of ecologically important shallow water areas along the coast, including tidal flats and seaweed beds, has hampered biological water purification and material circulation by means of food webs. With a limited water exchange with the open sea, enclosed bays, in particular, suffer from serious impacts resulting from the reduction of shallow water areas.

In this context, the authors are now trying to establish a guideline to carry out “health examination” for the sea or a marine environmental monitoring that aims at more precise diagnosis of the sea. This paper outlines the guideline: check sheets to grasp ecological features of enclosed bays; primary monitoring similar to daily checkup by using available data and environmental information obtainable by easy measurement, and advanced monitoring comparable to a thorough physical examination based on specialized measurements and analyses to examine “health of the sea” and find out causes of inflicted damages.

The authors have employed three criteria to examine the health of the sea: (a) dissolved oxygen necessary for marine life, (b) stability of ecosystem, and (c) smoothness of material circulation. Consequently, it is essential in this research to monitor properly not only the standing stock of a material at a certain point of time, but also its flux and flow. Presentation will be given on the monitoring items selected in accordance with the above-mentioned criteria, and on some results of case study. Furthermore, necessity of organized efforts toward continuous monitoring and its data management will be also discussed.